



# Traffic enforcement in Europe: effects, measures, needs and future

## Final report of the ESCAPE consortium

### The "Escape" Project

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Communities and Infrastructure

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## SUMMARY

The objectives of the project were to identify important issues of traffic law enforcement in the EU, examine traditional and innovative enforcement approaches and tools, and assess their potential to improve compliance for increased safety on roads. The following main issues were addressed: the extent of non-compliance with traffic laws and its contribution to accidents; how enforcement is organised and carried out in practice in EU countries; traffic law enforcement needs, issues and constraints, old and new; the potential for new approaches, technologies and tools to improve compliance through more efficient enforcement.

Emphasis was put on speeding, drink driving, non-use of personal safety devices and “aggressive” driving. The project focused more on the policing function as compared to legal functions. The analysis was largely qualitative because of the complexity of the systems, their intricate social context, and lack of reliable quantitative data in many countries. Attention was also given to organisational and legal issues of the system and not only to policing tactics and the behaviours targeted for enforcement. Other foci were anticipated enforcement issues in a larger, more integrated and even more motorised EU, and the special needs of CEE countries.

In examining new approaches and tools, the following were specifically considered: the potential of automated camera systems for enforcement of speeding and other violations the possible role of non-police organisations in enforcement, the necessity for monitoring tools, the application of a cost benefit analysis tool to enforcement, and the extent of professional and public support to various traffic enforcement practices and initiatives. One of the leading guidelines of the project was to address traffic law enforcement issues at a practical level and to propose potential solutions with a good chance of being accepted by enforcement professionals.

There is clear public support for existing traffic legislation in the four focus areas of speeding, alcohol, belts, and young drivers as well as effectively enforcing them. Considering the traffic system as a whole, including the role and resources of the police, it is clear that enforcement based on very high subjective detection probabilities only, will not be able to achieve even on a satisfactory level the compliance of all traffic rules. There are currently available systems that can be used directly preventively without the fear of punishment such as speed limiters. Moreover, the use of such “directly preventive” systems can be realised with much lower costs than extensive monitoring systems requiring manpower even when fully automated.

Only by realising that traffic enforcement is a part of integrated traffic safety work, where the whole system must be developed, can unnecessary pressures and unrealistic expectations concerning the impacts of enforcement be avoided. The use of new technologies in traffic safety work in both assisting and controlling road user behaviour also serve this purpose well.





## FOREWORD

The project was funded by the European Commission under the transport RTD programme of 4th framework programme.

The final report is naturally largely based on the work carried out in separate work packages. However, some additional work independent of work packages was carried out when writing the final report, especially concerning the behavioural foundations of traffic enforcement by the police, and the needs of enforcement from different perspectives.

Tapani Mäkinen and David Zaidel are mainly responsible for writing the final report, the former for the structure of the report and chapters 1, 2, 3 and 5; the latter for the summary and conclusions and other parts of the report. In addition, the work of the following persons contributed to the final report:

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## PARTNERSHIP

The ESCAPE project was developed by the following consortium:

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## EXECUTIVE SUMMARY

### 1 Objectives

The objectives of ESCAPE (Enhanced Safety Coming from Appropriate Police Enforcement) were to identify important issues of traffic law enforcement in the EU, examine traditional and innovative enforcement approaches and tools, assess their potential to improve compliance, and thus contribute to safety on European roads. ESCAPE addressed the following main issues:

- The extent of non-compliance with traffic laws and its contribution to accidents;
- How enforcement is organised and carried out in practice in EU countries;
- Traffic law enforcement (TLE) needs, issues and constraints, old and new;
- The potential for new approaches, technologies and tools to improve compliance by means of more efficient enforcement.

Based on previous related work it was possible to pre-select a number of particular issues relevant to each of these main objectives. Regarding non-compliance, emphasis was put on speeding, drink driving, non-use of personal safety devices and “aggressive” driving.

In assessing the needs and issues of enforcement, attention was given to organisational and legal issues of the system and not only to policing tactics and the behaviours targeted for enforcement. Another foci were anticipated enforcement issues in a larger, more integrated and even more motorised EU, and the special needs of CEE countries.

In examining new approaches and tools, the following was focused on: the potential of automated camera systems for the enforcement of speeding and other violations, the potential of non-police organisations in enforcement, the necessity for monitoring tools, the application of a cost benefit analysis tool to enforcement, and the extent of professional and public support to various traffic enforcement practices and initiatives.

Consultation with enforcement professionals from police forces, justice departments, ministries of transport, road authorities and other agencies were undertaken in all ESCAPE work packages. The consultation took the form of personal interviews with officials in several countries, structured survey questionnaires sent to officials previously contacted in person, and international workshops with participants from national TLE agencies, the European traffic police network (TISPOL), and ESCAPE researchers.

Three specific practical tools were adapted for enforcement purposes, in the project: a simplified cost-benefit analysis tool to assess the effectiveness of specified enforcement methods; guidelines for monitoring routine enforcement efforts, outcomes, and non-compliance levels; a list of innovative traffic law enforcement ideas addressing different



needs, and assessed to be feasible for application in demonstration projects throughout Europe.

## **2 Theoretical basis of traffic enforcement**

The model underlying TLE was developed. It links legislation, police force, and compliance by individual drivers. Legislation sets the rules of conduct in traffic and the sanctions for non-compliance. Many road users comply willingly with the rules. Others, however, would not comply if it were not for fear of being detected by the police and the wish to avoid sanctions. The aim of policing is to impress these individuals that the likelihood being detected is high and that punishment is inevitable. Police tactics and media support are designed to enhance the impression.

In practice, in existing TLE systems, the likelihood of being detected and sanctioned for a traffic law violation is very small. Therefore, the model needs to assume the operation of two mechanisms to explain how the actions affecting few impress many. The mechanisms are referred to as “specific” and “general” deterrence.

The psychological assumptions linking intensity of enforcement to compliance through perceived likelihood of detection was verified, in a general sense, in controlled field experiments trying out various enforcement tactics, primarily regarding speeding. The assumptions have not been systematically tested throughout the traffic system. The prevalence of recidivism, even immediately after being ticketed or fined, demonstrates that the model does not explain all behaviour.

## **3 Traffic law enforcement systems in EU countries**

EU countries differ in their legal systems and present several ways of organising internal security and policing functions. EU countries have a similar range of sanctions imposed on offenders and a generally similar process of adjudication. Sanctions include fixed fines, driving licence suspension, and court procedures that may lead to fines, driving restrictions, suspension and prison terms. In all countries, certain classes of violations, and all cases with injury accidents, must be referred to the courts and cannot be resolved by administrative actions of police or public prosecutors. Appeal venues are available to cited and prosecuted drivers in every country, but the systems operate under the practical assumption that the large majority of ticketed drivers accept the cost of the sanction and refrain from appealing.

The legal system of each country has found ways to streamline the processing of traffic violations and to substantially reduce the load on the courts. In a few countries the decision has been made to decriminalise most traffic offences and consider them as civil misdemeanours subject to fines. But even countries that retained the criminal status of traffic violations have adopted measures such as fixed fines or having a default whereby the driver is assumed to have admitted guilt unless requesting a trial. Such measures help to reduce the load on the legal system and the police. Differences in the legal ap-



proach come to light, however, when dealing with specific issues, such as how to handle the identity of a driver in case of a violation detected by an automatic photo radar camera.

Most countries have found it useful to add various special consequences other than fines and prison terms to non-compliance with traffic law, as well as designing special mechanisms for their application. Driving licence suspension, mandatory medical and psychological tests, re-licensing requirements, rehabilitation programmes, remedial courses, community work – are some of the possible other consequences of traffic related non-compliance. While courts can apply any of these, often there are non-legal authorities, such as the licensing office in a Department of Transport, which will administer the punishment (or treatment). In many cases the administration is in the context of a demerit-point system.

Regarding policing, a mix of organisational police structures can be seen in EU countries. A typical organisation may consist of three parts. A central Traffic Police force, under the control of some national command, is responsible for traffic control on main national highways. Another force, which may or may not have special traffic units, is responsible for rural roads and small communities in between. A third element is a local police force in larger communities, which in the case of large cities will also have special traffic units. The degree of centralisation of command and control, the level of autonomy of local forces, and the degree of personal specialisation in traffic control, vary from country to country and within regions and police forces within a country.

Dedicated traffic units have the advantage of specialising and focusing on their tasks. However, with scarce resources dedicated forces are under increasing scrutiny to prove their success.

Accurate and complete data of the size and effort of police forces dedicated to traffic are difficult to obtain. However, in public organisations such as police, number of personnel is a leading measure of size, which determines allocation of other resources. Based on personnel estimates, it appears that 7% to 10% of police personnel (or a corresponding proportion of person-years) in a country are dedicated to traffic control – patrolling and surveillance, violation handling, accident handling, and traffic directing.

Police forces in all countries lack both compiled and structured information on the extent of their traffic-related activities, important as they may be.

#### **4 Legal and administrative institutions and measures supporting traffic law enforcement**

In almost every European country the legal system for processing of traffic violations is a mix of criminal and administrative procedures. The criminal or penal system usually follows three independent stages – detection, prosecution and sanctioning – performed by the police, public prosecutor, and judge, respectively. The courts can impose a wide



range of sanctions to fit each case individually. No criminal legal system can handle efficiently and justly the large number of offences in traffic that are detected by police. Automated methods of detection can easily overload any legal system based on summons to court.

In the administrative systems, the three stages are essentially combined into a single one, with a smaller range and fixed set of sanctions. The whole enforcement process is under the control of police with legal and administrative support by other bodies.

Many EU countries have laws allowing certain traffic infringements to be treated under civil law with simplification of procedures and possibilities of appeal. At first this was applied to parking violations and road taxes, but has since been extended to most traffic violations excluding certain severe violations and accident-related ones. Most countries apply fixed fines, and in many cases they can be settled on the spot. Even in countries with strict criminal traffic law, simplifications and default shortcuts were instituted regarding the processing of traffic offences and imposing of sanctions.

Legal systems still lag behind the fast technological developments that would enable implementation of new enforcement methods. For example, automated detection of speeding and other violations still creates a bottleneck in several countries, since the issue of owner liability has not been satisfactorily solved. Another example is the use of alcohol interlock systems, which requires legislative changes even to make the installation and experimentation possible.

Other significant administrative support systems common in EU countries are those that handle driver offender recidivism. Whereas police usually deal with each violation as an independent case, other organisations monitor the accumulated violation record of drivers, and based on demerit points accumulated or other specified criteria, impose on drivers administrative licence suspensions, training or rehabilitation programmes. Most EU countries have such support programs.

Rehabilitation programmes have been developed to counteract high risk driving and they target primarily drunk driving. German-speaking countries have the most developed rehabilitation programmes, embedded in their driver licensing systems. Because of their wide and publicised application, it is assumed that they have a general deterrent effect in addition to individual improvement. Other EU countries are experimenting with such systems.

In all European countries there are basically three frames of reference that determine basic parameters for police enforcement. These frames are: (1) the road safety situation, (2) the law compliance by road users, and (3) the resources and tasks of police forces. These frames of reference need be combined in order to reach a useful perspective on road safety benefits of police enforcement and how police should be supported to achieve these benefits. In practice, the only way to achieve such a perspective is that several governmental agencies work together in order to establish a planned and agreed-



upon approach to police enforcement. At present, in many countries such co-operation is mainly for dividing areas of responsibility and exchanging information, but less so for planning a joint and mutually supportive enforcement approach.

### **5 Impact of enforcement on compliance**

Intensified and targeted enforcement campaigns often result in temporary and localised compliance improvement across the board. There are certainly enough testimonials to the fact that merely the presence of traffic police inhibits non-compliance in the short term.

The quantification of this relationship requires more precise definition of the nature of enforcement and the measurement of its extent, as well as reliable measures of compliance. With the exception of speeding, drink driving and non-use of safety belts and helmets, there are practically no measures and no data on the true extent of non-compliance.

In the area of speeding, at any given time from 15% to over 50% of vehicles in EU traffic are travelling at least 15 km over the posted speed limit. It was further estimated that just a very tiny fraction of speeding vehicles are issued citations. Legal speed limits set a general context for traffic speed, but within each context compliance may be low and it is not clear whether enforcement has any substantial impact.

The vast majority of research on the enforcement impact has focused on tactics of surveillance and speed control. The studies give a fairly uniform picture of the effects of speed control. In the immediate vicinity of the surveillance source compliance is very high. As soon as the surveillance site has been passed, speeds start increasing. Therefore, the duration of surveillance effect on speed is short in either time or space. Only camera enforcement with permanent installations have been shown to have a permanent impact on speeds, and again, only in the immediate vicinity of a surveillance source.

Results of local experiments in speed control do not always have national level application. Often it is not possible to extrapolate the tactics used in experiments or demonstrations because they have involved temporary shifting or concentration of policing resources to a specific location or target behaviour at the expense of other targets and locations. Sometimes, special resources have been added temporarily but society was not willing to maintain the increased support for an indefinite period and on a national scale.

Non-compliance with drink driving laws is very low compared to speeding, amounting to a few percentage points in most EU countries and less than 0.5% in the Nordic countries. Countries with low non-compliance rates pursue an enforcement strategy based on large scale, random or quasi-random breath screening tests and the use of evidential breathalysers. The likelihood of being apprehended for drink driving is higher, and is also perceived by the driving public to be higher than that for speeding, and higher than

objective data would suggest. After years of continued and persistent enforcement in this area it appears that when combined with other, educational measures, it has had a substantial impact on compliance.

Non-compliance with safety belt laws by drivers and passengers on EU roads has been estimated at 8% to 30%. The rates vary greatly among countries, regions, types of roads, and types of vehicles. The rates apply mostly to front seat passengers; they are considerably lower in the back seats. Seat belt enforcement is not a primary target for the police. Citation rates for non-use of safety belts vary considerably and in many countries it is a minor violation that is not recorded. With few exceptions, the police in each country consider belt-use rates (80–95% on inter-urban roads, 70–85% in urban areas) to be satisfactory, and the role of the police in maintaining or increasing the rate to be minimal. The police participate in various education efforts to increase awareness of the use of safety belts and child restraints.

As in other legal areas of non-compliance, severity of sanctions, as such, does not have a clear-cut effect on compliance, contrary to the simple deterrence model. Some censure may be necessary (sometimes a warning letter is sufficient) but increasing severity of sanctions has not proved consistently effective with either recidivism or as a deterrent to others.

## **6 Impact of enforcement on accidents and how cost effective it is**

Demands for more, or more effective TLE are, almost always, linked to a decrease in safety. There is considerable evidence that substantial changes in the extent of police enforcement are correlated to changes in the number or severity of traffic accidents; more enforcement is associated with fewer accidents. Some of the evidence is based on direct comparisons of accident levels on roads that had different levels of enforcement, and some is based on projections of what would happen to accidents if certain types of violations would be eliminated through more or better police enforcement.

Joint re-analysis of scores of separate evaluation studies of changes in enforcement levels suggest that increased enforcement may have reduced injury accidents by an average of 6% to 17%. There was a large variability in the results, depending on the method of enforcement, the type of roads, the baseline of compliance level, the target behaviours, the size of the project, and many more factors. Many of the studies indicate that there is a dose-response relationship between police enforcement and safety (= an association between the amount of enforcement and safety). Increasing the amount of enforcement further reduces the number of accidents. However, the marginal effect of increasing the amount of enforcement becomes gradually smaller.

Most of the evidence for the impact of increased police enforcement on safety comes from enforcement projects restricted to either selected roads, to few behaviours or to limited period. In practice this means that in most projects there has been a shifting of resources and concentration of policing efforts to fewer areas. It is not clear that safety





in other areas would not have been reduced, or that nation-wide increase in policing resources would multiply the local effects rather than result in a restored equilibrium between police, the legal system and the public.

The practical issues are which enforcement methods are likely to give the best value for money, and at what point the marginal benefits of more enforcement are too small to be socially justified because, for example, other methods can improve safety at a lower cost. These are policy issues of setting priorities. One way of setting priorities for police enforcement is to conduct cost-benefit analyses of alternative levels and forms of enforcement. Such analysis requires detailed data and exact specifications of the many assumptions and choices that need to be made during the analysis. In ESCAPE, a demonstration of the analysis was carried out on Norwegian data. The methods considered were those found earlier as having the largest impact on safety:

- Speed enforcement by stationary methods,
- Drink driving enforcement by random breath testing,
- Seatbelt enforcement and
- Speed cameras.

