



Integrated safety systems – the approach toward sustainable transport

J. ŻUKOWSKA^a, M. MIKUSOVA^b, L. MICHALSKI^a

^a GDANSK UNIVERSITY OF TECHNOLOGY, Narutowicza 11/12, 80-233 Gdansk, Poland

^b UNIVERSITY OF ZILINA, Univerzitná 1, 020 26 Zilina, Slovakia

EMAIL: joanna.zukowska@wilis.pg.gda.pl

ABSTRACT

Continuously growing mobility which has been observed from many decades means that societies are increasingly more affected by the negative aspects of transport such as: accidents, emissions, vibration and noise causing social, economic and environmental problems. With about 1.3 million people killed in transport each year and accident costs exceeding EUR 200 billion in the European Union (more than the European Commission's annual budget), there is an urgent need for action in the area of transport safety. There are also estimates suggesting that transport causes half of today's environmental pollution. The aim of this article is to present an idea of transport safety integration as a modern and effective approach toward sustainable transport which should be implemented on the European level.

KEYWORDS: sustainable transport, integration of transport safety, accident prevention

1. Introduction

According to World Bank figures, the total number of transport fatalities has exceeded 1.3 million annually and is growing constantly. Recent World Health Organisation (WHO) estimates put road accidents as the ninth most frequent cause of death shortening human life expectancy, but according to 2020 forecasts it will be the third [1]. In 2009, the first international ministerial conference on road safety was held in Moscow. Its participants made an appeal to the UN General Assembly, urging it to declare the period 2011-2020 a decade of action for improvement of safety on roads. At the same time, they declared that a global progress report would be prepared for preventive activities and efforts to reduce the health and death hazards in road traffic. In February 2010, during the 64th session of the UN General Assembly, the problem was presented under the title: "Global Crisis in Road Safety" [2] and it was decided that the problem of losses in road transport, especially in poor and developing nations, would be on the agenda of the 66th session. Furthermore, the General Assembly called on the UN Secretary

General to prepare a report on the progress achieved towards the targets specified in the Plan of Action for the Decade. In Europe, in spite of the significant progress in prevention, transport and especially road accidents are the most frequent external cause of death for people below the age of 45, while the human and material losses are valued at over 200 billion euro a year – more than the European Commission budget.

Transport accidents are also a source of great human losses to the public, resulting from their destructive impact on the lives of the casualties and their families. But until not long ago, only economic losses were considered to be the main element, which caused the work on a European transport safety system to accelerate. Meanwhile, terrorist attacks since 2001 have greatly intensified work on transport safety, as transport infrastructure has become the most likely target. Therefore, in countries with the highest level of transport safety, it is perceived as a major criterion in the life quality assessment. This means a special priority for activities to improve transport safety.

2. Sustainable transport development

Defined as the movement of passengers and goods, transport is the precondition for economic growth and other forms of human activity. Consequently, public demand for transport is determined by our lifestyles and the level of mobility, including not just economic activity but also tourism, sports and other spheres of life. Society is becoming increasingly mobile. The distances covered by the average European ranged from 200 m daily on foot in the Middle Ages to 500 m towards the end of the 19th c. Today people travel more than 50 km a day on average. Growing mobility means that societies are increasingly more affected by the negative aspects of transport such as accidents, emissions, vibration and noise causing social, economic and environmental problems. With about 1.3 million people killed in transport each year and accident costs exceeding EUR 200 billion in the European Union (more than the European Commission's annual budget), there is an urgent need for action. There are estimates suggesting that transport causes half of today's environmental pollution.

Public interest in the loss and damage caused by transport grew significantly in the second half of the 20th century. With World War II over, the excess production of fuel and steel encouraged quick economic growth and triggered a rising demand for transport. This, however, left the systems of transport unprepared for tackling the safety and efficiency needs of the public. It was not until the Treaty of Rome in 1958 introducing the elimination of borders, free movement of persons and goods and improved safety of transport, that the foundations for regular research and the implementation of its results were established. While the Treaty did state that "the citizens of the European Union have the right to safe living and working conditions", it was not enough to serve as a legal basis for ensuring the right level of transport safety. As the process of European integration progressed, the transport policy found itself unable to cope with the problems of transport safety and environmental protection and in particular with the side effects of transport. As a result, in technical and political terms transport proved unmanageable and too difficult to coordinate at a pan European level

