Relations of Public Transport and Traffic Safety

P. Holló

KTI Institute for Transport Sciences Non-profit Ltd.
Road Safety Centre
Phone: 06-1/371-58-23
Email: hollo.peter@kti.hu

Széchenyi István University Transport Department
Phone: 06-96 /503-400/3353
Email: hollop@sze.hu

Excerpt: comparison of public and individual transport, evaluation on traffic safety basis

Key words: public transport, traffic safety, sustainability

1. Introduction

Recently, the term of sustainability has spread in almost all domains of the life, thus in the field of transport, too. Given the traffic congestions developed in dense urban traffic, it is clear that those responsible for traffic management grab all the opportunities in order to sustain the smooth and undisturbed flow of traffic. A growing number of environmental and traffic control arguments insist on giving preference to pedestrian and cycling traffic because they are environment-friendly and their gaining ground decreases the occurrence of traffic congestions. Of course, these transport modes can be attractive and may constitute a real alternative only in case of certain distance and weather conditions.

2. Road safety of different transport modes

Let us examine the development of the probability of a road accident, or of the incurred fatal injury risk for the different traffic modes. (It is worth examining the latter not only because fatalities are the most severe consequences of the road traffic accidents, but also because the definition of the fatal injury is almost the same in every country, so it makes possible an undistorted international comparison. Notably: the deceased within a 30-day-period after the road accident date are considered as fatal victims of road accidents. It is important to note that the major international databases using the so-called correction factors convert to the 30-day-value the data of some countries which have not yet used this definition.) Tables 1 and 2 show the results of an EU-wide comparison. [1]

Table 1.: Accident fatality risk of different transport modes in the EU in 2001/2002 (killed/100 million passenger-kilometres)

Road (total)		**0.95**
motorcycle/moped	13.8	
pedestrian	6.4	
cycle	5.4	
passenger car	0.7	
bus	0.07	
ferry		0.25
Air transport (civil)		0.035
Rail		0.035

Table 2.: Accident fatality risk of different transport modes in the EU in 2001/2002 (killed/100 million passenger-hours)

Road (total)		**28**
motorcycle/moped	440	
cycle	75	
pedestrian	25	
passenger car	25	
bus	2	
Air transport (civil)		16
ferry		8
Rail		2

Although the data in the two tables are clearly different, the accident fatality risk of different modes of transport on several points present a similar ranking order. (In both tables road traffic is the most dangerous while the railway transport is the safest; in both tables the accident fatality risk is the highest for riders of the motorized two-wheelers – motorcycles and mopeds.) Unfortunately, there are no recent data available in the literature however, it is very probable that the scale of the values, their ratio has not changed significantly since then. Before the data are analysed it is worth thinking which data of the two tables reflect better the real risk of fatalities. Despite the fact that in the profession there are in quite a great number those holding the view that the number of trips, or the time spent in traffic express well the user's exposure, it can be declared that

the road safety experts widely agree that, as the matters actually stand in the field of transport sciences, the number of the kilometres performed (run or „travelled") is the best approach, a measuring number for effective exposure. Also the author believes that the extent of exposure is best represented by the number of kilometres performed. Unfortunately, this measuring number is not a perfect one either, since for example by far it is not all the same in what circumstances is the distance concerned performed (on a safe motorway or in the conditions of congested urban traffic), however, no more appropriate indicator is available for the moment. Both tables jointly assessed when comparing the different transport modes the following conclusions can be drawn.

2.1. Fatality risks in road traffic

The two-wheeled motor vehicle riders/passengers are exposed by far to the highest accident fatality risk in road traffic. In comparison to passenger car occupants, the accident fatality risk for motorcycle or moped riders is 17.5 times (time related) or 20 times (distance related) higher, respectively.

Passenger car travelling is 1~3 times (compared to time), or 7~9 times (compared to distance) safer than cycling or walking, in spite of it the safety of passenger car occupants is 10 times (distance measurement), or 12 times (measured in time) lower if compared to that of bus travellers.

Consequently, already here it is worth emphasizing two things:

- on the one hand, the outstanding safety level of public transport;
- on the other hand, the extremely unsatisfactory safety levels of the so-called "sustainable" and environmentally friendly transport modes (walking, cycling). (The related recommendations are detailed later.)