For the Norwegian conditions it was concluded that it is cost effective to increase all types of enforcement. Marginal benefits exceed marginal costs for substantial increases in conventional speed enforcement, seatbelt enforcement and the use of speed cameras. With respect to random breath testing, a more modest increase in the amount of enforcement is cost effective. It can be stated with a very high degree of confidence that increasing traffic police enforcement in Norway today is cost effective. This conclusion is likely to apply to most EU countries where speeding, drink driving and not wearing seatbelts are common violations and TLE methods are similar to those in Norway.

It should be recognised that cost-benefit analysis can not, and indeed should not, be a sole guide to policy decisions.

## **7 Public support for enforcement**

There is clear public support for existing traffic legislation in the four focus areas of speeding, alcohol, belts, and young drivers. Sixty-five percent of the respondents expressed a wish for a lower permissible BAC level, and 68% were in favour of 0 BAC level for new (typically young) drivers. The vast majority of drivers accept safety belts laws.

There is little support for stronger legislation regarding speeding. In several countries drivers support the current speed limits but in some countries drivers express a wish for a higher limit, or even no limit, on motorways. Nevertheless, about half of the respondents are in favour of in-vehicle devices to restrict the top speed of cars, or of devices to assist drivers not to exceed the limit. It appears that drivers are ambivalent about the legal approach to speed control. They recognise the importance of not speeding but also of the difficulty of not doing so, in practice. It is for that reason, perhaps, that they



would have preferred a technological solution to speeding rather than one based solely on law and conventional police control of drivers.

On the question of harmonisation of traffic legal requirements across Europe, the majority of drivers favour similar requirements across countries, the preferred standard often being the one in their own countries.

National studies as well as the SARTRE survey re-analysis found strong public support for more police enforcement of traffic regulations. The level of general support ranges from 60% to 80% across EU countries. Specific non-compliance behaviour may have larger or smaller support depending on the type of non-compliance in question. It is tempting to ascribe the national differences to cultural differences, but actual level of enforcement must also play a role.

While as individuals, drivers attempt to avoid and fight the sanctions imposed on them as a consequence of being caught as traffic violators, collectively they support the sanction or punishment mechanisms. They appear to accept at face value the deterrence theory underlying current TLE systems. Overall, 22% of respondents in the SARTRE survey supported current levels of sanctions, and 56% were in favour of more severe penalties for traffic violations, in their countries. Support of sanctions by country varied from 44% to 74%, with no clear correlation to existing severity level of sanctions by country.

The support of sanctions may not necessarily mean a desire to see everyone punished more severely; it may be an expression of a wish to see very serious and repeat violators punished more effectively than at present. The generally strong public support, in all countries, for establishing a demerit point system, is another way of saying that especially repeat offenders should be targeted by the sanctions systems.

## **8 Future of traffic enforcement**

Considering the traffic system as a whole, including the role and resources of the police, it is clear that enforcement based solely on very high subjective detection probabilities, will not achieve even on a satisfactory level the compliance of all traffic rules. No country could afford such massive enforcement systems that would guarantee considerably better compliance rates than is presently the case. Moreover, very extensive monitoring of road user behaviour based on the fear of punishment would probably raise such strong public resistance that the extensive implementation would become impossible. There are currently available systems that can be used directly preventively without the fear of punishment such as speed limiters.

Consequently, the fundamental issue when assessing traffic enforcement is not the principle of deterrence, but the need for increasing enforcement based on deterrence. Even though we can show that the deterrence principle is working in practice and enforcement is cost effective, we can also put forward that a transport management system has failed when massive enforcement systems are needed. Controlling driver behaviour by



means of a threat of punishment is a clear indication that safety management is insufficient, and that the traffic management systems are not functioning as integrated wholes. There are a number of examples outside the transport system, in which the infrastructure has been designed and built in a way that to a large extent the possibility for the human operator to make fatal errors is eliminated. This is not the case within the transport systems. On the contrary, the transport systems provide us with ample opportunities to make errors – either intentional or unintentional – which increase the likelihood of an accident.

The limitations of road users are well known and recognised. These are above all associated with the functioning of human cognition i.e. the way road users acquire, process and use information while driving. In addition to drivers' inability to increase their information processing quality when speed increases, the motivational system of drivers is not prepared for incidents with low occurrence probability – which accidents represent. An accident is for a single driver a rare incident, and, consequently, safety is not a sufficiently motivating factor to observe the traffic regulations. Moreover, drivers are guided by feedback received from the consequences of their own behaviour. In fact, speeding and some other violations are rewarding making it possible for drivers to fulfil so-called extra motives for driving not inherently belonging to traffic. The motivational system of an individual driver cannot simply support behaviour that does not “make sense”, except for short time periods e.g. when seeing a patrol car.

A considerable amount of traffic violations are committed accidentally and do not involve deliberate risk taking. Many of these violations could be eliminated simply by improving the road infrastructure rather than punishing drivers for something their perceptual-motivational system is not fit for. It can even be maintained that too much is expected from the police. By improving the road infrastructure the need for enforcement could be considerably reduced. There are actually a number of measures available that – when applied extensively – could to a large extent substitute enforcement. These include road humps, use of small roundabouts, more sophisticated traffic signal systems and the introduction of in-vehicle/infrastructure supported telematics systems such as intelligent speed-limiters or alcohol interlocks.

## **9 European traffic enforcement in a nutshell**

The results of the project can be succinctly summarised as follows:

- The mechanism of enforcement is based on deterrence. Ample empirical evidence show that the deterrence principle works in experiments
- Enforcement based on deterrence is cost effective
- The problem of enforcement studies is that they are experiments only, and do not show the realism of the design in terms of a nation-wide application (e.g. it is not possible to increase the volume of enforcement 3–4 times for a 1–2 year period throughout the country)



- Drink driving enforcement shows especially in Nordic countries that long-term, durable and combined methods (high risk of detection, education, information) bring about good results
- There is no proof that severe punishments are effective in suppressing reckless driving
- Interference by the police is important in influencing speeds; perhaps more important than severe punishments
- There is wide-spread support for enforcement among the public
- Automated methods are effective; current solutions are outdated; the adoption of automated methods is slow and in most European countries authorities are hesitant or reluctant to use them
- Automated enforcement should be arranged so that maximum deterrence is achieved through a minimum number of notices = indicate the camera areas clearly, ensure that drivers are aware of the areas covered by camera installations
- Efforts to be made to manage long stretches of roads/large areas with camera technology instead of spots; black spots need structural changes, not enforcement
- Police forces targeted to traffic have more potential for effective work than units with mixed duties
- One bottleneck in applying automated enforcement effectively in some countries is that drivers have to be identified from photographs
- The need for massive deterrence-based enforcement systems targeted to catch as many offenders as possible may be questioned; it is a sign of disintegration of the transport safety system
- Enforcement needs can be crudely classified into three groups: 1) old priority areas all nations share: alcohol, seat belts, speeds; 2) special needs of individual nations e.g. Greece: agricultural tracks and Finland: condition of winter tyres, and 3) new needs: e.g. cross-border traffic, illicit drugs, road rage
- More than the innovation of new gadgets or procedures, enforcement needs commitment and dedication; innovation is needed above all in persuading decision makers of the need for effective implementation of enforcement strategies
- Needs surveys reveal that more technological help is needed, and more simplified methods must be found for catching and treating violators
- A system should be created for enforcement including visions, strategy, target setting, qualitative and quantitative goals. Operations should be data led including monitoring of the success of activities
- The possibilities of enforcement do not reside in enforcement itself, but in integrated traffic safety work; the road infrastructure should be improved as far as possible
- There are major differences in the efficiency enforcement is implemented in Europe
- Enforcement is not solely the responsibility of the police; rather a division of enforcement responsibilities between different authorities is needed



- Improvement of in-vehicle technology (intelligent speed adaptation; lateral and longitudinal support systems) decrease the need for enforcement in the long run.





# 1 INTRODUCTION

## 1.1 OBJECTIVES OF ESCAPE

In 1998–2002, as part of the European fourth framework programme (DG TREND, Task 12.4), information was gathered and assessed concerning police enforcement strategies and effects throughout Europe for the EU research project ESCAPE (**E**nanced **S**afety **C**oming from **A**ppropriate **P**olice **E**nforcement). The ESCAPE-project builds on the experience gained from the 4th Framework Programme project GADGET Work Package 5 “Legal measures and enforcement” (Mäkinen et al. 1999) and other EU projects, and prepare the groundwork for implementing Europe-wide demonstration projects in enforcement.

The objectives of ESCAPE are to identify important areas of traffic and driver non-compliant behaviour and to assess the potential of enforcement tools, both traditional and innovative, to improve compliance and thus contribute to safety on European roads.

The work deals mainly with the issues of traffic police work, including surveillance and related activities, both strategic and tactical. Legal processes including adjudication and prosecution are treated only briefly, since this is an area that would unduly expand the scope of this work.

More specifically, ESCAPE consolidates existing information, as well as producing new data with respect to the following intertwined enforcement issues in Europe (the Work Packages that deal with each objective are in brackets):

1. What are the levels of non-compliance with traffic laws (WP2, WP5)?
2. What is the contribution of non-compliance to accidents (WP2)?
3. What new areas of non-compliance or enforcement issues emerged in Europe during the 1990s (WP1)?
4. How is enforcement carried out in practice in different countries (WP1, WP3)?
5. What are the constraints for efficient enforcement in different countries (WP3)?
6. What role do non-police institutions and functions have in enforcement (WP3)?
7. How can conventional enforcement be improved (WP1, WP3, WP4)?
8. What alternatives to police enforcement are there (WP3)?
9. What new tools and technologies for effective enforcement are there (WP4, WP1)?
10. How will such tools be accepted by individuals, the public, and institutions in different countries (WP5)?
11. What areas of enforcement, and using what tools, appear to be cost effective (WP1)?
12. How should non-compliance and enforcement effectiveness be monitored and assessed (WP6)?

These objectives explain in more detail the four general objectives listed in the Task Description Call for Proposals. In addition, ESCAPE utilises the professional contacts



made during the project with police agencies and officials in several countries, in order to create a fruitful basis for new enforcement initiatives in Europe.

Therefore, ESCAPE established close contact with TISPOL (*Traffic Information Systems by the Police*) and other European bodies with an interest in traffic surveillance, enforcement or adjudication. They were invited to workshops and approached as participating user groups, not only as informants.

This report is naturally based mainly on the work done in the separate work packages. However, it is more than a mere summary of the work carried out. The authors of the report also incorporated the most reliable or interesting findings of previous work outside this project – especially GADGET WP 5, and evaluated and assessed the research carried out in this field in past decades.

The report is organised as follows: Chapter 1 briefly treats the history of traffic behaviour regulation in Europe, and traffic law uniformity issues such as the need for pan-European traffic behaviour regulation. Chapter 2 addresses the mechanism of traffic law enforcement, such as what compliance is based on, and the role of subjective risk of detection, sanctions and other mediating factors in compliance. Chapter 3 puts police enforcement within the broader context of traffic safety work, and concerns the evaluation of traffic law enforcement starting, then focusing on, the effects of traffic law on both driver behaviour and accidents. The chapter ends with an assessment of the priorities in enforcement. Chapter 4 discusses the role of legal measures and enforcement in traffic safety work, traffic policing in general, and the views of practitioners expressed in ESCAPE seminars and surveys targeted at them. Chapter 5 carries on this discussion by focusing on the needs for legal measures and enforcement both from the drivers' and practitioners' point of view. Also other viewpoints such as societal needs, European needs and future needs for developing enforcement are dealt with. Chapter 6 concentrates on issues for improving legal systems and enforcement. Chapter 7 closes the report with discussion and main conclusions.

A number of European countries and Israel were included in the ESCAPE-project. The roles varied from an active participation in the project work to providing/serving as a source of the information and data or the object of studies on enforcement issues. The list of these 22 countries is as follows:

Austria, Belgium, Czech republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

## **1.2 TRAFFIC BEHAVIOUR REGULATION**

In the course of human evolution the mind and body have adapted to walking at the speed of about 3 to 5 km/h. Falling down and crashing at these speeds in most cases happens relatively safely. Transport safety problems obviously emerged when man





mounted a horse. Speeds of this travel mode exceeded 5–6 times the speeds the human body was built for. Today, our walking pace is exceeded 20 to 30 times by the speed of motorised traffic.

A short look at history reveals how fast the transportation revolution has come about.

In 1885, the German engineer Carl Benz built the first three-wheeled motorised vehicle. Independently of Benz, in 1886, Gottlieb Daimler built the first car (or motorised vehicle) on four wheels. At the very end of the 19th century the world speed record of a motorised car on a racetrack was already over 105 km/hour. In 1909 the 200 km/hour limit was broken (Leerink, 1938).

In the first few decades of the 20th century the car conquered the world at a dazzling rate. In 1916, there were 4.2 million registered motorised vehicles (trucks and buses included); this number had nearly tripled (12.5 million) 6 years later in 1922. Only four years later, in 1926, the number had again doubled to 24 million (Leerink, 1938). Currently the number of cars exceeds 700 million.

Even at the dawn of motorised traffic, problems caused by increasing speeds, speed differences and associated huge retardation forces in accidents gave rise to a need for regulating behaviour on roads. A quotation from 'The Times' shows that even in the first decades of the 20th century motorised traffic did not tend to comply with rules and regulations. *"Motorists have shown from the beginning that they will not comply with any law which causes them inconvenience (such as the speed limit), or which, though easy to obey, they are not forced to obey (such as the regulation for number-plates). If that is to be their attitude, let us accept it for the time, and counter it by increased police activity, especially by the provision of more mobile police, until it is brought home to their minds that compliance with the law is their necessary contribution to the common weal."* (Frank Elliott in 'The Times', January 1934; cited in Leerink, 1938). Already in 1934 police enforcement was seen as the appropriate response to massive rule violations.

With the growth of motorised traffic within Europe and cross-border traffic, the need arose for some uniformity in traffic regulations. On 11 October 1909, 17 European countries agreed on a treaty (Le convention internationale de la circulation) concerning vehicle requirements, international licensing, plate numbers, warning signals, overtaking, and symbols for danger. By 1924, 24 countries had signed the treaty.

In the second and third decades of the 20th Century some European countries made a serious effort to formalise or organise the different laws, orders, regulations, and amendments into a coherent traffic legislation (Leerink, 1938). In Britain, the Royal Commission on Transport regularly assembled in 1928–1930 to study traffic and transport problems. Based on two reports of this commission, the Road Traffic Act was enacted on 1 August 1930, and amended on several points on 31 July 1934. Austria enacted traffic legislation on 1 October 1930 and modernised this legislation 6 years later



in 1936. In May 1930 the third national conference on road safety was held in the US. One result of the conference was a model for a “Uniform Vehicle Code” which was revised in 1934. Many states have harmonised their traffic regulations with this code.

France already had “Codes de la route” in 1851. The French revised these codes in 1899, on 27 May 1921, 6 January 1923, 31 December 1932, and again in early 1938.

The treaty of Geneva of 30 March 1931 regulated the uniformity of traffic signs.

Europe combines a great diversity of national Law and Policing systems. Notwithstanding this variety, most Western and Southern European countries share long similar historical conditions of developing modern democratic systems of law and social control. This common background particularly concerns the key areas of justice and police powers, divisions and independence, which highly condition the way in which law enforcement in general is governed and applied. Strong ties with the long history of legal systems also create a large diversity in the way laws are applied to traffic enforcement.

Returning to the present situation in Europe we find that the map of Law in Europe is divided into two straightforward regimes of criminal sentencing:

- the Continental sentencing regime based on written codes ranking laws and penalties and involving a judiciary police power normally controlled by the justice (Delmas-Marty & Teitgen-Colly, 1992),
- the British sentencing regime based on previous jurisprudence of cases (Common Law) and enough independent police bodies (Corbett, 1997).

In the 1980s and early 1990s, several European countries totally or partly reformed their criminal law for different reasons, such as to update and adapt criminal contents to issues and areas arising from contemporary concerns but also to unburden the courts. It is also known that several European countries have recomposed the map of national and local administration powers. Both reforms may have mitigated the map of police power independence. In other respects, in each country the law system encompasses a large range of public and private law branches. Traffic law can only rely on a public law branch such as criminal or administrative law. The police power consists of legal, but also of territorial competencies which are ruled by legal requirements controlling their legality.

In most countries a large amount of discretion is given to police officers on the road regarding the classification of a non-compliant behaviour into one of several potential violation categories that carry very different consequences. It may result in a verbal warning with no record of it, a recorded (but not processed) warning, or a relatively small fine paid on the spot and no further record of it. It may also result in being classified as a recorded violation of a given degree of seriousness, which may carry not only a fine but other consequences as well. Clearly, in this respect too, there is a large range of variation within a police force and between forces.