The early 1980s saw the emergence of a new doctrine of political economy called "Sustainable Development". Originally defined as "development based on a reasonable use of cultural and natural resources which cannot be replenished, renewed or have a limited ability to self-replenish or reproduce". At the time the negative effects of transport systems were considered one of the most significant factors having a strong negative effect on nature causing in turn the deterioration of culture. Where there is no culture, there is no civilization. Following up on these scholarly warnings the United Nations Organization organized the 1992 Rio de Janeiro Earth Summit. One of its main themes was "We have borrowed Earth from future generations". In September 2001 the European Union published its "White Paper on Transport Policy – Time to Decide" stating that there is an uneven focus on safety across the modes of transport. The document has highlighted a significant lack of proportion in the development of transport, in particular road and air transport leaving rail far behind [3]. The

European Parliament and European Commission have stated that the right to free movement of EU citizens means the right to safeguarding the safety of the entire system of transport. That gave rise to the need to integrate the different modes and in particular their systems of safety.

3. Safety culture approach

Building an integrated safety system of transportation by road, rail, air and water is not simple. The problem is not only that integration requires considerable spending and a long time to change the quality of many subsystems now in place [4]. Integration is, in the first place, about people and their perceptions of what is a life or health hazard in transport that have to change. Only after these changes have taken place is there the right climate to develop new systemic solutions. One of them is the development of the "safety culture" – an important, constituent element of social development [5]. The term means *a lasting value and a priority for every person or organisation trying to minimise the health and life hazards caused by the malfunctioning of the safety system*. In developed societies, the safety culture becomes a standard also in transportation. Of the ample evidence supporting this statement, let us quote the most important. As early as half a century ago, the Americans integrated the research into road, rail, air, water and pipeline transport accidents into one, independent system, directly reporting to the Congress and the President. This independence is the core of the matter, as scientific progress in investigating the causes and circumstances of accidents is primarily dependent on the knowledge that can be obtained about what really happened, and not about whose actions led to the disaster. In Europe, which learned from the American experience, we can see an even more sophisticated approach to the accident-related death or health hazards. In the Netherlands, for example, independent investigation is conducted into the causes and circumstances of accidents and disasters in all areas of human activity. A change in the way transport risk is perceived can also be observed, especially road transport risk. Until recently, investigation into the causes and circumstances of road accidents was conducted in order to reduce their number through accident prevention and consequently, mitigate the effects in terms of fatalities and injuries. The new approach, however, uses the term "injury prevention" more and more commonly and refers to injuries caused by road traffic, which is considered to be the main source of accidents – not only in transportation. To conclude: the shift from accident prevention to injury prevention means a new paradigm in transport safety. So it is actually a change of attitude, from "an accident is a random event that cannot be foreseen" to "an event causing human injury can be foreseen." If it can be foreseen, it can be averted, if it does happen though, its impact can be mitigated.

We should also note the changes in the way safety is approached by modern societies, who make it a priority not only in the national budgets, but in family budgets as well. An example is the new method of estimating the value of prevention of death or injury by examining the "willingness to pay." Surveys are conducted to provide the answer to the question: "How much a citizen would be prepared to spend on improved safety, e.g., in road traffic, to save one fellow-citizen

from an accident?” The growing interest in the method indicates that the problem of safety is increasingly important, becoming a major criterion in quality of life assessment. Furthermore, modern societies have accepted other sacrifices for the sake of various safety/security procedures, despite the cost involved in terms of giving up certain freedoms or personal comfort [6]. For example, security procedures imposed after the September 11, 2001 terrorist attack in New York contain many elements the introduction of which would have seemed impossible prior to the attack, because of the way in which the notions of “civil liberties,” “personal freedom,” or “information privacy” were then understood. These sacrifices may have helped to give rise to the interest of the public in transport safety, broadly understood as a public health issue.

