

# **Risk and safety in transport (RISIT)**

**Research programme**

## 0. Summary

The programme for research in risk and safety in transport (RISIT) describes relevant themes for research into risk in transport and defines the main priorities for such research.

The programme's objective is to produce knowledge, which can provide a better understanding of transport risk and a better basis for risk management within the transport sector. Important sub-goals are to contribute to realising Vision Zero for transport safety, analysing normative foundations of safety policy in the transport sector, studying transport risk in a wider social perspective and analysing how different methods of organising risk-management may affect transport safety.

The greatest challenge with regard to transport safety is to establish a connection between the high ambitions expressed in Vision Zero and the opportunities, which exist in practice for better transport safety within the framework set by our political system. Three main research topics have been defined:

- visions for transport safety
- understanding transport risk and putting it into a social perspective
- organising risk management

The programme allows space within each of these topics for defining a number of projects. However, no concrete, clearly defined projects have been laid out in this programme, since this can best be done by researchers working in the field of transport safety.

It is assumed that projects which are carried out within the programme are long-term and have a scope which corresponds with a strategic institute programme (SIP) or a strategic university programme (SUP). It is a condition that the projects will deal with problems which are relevant for more than one mode of transport.

In addition to projects which are funded upon application, the programme committee will also commission state-of-the-art reviews covering selected topics which concern transport safety.

## **1. Background**

Social science transport research was organised into a programme in 1990. Two programmes have been carried out by the Norwegian Research Council: "Forskningsprogram om kollektivtransport" [Research programme into public transport] (1990-1994) and "Forskningsprogram om lokal transportpolitikk" [Research programme into local transport policies] (LOKTRA) (1994-1999). The Ministry of Transport and Communications has been the major source of finance for these two programmes.

Based on the fact that travel and transport represent high risks and that society is faced with major changes with respect to reducing such risks, the Ministry of Transport and Communications wanted further research to focus on transport risk, primarily in the form of an applied research programme under the auspices of Culture and Society. In order to clarify the content of the programme, the area director appointed a planning committee with representatives of interested parties. The committee report was approved by the board of directors of Culture and Society in April 2002. The programme committee was set up in June 2002.

This programme plan is based on proposals from the planning committee.

## **2. Needs for improving knowledge**

Social change is characterised by increasing mobility and a stronger demand for safety and reliability within the transport system. Since 1970, the volume of travel has more than doubled. On average, each Norwegian now travels approximately 15,000 kilometres per year and spends almost one hour a day travelling. Many businesses are dependent on a reliable and safe transport system and in order to produce goods and services. Changes in land use patterns and utilisation of economies of scale in the production of goods and services increase the need for transport. At the same time, investments in the transport system have made it easy to conquer distances. Technology and forms of organisation are in state of rapid change. It is a challenge to predict the consequences for safety of new technology and new organisational structures within the transport sector.

The numbers of those killed in transport accidents in Norway has gone down from a peak of around 600 per year around 1970, to around 300 per year in the last part of the 1990s. Even though travel and transport have become much safer in Norway in the last thirty years, the transport industry is still associated with high risks. For the vast majority people, the risk of dying or being injured while travelling is significantly higher than the risk involved in other everyday activities (for example activities in the home or leisure activities). When travelling, between 15 and 20 people die per 100 million person hours. The corresponding fatality rate for other daily activities is between one and five deaths per 100 million person hours. Journeys and transport have a major catastrophic potential. 80% of all

accidents in Norway after 1970 in which five or more people were killed out occurred in the transport sector. The potential for major accidents has hardly decreased in recent years and in fact may be increasing. A series of serious accidents and other events in recent years may indicate that the declining trend in the number of accidents and risk after 1970 is coming to a halt. There are major differences in the risk of death and injury between different modes of transport.