The legal system commands large discretion powers when it comes to considering individual cases. Regardless of the nature of the law under which traffic violations are handled in the various countries – administrative, criminal, or a kind of a hybrid system – administrative officials, legal clerks, prosecutors, or judges can exercise their judgement and close or modify a case, and apply a wide range of consequences depending on their job objectives, social context and, of course, the individual merits of the specific case and driver.

Finally, the European geography of traffic law systems is mainly typified by a combination of several facts:

- the predominant type of law sentencing and social control,
- national traffic control necessarily relies on legal systems of public law and judiciary police power,
- the public law used for traffic law is either the criminal law or the administrative law,
- the police have a varying degree of independence in the enforcement process.

### **1.3 UNIFORMITY IN EUROPEAN LEGISLATION: THE CASES FOR SPEEDING AND DRINK DRIVING**

In the early days of motorised traffic, the highest speeds permitted on roads and in towns were fixed. It is especially interesting to examine the historical background and the laborious creation of the general speed limit system in Europe – a task that has not yet been fully accomplished. As far back as the early 1900s, most industrialised European countries had regulated driving speeds and introduced a driving licence so as to identify drivers for accident damage compensation, except for Belgium where the licence was not introduced until the late 1960s. Different limits were fixed for rural roads and urban areas, in 1899 in France (30 km/h and 20 km/h), in 1903 in Denmark (30 km/h and 15 km/h), and in 1912 in Norway (25 km/h and 15 km/h). However, after this positive start, the interest of industrial development prevailed over traffic safety concerns. Speed limits were later abolished in most European countries with strongly developing car industries. A general speed limit was again brought in during the 1970s following the energy crisis caused by the 1973 Middle-East war. Paradoxically, the main object of the speed limit system was initially to save energy rather than decrease the number of traffic accidents. Today, speed limit systems in Europe are very different, even in the same cultural areas and neighbouring countries (Mäkinen et al. 1999).

Also drinking and driving was at an early stage of motorization regulated by laws. Considering the size of the problem and its deep roots, European countries have been very inefficient in tackling this issue. Finland was among the first countries to ban driving under the influence of alcohol, as early as 1926. As an object of research alcohol and driving has figured in industrialised countries since the 1930s. There is widespread una-



nimity on the deleterious effects of alcohol on driving and safety, but no full agreement has been reached on above what level of blood-alcohol concentration the accident risk increases. The currently held view based on the classical Grand Rapids study by Borkenstein et al. (1964) is that from 0.5 per mille the risk of an accident increases sharply, still accelerating beyond 0.8 per mille.

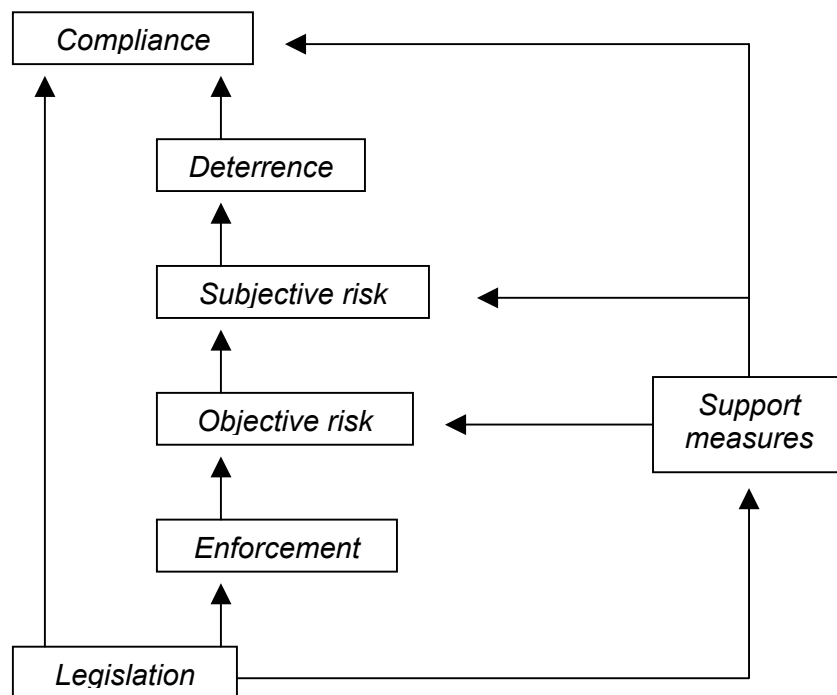
Accordingly, these levels have been set as legal limits for driving under the influence of alcohol in most industrialised countries. However, applied limits differ between countries, ranging from 0.0 to 1.2 per mille, and the limit tends to be inversely correlated to the efficiency of enforcing compliance with the permitted level (see Biecheler & Cauzard, 1999). The problem in terms of uniform European practices is that there are currently three different limits in use: 0.2; 0.5 and 0.8 per mille. The trend in the Nordic countries is to introduce the 0.2 per mille limit, since it is believed to convey an explicit message to drivers that no alcohol is permitted when driving a car. Also in the Netherlands, a lowering of the limit from 0.5 per mill to 0.2 is currently under discussion. The idea is to introduce this lower limit initially only for young drivers. However, as calculated by Mathijssen (1999) a beneficial road safety effect of this measure can be expected only if certain side-conditions for practical enforcement strategy are fulfilled at the same time.

So far, the European Commission has not taken any stronger measures in terms of drink driving than a Commission Recommendation of 17 January 2001 (OJ C 48/2 of 14.02.2001) on the maximum permitted blood alcohol content (BAC) for drivers of motorised vehicles.

## 2 FROM LEGISLATION TO COMPLIANCE

### 2.1 COMPLIANCE MODEL

The following model (Figure 1) describing compliance of traffic laws is based on research into the effects of legislation and enforcement. Different steps in the model are assessed in the light of empirical evidence to understand why better compliance and resulting higher safety level is so difficult to achieve in transportation systems.



**Figure 1. Model of the mechanism of traffic law enforcement.**

According to Figure 1, legislation forms a framework for traffic enforcement. Legislation may influence drivers in three ways. First, enforcement including surveillance, catching the offender, possible prosecution and adjudication creates an objective risk of detection for traffic offences. This, again, has an impact on drivers' perceptions of possibilities of getting caught for infringements. Subjective risk of detection is the drivers' own more or less conscious and less explicit judgement on possibilities of getting caught for violations. Moreover, supportive measures such as media or word of mouth (e.g. communication among professional drivers) may either increase or decrease the subjective risk of detection. Thirdly, the effects of legislation and other sources of information often directly influence behaviour just by making road users aware of the norms or the codes of correct behaviour. This is simply because usually the majority of road users *want* to comply with the rules, not in order to avoid fines, but simply to behave as prescribed by law. For some road users, however, it is their concepts and ex-



periences of the enforcement system in the last phase that create the deterrence effect of enforcement and make them comply with regulations. The following discussion attempts to evaluate different aspects of the model and provide empirical evidence for it where available.

As a guide to TLE policy the model is, however, fairly general and explains only a part of driver behaviour. As the model suggests, there is a direct 'line' from legislation to compliance, suggesting that for some road users the mere existence of a traffic code reinforced by observations of the behaviour of others is sufficient for compliance. Moreover, it is unlikely that compliance is determined mainly by what police do about detection and on the private translation of these actions into subjective risk of detection. The model does not consider other likely determinants of compliance such as how sensible or how fair a regulation may seem to people.

## 2.2 DETERRENCE

The mechanism and functioning of traffic law enforcement has been extensively reviewed and discussed in GADGET WP 5 by Goldenbeld et al. (1999). This discussion is briefly reviewed and some additional perspectives and aspects not previously dealt with are brought in.

There is a wide consensus that the main mediating factor in the mechanism of enforcement is *deterrence*. This means that the surveillance or perceived surveillance by the police *prevents* road users from committing violations and infringements by instilling a fear of being caught and fined or otherwise punished. Above all, the concept of surveillance includes the possibility of intervention by the police that can result in negative consequences (WP3 Deliverable 4).

It is generally accepted that traffic law enforcement influences driving behaviour through two processes: *general deterrence* and *specific deterrence*. General deterrence can be described as the impact of the threat of legal punishment on the public at large, while specific deterrence can be seen as the impact of actual legal punishment on those who have been apprehended. Thus, general deterrence results from a perception of the public that traffic laws are enforced and that a risk of detection and punishment exists when traffic laws are violated. Specific deterrence arises from actual experiences with detection, prosecution and punishment of convicted offenders. General and specific deterrence are in fact based on the same underlying mechanisms, but the populations which they refer to are different. General deterrence is relevant for those who have not yet undergone sanctions; specific deterrence is relevant for those who have.



### 2.3 SUBJECTIVE RISK OF DETECTION

Traffic enforcement and its mechanism has been subject of research since the late 1940s. Already then the objective of traffic enforcement was “to implant a feeling of ever-present surveillance by highway patrols” (Irby & Jacobs, 1960), the essential term being “the feeling of presence” rather than the actual presence of the police. The subjective factor, “feeling” in the concept of deterrence, was probably first introduced explicitly as *subjective risk of detection* in the mid 1960s by Brehmer (1966).

According to Brehmer, subjective risk of detection develops as a function of the visibility of surveillance and the principles of learning psychology. Traffic surveillance can be classified in three different categories by visibility of the surveillance source:

1. The surveillance source is fully visible, and it is possible for the driver to detect the presence of the surveillance source well in advance so that he can correct his driving behaviour and avoid being stopped for a violation.
2. The surveillance source is not detected until the violation has been detected and registered by the police. So, the surveillance source is "half visible" and will be seen too late to adjust driving behaviour to avoid the stopping by the police.
3. The surveillance source is completely invisible, and only those who commit a violation will become aware of the surveillance when they are stopped.

Critical to creating a subjective risk of detection is that when the visibility of the surveillance source is restricted, the driver will learn two things: First, that there is a probability of given magnitude associated with his violation and an apprehension for that violation. Second, since the driver cannot precisely locate the surveillance source, he will gradually start observing the rules also elsewhere than in the immediate vicinity of the surveillance source.

According to this theory, traffic enforcement results in widespread deterrence in time and space on the condition that drivers cannot precisely anticipate the presence of surveillance. Consequently, the *expectations* of drivers are critical in deterring them from violations.

It can be postulated that if deterrence is to function at all, we have to create sufficiently high expectations for drivers to be checked for driving violations, also beyond the range of visible police presence. This subjective risk of detection has been shown to be associated with the presence of the police or detection equipment such as a camera pole (see Table 1). A number of studies have shown how drivers comply with the rules only in the vicinity of a visible surveillance source, merely to revert to their usual behaviour after passing beyond the surveillance area. Perhaps the best illustration of the role of subjective risk of detection in deterrence comes from comparing the results of conventional enforcement studies with those on camera enforcement in Australia, Europe and USA (see e.g. Syvänen, 1971; Cooper, 1975; Olin et al. 1976; Spolander, 1977; TFD,



1978; TFD, 1979; Hauer et al. 1982; Rothengatter, 1982; Armour, 1984; Mäkinen & Syvänen, 1987; Nilsson, 1992; Zaal, 1994; Mäkinen & Rathmayer, 1994; Goldenbeld et al. 1999; Sisiopiku & Patel, 1999).

**Table 1. Effects of conventional and fixed camera enforcement on speeds.**

Type of enforcement	Effect in space	Effect in time
<i>Conventional</i> = the police monitoring the same site at intervals	Speeds decrease in the vicinity of the surveillance source	Speeds increase after the removal of a surveillance source
<i>Fixed camera</i> = surveillance facilities continuously monitoring at the same site	Speeds decrease in the vicinity of the surveillance source	Speeds do not essentially increase over time

Repeating surveillance and informing drivers about surveillance through roadside boards have been shown to increase the effects of conventional surveillance both in time and space (see e.g. Mäkinen, 1990). This is mainly because they increase the time and space of *uncertainty* of the presence of the police, or there is a more or less hidden message that drivers are being monitored. Since the results are available only from experiments, little is known about how these methods would have worked as permanent practices of the police.

The issue of the visibility of surveillance has raised a lot of debate among the public, authorities and researchers over the years. The issue is, however, somewhat of a misnomer, since both visible and hidden enforcement is effective as long as they can maintain uncertainty of the presence of surveillance. Totally hidden surveillance and surveillance sources visible from far downstream and upstream may not have lasting effects due to either too few perceptions of surveillance activities or the monitoring of behaviour being too predictable. When both aspects are ideally combined, surveillance may be both visible and hidden simultaneously, when drivers have a possibility to see the surveillance source only after the violation has been detected and registered.

## 2.4 SANCTIONS

The subjective risk of detection functions as a motivational psychological factor if personally aversive consequences are expected to follow upon detection. Without the possibility of a negative outcome for a traffic offence, there will be no deterrent effect of objective or subjective risk of detection. Despite the essential role the fear of punishment is assumed to have in deterrence, the effects of sanctions have remained largely an area that has not brought a clear understanding of the effects of punishments on driver behaviour control. When research results are available, it is often difficult to isolate the effects of sanctions per se, since the sanctions have been accompanied by new legislation. It has been argued that in order to be effective, sanctions must be based on certainty and be imposed immediately without delay (Zaal, 1994; Goldenbeld et al, 1999).



From a theoretical viewpoint, the argument of immediacy of punishment is mostly deduced from the scientific field of learning theories and behaviouristic animal experiments. In practical terms, there is no evidence that instantly imposed sanctions (within a few days) are more effective than sanctions imposed with a short delay of one or several weeks.

Although, as a general rule, the use of negative sanctions seems necessary to achieve compliance, alternatives to negative sanctions should be considered a lot more. In a Finnish experiment it has been shown that stopping drivers and issuing them a speeding ticket was not more effective in suppressing speeding than a warning letter sent by post (Mäkinen, 1990). Both a warning letter and a fine resulted in decreased speeds of interfered-with drivers of 9–10 km/h for at least 3 months. Somewhere between 3 months and 12 months, most of the speed reduction effect subsided. The study, however, does not question the significance of punishments in controlling driver behaviour and punishment as a mediating factor in subjective risk of detection. What it does question is the certainty principle in imposing punishments. Moreover, this particular study suggests that *interference* (certainty principle of interference) by the police and not necessarily the *financial sanction per se* may be the decisive factor in influencing road users, since the results were almost identical between fines and warning letters. Therefore, being caught/detected by the police and being under monitoring and control may be just as important as the fines issued – at least when dealing with moderate sanctions. This study, however, does not deal with severe fines.

Enforcement of drink driving in Finland during the past 20 years also suggests that a steadily increasing risk of detection with supportive publicity combined with moderated punishments is effective in reducing drink driving (Mäkinen & Veijalainen, 1997). Again, in this case we find that the role of sanction severity has obviously been smaller than that of the highly increased subjective risk of apprehension.

Currently the use of sanctions in the form of demerit point systems is widely applied e.g. in Australia, Belgium, Canada, France, Germany, Japan, New Zealand, Norway, the United Kingdom and the US. Very little is known on the effects of the demerit point system on traffic safety. However, in the light of the available evidence, it appears that when demerit points start to accumulate, the number of subsequent violations tend to decrease (Vaa & Glad, 1995). Thus, as might be expected, the effects seem to be at least driver specific. However, it is not known whether the demerit point system has any general deterrent effect. It could be assumed that for drivers with a low number of points who know the system and are willing to gamble with it, the demerit system gives an opportunity for more reckless driving than do accumulated penalty points. It is not known whether this is the case.

In all, the effect of sanction systems is an area that has not been properly explored. The few studies found in the literature suggest that for punished drivers longer times have elapsed before the next punishment than for control drivers, or actual driving behaviour have been shown to improve (see Mäkinen, 1990; Zaal, 1994; Vaa & Glad, 1995;



Goldenbeld et al. 1999). Moreover, warning letters sent to drivers caught for speeding have also been shown to increase the time before the next punishment. However, no consistent results on the effects of increasing punishment severity or the effects of punishments in general have been found.



### **3 EVALUATION OF TRAFFIC LAW ENFORCEMENT**

#### **3.1 EFFECTS OF TRAFFIC LAW VIOLATIONS ON SAFETY**

It is a well-established fact that the major part of all traffic accidents is caused by various types of human factors (Lewin, 1982; Evans, 1991). One of these human factors widely recognised as associated with increased accident risk is the commission of traffic law violations.