On the basis of the results recommendations of the authors of the referenced study [1] are the following. If the distance travelled by walking or cycling prior to, or after getting to bus (or train) exceeds the 15 percent of the total travel distance, it is safer for the road user to travel the whole distance by a passenger car than by bus (or train). Namely, in this case the outstandingly high accident fatality risk of walking or cycling can be avoidable. Other road users (another passenger car's driver, passengers, riders of two-wheeled vehicles /cycle, motorcycle, moped/, pedestrians) are killed mostly in accidents in which passenger cars are involved. Therefore, from community aspects the trips made by using the public transport means and previous/subsequent walking or cycling are safer than travelling by passenger cars. Consequently, when evaluating the results, a substantial difference should be made between the individual and the public (collective) accident/injury risks.

In 2010 30,700 people lost their lives as a consequence of road traffic accident in the 27 member states of the EU. Despite the fact that this means on average 44 percent decrease in comparison to the 2001 data (54,300 fatalities), the EU's new road safety action plan foresees another 50% reduction by 2020 [2].

According to data 97% of the victims of fatal traffic accidents are killed in road accidents. The so-called fatality risk of road passenger transport (number of killed/1 million population) is almost hundred times higher than the sum of all the other

transport modes in total (railway, shipping, air transport), because the accident fatality risk in road transport is significantly higher than in other transport modes. In the EU member states 88 percent of passenger transport is implemented on roads.

If the problem is analysed from the aspect of accident losses, in conformity with the EU Commission's estimation [1] 93% of the passenger transport related annual accident losses is caused by road accidents ahead of the losses resulting from traffic congestions and environment pollution.

Analyzing the fatality risks of different transport modes in the terms of health care it can be ascertained that the EU citizens besides cancer and coronary heart diseases, most frequently are fatal victims of road accidents, i.e. these three are the predominant causes of death. Moreover, most people need hospital care due to these three reasons as well. Clearly, under the age of 50 road accidents are the leading cause of death in the EU member states. The consequences of road accidents are the most serious even if the expected number of the lost years of one's life is analysed. Its main reason is that the average age of road accident victims is regretfully low (about 32 years).

It is almost a cliché to say that road transport is dangerous. If the number of fatal injuries is related to the time spent in road transport, fatality risk is 40 times higher than in a workplace and 12 times higher than at home. Even the risk of death of the safest road transport mode (travelling by bus) is more than twice the risk of death in the workplace (in relation to time spent in transport).

2.2. What is reflected by national accident data?

Let us examine the breakdown of the number of the fatal victims of road accidents by their participation in traffic.

An essential proof is offered for by Figure 1 which presents the number of killed in road traffic accidents in a breakdown by participation in traffic between 1984 and 2010.

It is not surprising that in most cases and in an increasing proportion the passenger car drivers or passengers were the fatal victims (almost 45% in 2010). To a certain extent this increasing proportion is the evident consequence of motorization. However, it seems that in recent years (as of 2003) the increasing rate of the safety belt wearing as well as the higher and higher passive safety level of passenger cars have started to stabilize the previously rising curve. The decreasing rate of the pedestrians killed in the long term can also be associated with the domestic development of motorization, i.e. less walking, more driving. The share of this group was about 26% in 2010. Here also, as of 2003, the trend decreasing in the long term seemed to be stabilized. The proportion of killed cyclists fluctuates around a constant value. The measures wanted and intended to improve the safety of cycling – probably because of the increasing popularity of this transport mode (i.e. due to growing cycle traffic) – had no provable results.