There is reason to believe that it is still possible to reduce the number of accidents and injuries considerably in all modes of transport. Vision Zero is now used as a base for transport policy in Norway. This states that the long-term ideal for transport safety is that no one should be killed or permanently injured as a result of transport accidents. Vision Zero is an expression of high ambitions to improve safety – ambitions which can only be realised by knowing more about actual risk, factors which affect it and the possibilities of influencing these factors. Measures that can improve safety in the transport system often conflict with other policy objectives. Such conflicts must be recognised and solved as part of good management of risk in the transport sector. It is highly likely that current transport safety policy does not make optimal use of policy instruments that may reduce risk. Safety can be improved but why is this not happening?

Increased participation in the transport system by vulnerable groups – children and the elderly, pedestrians and cyclists – represents new challenges with regard to protecting these groups from injury, while at the same time protecting the mobility and freedom of movement which these groups perhaps value more highly than other groups in society. There is also a need to increase knowledge about how immigrants/transport operators from other cultures affect the level of safety within the Norwegian transport system. Recent research has made us aware of the fact that factors connected to life style may besignificantly influence transport safety. Risk is not just something we want to avoid but also something we actively seek. Thus, it is important to gain more knowledge about this subject.

The different modes of transport are becoming ever more closely interwoven. Tasks which were previously performed by public monopolies are now open to competition, wholly privatised, or are assumed to be solved through public – private co-operation. Is the tendency towards a more open economy compatible with the higher ambitions for safety expressed in Vision Zero? Or will the desire for the greatest possible effectiveness or profits weaken safety?

In brief, the current situation with a high risk of injury in the transport system, increased demand for transport, rapid technological changes and a more and more open economy, combined with a vision of a transport system where there are no accidents leading to fatalities or long term injuries, creates challenges with regard to setting up well-functioning systems for dealing with risk within the transport sector. There is a risk that the distance between the long-term ideal vision on the one hand and more short-term, practical considerations which guide transport safety policy on the other, will be too great. There is a need for research which can contribute to a better understanding of risk and knowledge that can make it easier for regulatory authorities to implement effective risk management.

### **3. Objective**

The main objective of the programme is to provide the population, business, organisations and the authorities with a better understanding of transport risk, increasing knowledge regarding risk perception and evaluation and creating the best possible knowledge base for good risk-management within the transport sector.

The main academic objective is related to the intended application of the knowledge, which the programme will produce. The idea is that the value of such knowledge depends to a significant extent on how it can be applied. It is natural to assume that the interests of business, organisations and regulatory authorities are related to opportunities for more successful risk-management.

The programme has three sub-objectives which further develop the main objective. Firstly, the programme should contribute to making visions and ideals for transport safety more operational, as well as obtaining increased insight into ethical, economic, political and other types of normative foundations of transport safety policy.

Secondly, the programme is intended to improve knowledge and understanding of transport risks. This objective also includes studying risks in transport in a social perspective, by which transport risk is seen in relation to other forms of risk.

The third objective is to develop a better understanding of the implications of different ways of organising risk management, specifically how the responsibility for safety is formulated and shared.

### **4. Central research topics**

The programme will concentrate on three main topic areas:

- visions for transport safety
- understanding transport risk and analysing it in a social perspective
- organising risk management

Some research topics in each of these three areas are outlined below.

#### **4.1 Visions for transport safety**

The concept of a transport system which is ideal with regard to safety, a vision of total safety, can provide those who are responsible for transport safety with a perspective which both inspires new thinking and gives an incentive for critical, but constructive, utilisation of current knowledge regarding opportunities to improve safety in the transport system. Such a vision, known as Vision Zero, today forms the basis for transport safety policy in Norway. Vision Zero states that the long-term ideal for transport safety is that no accidents should occur where people are killed or permanently injured. Vision Zero is based on two main principles. The first is a set of ethical principles for accident prevention. One of these ethical principles states that human life cannot be traded off against other goods, i.e. that it is ethically unacceptable to sacrifice human life to obtain other benefits, for example cheap, fast transport. The second principle of Vision Zero is knowledge of the amount of biomechanical energy (external force) a person can be exposed to, without being killed or seriously injured. Vision Zero states that human tolerance to biomechanical impacts should be the basic design parameter of the transport system.