Violations of road traffic law contribute to increasing the number of road accidents in all countries. An estimate for Norway (Elvik 1997; also ESCAPE Working Paper 1; ESCAPE Deliverable 3; ESCAPE Working Paper 3) suggests that if 16 of the most frequent traffic law violations were eliminated, the number of road accident fatalities could be reduced by 48%. The number of road accident casualties could be reduced by 27%, according to this study. Preliminary estimates for Sweden (Elvik 1999a) indicate that violations of road traffic law is an even greater problem in that country. It has been estimated that by eliminating traffic violations, the number of road accident fatalities in Sweden could be reduced by 76% and the number of road accident casualties by 48%. There is little doubt that safety improvements of a similar magnitude could be attained in most motorised countries if road users complied with the rules of the road. Evans (1991), for example, has estimated that the number of traffic fatalities in the United States could be reduced by about 40% if driving with an illegal blood alcohol content were eliminated.

Knowledge of the true incidence and nature of non-compliance is critical for any discussion, planning, or evaluation of TLE activities (or any other measures intended). Various sources of information are reviewed, but none provide a comprehensive picture of non-compliance on European roads.

It is a well-known fact that police-reported traffic violations are not only a small fraction of non-compliance acts committed, but are also a biased sample of violations, reflecting enforcement priorities and constraints. One acknowledged, and possibly justified, bias is the result of selective enforcement practices aimed at targeting violations (and thereby vehicles, drivers, locations or times) believed to be strongly associated with accidents.

Other estimates of non-compliance are based on drivers' self-reports, or on independent observations of traffic behaviour. Each source of information requires separate measurement methods, each with its own advantages and limitations.

Self-reported violations are commonly associated with research into individual differences, the motivations underlying non-compliance and similar issues. Collecting self-reported violation data is relatively simple and could be rich in information, but links



between self-reported violations and non-compliance incidence and distribution, in actual traffic, are not clear or obvious.

External observations of vehicle or driver behaviour are common to local projects or experiments dealing with specific measures (roadway improvements, traffic control devices, enforcement tactics, legal rules etc.) intended to influence compliance. Some behaviours, such as speeding, appear easy to observe, while others, such as dangerous overtaking, are difficult. Continuous, systematic, and network-representative observations of non-compliant traffic behaviour are currently less common. However, as the cases of seatbelt use or BAC monitoring have demonstrated, data from reliable field observations ultimately provide the most valid measures of non-compliance.

The first approach in the project was to investigate the extent and frequencies of non-compliance in Europe by means of reviews, analysis of police registered data and re-analysis of SARTRE interview data (see ESCAPE Deliverables 1 and 7; Working papers 2 and 8).

The second approach carried out in the ESCAPE project reviews data linking non-compliance and accidents (see ESCAPE Working Paper 3). The links were established with different methodologies, which tend to emphasise different aspects of the relationship. For example, analysis of accidents in a population of drivers with different recorded-violation rates examines whether drivers who tend to commit more violations are also more likely to get involved in more at-fault accidents. Other methods include analysis of the violations involved in a population of accidents, and a comparison of violations and accidents on a given set of roads.

Emphasis was put on presenting data from recent experience (such as the GADGET project and other EU research) as well as on special analyses prepared by ESCAPE partners.

### ***Drinking and driving***

Alcohol is a major cause of crashes and can increase the severity of injury outcomes. Well documented and convincingly shown – but based on surprisingly few studies – is the relationship between driving under the influence of alcohol and accident risk. After consuming 1 to 2 glasses of alcoholic beverages the accident risk increases exponentially with every additional glass, resulting in increased risk factors of 4, 6, and 17 for BAC levels of 1, 1.3 and 1.8 per mille respectively (Borkenstein et al. 1964; Hurst et al. 1994). Besides the increased accident risk, alcohol consumption negatively influences injury severity as well. Fatality rates for drivers involved in a traffic accident with a BAC above 1.5 per mille are reported to be up to 200 times higher compared to those of sober drivers (Simpson & Mayhew, 1991).



For the EU as a whole, a rough average of about 3% of journeys are associated with an illegal BAC, but about 30% of injured drivers are under the influence of alcohol (ETSC, 1999).

### **Speeding**

Speeding is another traffic violation with ample evidence of its relationship with accident risk and severity. On the basis of extensive research on the relationship between speed, speed limits and accidents it is estimated that, depending on the road category, a 1 mile per hour reduction in mean speed of traffic could produce a 2 to 7% reduction in the number of injury accidents (Nilsson, 1990; Finch et al. 1994; Taylor et al. 2000). Other researchers have pointed to the importance of speed variance: vehicles moving much slower or faster than the mean traffic speed tend to be over-represented in accident statistics (Solomon, 1964; Cirillo, 1968; Hauer, 1982).

Due to the many different types of road users crossing, road junctions can be considered as inherently unsafe. In urban areas, junctions are the most frequent crash sites. Typically, the proportion of casualty crashes ranges from 40% to 50% in European cities (ETSC, 1999). In addition to rear-end crashes, many other types of crashes occur at junctions such as:

- collisions with intersecting traffic including non-compliance with right hand rule, yield sign, stop sign and traffic signals,
- crashes when changing lanes,
- crashes involving unprotected road users,
- single-vehicle crashes (drunk driving).

The causes of these crashes vary considerably. Very often, they are associated in one way or another with excess or inappropriate speed.

### **Seatbelt use**

Violations such as seatbelt wearing and moped riders helmet usage are not directly linked with accident risk. However, it is estimated that wearing front seatbelts reduces the risk of getting severely injured in a car crash with 10 to 50% (Evans, 1986; Bos & Wegman, 1990). Based on international studies, the safety effect of moped riders' correct helmet usage can be estimated on a 25% reduction of severely injured victims (Huijbers & van Kampen, 1985).

Seatbelt wearing is mandatory in the front and rear seats of passenger cars in European countries. The actual usage differs a lot between countries. About 75–80% of EU passenger car drivers used their front seatbelt in 1996. Rear seatbelt use was much lower. If every car occupant had used available seatbelts that year about 10,000 of a total of 25,000 killed car occupants in EU would have survived. About 7,000 would have survived had all wearing levels been up to the best achieved internationally (ETSC, 1999).



In the GADGET review of enforcement activities among 15 countries (Zaidel, 2000), not one of 15 EU countries reported a special enforcement effort aimed at safety belt and child restraint use. Enforcement is often secondary – either resulting from routine general surveillance or a by-product of the enforcement of some other law, such as drink driving. Sometimes roadblocks may be set for security reasons or vehicle inspection and unwary non-wearers could be caught off guard. Despite the low emphasis on active belt enforcement, some countries report a surprisingly large number of safety belt tickets, sometimes second or third only to speeding tickets.

### ***Red light violations***

Traffic lights can increase safety by organising and managing traffic flows. However, traffic lights themselves create expectations about other road users' behaviour and therefore observance of their signs is crucial. Installation of red light cameras on high-accident intersections have been reported to have accident effect rates of between 30 and 60% (Ng et al. 1997; South et al. 1988), which are likely the result of a change in violation behaviour (Chin, 1989; Walker, 1993; Retting et al. 1999). Regarding accident severity, a study by Retting et al. (1995) suggests that within built-up areas, the risk of injury is highest for accidents caused by a red light violation.

### ***Short headways***

Short time headways are associated with a large number of rear-end crashes and also with some other types of crashes – and rear-end collisions are the most frequent crash type in several countries. For instance, Finnish insurance companies' data shows that the proportion of rear-end crashes leading to a claim was 21% (VALT, 1995 and VALT, 1996). The proportion of rear-end crashes in Norway has been close to 15% of all police-reported injury crashes in the 1990s (Norway, 1998). The respective figure in Sweden in 1996 was about 10% (Nilsson, 1998).

Although the consequences of rear-end collisions are usually not as severe as with other types of collision, their total number causes major economic losses and disrupts traffic flow. On the other hand, severe crashes which take place infrequently on motorways and which involve a large number of cars are caused by a combination of factors including driving too fast for the conditions, keeping too short a time-headway and adverse weather conditions.

### ***Drugs use and accident risk***

It is generally unknown which drugs under what conditions may impair road-user performance and safety (ETSC, 1999). Epidemiological evidence clearly demonstrates that benzodiazepine users are over-represented in injured and fatally injured drivers (Ellinwood and Heatherly, 1985). Although controlled laboratory and driving task studies support the notion that cannabis induces impairment (Moskowitz, 1985), and a growing incidence of cannabis in the blood of fatally injured drivers is found in some countries,



the evidence for its relationship with crash causation is ambiguous (Moskowitz 1976 and 1985; Robbe, 1994).

### ***Violations and accidents***

Traffic enforcement has mostly concentrated to date on the important problems of speeding, excess alcohol impairment and failure to use seatbelts. The scope for securing further reductions in casualties through continued attention to these areas is very large (ETSC, 1999).

The emphasis given to the enforcement of various types of violations according to a cost-benefit analysis will depend on the relationship between the marginal benefits and the marginal costs of enforcing each type of violation. According to the analyses presented in the ESCAPE Working Paper 1 (Elvik, 2000), the main emphasis should be put on speed enforcement and seatbelt enforcement, somewhat less emphasis on random breath testing. This recommendation is, however, based on the Norwegian experience, where the number of breath tests is already high.

There is, however, a host of other violations that also contribute to accidents, like right of way violations, failure to yield to pedestrians at pedestrian crossings, close following, and overtaking at locations with insufficient sight distance. It would not be acceptable to stop enforcing these violations altogether, simply because they did not come at the top of a list of priorities based on a cost-benefit analysis. If such a policy were announced, road users would know that some of the regulations of road traffic law could be disregarded with impunity, because they are never enforced. This could lead to more violations and, in turn, to more accidents. For many traffic behaviours defined as illegal and punishable the association with safety is evident. However, there are also many violations for which the association with safety is unclear. Therefore, for the legal systems to develop sanction and surveillance strategies, it is useful to have a clear idea of how illegal behaviour predicts the accident involvement of drivers.

Different traffic violations, however, are not independent of each other but in many cases are associated with each other. It has been shown that those drivers who are speeding also commit other violations considerably more often than those who keep to the limits (Mäkinen, 1988). These violations are usually close following, overtaking violations and other driving errors and infringements.

Several studies suggest that a single behavioural feature or single observation of driving does not predict accident involvement (Rajalin, 1998). A more comprehensive picture of a driver's driving style is needed to predict accident involvement. One aspect of this is a driving record containing violation history.

Research carried out previously shows that a group of drivers can be identified who have a high number of violations on their record compared to the whole population of drivers, even when the exposure factor is controlled for. Moreover, the drivers involved

in serious accidents as a first party (defined as a having the main responsibility for the accident) have a traffic violation record with a number of offences that is clearly above the average (Joki & Piipponen, 1984; Rajalin, 1994). On the other hand, there are also a great number of drivers involved in accidents who have no prior traffic violence record.

A study by Mäkinen & Wuolijoki (1999) explored the association of accident involvement and violations with two groups of drivers: those involved in a serious accident and the randomly stopped and interviewed control drivers. The conclusion from the study is that traffic violation history is associated with increased likelihood of getting involved in serious accidents. Especially strong is the association in terms of run-off-the-road accidents. If an average driver in terms of exposure (about 17,000 km in the Finnish data) is punished (to a large extent the punishments are for speeding) for a traffic violation once in 3 years, this is a sign of a significantly increased run-off-the-road accident risk. Also a record containing at least two drink driving convictions implies an increased accident risk. For developing enforcement strategies, the driving record containing several punishments clearly signifies that this driver belongs to a risk group and conventional measures may not be sufficient for improving his behaviour.

The figures of the study as such cannot be generalised to all European countries, but generally it seems obvious that drivers having a record containing several punishments for traffic violations have a strongly increased likelihood of getting involved in a serious traffic accident. For this reason, monitoring driver violation records, especially speeding, drink driving convictions and other serious violations and developing measures other than conventional punishments are needed.

In the above, a range of studies all using drivers as the unit of analysis demonstrated that non-compliance was associated with increased likelihood of accidents. Three conceptual-methodological problems limit the robustness of this conclusion (Zaidel, 2002a). One is that individual non-compliance was usually measured via a proxy, such as recorded citations or self-reports about citations rather than actual road behaviour. Second, in many research designs detailed information is available only about drivers who have been involved in accidents and little is known about the behaviour of non-involved drivers. Third, the issue of exposure, particularly the amount of driving, is not controlled (with the exception of the Mäkinen & Wuolijoki study), and can be assumed as a potential confounding factor.

One or more of these issues affects all driver-focused studies and, therefore, it is useful to have an alternative way to look at the evidence. In this section, we present analysis based on the *km unit* (exposure) rather than the *driver unit*. Traffic behaviour can be monitored on a road network. Behaviours can be recorded as discrete events (e.g. vehicle with belted or unbelted driver) or continuous (e.g. speed of each passing vehicle). The events can be associated with a unit of the network (e.g. section 177 on Europe road 44). To each network unit we link the accident data associated with it. This kind of database can then be analysed for the association between non-compliance and accidents.





In this approach, all three of the conceptual problems mentioned above are under control. The approach may have practical implications for TLE strategic thinking as well.

The European speed-accident data collected under the MASTER project have been critically examined to investigate the impact of speed-limit violation on accidents (see Kallberg et al. 1999). The MASTER database consisted of information on speed, flow and geometry, on 139 rural single-carriageway roads under five speed limit regimes – 70, 80, 90, 100 and 110 km/h. Different countries supplied data from different speed limit roads. Sweden supplied data from 70, 90 and 110 km/h roads, The Netherlands from 80 km/h and the UK from 100 km/h roads.

Information regarding different levels of violation was extracted from the upper tail of speed distributions. The level of violation was defined in terms of ‘excess’ speed over the speed limit. The violation statistics derived from the speed distributions were critically examined for each speed limit regime separately, and violation-accident relationships were derived for different levels of violation.

The results of the investigation are mixed and interesting. Two speed limit groups (80 and 90 km/h) produced neutral results, suggesting that on roads belonging to these two speed limit groups speed violations have no significant effect on accidents. However, the remaining three speed limit groups (70, 100 & 110 km/h) produced consistently significant results, indicating that there is a strong association between speed limit violation and accidents. These results also suggest that the *accident gradient* parameter, representing *the relative change in accidents for a unit change in the violating proportion (percentage)*, is higher for a higher level of violation. The value of this parameter has been found to increase exponentially with increasing level of violation.

A word of caution needs to be given about the limitations of the analysis. This investigation was essentially exploratory. The results are based on small sub-samples ranging from 15 to 38 road sections. Each sub-sample is a collection of roads selected, under the MASTER programme, from a particular speed limit regime and they may not be suitable for the type of analysis warranted by this investigation. Besides, each sub-sample has been drawn from a particular country, and the participating countries are not represented in a balanced way in these sub-samples. A larger and more representative database would be useful to confirm and extend the analysis to additional variables, such as traffic flow, which may influence the accident gradient curves.

To conclude: a number of studies clearly show how illegal behaviour is associated with non-safety. For this reason, enforcement targeted to infringements is well grounded. Again, speed seems to be the core of the problem – even in the way that while speeding can be eliminated, so can many other violations associated with it. More mobile enforcement, or enforcement controlling longer stretches of road such as traject control (measuring speed of vehicles between two locations by means of digital cameras) would be recommendable, since they give the possibility to monitor driving styles rather than isolated, often unintentional mistakes that are impossible to eliminate. Unintentional

mistakes occur as a consequence of variations in performance level rather than through lack of respect for traffic laws.

### 3.2 EFFECTS OF TRAFFIC LAW ENFORCEMENT ON DRIVER BEHAVIOUR

The effects of traffic enforcement have figured as a topic for systematic research since the Second World War. Research tradition in this field was mainly created in the US. In Europe, Sweden changed to right hand side traffic in 1967, and research on traffic enforcement was boosted and further developed in the 1970s when the US introduced the STEP programme (Selective Traffic Enforcement Programme). This has been followed by a number of camera enforcement programmes in the industrialised countries since the late 1980s. The great dilemma is still the duration of the effects of traffic enforcement measured both in time and space. Studies of police enforcement have addressed the effects of deployment of surveillance such as

- duration of surveillance,
- repetition of surveillance,
- informing road users of surveillance either through on-site boards or through media,
- deployment of several surveillance units in space such as chaining them,
- varying visibility of surveillance,
- stationary versus mobile enforcement,
- arranging campaigns of varying length either
  - associated with increased surveillance activities or
  - keeping the volume of surveillance constant but conveying the message of increased surveillance activities,
- deployment of surveillance in terms of site and
- deployment in terms of traffic behaviour, e.g. primary vs. secondary enforcement.