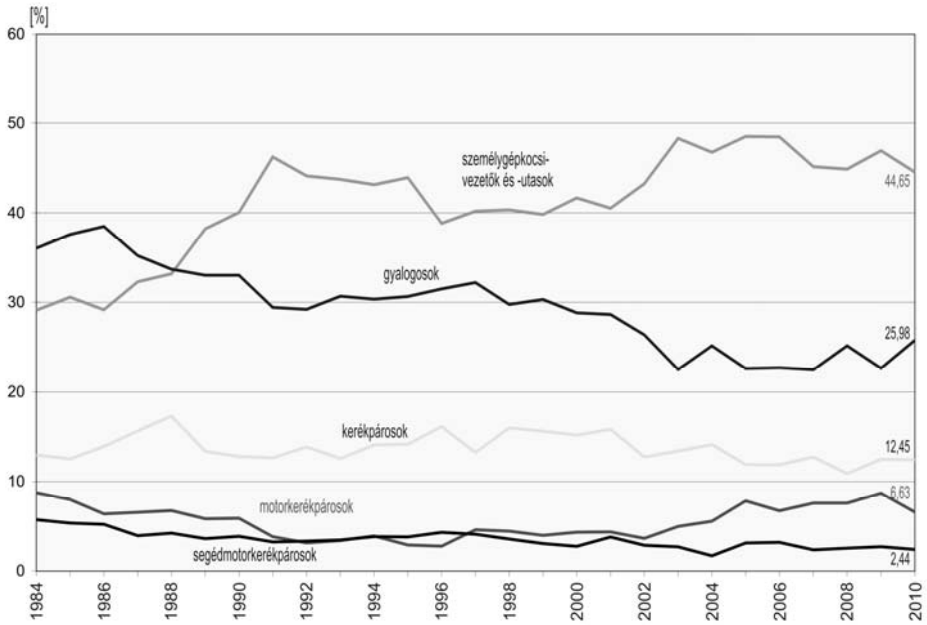

Figure 1.: Distribution of the number of killed as a consequence of road traffic accidents in a breakdown by mode of participation in traffic between 1984 and 2010

In recent years for a long time with a "head-to-head" development the curves of the two-wheeled motor vehicles (motorcycles, mopeds) diverged. [3]. While the rate of died moped riders remained relatively low (2.4% in 2010); that of killed motorcyclists – correspondingly to trends experienced worldwide – significantly grew, until 2010, then a decrease occurred [4]. 92.15% results if the right-hand side partial results are added. If considered that the transport modes in the figure without exception are individual forms, the safety level of public transport is outstandingly high. Further important conclusions can be drawn from the analysis of the values. For instance it can be found that the 44.65% rate of the passenger car occupants can be compared to the summed up 47.5% proportion of the so-called vulnerable road users (pedestrians, cyclists, motorcyclists, moped riders). If the Annual Accident Statistics of 2010 is opened [5], it turns out that 3 and 9 persons were killed in road accidents as bus drivers and bus passengers, respectively. This is but 1.62 percent of all killed in road accidents (740 victims) also proving the high safety level of bus transport. Consequently, the vulnerable road users and the passenger car occupants continue to be the main target groups of road safety activities. It is a fact, that in the years before 2010 the proportion of killed motorcyclists increased in Hungary as well, but this rate undoubtedly requiring an increased attention does not make yet these road users the number-one target group of prevention.

3. Public transport in transport policy

3.1. The national transport policy actually in force

In the currently in force Hungarian transport policy [6] reference is made in several places to public transport. For example, the chapter dealing with the provision of sustainable development emphasizes: "the preservation of the present share of the passenger transport within public transport through the development of its assets, infrastructure and service level as well as the modernization of the urban transport systems for the upgrading of the conditions of non-motorized transport." The degree of approvability of this effort from the points of view of both road safety and environment protection are well illustrated by the data above [1]. The Hungarian transport policy has obtained similar findings when it states that: "the improvement of the relations of the different transport modes is an important view point of the national transport policy. The appropriately developed points of meeting and interchanging of the modes of individual (pedestrian, cycle and passenger car traffic), and public transport (bus, railway, urban transport vehicles) help providing a higher quality, safer and more environmentally friendly transport with better and wide-ranging services for individuals, families and business trips."

3.2. The EU's road transport policy in force

Public transport is not specifically mentioned in the current road safety policy of the EU [2}. The different modes of road transport are compared in one place only. On page 11 of the section dealing with enhancing the safety of vulnerable road users it is assessed in what extent succeeded to moderate the number of killed as a consequence of road accidents by their participation mode in traffic between the years 2001 and 2008. The road safety advantage of public transport is clearly underlined by the fact that in the period referred to above the number of killed in bus transport decreased to the greatest extent, i.e. by 60%. The already excellent traffic safety of bus-passengers improved even further. It is worth mentioning that the number of killed in passenger cars decreased by 35% while the number of victims fatally injured in motorcycle accidents was reduced to the lowest extent, all in all by 4%.