Vision Zero applies to all modes of transport. However, its practical implications are not necessarily the same in all modes of transport. Within road traffic there is still much that can be done to protect road users against injury in the event of an accident. In the other modes of transport, the amount of uncontrolled energy in an accident is often so large that it is difficult to provide effective protection against fatalities or serious injuries. This means that injuries must be prevented by reducing the probability of accidents occurring at all.

Vision Zero represents one of many possible visions which could be used as a basis for transport safety. The principles underlying it deserve to be subjected to critical analysis. How can long-term visions and ideals for transport policy be formulated and developed in such a way that they actually become guidelines rather than pure rhetoric? How can a vision be made operational in the form of objectives or guidelines for priority setting? One possible topic for research is analysing normative foundations of transport safety. Normative foundations include all statements about what we ought to do – about what is regarded as ideal, desirable or ethically correct. The risk of accidents is a social problem, which has ethical dimensions which need to be discussed and clarified. The purpose of analysing the normative foundations for regulating risk is partly to clarify and further develop these foundations, and partly to invite to a discussion regarding the formulation of ideals for transport safety. Normative issues are difficult to study, partly because it is not always clear which answer is right.

Cost-benefit analyses are being used to an increasing degree to set priorities for accident and injury prevention. The use of such analyses is based on normative foundations which are not always made explicit. Valuing goods which do not have a market price is of major importance for the results of cost benefit analysis,

but many of the evaluations which are used today can be criticised on methodological grounds. The question has also been asked if there is a basic contradiction between Vision Zero and an economic approach to preventing injuries and accidents.

Does the concept of "acceptable risk" have any meaning? If it does, what gives such a concept meaning, and how can we ascertain whether a given risk is acceptable? Is the evaluation of risk, and how acceptable it may be among the majority of people and decision-makers, rational? There is a need for research which can show how to make decisions that are both rational, contribute to increasing welfare and do not leave behind unresolved conflicts between policy objectives. Examples can be given where media coverage leads to disproportionately large resources being used to prevent relatively small accident problems. Is this the price we have to pay for an open, democratic, decision-making process?

Vision Zero is future-oriented. Risk analysis, particularly within road traffic, has often been based on historical accident records. Risk analysis as such does not, however need to be records of past events only. Vision Zero requires that new hazards are identified and controlled before they show up in the form of injuries. This requires new methods for risk analysis and the development of more effective barriers to reduce the impacts of accidents. In this context, RISIT wants close contact with the research council's strategic project "Risiko og usikkerhet", [Risk and Uncertainty] where one of the topics for research is methods of risk analysis and decisions under uncertainty.

#### **4.2 Understanding transport risk and analysing it in a social perspective**

This area refers to how the risk involved in travel and transport is perceived, interpreted and reinterpreted and how transport risk gets on the agenda as a social problem. Currently, there is probably a contradiction between the level of risk in transport faced by an individual and the large number of accidents which make transport risk a social problem. For most people, travel is the most dangerous daily activity they perform; nonetheless, it does not seem that most people perceive the risk of accidents as a big problem. Most people probably have their own Vision Zero for their journeys: – no one wants to be involved in an accident. At the same time, many measures which are intended to reduce the number of accidents are unpopular and meet with resistance.

Fear of accidents – insecurity – undoubtedly plays a role in people's willingness to travel by plane, but may also be significant for other modes of transport. The perception of risk is emotionally laden and therefore difficult to keep apart from the fear created by risk or a desire to reduce it. Everyday risk perception is not

always characterised by cold, distant observation but by a mixture of observation, fear, wishful thinking and possibly wrong information created by media coverage of rare events. For the majority of people, distinguishing between "subjective" and "objective" risk has little meaning. The experience of risk in daily life is by definition subjective. However, within a research perspective, concepts such as subjective and statistical ("objective") risk can be given meanings which make them analytically fruitful. However, even amongst researchers there is no agreement about how meaningful it is to distinguish between subjective and statistical risk.