#### **Speed**

The vast majority of studies have focused on speeds. The studies on these experiments give a fairly uniform picture of the effects of traffic enforcement on driver behaviour. In the immediate vicinity of the surveillance unit traffic rules are observed very well, even speeds below the posted limit may decrease. As soon as the surveillance site has been passed, speeds start increasing again. Thus, the duration of surveillance effects is short term when measured either in time or space (Syvänen, 1971; Cooper, 1975; Olin et al. 1976; Spolander; 1977; TFD, 1978 and 1979; Hauer et al. 1982; Rothengatter, 1982; Armour, 1984; Mäkinen & Syvänen, 1987; Zaal, 1994; Oei, 1998; Goldenbeld et al. 1999).

The repetition of surveillance and the increase of manpower in clearly defined limited areas have shown to increase the halo effects of surveillance (Syvänen, 1971; TFD,

1983; Salusjärvi & Mäkinen, 1987; Oei, 1998; Vaa, 1995). After the intensified enforcement, behaviour of drivers usually has gradually reverted to the level before the changed situation. However, the results of all these studies do not enable us to define an optimum enforcement intensity needed to suppress speeds permanently. Obviously, the number of repetitions needed is so high that planning meaningful enforcement tactics on aggregate level is not possible due to the vast sizes of transportation systems, even though good results have been achieved in single experiments concerning narrowly restricted areas (see e.g. Vaa, 2000).

Goldenbeld et al. (1999) have concluded that the efficiency of traditional speed enforcement methods, referred to above, is so low that careful consideration is needed as to which circumstances warrant these methods. This conclusion may be valid in terms of speed enforcement but other forms of traffic behaviour can be more easily influenced, as is shown by the high seatbelt wearing rates and relatively low drink driving figures in some Western and Northern European countries.

### **Alcohol**

The Finnish police have pursued a systematic DUI (Drinking Under the Influence) surveillance, including random breath testing and extensive use of publicity, for a over a quarter of a century (Mäkinen & Veijalainen, 1997). The risk of being caught for drink driving has increased considerably since 1977 when the police were first empowered to carry out random breath testing and were equipped with pocket-size Alcolmeter breath analysers. Currently, some 40% of drivers are tested annually in Finland. The number of those caught for drunk driving has fallen during the past 10 years from 0.33% to 0.14%. The overall positive trend is clear when evaluating the figures together with the results of roadside breath-testing studies. In the course of this process the punishments for drunk driving have gradually eased.

In France, the number of preventive tests rose steadily during the period 1980–1995. Almost 6.4 million drivers (about 5% of drivers) took the ethylo-test in 1995 (compared with 2 million tests in 1988). Concurrently with this striking increase in testing, the percentages of detected illegal alcohol levels tended to maintain about the same since 1988. Thus, in spite of the increase in testing, we can only observe here a stabilisation of illegal drink driving, not a reduction of the phenomenon (Biecheler-Fretel, & Cauzard, 1997). It is to be pointed out that the proportion of tested drivers in France is still rather low (5 %) compared to Finnish intensive testing – a figure equalling 40 % of the drivers – that has been carried out for years until a decrease in the drink driving figures was achieved.

In the Netherlands, the intention to optimise drink driving deterrence has led to some important improvements (Goldenbeld, 1996), starting in the 1980s. Since 1984, electronic breath testing equipment has been gradually introduced to replace chemical test tubes; at the same time, there has been a gradual transition from selective to random breath testing. After 1987, the cumbersome blood testing technique was replaced by

evidential breath testing. At the same time, there was a change in enforcement strategy from large static teams to smaller, mobile ones. Together with anti-alcohol campaigns and changes in consumer patterns (non-alcoholic beers), these improvements in enforcement strategy have contributed to the decline in drinking and driving between 1970 and 1991. In that period, the proportion of drivers with a BAC above the legal limit steadily decreased from 15% to under 4%. In the Netherlands the focus of increasing the acceptance of drink driving laws has been on improving police enforcement procedures, rather than on strict punishment.

In addition to Finland, Sweden and Norway also have very low drink driving figures ranging from 0.1% to 0.3% drivers over the legal limit in the traffic flow (Biecheler & Cauzard, 1999). However, these figures have been reached with a considerably lower number of breath tests than in Finland. On the other hand, sanctions from drink driving are more severe in Norway and Sweden than in Finland. When comparing the Nordic figures with other European countries (where data is available), it can be seen that the proportion of tested drivers in the 1990s ranged roughly from 0% to 5%, in most cases the figures being 0–2% (Biecheler & Cauzard, 1999). The drink driving figures respectively range roughly from 1% to 30%.

Even though the accuracy and comparability of these figures between countries are questionable, still they clearly indicate that there is a strong correlation between the objective risk of detection and the frequency of drink driving. The correlation is not perfect as the Nordic figures suggest. It can be summarised that the countries fulfilling *most* of the following criteria have the lowest drink driving figures:

- long tradition in drink driving enforcement including low legal limits,
- relatively high objective risk of detection (Finland),
- mass media supporting enforcement.

### **Seatbelts**

The history of seatbelt use enforcement is rather short. It has not been a primary target for the police in most European countries (Seatbelt enforcement is secondary, resulting either from routine general surveillance or as a by-product of the enforcement of some other law, such as drink driving). The large safety effects of even a few percentage points increase in belt-usage rates were probably not fully understood by the authorities until recently, even though the process of improving awareness started in the early 1960s. The same applies to the use of rear seatbelts as well. In terms of cost-effectiveness of policing operations, enforcement of seatbelt use ranks quite likely considerably higher than either enforcement of speeding or enforcement of drink driving (see e.g. ETSC, 1996; ETSC, 1999). The main reason for this favourable cost-effectiveness is that good results have been achieved even by means of secondary enforcement not primarily targeted to seatbelt use after non-use has been made punishable.



The emergence of airbags does not lessen the significance of seatbelts. Only by having the belts buckled up can the passive safety effects in vehicles equipped with airbags be optimised.

Even though seatbelt wearing has been mandatory in the front and rear seats of passenger cars for many years now – in some countries more than 20 years – there are still huge differences between countries in the wearing rates, especially concerning back seats (ETSC, 1996; ETSC, 1999). The Council Directive 91/671/EEC has made use of safety belts compulsory in vehicles of less than 3,5 tonnes, and the draft Directive amending this directive (OJ C 096 E of 27.03.2001, pp 330-332) extends the obligatory use to truck and bus drivers and child restraints. However, the sanctions for not wearing belts are usually mild.

The importance of the threat of police enforcement for compliance with seatbelt laws has been shown in American research that compared the effects of primary and secondary enforcement of seatbelt laws. Campbell (1988), in a study undertaken in North America, examined the effect of enforcement in 20 states, of which eight had primary enforcement laws and 12 had secondary enforcement laws. He found that for a given level of enforcement, seatbelt usage rates in primary enforcement states were 17 percentage points higher than those in secondary enforcement States (49% and 32% respectively).

However, there is evidence that through positive reinforcement (e.g. warnings and advice), belt usage rates can be increased in areas where the rates are not very high. In the Dutch province Friesland, a well-evaluated province-wide enforcement campaign began in September 1984. In the first phase of the campaign, police controls on seatbelt use were limited to advice and a warning. A simple cost/benefit analysis was conducted, which indicated that an enforcement/publicity campaign based on the Friesian model should be quite cost-effective. It was calculated that a campaign costing three times as much as the Friesian campaign and achieving an improvement of 15 percentage points in seatbelt use for one year would about break even.

According to a survey carried out in the GADGET project, only a few EU countries reported any special enforcement effort aimed at safety belt and child-restraint use (Mäkinen et al. 1999). In spite of this, some countries report a surprisingly large number of safety-belt violation tickets, sometimes second or third in size only to speeding tickets. In many countries there are no records kept of minor violations such as non-use of belts and when the fine is paid on the spot. There is no data on how many of the tickets were given to drivers, passengers, front or back, or for not seating and restraining children correctly. The fines on belt-use violations are the lowest on every country's list of fixed fines and the violation is not a criminal offence.

With few exceptions, the police in each country consider belt-use rates (80–95% on inter-urban roads, 70–85% in urban areas) as satisfactory and the role of the police in maintaining or increasing the rate as minimal. The police participate in various educa-

tion efforts to increase awareness of the use of safety belts and child restraints. Compared to drink driving rates, red light violations, or the non-use of helmets by moped riders, these non-compliance rates are very high.

It is not clear what the nature of non-compliance is, whether it reflects a random lapse by many drivers or a consistent rejection of restraint use by a hard core of objectors. It is also not clear whether police officers tend to ignore the violation or that the detection rate reflects what is possible with random surveillance methods unaided by technology. Depending on how these issues are clarified, there could be different approaches for increasing the overall impact of enforcement on compliance with restraint use laws.

### 3.3 EFFECTS OF TRAFFIC LAW ENFORCEMENT ON ACCIDENTS

The ultimate goal of traffic law enforcement is to prevent accidents from occurring by deterring drivers from violations that increase accident risk. Consequently, the most straightforward question that can be posed is how much traffic law enforcement is needed to decrease *the number of accidents*. Answering this question, however, is not easy. First, we ought to be able to define how much traffic law enforcement is needed to improve traffic *behaviour*, e.g. what are the effects of enforcement on mean travel speeds or on the occurrence of drink driving. The section “Effects on behaviour” deals mainly with various *experiments* relating to speeding, alcohol and seatbelt use, but it does not address the effects of traffic law enforcement on *systems as a whole*. Answering these questions would require comparisons between areas that are identical except for one aspect: one having a high level of traffic law enforcement and the other a very low level of enforcement or no enforcement at all (see also ESCAPE Working Paper 1).

There are only two cases reported that allow for some reflection on what will happen when there is no enforcement at all. Due to exceptional conditions, in 1979 the Finnish police forces went on strike and traffic law enforcement, among other things, was completely stopped. This meant that the objective risk of detection was zero. Road users were very well aware of this owing to the strong publicity associated with this unusual strike. A small-scale but interesting experiment using a before-after design was arranged (Summala & Roine, 1980). It turned out that the proportion of those speeding increased considerably both in urban and rural areas. Moreover, in urban areas where the speed limits are most strict, mean travel speeds increased by 2–3 km/h. Unlike before the strike, drivers also did not slow down when passing a car parked at the roadside (signifying a speed measuring unit). These fairly strong changes were measured during the first 2 weeks of the strike, which after that period came to an end. The results of the study suggest that the mere existence of traffic police – even though representing a small objective and relatively small subjective risk of detection – have an impact on driver behaviour, also implying safety effects.

Another case where police have not been carrying out any traffic law enforcement comes from USA. Carr et al. (1980) report the results from a natural experiment when

the Nashville traffic police force first intensified enforcement for 2 months but, subsequently, went on for a short-term slow-down strike as part of a contract dispute. There were large differences between the three periods in surveillance and citation levels but there were no corresponding changes in the recorded amount or distribution of accidents. Temporary withholding of policing activities, at least for a short duration, need not result in safety costs.

A second way of assessing enforcement effects is to increase the volume of enforcement over a certain period in restricted areas and to evaluate the safety impacts as an accident reduction. The purpose of these experiments is actually to study the effects of a reallocation of available enforcement resources. A number of studies addressing this issue have been carried out (see the reviews by Mäkinen, 1990; Zaal, 1994; Goldenbeld et al., 1999; Elvik, 2000; also ESCAPE Working Paper 1). The overall conclusion is that without a very strong increase in enforcement level, it is difficult to decrease the number of accidents. The results also indicate that safety effects by means of enforcement can be achieved in those restricted areas that are the focus of the enforcement experiments, not nation-wide, since the effects are achieved only through a very strong increase in enforcement input. In most European countries this is likely impossible to achieve on a national scale.

The use of automated methods is a partial solution to this dilemma (see ESCAPE Deliverable 6; ESCAPE Working Papers 6 and 7). So far, the experiences are fairly positive. In a recent meta-analysis comprising 10 studies, the effects of automatic speed enforcement on accidents were explored (Elvik et al. 1997). When all levels of injury are taken together, the effect on the number of accidents shows a total reduction of 19%. Considering casualties only, the accident reduction is 17% (Confidence intervals: -19/-16). As a traffic safety measure, automatic speed enforcement seems to have a larger effect in urban areas (28% reduction) than in rural areas (4% reduction). All studies but one are before-after studies with control groups or reference stretches of road. The accident data do not allow a separate estimation of the effect on fatalities only.

On the other hand, also optimisation of sanction systems may lead to a better safety level. Elvik et al. (1997) have identified 12 studies concerning the effects of warning letters, penalty point systems and licence revocation on accidents. There is not a large difference in the effects of warning letters and revocation of the driving licence, which measures decreased the proportion of all types of accidents by 15% and 17% respectively, whereas the effects of a penalty point system was roughly a 5% reduction in accidents.

Several meta-studies have been carried out on the effects of various enforcement *experiments* such as stationary speed enforcement, effects of speed cameras, camera enforcement of red light violations, and drinking and driving enforcement (Elvik, 2000). Usually, meta-analysis on the effects of these *experiments* indicates accident savings. The experiments clearly show the potential of enforcement as a safety tool. The issue is how to transfer the success of experiments to national strategies and practices. Results

from camera programmes and the use of sanction systems suggest that great increases in manpower and enforcement hours are not always needed.

Elvik (2000) summarises his review concerning the “dose-response effects” of enforcement, i.e. the relationship of enforcement level and safety as follows: “Despite the heterogeneity of the studies reviewed in this report, it is not altogether impossible to generalise the main trends in the findings by relying on the following set of assumptions:

- 1 The present level of enforcement maintains the present level of road safety (“the basic equilibrium condition”).
- 2 Reducing enforcement worsens safety (violations increase).
- 3 Increasing enforcement improves safety (violations decrease).
- 4 The marginal effect of increasing enforcement is gradually declining.

The results of the various enforcement experiments leave one central question in dispute: What is the *increase compared to the baseline level* in enforcement input needed to establish a safety effect? There are only a few studies showing this (see Engdahl & Nilsson, 1983). According to this study, the experiment increased the level of enforcement 3 to 5-fold. The second quantified estimate is an evaluation by Norwegian researchers (Östvik & Elvik, 1991; Elvik et al. 1997). They conclude that changes in behaviour and sometimes accident reductions are achieved when enforcement intensity is increased by at least a factor of three. A basic reason for this can be seen in the fact that standards to measure police intensity do not currently exist. In many countries, no system of indicators for enforcement activity has been developed. Neither police headquarters nor road safety authorities are regularly using such indicators. As a result, first of all, the findings of various studies cannot be compared in a meaningful way. Secondly, the actual reasons for the enforcement success/failure are less well understood; and thirdly, relevant managerial information which could form the basis upon which enforcement could be optimised is usually unavailable (Gelau et al. 2000).

Elvik suggests in his cost-/benefit analysis that it would be cost-effective to increase all types of traffic police enforcement. The analyses indicate that it is cost-effective to substantially increase the use of speed cameras and seatbelt enforcement. Stationary speed enforcement is cost-effective at six times the current level, whereas a more moderate increase would be cost-effective with respect to random breath testing (see Escape Working Paper 1). The analysis is based on Norwegian conditions.

It may be reasonable to assume that the short-term increase in enforcement levels in experiments has been even greater than in the Engdahl & Nilsson experiment. This means that achieving effects on a national level would require inputs in enforcement that may far exceed realistic expectations, no matter how cost-effective they may be proven. Consequently, the proven cost-effectiveness may not be the only criterion when planning enforcement strategies. Also the simple costs for the required input in parallel with the possibilities for political and public acceptance for the input needs to be considered – not only the predicted possible cost-benefit ratio showing greater return than the costs.





It can be concluded that theoretical estimates of the potential accident reduction impact of policing, based on enforcement inducing full compliance (and the role of non-compliance in accidents) are fairly high, up to 50% reduction. Estimates based on statistical analysis of empirical studies dealing with specific enforcement elements generally suggest much lower estimates, 10% being at the high end.

However, some well-implemented and sustained enforcement efforts have documented large safety gains, in the range of 25%. Typically these programmes involved both speed and drink driving control. The positive impact is larger with fatalities and serious injuries, pointing to the importance of speed control and possibly also of improved emergency response with improved or increased police deployment.