Transport safety issues are also becoming a research subject of political sciences. From the sociological point of view, safety seems an easy task – it would be enough to get the public accept a preventive slogan “Don’t get injured!” and the level of health or death hazard in transport (and not only there!) would go down significantly. One might even assume that the on-going process of educating the public would take us towards the zero level, like in the Swedish programme “Vision Zero”, which is expected to bring the number of fatalities and serious injuries close to zero. In reality, however, it is difficult to get to such a state; to develop a structure that would ensure safety in confrontation with a sudden hazard. Besides, having a safety system is not enough to achieve safety as a permanent condition [7]. What is also needed is the organisational culture that supports the management system and helps it to develop. Forecasting the safety situation is an ex-ante activity, while evaluating how effective the measures taken have been is an ex-post activity. This does not seem to be popular with researchers. Most commonly, publications are of contributory nature and have to be studied in combination with others. At the same time, politicians do need the support of researchers, especially in the process of making decisions and seeking solutions to major social and economic problems. Transport safety is one of such problems, where it is difficult to find simple criteria to choose a policy or a concept for the solution of the problem. So why do we deal with integration? There are several reasons for this. Integration makes knowledge sharing easier, accelerates the implementation of proven methods and procedures, improves organisational cohesion, strengthens the influence on the legislative system and ensures the best possible use of human resources. While building an integrated transport safety system, therefore, we also have to develop the tools with which to evaluate the impact of the adopted transport policy and the preventive measures applied on the actual improvement of transport safety. Ex-ante studies are, by nature, complex – especially when standard methodologies are used, meeting basic requirements of research work. Both politicians and authors of preventive programmes are known to be interested in what is called a forecast of transport safety improvement in the context of the technical, organisational and financial means that are used. Most importantly, though, the number of countries setting specific targets in their transport safety programmes is growing and politicians want to have instruments with which to evaluate the effects of their policies. This helps them to understand why progress has been made in safety improvement or why there has been no progress despite the resources allocated.

4. Transport safety in transport policy

The EU Council has acknowledged the significance of research and technology for improved transport safety by Directive 94/914/EC, in which basic lines of activity have been specified. One of the priorities is the development of research on greater safety of means of transport. In some EU member states, special administrative and consultative bodies have been established as well as research centres engaged in comprehensive studies on safety in particular transport modes: road, rail, air and water. The starting point for the development of a new European policy was the Commission document on transport, which focused mainly on the significance of the sector for the economy and the need for its liberalisation. In the new European transport policy document adopted in 2001, “White Paper – European Transport Policy till 2010 – Time to Decide,” Commission expectations are specified concerning a 50% reduction in the number of transport fatalities [3]. An important role in the efforts to improve transport safety is played by the ETSC – a non-governmental organisation established in 1993. The ETSC is an advisor to the European Commission, the European Parliament and national governments on safety issues of all transport sectors: road, rail, air water and pipeline. However, as the losses sustained in road transport are much higher than in the other modes [8], road accidents are the main focus of ETSC attention. The organisation is the author of subsequent road safety improvement programmes in the European Union. After the publication by the Commission of the “White Paper on Transport Policy” in 2001, the ETSC had a strong influence on the preparation of the road safety programme “III Road Safety Action Plan,” which was to implement the road safety objectives of the EU transport policy. The responsibility of the states is to ensure that road transport is no longer connected with the high level of hazards to life and health of the citizens. To achieve this goal, the state must not only allocate adequate financial resources, but also provide efficient coordination of the road safety efforts made by all the entities involved. Furthermore, the document clearly states that “The principles consistent with the Europe Agreement and EU transport policy require that the hazards to health and life in all transport sectors be minimised...”

Towards the end of the 2001-2010 decade it was stated that not all the goals had been achieved. The experiences gained in the course of the III Road Safety Programme of the EU have been used in the blueprint for a IV Programme for the 2011-2020 period prepared by the ETSC. Probably one of the most significant research projects aimed at the integration of transport safety research was the SafetyNet “Building the European Road Safety Observatory,” implemented in 2004-2008 within the VI Framework Research Programme and co-funded by the Directorate General Transport and Energy (DG TREN) of the European Commission. Although the project dealt only with road transport, it is an important stage on the way to an integrated safety system for all transport modes in the EU. It is, in the first place, an independent database on the road transport safety that can be very useful to politicians and decision makers prior to decisions about prevention activity. Part of the database is generally accessible via the Internet (www.erso).

eu), and its main advantage is the reliability of the information it contains. One of the most important recommendations for future work is the necessity to build national road safety observatories in the member states and their regional branches [9].