In quantitative risk analysis, risk is a purely statistical concept, which is often defined as expected loss, i.e. the product of the probability of an unwanted event and the consequences of the event:

Risk = Probability x Consequence

Extensive research shows that everyday concepts of risk contain many more dimensions than just these two and are significantly richer than the traditional statistical concept of risk. An example of one dimension of risk which has been studied by many is the fear of catastrophe. This means that an accident where 100 people die is regarded as far worse than 100 accidents, each with one fatality. Is an aversion to catastrophe rational? How can we reliably estimate the frequency of catastrophes? How can catastrophes be prevented?

Another dimension of risk which has received much attention is the degree of voluntariness and self-control. Voluntariness refers to the extent to which a person can choose the extent to which he or she would expose himself to risk. Self-control refers to the extent to which one can affect the probability of accidents and the consequences of accidents through one's own actions, within given physical and technical boundaries. It is highly likely that many people accept being exposed to much higher risk voluntarily than being forced to accept a similar risk as the result of others' actions.

Attitudes to risk vary between different groups of the population and through the lifecycle of an individual. Society's understanding of risk problems also changes over time. Knowledge about risk and how to reduce it is also highly variable. Insecurity is one aspect of attitudes to risk where knowledge in Norway is inadequate. To a large extent, insecurity is good, because a person who feels unsafe will take precautions which often reduce the risk of accidents. Nonetheless, insecurity is a problem if it becomes so great that it prevents normal everyday life. Many parents who live in areas with car traffic do not let their children play outside alone because of the danger of traffic. Restrictions are imposed on children, which both parents and children would rather avoid.

A social science perspective on the risk in transport includes studies of risk culture, i.e. collective ways of understanding and evaluating risks, as well as the desire to regulate risk. In a society, there may be many types of risk culture attached to working life, leisure activities or informal groups. The ways in which these cultures arise, and the kind of effect they have on actual risk are topics about which little is known. The opportunities for influencing or modifying undesirable risk cultures is another subject matter which deserves academic investigation.

In a broader perspective, different forms of risk should be seen in context and a "health risk account" should be applied to our everyday activities. Children who are not allowed to climb trees or ride bicycles, because there are cars in the area, may not get enough physical activity. The basis for a sedentary life in front of a computer screen is formed at far too young an age and physical health in later life may suffer as a result. The gains in the form of reduced traffic risks may be lost in the form of increased risk of other types of health-related problems. Knowledge about how different sources of health risk are related and affect each other is insufficient.

### **4.3 Organisation of risk management**

Broadly defined, risk management covers activities where regulating or controlling risk is one of the objectives – not necessarily the only one. We all try to manage risk in our own way. As travellers and road-users we try to take care of our safety by looking out, by staying alert and by using compulsory safety equipment. Companies manage safety by means of technical measures and rules regulating employee behaviour. All professional drivers are required to refrain from drinking alcohol. Those who build transport vehicles add safety features to them. The authorities set rules directed towards producers, organisations and the individual.

One of the problems with the way in which risk-management is organised in modern society is that very many actors at different levels have sub-tasks and shared responsibility for managing risk, while nobody has an overall responsibility. The widespread delegation of responsibility for safety can - in the worst cases - lead to the abrogation of responsibility. The fact that nobody has an overall responsibility for risk management may lead to ineffective risk-management, where disproportionately large resources are used for relatively small problems while more serious accident and risk problems remain unsolved.

Both internationally and in Norway, supervisory authorities for transport safety have existed for many years. Today, the role of such authorities is being redefined, partly due to a desire for responsibility to be more precisely defined in order to counteract the risk that a more open economy, with a greater degree of competition, may lead to de-prioritisation of safety aspects in favour of short-term

profits. Increasing emphasis is being placed on distinguishing supervisory functions from the functions of developing, operating and regulating transport systems. Previously, all these functions were often assigned to the same authority, i.e. that the authority to a certain extent "acted as its own auditor".