Much of the evidence for the positive impact of increased police enforcement (as separate from new legislation) on safety comes from enforcement projects and experiments restricted to either selected roads, to few behaviours or to a limited period. In practice this means that in most projects there was a temporary increase in local resources or shifting of resources to concentrate policing efforts in the selected area. Even after discounting the overestimate of safety gains due to methodological limitations of many of the studies, the safety benefits of police enforcement are often substantial.

One suspects that not all local projects of intensified enforcement result in success, but they are more likely to be quietly dispensed with and not widely reported. One of the few exceptions was reported by Weiss and Freels (1996) regarding the null safety effect of Dayton's experiment in community-wide aggressive traffic policing.

Most assessments of policing effects on safety follow the introduction of new traffic related regulations, increases in policing resources or a change in enforcement practices. Some quantitative studies measure intensity of enforcement, which may include no enforcement at some locations or times, but this refers to the *specific* enforcement activities under study and does not rule out other expressions of policing.

A large and permanent increase in policing resources is not an attractive or feasible option in most countries, and the evidence on the effectiveness of this approach is somewhat equivocal. The 'common wisdom' is that increases need to be at least 3–5 times over 'current levels' before substantial safety gains could be maintained. However, what is already being done with the 'current level' of traffic policing, what is the 'current' incidence of non-compliance, and what safety level is enjoyed in a jurisdiction must also be important in determining thresholds for police impact, base-level and ceiling effects.

Enforcement programmes in Australia and New Zealand demonstrated safety gains by policing with random deployment management of low intensity traffic surveillance. This is combined with automated photo-radar for speed detection and random breath tests. All these elements exist in routine enforcement programmes in several European



countries, many of which have as good or better a safety record than the countries above.

Nevertheless, the approach merits a more detailed examination and perhaps a more systematic application. It is possible, for example, that the safety efficacy of some general enforcement programmes is achieved not only, or not primarily, through the mechanism of deterrence but through mechanisms of better system management.

Another point of caution is that many of the studies reviewed here and elsewhere have been carried out in various states and communities in North America and Australia rather than in European countries, and many of the studies are from past decades with different social, legal, roadway, and traffic contexts. The validity of conclusions derived from that past experience needs to be examined in the framework of present day EU countries. For example, the acceptance of drink driving, owner responsibility and safety belt legislation; the use of RBT, photo-radar and automated speed and RL cameras; the extent of belt use and drink driving have all been different in Europe and are different now compared to 20 years ago.

### **3.4 ENFORCEMENT PRIORITIES AND UNIFORMITY**

It goes without saying that traffic law enforcement needs prioritisation. Forms of misconduct in traffic behaviour are numerous and focusing on them all systematically in enforcement is simply impossible. The ratio of police officers dedicated to traffic enforcement only and the number of driving licences varies in most European countries roughly from 1:2400 to 1:5800 (see ESCAPE Deliverables 1 to 3; Zaidel, 2000). This means among other things that while relatively few drivers may be influenced, only a few aspects of driving behaviour may be focused on. There are also reasons other than resources why the police need to set priorities for enforcement. These are associated with the capabilities of the police to measure and detect various violations. Modern in-vehicle technologies extend the scope of possibilities to detect and even prevent violations but their advent seems to be slow. This is due to the opposition both by the driving public and possibly by the automotive industry.

Generally, the state of enforcement in European countries is currently such that in all countries enforcement creates a very low objective risk of detection for most violations (Zaidel, 2000). This is mainly due to the huge size of the road transport systems. No matter how effectively so-called conventional enforcement is organised, there are no great possibilities to increase the deterrence effect of enforcement unless clear priorities are set as to what to focus on.

Currently, there is ample space for considerably better application of legal measures. There are many examples, ranging from excessive speeds to neglecting the use of safety equipment, and drink driving. Flaws can be identified in each link of the legal measures chain: passing laws, monitoring their observance, and the process of adjudication. For



European legal systems in the transport area to become more effective, they must consistently apply *the same norms* for regulating driver behaviour *in the essential areas*. It is not realistic to expect every rule from many different European traffic codes to be made identical. There are, however, certain key areas that need to be prioritised and that can have uniform regulations and uniform ways of enforcing them. Moreover, for the laws to be credible as well as uniform, they also require effective enforcement, not only in those countries where there is a high level of transport safety, but throughout Europe. The following priorities are proposed for the enforcement of traffic laws all over Europe:

### **Speed**

The role of speed in traffic accidents is a topic in the field of transport safety, of which probably the most solid evidence has been provided. Although numerous measures for effective speed control and management are available (see. e.g. Nilsson 1992; Ranta & Kallberg, 1996; Elvik et al. 1997; Kallberg et al. 1999; ETSC, 1999; Mäkinen et al. 1999), speeding and inappropriate speeds are still an area that seems to be almost impossible to tackle effectively. This is not due to the lack of effective measures for managing speeds but due to the lack of commitment needed for the engagement of effective measures. Automated speed enforcement methods are using almost exclusively outdated and laborious still-camera surveillance techniques dating back to the early 1970s. The priority given to speed enforcement means also priority for improving speed control measures.

Consequently, there are strong arguments for giving speed enforcement a high priority. Conventional, non-automated speed enforcement methods are not effective in further reducing speeds beyond their present impacts, since more resources are difficult to allocate for personnel consuming methods, such as speed controls requiring measuring and stopping units.

The need for prioritising speed enforcement can be summarised as follows:

- It has been convincingly shown that a change in travel speeds affects both the risk and the severity of an accident,
- Speeds are not enforced with the seriousness they deserve, the risk of getting caught for speeding is low in any given European country,
- There is an increasing pressure for higher speeds due to the growing number of high performance motor vehicles,
- Speeding increases the likelihood of other traffic violations, especially of those associated with overtaking,
- Lower speeds with reduced noise level increase the living comfort in the vicinity of road networks,
- Moderate speeds support sustainable development.

### ***Use of safety restraints***

As is the case with speeds, there is a lot of international research evidence showing that the use of occupant restraints is highly effective in reducing serious and fatal injuries. However, not all of the studies are well controlled. Elvik (2000) has identified two studies that explored the effects on accidents. These studies show tendencies for a reduction of accidents at all levels of severity. The observed changes in the number of accidents are, however, not statistically significant. Evidence from other studies that have evaluated laws requiring mandatory seatbelt wearing confirms that increased seatbelt wearing reduces the number of fatalities and injuries (see Elvik et al 1997).

Again, it can be seen that the process of promoting seatbelt use has been long and laborious. The promotion started in the early 1960s by means of information campaigns only. The results were disappointing. Not until seatbelt wearing laws were passed, and non-use made punishable, did wearing rates reach their current levels. The differences between European countries in legislative actions were great; the first law for making the use of front seatbelts compulsory was passed in 1971 (Luxembourg) and the last in 1993 (Portugal inside urban areas). The respective dates for rear seatbelts are 1984 (Austria, Germany) and 1994 (Portugal). Greece is still pending. The available data show great differences between European countries in user rates for adults in front seats varying from 52% to 92%. The situation in terms of rear seatbelt wearing rates and the use of child restraints is much worse (ETSC, 1996). Consequently, there is still a lot of potential for improving rear seatbelt use and the use of child restraints.

Moreover, there is also ample space for improving the use of occupant protection devices. The history of seatbelt promotion shows that mainly legislative actions combined with information have contributed to the relatively high wearing rates in some countries. There is little evidence that the police are enforcing the use of seatbelts actively. Usually, enforcement is so-called secondary enforcement i.e. enforcement carried out in combination with other enforcement activities. ETSC calculations show that more active promotion, especially primary enforcement dedicated to occupant protection restraints only, could save the lives of about 7,000 car occupants annually. The calculations are based on the estimated use rate of 95% throughout EU countries with a fatal injury reduction effectiveness of 50%.

### ***Drink driving***

In the light of the available evidence drink driving is relatively infrequent, but risky compared to other traffic offences such as speeding or not wearing seatbelts. In European countries about 3% of all journeys are estimated to be associated with an illegal BAC, whereas about 30% of injured drivers were under the influence of alcohol (ETSC, 1995). Consequently, alcohol is definitely one of the major causes of accidents and is also an aggravating factor. Alcohol is also the major cause of accidents from the road users' point of view. Some 85% of European drivers maintain that alcohol is often, very often or always the cause of accidents (SARTRE, 1994; also ESCAPE Deliverable 7).



While 93% of Swedish drivers are of this opinion, in Western Germany the figure is about 20 percentage points lower (72%). This is quite a remarkable difference but the ratings concerning other accident causes differ even more.

Drink driving is considered a serious offence in all countries. In countries with administrative traffic law, drink driving is one of the exceptions considered under criminal law. However, the practical significance of this uniformly strict legal approach depends on the alcohol level set as being a criminal offence and the tools the police use to monitor and enforce compliance. Systematic random breath tests (RBT), that have proved to be essential for both monitoring and deterrence, are applied on a large scale only in a few countries. Others have the legal provisions for RBT but do not carry out the tests except on selected occasions, thus losing much of the deterrent effect. Consequently, the estimated rate of actual drink driving varies in European countries from 5% to 0.2%. Enforcement practices differ also considerably from country to country. In some countries the risk of being caught for drink driving is practically zero or drivers are mainly tested only when involved in an accident. Countries where random breath testing is allowed and very actively applied represent the other extreme. In that case, the proportion of drivers annually tested varies from close to zero up to 25% (France) and 40% (Finland).

Drink driving enforcement is highly cost-effective. The meta-analysis carried out by Elvik (2000) is based on a total of 39 studies (also ESCAPE Working Paper 1). A majority of these – 26 – have evaluated drinking and driving enforcement alone or in combination with another measure, often an accompanying campaign. The overall effects of enforcing drinking and driving are reductions of 9% and 7% in the number of fatal and injury accidents, respectively. There is less evidence with respect to the effects on damage-only accidents, but it has been assumed that the effect is close to that found for all levels of accident severity combined, in data sets that include a mixture of injury accidents and property-damage-only accidents. This effect amounts to a reduction of 4% in the number of accidents. All reductions are statistically significant. It should be kept in mind that the figures presented above are based on experiments and are not nation-wide results.

### ***Traffic enforcement vs. other safety measures***

The cost benefit analyses presented in Working Paper 1 (Elvik, 2000) indicate that increasing police enforcement is very cost-effective. Estimated benefits are, roughly speaking, four times greater than costs. This does not rule out that other road safety measures could be even more cost-effective. In that case, cost-benefit analyses would recommend implementing these other measures before police enforcement was stepped up. In principle, implementing other effective road safety measures could make police enforcement less cost-effective, because the number of accidents or injuries would already have been reduced by the other measures. A recent study in Norway (Elvik 1999b) has assessed the costs and benefits of a broad range of road safety measures. As part of this study, five alternative road safety strategies were proposed for Norway. One



of these strategies was the “cost-benefit strategy”. This strategy consists only of cost-effective road safety measures, i.e. measures for which marginal benefits are greater than marginal costs. The estimated benefit-cost ratios of various categories of measures are shown in Table 2.

**Table 2. Cost effectiveness of various road safety measures.**

Group of measure	Benefit cost ratio
Road safety audits	1.1
Improving road design and roadside equipment etc	1.9
Improving road maintenance, especially in winter	2.5
Traffic control, including new speed limits	2.2
New motor vehicle safety standards	1.3
Driver training, public information and education campaigns	3.0
Increasing traffic police enforcement	3.3
All road safety measures	1.8

Traffic police enforcement tops the list. It is the most cost-effective road safety measure. It would therefore seem that, at least in the case of Norway, one cannot argue against increasing traffic police enforcement by pointing out that some other road safety measure would be even more cost-effective.



## 4 TRAFFIC LAW ENFORCEMENT AS A SAFETY MEASURE

### 4.1 ROLE OF LEGAL MEASURES AND ENFORCEMENT IN SAFETY WORK

#### *Background*

In the past decades, vehicle mobility has experienced an enormous growth, leading to a very strong increase in the number of cars on the road and associated traffic offences, and more complex traffic systems in general. As a consequence, the police role in traffic has become more extensive and complex as well. In our modern society we will increasingly find many organisations committed to or involved with road safety problems. Therefore, success or failure of an enforcement policy is not merely determined by the internal functioning of the police organisation, but rather determined by the way in which different organisations, such as legislative bodies, police, road authorities, publicity organisations etc. work together and co-ordinate their activities in a professional network. In this view, the quality of traffic law enforcement is determined by the extent to which activities are geared to each other to make up an effective chain of legislation, enforcement and supporting measures.

#### *Provision of sound laws*

In traffic, as in other areas, laws are intended to regulate behaviour. The function of road traffic laws is to save lives and prevent suffering. The combined forces of laws, regulations, enforcement and a sensitive penal system act to create the deterrence effect of police enforcement, both on the individual level and on society at large (Hakkert, 1994). In the same way that the functioning of police enforcement depends on a supportive penal system, the penal system itself needs to be grounded in the moral convictions of the larger society. Ultimately, the process of deterrence can be traced to a great extent to the community and its morals and social values (e.g. Andenaes, 1977). Research has shown that a positive attitude towards a particular law greatly increases its observance. In other words: deterrence through laws, surveillance, and punishment will be more effective, the more public opinion agrees with them. A road safety law or regulation is likely to be accepted if first of all it is known, and second it is generally considered to effectively reduce an unwarranted road safety risk against acceptable social and/or personal costs (Goldenbeld, 1996).

For the knowledge aspect, it is important that the law should fulfil certain inherently correct qualifications, e.g. (Noordzij, 1976):

- It is easy to understand for all road users;
- It is easy to follow;
- It is not in contradiction or conflict with other laws;
- It is not in conflict with situational prerogatives;



- It makes it easy to identify any violation of the law.

Road users tend to develop habitual behaviours that use a minimum of information processing time. Therefore, a rule should be easy to understand and give clear prescriptions for behaviour. A knowledge and understanding of the law should be accompanied by some notion of the intrinsic or communal value of the law or rules. That is, the road user should have a personal or social interest in displaying compliant behaviour. The one condition that is paramount in this respect is that the law has a clear relationship to road safety.

As argued next, there is more to laws than just the “laws on paper”. In practice several parties participate in the chain of traffic law enforcement: police, court officials, public prosecutors, policy makers, lawyers, judges and others. The question is whether this “social machinery of the law” works smoothly or not.

### ***The social machinery of traffic law enforcement***

However, as a recent survey by Cauzard et al. (2000) has shown, the existence of a good, clear, well grounded and accepted legal framework is not enough to ensure smooth operation of the traffic law enforcement machinery. The complexity of police traffic law enforcement is to a large extent due to the fact that it is indissolubly linked to both developments within the police force itself (re-organisations, management, priorities, expertise) and to the way in which the European police forces are currently managed. More specifically, the complexity resides in:

- the co-operation and co-ordination required between different organisations (local authorities, the police, the public prosecution service, public information providers), in which there are other interests at stake besides road safety;
- the need to organise effective and efficient police enforcement for each type of traffic offence.

A survey in four European countries (Cauzard et al. 2000) shows that these issues are not satisfactorily solved in all European countries. In Austria, for example, the diffusion of traffic enforcement responsibilities over several organisations leads to an undesirable situation: ‘the division of jurisdiction between different federal ministries and the provinces leads to a problem that no one feels ultimately responsible for and existing problems are not worked through to a solution, but rather deferred to other responsible authorities’ (Cauzard et al. 2000). A recently launched Austrian traffic safety programme sets also clear responsibilities for the police concerning several areas of traffic behaviour (see ETSC, 2002). This implies more pressure for a more coordinated traffic safety work also inside the police. A similar lack of co-operation between different enforcement authorities is observed in other countries (e.g. Greece).

Another difficulty is the fact that the effectiveness of police enforcement is usually weighed against other potential improvements in the traffic infrastructure and education,





a process that is often difficult to back up rationally. Unfortunately, in practice, there is a tendency to shift responsibility onto others: the police claim that local and regional authorities should tackle the problem first, whereas these authorities believe that the police should be the first to act. Yet precisely because the issue is so complex, it is vital that discussions between partners are structured as clearly and kept as specific and simple as possible. The only yardstick to be used should be the question whether the police and judiciary bodies have, or are being given, sufficient opportunities and competencies to contribute to meeting road safety targets, compared to the contribution being made by engineering and education measures (Wegman and Goldenbeld, 1996). Police traffic law enforcement can be an effective instrument for improving road safety (see e.g. Elvik, 1999b).