Most recent experience of countries which are advanced in the development of transport safety systems indicates that major issues here are [10]:

- how transport safety fits in the transport policy of the state;
- whether or not transport system activities are duly coordinated;
- the human being, with his/her skills, abilities, perceptions and resilience.

Preventive measures should therefore reduce human vulnerability, probability of collision and its consequences. They should also include a proper technical approach in terms of how the technical condition of a vehicle (object) affects the safety of transport task performance. A systematic approach like this improves the safety of people, goods and the environment, requires less expenditure on the operations of the safety system of the state and minimises transport-generated environmental hazards. We may therefore conclude that without integrated efforts for a single transport safety system there can be no efficient transport. Public awareness of hazards to life and health in transport or during a journey is a prerequisite of successful efforts to improve a transport safety system. Similarly, politicians' knowledge of innovations and solutions based on scientific research lays the foundations for a good national transport policy, in which transport safety issues should figure high on the agenda. On the other hand, we should also stress the extent of economic and social losses, of which neither governments nor the public, particularly in countries with a high accident rate, are aware, due to the distance in time and space which separates one accident from another. In developed countries, transport safety is increasingly viewed by the public as a major criterion in quality of life assessment.

5. The main institutions within the integrated transport system

Developing the idea of integrating transport safety systems dispersed throughout individual transport modes, we are joining an international group of researchers who seek an answer to some fundamental questions about a structure to be built in order to effectively avert transport accidents:

- How can we improve safety through a proper understanding of the common features of accidents occurring in various transport modes?
- To what extent can the integration of knowledge and experience accumulated in various transport modes benefit prevention in the whole transport system?
- How can the pooling of the knowledge about transport disasters, accidents and incidents, obtained through scientific research and investigation into the causes and circumstances, contribute to a better transport policy?

- To what extent can international cooperation be the key to the problems of health and death hazards in transport as well as the losses generated by disasters and accidents?

The world's first integrated transport safety system was the National Transportation Safety Board (NTSB) established in the USA in 1967. The next system bringing all safety investigation into one place was established 40 years later in the Netherlands as a result of a long evolution. It began in 1980 with the establishment of the Dutch Road Safety Board which after 18 years was transformed into the Dutch Transportation Safety Board (DTSB) covering road, rail, air, water and pipeline transport. 2005 saw the establishment of the Dutch Safety Board (DSB). Its fundamental objective is independent accident and disaster investigation in all spheres of human activity, which if operated to a malfunctioning system could put people's health, or lives at risk. The only exception is threats against public order and acts of war.

6. Conclusion

With the coming new transport policy, the EU transport system faces major challenges of great magnitude. This calls for many changes, including a revised outlook on transport safety. According to the European Commission, if these challenges are to be met, efforts will have to concentrate on new technologies and integration of various transport modes into one safety system. European integration of transport safety systems is consistent with EU transport policies as well as with the expectations of leading European safety-oriented organisations (like the ETSC), which is an important factor supporting efforts towards a new quality of the transport safety system.

International experience shows that an independent investigation agency working across all modes of transportation can most effectively improve safety. An intermodal agency provides economy of operation, transfer of safety lessons between different modes of transportation, the advancement of new and innovative investigation techniques and the ability to focus on key issues of concern in all modes. It is therefore suggested that serious consideration be given to a unified independent agency wherever it is feasible. Based on the NTSB's 40 years of experience, one of the best and most efficient ways to improve transportation safety is through the lessons learned from independent accident investigations and safety research. The organization responsible for these investigations should ideally be completely independent from other governmental and judicial organizations and should be responsible for investigation in all modes of transportation.

The essence of the new approach to accident and disaster investigation is that this independent organisation works to identify the causes of incidents and does not in any way seek to apportion blame or liability to an individual. If we are to understand the underlying causes of accidents, we must ensure by law that the information gathered would not be used as evidence in criminal proceedings. This is how we can learn the truth about what happened and why. Once known, these answers can be used as a basis for formulating recommendations on what to do to stop a similar incident from happening. This is exactly what independent safety investigation is all

about. Other countries have followed suit and are implementing their visions of integrated safety investigations. Australia, Canada, Sweden, Norway, Finland and New Zealand have already put the structures in place, however with varying remits and ideas.

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