4. International research

Because there is a big difference among the safety level of different transport modes [1], the idea emerged that it is worth analysing what could the different transport modes "learn" from each other. As a part of the seventh EU research framework programme the "EXCROSS" (EXploiting safety results aCROSS transportation modes) research project has been started recently. This project compares the different transport sectors just in terms of safety while endeavouring to exploit one of the sectors' safety-enhancing strategies and actions which proved to be successful in other ones as well. Here there are just a few topic-related ideas highlighted from the findings of the ongoing research.

As far as modal split is concerned the section on road safety emphasizes that in comparison with individual transport, public transport is obviously safer and more

environmentally friendly, but less attractive. Therefore efforts in transport policy are focused on the improvement of the attractiveness of public transport worldwide, i.e. the wished to have it transformed into a clean, fast and comfortable mode. Another major finding is that the avoidable motor vehicle traffic shall be avoided. This is beneficial both in terms of road safety and environmental protection, but it contributes to ensuring sustainability as well. To this aim such options as e-learning, e-working can be used, i.e. those online forms of learning and working which do not require travelling. In addition, rational urban development can also help a lot in reducing the number of unnecessary trips. Lesser traffic does not only mean fewer traffic conflicts, reduced number of accidents, less traffic congestions, but also cleaner air and lower noise level.

5. A few words about the passive safety of bus passengers

Anyone who has already travelled abroad by a coach could experience that the safety belt is available for bus passengers, too. The analysis of bus accidents shows that mostly the unfastened passengers suffer fatalities, because they got fatally injured either by tumbling to one another, or by colliding with the inside of the bus, or by falling out the windows or often by getting under the bus. In my view, from many respects several sections of domestic legislation need updating.

Firstly, currently the safety belt should not be fastened in scheduled buses carrying passengers outside built up areas if the carriage of standing passengers is also allowed. Exemption to safety belt wearing is also given to children under 3. It is easy to see that these provisions do not guarantee maximum safety for bus passengers.

As far as the installation of buses with safety belt is concerned, the item (11) (f) of the Article 81 of the KÖHÉM Regulation No. 6/1990 (IV.12.) should be mentioned, according to it all passenger seats looking forward must be equipped with one of the following safety devices:

- Safety belt, or
- Properly designed backrest of similarly forward facing seat of sufficient strength, or
- Crash wall or crash rail of sufficient strength and properly designed.

It goes without saying that only the appropriate safety belt protects bus passengers against collision to other passengers or to the inside of the bus or from falling out the bus.

A special chapter would be addressed to the problem of school buses. According to the Hungarian Highway Code (KRESZ) all non-scheduled buses which are engaged in the transportation of preschool children or pupils of public institutions are classified as school-buses. Accordingly, to these buses defined tables should be affixed, the seats should be equipped with safety belts, children under 135 cm height should be fastened with child safety systems, while children at least 135 cm tall should be fastened with (adult) safety belts. However, the question is what the term “regular” means.

By these few examples I just wished to draw attention to the possibilities of further road safety improvement of the current domestic legislation.

6. Summary, conclusions.

Taking into consideration the traffic safety and environmental protection advantages of public transport, and in view of its preference that also contributes considerably to the sustainability of transport, efforts should be made in order to maintain and enhance its role. For this to succeed, the public transport should offer an attractive alternative vs. individual transport.

For professional comparison of the accident risk of the different transport sectors and transport modes reliable, exposure-describing data would be needed. Such data are referring to distance and passenger transport performances characterizing the vehicle- and passenger-kilometres. In the future, in any event, more attention should be paid to the collection of such data which are based on regular and representative samples.

Higher safety level supported also by the number of bus passengers could be made even more attractive by further updating of the domestic legislation.

During intermodal passenger transport developments the great differences existing between the accident risks of the different transport modes should be taken into consideration. The safety of pedestrian and cycle traffic should be improved. Not only because the safety level of these environmentally friendly, healthy and traffic sustainability supporting transport modes is not satisfactory, but also for optimizing the safety of public transport, since the accident risk is very high in case of cycling or walking while passing along or following the motor vehicles engaged in public transport.

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