If co-operation between parties is the key to successful police enforcement, we cannot expect this co-operation to come about spontaneously. Even though police, court officials, road safety organisations and other parties may share a common interest in the improvement of road safety, they may very well have divergent interests as to financing, target setting, responsibility structure, communication with the public, the use of instruments, publicity etc. Of paramount importance is to ground and operationalise co-operation intentions in a road safety plan that is endorsed by the parties. In the plan, there should be clear target setting for road safety and compliance with traffic laws and division of responsibility between organisations at the highest national levels (Ministries) and intermediate levels (provinces, regions, police departments).

Goldenbeld (1997) put forward the following elements of a road safety plan where police have to co-ordinate activities with other parties:

- a clear description of the aims and targets to be achieved by the police activities;
- consideration of groups of road users which can be specifically targeted for publicity or enforcement activity;
- the choice of publicity strategy and message and publicity channels, including internal publicity to police personnel involved in executing the enforcement operations;
- clear agreements with other parties, e.g. local road safety authorities, municipalities, Public Prosecutor's Office, citation handling authority;
- the support of enforcement activities by additional measures along the road such as adding or placing road signs or road markings, or making them more visible;
- a sensible choice of locations and times of enforcement operations;
- consideration of the best mix between highly visible police checks and more unexpected, less visible controls;

- the set-up and execution of police controls according to time saving operational guidelines;
- a well-considered build-up and build-down of activities over a longer period of time;
- in-between evaluation of the extent to which agreements are fulfilled and the extent to which expected effects of enforcement activities have been realised.

Such a plan offers the best opportunities for evaluation of the enforcement activities and thus for learning from experience. Also, the plan clarifies the division of tasks and responsibilities between partners involved in the traffic law enforcement activities. This will facilitate communication and co-operation of parties during the enforcement process. Ad hoc massive police controls that are not grounded in a thought-out rationale and that are not prepared very well, may have only short-lived and minor effects on road users' behaviour and may even undermine the credibility of police traffic enforcement operations.

## **4.2 AREAS OF TRAFFIC BEHAVIOUR CURRENTLY ENFORCED**

### ***The most common violations***

The police are enforcing various forms of traffic behaviour, some areas, however, having a higher priority than others. Speeding, drink driving and seatbelt use seem to have the highest priority in traffic policing (see Table 3). There is great variation between European countries in how much the police produce traffic citations indicating the activity of enforcement. The information collected in GADGET Work Package 5 turned out to be very sporadic, with no country providing a comprehensive picture of its TLE system (Zaidel, 2000). It appears that in most countries there are big gaps in the information available on the extent and nature of traffic policing (also ESCAPE Deliverables 1 to 3).

Several countries have decentralised government structures on a state, regional or local level. States within a federal system, regions within a country, or local communities may have their own budgets, police forces, legal administration, and statistics offices. Traffic policing data are not routinely aggregated for the whole country. Data may be out there somewhere, but they are dispersed among many agencies and jurisdictions.

Another difficulty is caused by the possibility of separate police forces co-existing within a country, each with a different structure and under separate control – for example, a civil guard under the control of a ministry of defence, urban police under the control of an interior ministry, local police belonging to a community and controlled by the mayor, and transport police controlled by a ministry of transport. There is no one source of information that knows about each force in sufficient detail.



In many cases it is impossible to separate traffic policing resources and activities from general policing because there is no structural or functional separation between them in the police organisation.

To be complete, TLE data should perhaps have included also information about legal and other administrative resources spent on traffic enforcement, in addition to police resources. However, such data proved even more difficult to obtain than data on the activities of the police.

While a number of across-country comparisons are presented here regarding specific issues, the data and their interpretations must be considered as suggestive only, due to their serious limitations (Table 3, Table 4, pp. 58–59). In particular, the absence of a reference to a fact, a practice, a sanction, etc. in national data does not necessarily mean it is not relevant or is not an issue in a given country; this may be the case, but it can also be due to lack of information.

Over and beyond the availability of data, especially quantitative data, there is the overwhelming difficulty of interpreting data, organisational structures, practices, legal codes, sanctions etc. outside the linguistic, social, and cultural context of each country.

Data, even though difficult to compare and not available in several countries, do however give a good overall picture of the situation in Europe. Enforcement tends to concentrate on some key areas such as speed, alcohol, the technical condition of a vehicle, driver documents, and seatbelts. Reasons for this prioritisation are obviously of two kinds: objective monitoring of some areas of driver behaviour is relatively easy, and the monitored areas are also relevant to safety.

Many critical forms of misconduct are ignored, or at best only slightly enforced, since they are very laborious to detect and need a lot of manpower. These include dangerous overtaking and other forms of reckless driving.

Moreover, the evaluation of data on police activities shows that their enforcement strategies and tactics are not properly data led, since sufficiently detailed data on enforcement do not seem to exist and are not centrally accessible in many countries.

Finally, judging from the available data, there are clearly major differences between European countries in the intensity of police enforcement in all key areas of traffic behaviour.



**Table 3. The most common violations in selected European countries (Zaidel, 2000).**

Country	Most common tickets
Austria	Speeding
Belgium	Alcohol, speed, seatbelts, parking
Czech Republic	Speeding, wrong overtaking, "wrong way of driving" (covers many items, such as lane use), and of course parking (mostly in competence of municipal police).
Denmark	Violations/convictions of Road Traffic Act. Licence suspensions – 1997: Indictments/charges – drunken driving 12 516 Indictments/charges – all other violations 223 083 Decisions/convictions against drivers – drunken driving 0 10.911 Decisions/convictions against drivers not giving way 2 4.391 Decisions/convictions against drivers without driving licence 4 11.308 Decisions/convictions against drivers – with overloaded vehicle 16 7.550 Unconditional licence suspensions – drunken driving 8 7.550 Unconditional licence suspensions – reckless driving 0 190 Conditional licence suspensions – drunken driving 2 1.729 Conditional licence suspensions – speeding 4 779
Finland	1) Speeding, 2) other moving violations, 3) alcohol (1.4 checks; 22,000 citations)
France	Tickets 1 – parking in urban areas 2 – speeding, 1 129 254 tickets in 1997 3 – seatbelts, 597 104 tickets in 1997 From a survey in one Département: speed = 23%, seatbelt = 22%, papers (licence, insurance) =21% of all traffic offences (excluding parking) Summonses for illegal BAC, 95 495 sentences.
Germany	Speeding
Greece	Exceeding the speed limit, illegal parking and violation of traffic lights
Ireland	No specific information
Italy	No specific information
Netherlands	1) Speeding, 2) faulty parking 3) red light negation.
Norway	Type of violation Speeding 3,175 33.1 Red light violations 021 0.5 Violation of road signs & markings 17,591 4.7 Drunken driving 129 1.6 "Yellow indication" (drunken driving below limit) 054 1.1 Missing documents 498 10.9 Tyre defects 942 4.3 Light/sight defects 9,393 24.0 Vehicle Emissions 3,664 3.7 Other violations 190 6.2 Total 2,657 100.0
Portugal	No specific information
Spain	Speed, alcohol and parking
UK	1. parking (5.8 million in 1996: 100% fixed penalty/penalty charge) 2. Speed limit offences (0.76 million in 1996, of which 78% fixed penalty/penalty charge) 3. Neglect of traffic signs and directions and pedestrian rights (0.28 million of which 75% fixed penalty/penalty charge) 4. Miscellaneous (0.25 million of which 64% fixed penalty/penalty charge)

**Table 4. Indicators of police enforcement in twelve countries (Zaidel, 2000).**

	Aus- tria	Fin- land	France	Ger- many	Gree- ce	Ire- land	NL	Nor- way	Portu- gal	Spain	UK
Population mil	8.0	5.1	58.0	81.5	10.7	3.7	15.4	4.5	10	39.4	59.0
Tickets, all (1000)	3,550	378	6,000	3,500		90	4,700	414	930	1,900	3,700
Speeding tickets x1000	1,710	192	1,230			37	2,900	123		665	760
Automatic Tickets x1000	1,710	12	270				3,730	42	40%		350
RBT / EBT	y/y	Y/ Y	Y/Y	N/Y	Y/?	N/N	Y/Y		Y/Y	Y/Y	N/Y
DUI tickets x1000	76	25	95		2	4	20	10		41	96
Alco Tests x1000	100	1,400	7,200		260	17	500			1,400	860
Belt enforcement	Sec.	Sec.	Prim.	Sec.	Prim.	Prim.	Sec.	Prim.	Sec.	Sec.	Sec.
Belt tickets x1000	NR	23	597		51	6	5	33		161	126

### **Technology and new violations**

New technology broadens the scope of enforceable offences. The first traffic cameras captured violation images using film – simply because it was the only imaging technology then available. By comparison, digital traffic cameras capture speed and red light violation images directly in digital form. Digital images are ideal for the automated image processing technologies applied in the best Traffic Camera Offices (= dedicated places for treating images and data produced by cameras). They also eliminate the costly, time-consuming processes of film transfer and development – with their risks of image tampering and loss of evidence. The most significant advantage of digital traffic cameras may, however, be their capacity to encrypt images and violation data at the point of capture (Malenstein et al. 2000). From then on, the encrypted (primary) files cannot be manipulated or tampered with. The actual medium (JAZ drive, CD, WORM drive, HD etc.) on which they are stored is irrelevant. What matters is that encryption has secured and protected the primary (image and data) file as the primary evidence for the violation. This encrypted digital evidence constitutes optimal primary evidence for prosecutions.

The use of automated enforcement systems (i.e. deferred enforcement without the intervention of an enforcement representative) is allowed in all European countries surveyed (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom) by the VERA project on Video Enforcement for Road Authorities (Malenstein et al. 2000). There is no specific law that prevents the use of digital rather than wet-film based enforcement systems.

Driver/owner responsibility is a key issue for automated enforcement systems. Legal responsibility differs between countries. In some countries only the driver is responsible for the traffic violation (e.g. Finland, Germany, Norway, Sweden and Switzerland). In



others, the registered owner of the vehicle can be held responsible if the driver cannot be identified (The Netherlands, Belgium, Italy, France, and the United Kingdom). Furthermore, driver/owner responsibility differs within and between European countries depending on the different violation types. The situation is highly fragmented.

One promising development is the instalment of video-imaging techniques on existing camera systems in order to broaden the scope of enforceable offences. Video image processing can be used to automate detection of traffic incidents, including violations such as speeding, driving in the wrong direction, or forbidden stopping or turning. The main argument for video image processing is that very often cameras are already part of the standard equipment. Adding automatic detection of traffic incidents to the cameras could optimise the activities of the traffic managers by informing them better about the traffic parameters and the detected incidents, including violations.

In the VERA project European standards are set for the use of video enforcement techniques by European police forces.

The digital camera technology is not only meant to replace the old wet-film cameras. This new technology has the potential to open up a whole new area of traffic regulations that may have existed before but, in practice, were unenforceable:

- lorry bans through towns;
- illegal U-turns and set-downs;
- dangerous or careless driving;
- illegal right turns;
- illegal use of bus lanes.

These types of transgressions that require more manpower than is currently available could be captured automatically on hard disk (Bagot, 1998).

### ***Violations by foreign drivers***

In the GADGET review of enforcement practices (Zaidel, 2000), all countries reported enforcement difficulties regarding foreign registered vehicles or drivers. The legal sanctions in each country assume a local driver licence, a local address, and a local bank account. The process of adjudication cannot work properly with non-local drivers. In the case of automatic recording of a vehicle licence plate, a foreign registered vehicle is hard to trace and prosecution is difficult. In most countries, when a vehicle is stopped for a violation, foreign drivers have to pay a fine on the spot or be taken to court. Fines against foreign vehicles are sometimes higher. Other sanctions are not usually applied.

For effective and efficient cross-border enforcement, aiming at the proper enforcement of foreign violators, communication across the borders will be necessary. As a result of the VERA project, the European Commission plans to start working on a Memorandum of Understanding (MoU) to institute a legal framework for cross-border enforcement, applicable to the entire violation (Malenstein et al. 2000).



### **4.3 TRAFFIC POLICING IN PRACTICE**

#### ***Organisation of traffic policing EU-wide***

Regarding policing, a mix of organisational structures of police can be seen in EU countries (ESCAPE Working Paper 2; Zaidel, 2000). A typical organisation may consist of three parts: A central Traffic Police force, under the control of some national command, is responsible for traffic control on main national highways. Another force, which may or may not have special traffic units, is responsible for rural roads and small communities in between. A third element is a local police force in larger communities, which in the case of large cities will also have special traffic units. The degree of centralisation of command and control, the level of autonomy of local forces, or the degree of personal specialising in traffic control, vary from country to country and within regions and police forces within a country.

Finland, Greece, Ireland, the Czech Republic and Israel rely on a single centralised national police force. France, Portugal, Italy and Spain have two national centralised forces, one primarily for rural areas and one for more populated areas. Austria and Germany are federal countries with a more complex structure of state, local, and federal forces. The Netherlands, Denmark, Norway and the UK each have a large number of regions with co-ordinated but autonomous police forces.

Traffic policing is organised within these basic structures according to choices made about two doctrines (Zaidel, 2000). The first is functional (professional) specialisation of traffic work versus traffic policing being a duty of general policing. The second is about separation and centralisation of a traffic police force with its own command chain, versus traffic policing units being part of a larger local force. Many variations of these options exist.

In most countries, regardless of police structure, large cities have specialised traffic units as part of the one or more police forces having jurisdiction there. Several countries (Austria, Finland, Israel, Norway and the Netherlands) operate separate, centrally commanded Traffic or Motorway Police focusing on major inter-urban roads. France, Germany, Spain, and Portugal have similarly specialised traffic units within the structure of their general forces. In Ireland and Greece, with a single national police force, local police units have a detachment of traffic specialised officers.

Similar solutions to the organisational structure of traffic policing can be found in other EU countries. Specialisation and command – centring of traffic policing – may indicate an increase in the relative importance of traffic policing (separate organisation requires dedicated resources) and may result in “more” or more effective traffic policing. It is clear, for example, that the size of a country, its political structure, and its social-cultural history all play a role in shaping the structure, functions, and size of traffic policing.



### ***Scope of traffic policing***

Besides road traffic enforcement, almost all police forces in Europe engage in the following traffic policing tasks:

- waterways traffic enforcement,
- traffic planning and advice;
- accident registration;
- in-depth technical research in case of serious accidents;
- traffic surveillance (in general and special events);
- traffic management (in general and special events);
- prevention of traffic crime;
- traffic education;
- traffic publicity;
- traffic escort of VIPs.

Some forces also engage in additional tasks like:

- prosecution of traffic offences;
- licensing;
- vehicle/tachograph inspection (private vehicles and/or commercial vehicles)
- fine administration.

As stated before, vehicle mobility and the number of cars on the road and associated traffic offences and complexity have increased drastically over the past decade. However, police capacity has not increased proportionally. In most European countries it is commonly agreed that police resources are scarce. Besides, it should be realised that enforcement of traffic rules is just one of the various tasks of traffic policing. There are certain advantages of traffic policing comprising a range of different tasks. First, police officers experience different aspects of the total traffic system, increasing their knowledge of the operation of the total system. Second, the work itself is more interesting, which is likely to lead to higher job satisfaction and more commitment to traffic policing itself. On the other hand, a police organisation that is burdened with too many traffic-related tasks may easily fall short in resources left for actual traffic enforcement activities. Moreover, in police forces that have a general policing task, traffic enforcement activities generally do not have the highest priority or status.

It is also questionable whether some tasks, such as licensing, technical vehicle inspection, and prosecution, should actually be carried out by a police organisation rather than by a commercial or administrative organisation or a separate governmental department (ESCAPE Deliverables 5, 6 and 8; Heidstra et al. 2000). Some processes and problem areas in traffic are eminently suited to a specialised approach (see paragraph 4.5 for further discussion of this subject).





### ***Tolerance levels in actual enforcement and adjudication***

In the enforcement of speeding and drink driving there is often a tolerance level being used between the actual legal limit and the behaviour that is factually enforced on the spot. The tolerance levels allow the behaviour to be slightly more extreme than the legal limit before the behaviour is actually enforced. Zaal (1994) mentions three reasons for the introduction of tolerance levels.

First, the measurement of a traffic violation may be controversial among the courts. Second, the police may compensate for inaccuracies in their measurement equipment. Finally, as well as maximising the likelihood that police evidence will stand up in court, the tolerance level may also promote good will among drivers.

How much deviation from compliance to the letter of the law is practised in the EU? Detection, recording and punishing a violation depends on several factors. To begin with, the law itself may give a range of compliance levels that may be handled differentially. This is common for speeding and for alcohol levels.