Vision Zero has stimulated new ideas about how responsibility for safety in the transport system can be defined, given that it is affected by numerous actors, each of whom is required take their share of responsibility for safety. The transport system consists of three main elements: infrastructure (permanent equipment), vehicles and drivers and travellers. The authorities are responsible for designing the infrastructure and regulating the production of vehicles. These activities can be denoted as system design. System users are those carrying out transport and travellers. Vision Zero defines a division of responsibility for safety between the system designers and the system users. This division of responsibility states that if the system users (transport providers, travellers) comply with the rules for the use of the system, then the system designers will design the system so that people are guaranteed not to be killed or permanently disabled if they are involved in an accident. We are currently a long way from realising this ideal, but the authorities are increasingly being held legally responsible for accidents. Responsibility for safety no longer exclusively belongs to the system operators.

Will a clearer definition of responsibility for transport safety improve safety? Are the supervisory authorities necessary to implement responsibility for safety? What experiences do we have with the supervisory authorities with regard to safety?

## **5. Programme organisation and strategic tools**

### **5.1. Programme organisation**

The programme committee's tasks include strategic development, programme organisation, long-term finance and recruitment within Norwegian research into transport safety. The committee consists of representatives from central user groups and interested parties in relation to transport safety:

Fagdirektør Finn Harald Amundsen, Vegdirektoratet, *leader*

Førsteamanuensis Marit Boyesen, Høgskolen i Stavanger

Forskningsjef Lena Nilsson, Statens veg och transportinstitut (VTI), Sweden

Forskningschef/vicedirektør Kurt Petersen, Danmarks Transportforskning

Avdelingsdirektør Lise Sandsbråten, SD

Førsteamanuensis Øyvind Thomassen, Inst. for tverrfaglige kulturstudier, NTNU

Representative for FiD (no name proposed at the time of writing)

Since this programme affects the whole transport sector, an arena has been set up where researchers and the central administrative institutions can meet and collaborate. In addition to the Norwegian Directorate of Public Roads, the Ministry of Transport and Communications and the Ministry of Fisheries which are represented on the programme committee and which will contribute the majority of the finance, the Aviation Authority, the Railways Authority, the Maritime Directorate and the Association of Financial Institutions are observers on the programme committee. The purpose of inviting observers is to disseminate important information to and from central players in the field. The observers will therefore be invited to participate in discussions, but will not have voting rights in the way that the ordinary committee members do.

In accordance with standard practice in Culture and Society, external experts will be engaged as required. The committee can supplement peer-review of applications with evaluations of user relevance, contributions to long-term professional development, institutional- political criteria and an assessment of how best to distribute research activities between relevant institutions.

## **5.2 Project support**

One of the programme's most important policy instruments is direct support for projects. The majority of projects should be longer than one year in length and involve a number of co-workers. It is desirable that both established and newly-qualified researchers participate in the same project, and that there is room for both post-doctoral and doctoral students and network co-operation within the projects.

The research field consists of contributions from several research traditions within social sciences, the humanities and technology. Many of the problems will be of a cross- disciplinary or multi-disciplinary nature. The programme should present a new, broader approach to research within transport safety and risk, where perspectives from the humanities are also included. On the basis of this, the programme committee will encourage co-operation between the established research institutions in the field and new institutions which may bring new impetus to research.

Projects may well take a critical perspective, but it is desirable that research projects examine opportunities as well as limitations, and consider developments in transport safety within an international, comparative perspective.

High scientific standards are required for the projects and it is assumed that the results will be of sufficient quality to be published in recognised scientific fora.

### **5.3 Recruitment and scientific training**

There is a need to recruit researchers within the majority of areas in the programme. An important contribution will be to promote doctoral level work within the project. This could be done by allocating adequate financial resources of a long-term nature to projects where doctoral work can form an explicit part of the project. In accordance with the Research Council guidelines, individual scholarships will not normally be awarded.

The second contribution to recruitment and scientific training will be in the form of research networks and research gatherings. It is stressed that new research workers, as well as research leaders, should take part in such gatherings. Network gatherings must be organised for training and production, ideally in the form of joint articles.

### **5.4 Developing strong institutions**

The programme is intended to provide room for strong, competent institutions which carry out high-level research into transport safety. All relevant scientific disciplines in universities, polytechnics and the institute sector are eligible, but priority will be given to a limited number, regarded by the programme committee as being the strongest in the field, with the potential to act as specialists in the long term. The programme will allocate funds to projects which are primarily long-term and with a broad scope, carried out at institutions with a significant engagement in the field.

The programme committee will initiate co-operation between research institutions and, where necessary, discuss the development in the institutions' strategies in this field. As part of its work, the programme committee will contribute to a strategy for institutional policy with the intention of developing strong, sustainable research institutions.

### **5.5 Measures towards internationalisation**

It is stressed that the projects should involve contact and co-operation with international research institutions. It is particularly important that young research workers and established researchers should have contacts abroad. Applicants are encouraged to include an element of international co-operation in their research projects. In co-operation with EU research information, the programme committee provide information about the EU's 6th framework programme and regard favourably the use of project funding from the programme for part-financing participation in EU programmes.

The programme committee will invite outstanding foreign researchers to conferences and seminars which will be arranged through the programme.

## **5.6 User contacts**

The programme will be opened to part-financing from users. Through research design and dissemination, the programme will strengthen contact between the research institutions and users of research, strengthen researchers' knowledge of business and public authorities' problems and ways of thinking and strengthen the knowledge of businesses and public authorities regarding the perspectives and ways of thinking within research. It is important to emphasise that user contact will not be at the expense of quality.

## **5.7 Identifying new challenges**

In addition to the programme's focus on topics related to transport safety mentioned in section 4, it will be necessary to be aware of other new challenges within transport safety with regard to later phases in the programme. This can be done through support for trend analyses, monitoring projects for public statistics, panel studies or state-of-the-art reviews. The programme committee may take the initiative to commission such tasks.

## **5.8 Dissemination strategy**

It is taken for granted that major projects have an active attitude towards dissemination. All project applications are expected to contain a plan for the dissemination of results. Since one of the main objectives of the programme is to strengthen a more unified Norwegian research programme into transport safety, it is important to ensure that the results reach the research community. This will be done through seminars and conferences both during the research process and at the end of projects. A separate electronic home page has been set up for the programme, which will be updated at regular intervals. An electronic newsletter will also be issued.

It is desirable that those working in the field contribute to the public debate. Contact with users and the press will be made through open seminars and conferences. Completed projects must contain a summary which can be used for information purposes. As a rule, the individual institution will be responsible for contact with the press at the end of each project, but the programme committee can help with publicity if this is necessary.

The programme committee will initiate issuing books/collections of articles with summaries and syntheses of the research in the programme. An evaluation of the need for textbooks within the field of transport safety will be carried out and an assessment made of how knowledge produced through the programme can be used in textbooks. However, in accordance with the guidelines in Culture and Society, the programme will not be responsible for the production of textbooks

The programme committee will evaluate individual dissemination strategies in co-operation with establish channels such as internal newsletters in major companies, journals and newspapers etc.

### **5.9 Co-ordination with other programmes**

The programme for risk and safety in transport will border on a number of other programmes and initiatives both within and outside the Norwegian Research Council. This primarily affects the strategic project "Risiko og usikkerhet", [Risk and Uncertainty], "HMS i petroleumsvirksomheten" [Health, Safety and the Environment in the offshore industry] and PULS (IE).

Co-ordination and division of tasks will be handled through reciprocal exchange of information and participation meetings where appropriate. It may be appropriate to join forces for some seminars and development measures.

### **5.10 Timetable and financing**

The programme has a long-term perspective and will run from 2002 to 2007 with long-term research projects starting in 2003. State-of-the-art reviews have been commissioned for the most central themes in 2002 and will be ready in January 2003. In the first round of awards, priority will be given to longer (2 – 3 years) projects. There will be two main allocations of awards. The programme will be evaluated half way through the period.

The programme will be financed by the Ministry of Transport and Communications, the Norwegian Directorate of Public roads, the Ministry of Trade and Industry, the Railways Authority, the Ministry of Fisheries and the Aviation Authority with a total budget of approximately NOK 42 million over five years .