Police in all countries set speed detection devices to a higher threshold than the legal speed limit – sometimes 7%–10% higher or a fixed number of km higher than the legal speed limit (ESCAPE Deliverable 1; Zaidel, 2000). Functional reasons include catching the real speeders, not clogging the system with minor violations, and being perceived as fair by citizens. The thresholds vary not only between countries and regions within a country, but also within the same police unit from time to time and from one location to another.

Essentially the same situation holds for automatic detection of red light violations. The thresholds for most other violations, which are detected by unaided observation, are certainly determined by shifting organisational and individual standards. The same behaviour may not be considered a violation in different countries, by different officers, or even by the same officer at different times.

As stated in the introductory chapter, in most countries a large amount of discretion is given to police officers on the road regarding the classification of a non-compliant behaviour into one of several potential violation categories that carry very different consequences. An identical traffic violation may result in a verbal warning with no record of it, or it may result in a recorded (but not processed) warning. It may result in a relatively small fine paid on the spot and no further record of it, or it may result in being classified as a recorded violation of a given degree of seriousness. This, in turn, may carry only a fine or other consequences as well. Clearly, also here there is a large range of variation within a police force and between forces.

### ***Monitoring of traffic enforcement activities and results***

From an English study into traffic policing activities and organisations (Ogilvie-Smith, Downey and Ransom, 1994) we learn that about one quarter (25%) of the traffic officer

man hours in British forces is spent on preventative patrol (stationary, targeted or mobile patrols), whereas one twentieth (5%) of the time is allocated to traffic checks (vehicle crime, drinking-driving, speeding, excise licence).

Since a lot of traffic policing time is written on “surveillance” or “patrol”, it is very important to have indicators for the quality of traffic surveillance. For example, in the Nice workshop (ESCAPE Working Paper 5; Christ, 2000), a Swedish superintendent of the traffic police distinguished three forms of traffic surveillance in problem-oriented police work:

– *Reactive policing: reacting to circumstances*

The “old fashioned” non-problem oriented way of carrying out police work, but in some situations necessary even in problem-oriented policing when there is some traffic problem or disorder and prompt action from the police is called for.

– *Proactive policing: prevention by presence*

The stationary clearly visible police control of traffic, where there is active policing going on and the presence of policemen in full action is functioning as a crime preventive method, often in combination with clearly visible information by signs. Maybe even by spreading information about time and place through the media about where the police is working, why they are there and the expected traffic calming result on road users.

– *Proactive repressive policing: prevention by checking possible offenders*

In combination with the clearly visible policing action there are units working in the same area with the same purpose of supervision, but possibly also checking up on potential offenders. They are checked and charged by the proactive repressive police unit.

Clearly, these different forms of surveillance differ in effectiveness. The indicator of hours spent on traffic surveillance is not specific enough to capture the different forms of traffic surveillance. Police management should at least know how the total patrol time is subdivided amongst these specific forms of traffic patrol.

There is a paradox with monitoring and supervision. In order to lessen the bureaucratic workload for managers and supervisors, the paperwork for traffic policing, e.g. for prosecutions, may go via either a prosecution section or an administrative unit rather than via the bureau of a supervisor or manager. This may increase the speed of the procedure and relieve some of the bureaucratic workload of managers. On the other hand, managers may now have far less information to estimate the effectiveness of what their personnel are doing. In the words of two British researchers (Southgate & Mirrlees-Black, 1991): “How are they to manage resources if they are deprived of information about what the resources are used for?”

Clearly, there are two important lessons:

- Indicators for the quality of traffic policing need to be critically reviewed from time to time to see whether they still truly reflect the original criteria they were

meant to capture; in bureaucratic systems, some changes in administrative procedures can lead to a different meaning of figures and indicators. For example, increased number of tickets does not always imply increased efficiency, but may imply changes in practices reflecting rather focusing on areas or forms of behaviour that may make the accumulation of tickets easier than perhaps targeting on more safety critical areas.

- Managers and supervisors of traffic policing should keep in touch with the actual practice of the work and should from time to time confront administrative figures with personal reality checks, since the figures they receive may not be a good reflection of actual realities.

### ***Evaluation of enforcement performance***

Judging the effectiveness of actual police enforcement activities in practice may be difficult. Numerous factors may interfere with reaching valid and clear conclusions. A few of these factors are: unreliable accident registration (of particular accident categories), statistically low numbers of accidents, missing data on important characteristics of accidents, missing data on actual traffic behaviour, imprecise data on traffic offences, the lack of a research control group or control area, changes in the police administration system, etc. Regarding the effectiveness of police enforcement, it should be said that it is unrealistic to expect that police enforcement can lead to continuous improvements in road safety. In general, in most European countries there are stable yearly levels of enforcement. Given this stability in enforcement levels, it cannot be expected that road safety will continue to improve. Even if enforcement levels increase over time, this will not necessarily lead to any change in behaviour or road safety. For instance, in their review of a number of speed enforcement studies Östvik and Elvik note that increasing the enforcement level on a certain road by less than three times had little or no demonstrable effect on subjective risk of detection. (Östvik and Elvik, 1991).

However, if we have a situation of stable road safety and stable enforcement levels, it cannot be concluded that police enforcement has actually no effect at all. Very likely enforcement still has an effect, but this effect is counteracted by other developments in traffic (increased motorization, changes in composition of the road user population, changes in the road network). The result may be a stable situation in which police enforcement influences road users to comply with traffic rules, while other factors lead road users to violate them. In this respect, Homel (1989) uses the 'hole-in-the-bucket' metaphor, according to which deterrence can be seen as a continuous process of opposing forces. During this constant process, enforcement influences some road users to a certain extent (filling the bucket), but at the same time other forces, such as the emergence of new road users, social pressures etc. lead road users to begin or continue with violation of traffic rules (draining the bucket).

Therefore, it should be realised that police enforcement activities can be effective without an actual absolute improvement in road safety statistics. In many European coun-



tries the increase in motorization rate may be so sharp that traffic risks and traffic accidents will in all likelihood increase rather than decrease even if sharp countermeasures, such as increased police enforcement, are taken. If it is unrealistic to expect continuous improvement in road safety, it follows that the evaluation of effectiveness of police enforcement cannot be done solely on the grounds of accident statistics. Although most experts have stated that road safety is the ultimate criterion against which to judge traffic enforcement, it should be clear that road safety cannot be the only criterion.

#### 4.4 VIEWS OF PRACTITIONERS

At the Nice workshop on traffic law enforcement in November 1999 (ESCAPE Working Paper 5; Christ, 2000), consensus could be reached on a list of priorities in regard to knowledge and information measures for support or improvement of police enforcement in practice.

– *A strong role for the police as adviser in traffic affairs*

Main argument: The police are the ‘ears and eyes’ of society, also in the field of traffic where the police may develop very practical knowledge of how the traffic system actually works. Many traffic and enforcement problems may be avoided in the first place if traffic police is consulted in advance about infra-structural changes, planning of special events etc.

– *Quantitative targets*

Main argument: Target setting is necessary to motivate, steer and evaluate police activities.

– *Solid criteria for planning of enforcement activities*

Main argument: Given scarce resources of traffic police there should be good criteria on which to base decisions about allocation of these resources to enforcement activities.

– *Yearly monitoring of traffic behaviours*

Main argument: Besides accident data, behavioural data provide input for planning of enforcement activities. Also, the targets for the traffic police may be behavioural targets, e.g. 85% of front-seat occupants wear seatbelts inside built-up areas.

– *Accident registration quality*

Main argument: Accident data are the most widely used and often only source of data used to plan, steer and evaluate police enforcement activities. Given this importance of accident data the quality of accident data registration should be a continuous concern.

– *Evaluation*

Main argument: Evaluation of police enforcement activities is the only way to find out whether the activities were meaningful, successful, well planned, well-executed etc.



Without evaluation of some kind, one cannot conclude anything about the value of your activities.

– *European knowledge body*

Main argument: The knowledge gained with enforcement activities in some countries or in some regions should be freely available to every European force *that wants* to learn from the experience of others. For this purpose, it would seem a good idea if there were some European body that collects the practical experience of various European police forces with enforcement activities and that makes this knowledge freely available by modern technological means (Internet, electronic helpdesk etc.)

A comment for the wish of the European knowledge body: there is currently available a CARE database of the Commission (Community Road Accident Database) that covers also data relevant for traffic policing. Some parts of the CARE are now also accessible by internet: [http://europa.eu.int/comm/transport/home/care/index\\_en.htm](http://europa.eu.int/comm/transport/home/care/index_en.htm)

– *Enforcement guidelines*

Argument: It was pointed out that enforcement guidelines for police operations in the streets were very important for the quality of the actual police work. The organisation TISPOL is looking into ways to see whether European guidelines can be established.

– *Clear responsibilities of parties involved in road safety or enforcement work*

Argument: The traffic police have a very specific responsibility in road safety or enforcement projects. However, other parties (road authorities, government, accident-registration agency) are also involved in road safety work. It should be clear what the specific responsibilities of the partners in a project are. In the Czech Republic, for instance, the traffic police are almost solely held responsible for all matters involving road safety. Clearly too much responsibility is loaded onto the shoulders of one organisation. Clear responsibility ensures that every partner can be specifically held accountable for a certain performance. It was indicated that the police should not only be an adviser but also be held directly responsible for certain outcomes.

– *There should also be qualitative targets, e.g. perceived environmental quality*

Argument: Not all qualities can be measured objectively.

In the light of the EU perspective, several members of the expert group could agree that the quality of accident data registration was perhaps the foremost priority (Christ, 2000). Also, evaluation was ranked quite high among the priorities. In the opinion of one group member, both the accident data registration and evaluation would have to be the responsibility of external experts.



#### **4.5 NON-POLICE BASED ENFORCEMENT**

In most European countries it is commonly agreed that police resources are scarce. Moreover, in general, traffic enforcement activities do not have the highest priority or status in police forces that have a general policing task. Therefore, other measures are implemented and explored that contribute to safe behaviour on the roads and that lessen the burden of traffic enforcement placed on the police. With this situation in the background, in several European countries a tendency has arisen to explore the possibility of transferring certain traffic law enforcement tasks to non-police organisations.

Enforcement of traffic laws carried out by institutions other than the police can be called “non-police based” enforcement. Some parts of the enforcement system, such as detection, registration and imposition of a penalty for violating a traffic law or regulation, are in several countries no longer the exclusive right of the police.

Non-police based enforcement may appear in several forms with different bodies involved (see ESCAPE Working Paper 4; ESCAPE Deliverable 5). The enforcement activities can for instance be fully government-controlled, performed by a completely privatised, commercial organisation or be a public-private conjunction. Besides the different types of organisations that can be involved and the differences in the administrative and co-operative structures employed, the diversity stretches out to different types of traffic behaviours as well. The non-police based enforcement task may for instance be focused on a specific target group (e.g. heavy trucks, freight traffic) or on specific (mass) behaviours (e.g. parking, speeding, etc.). However, the term non-police based enforcement may easily suggest that the police are no longer involved in the enforcement process, which does not necessarily have to be the case. In any case, the police organisation may still have an advising, supervising or otherwise important role in the whole process of enforcement. In this sense non-police based enforcement can be considered a misnomer for what is meant. However, for want of a better term we will keep using it, noting that it should be interpreted as any activity in which other bodies than the police take part in the traffic law enforcement process.

From a theoretical point of view it is tempting to view the traffic law enforcement process as a production process. The links in this production process could be described as: monitoring, detection, identification, administrative processing, prosecution, jurisdiction and fine – collection or imposition of (alternative) sanctions. In many European countries several parts of this process are handled by other parties than the police. The last mentioned activities, for instance, are usually processed by the courts’ officers or special administrative agencies. Another example is enforcement in relation to specific categories of road users (e.g. heavy traffic) which in many EU countries is at least partly delegated to specialised government agencies or private companies.

Historically, there has always been a trend that those parts in the process and those problem areas in traffic which require a high degree of specialised knowledge or standardised, routine and repetitive care, are handled by specialised, relatively autonomous

agencies or departments, either public or private. The dynamics behind this phenomenon are mainly economical. Some processes and problem areas in traffic are eminently suited for a specialised approach. In some cases, as in the case of vehicle inspections and heavy traffic enforcement, this specialisation requires both standardisation of tasks and procedures and a specific high level knowledge of performing employees. In other problem areas, such as detection and processing of parking violations, the specialisation is on the management level rather than on the workforce level: the work is standardised and routine, requiring relatively little specific knowledge.

Table 6 presents a number of characteristics that can be used to describe whether a traffic enforcement task is eligible for a high degree of specialisation. As can be seen in the table, specialisation can take the form of a standardisation: highly repetitive routine tasks that require only a low or moderate level of education of employees. Enforcement of parking violations with a large personnel force of traffic wardens would be an example of standardisation. On the other hand, specialisation may also involve tasks that require a high level of specialised knowledge. Inspection of heavy traffic or vehicle inspection would be examples of these tasks.

**Table 6. Task characteristics in the traffic enforcement process and eligibility for standardisation and specialisation.**

Standardisation	Mix of standardisation and specialisation	Specialisation
Repetitive routine standardised tasks	Multiple tasks	Repetitive specialised tasks
Fixed sites	Different sites	Different sites
Non-moving traffic	Both moving and non-moving traffic	Both moving and non-moving traffic
Low level education / knowledge required	Moderate to high level education and knowledge required	High level education and (technical) knowledge required
Tasks not driver contact sensitive	Tasks driver contact sensitive	Tasks not driver contact sensitive
Tasks stable over time	Tasks unstable over time	Tasks stable over time

Typically, the (traffic) police are an organisation that is best suited for offering traffic enforcement services on the middle ground between highly standardised, repetitive tasks and very specialised enforcement tasks (i.e. the central column). In general it can be expected that the police will tend to remain an organisation that performs a multitude of tasks, in particular those involving a mix of routine and specialisation and those in which contact sensitivity is rather large.

The main asset of the traffic police in this respect is probably their capability to engage in multi-tasking: the ability to deal effectively with all sorts of different traffic problems (e.g. recording and analysis of traffic accidents, enforcement checks, traffic management, advisory function etc.) and even other law enforcement related problems at the



same time. As soon as certain standardised tasks require a high degree of specialisation or a large amount of manpower for the execution of daily routine tasks, they tend to become tasks that can be performed more cost-effectively by specialised departments, either within or outside of the police organisation. In the following chapters a number of examples of non-police based enforcement in different European countries is studied in more detail.

In the ESCAPE project, a number of different situations in Europe were reviewed and assessed in which non-police based organisations are taking part in the total traffic enforcement system or are experimenting with such a system (ESCAPE Working Paper 4; ESCAPE Deliverable 5). Examples of these non-police enforcement tasks were speed enforcement by local authorities (Germany), driver improvement measures conducted by specialised governmental authorities (France), periodical vehicle inspections by private companies (Finland), and fiscal and administrative enforcement of parking by local authorities (the Netherlands). It was attempted to broadly identify strengths, weaknesses, opportunities and threats of these systems. The situations reviewed in Finland and France are relatively the least controversial since they involve situations where the role of police traditionally has been small or non-existent.

Up until the end of 1992, periodical vehicle inspections in Finland were the exclusive responsibility of a government bureau, the Central Motor Vehicle Register. From the beginning of 1993 the Central Motor Vehicle Register ceased to operate as a government bureau, and its status was changed to that of a state-owned commercial enterprise. In 1996 it was incorporated as a joint stock company, in which case there may be owners other than the state. Privatisation of the vehicle inspection system was carried out also in other ways. Thus, the reviewed changes to traditional vehicle inspection in Finland mainly involve a transfer of government tasks to commercially operated institutions. As the results of an evaluation study show, in this case the transfer may have positive effects on public acceptance, since some groups of drivers even seem to think they may personally profit from the choice between government controlled and commercially operated institutions.

In France, a licence demerit point system was introduced in 1992 to drive back recidivism rates in traffic violations. Associated with this, driver improvement courses are conducted by which convicted drivers can recover their lost licence points. State authorities are responsible for the accreditation of course centres and their staff. This traffic management system can be regarded as an important support system for the police in reducing the number of traffic offences on the road. The French example presents the substitution of traditional punishment by fine or imprisonment by the alternative of participating in a driver improvement course. In both cases the options open to the driver are enlarged and the role of the (traffic) police is only marginally affected or is not at issue at all.



The Dutch and German examples bring us closer to the heart of the controversy surrounding non-police based enforcement. They pertain directly to the transfer of important responsibilities of the (traffic) police to other institutions.

In some European countries the legal basis for the operation of governmental bodies as enforcement authorities already exists. It was found that in the majority of German federal states, local authorities have the legal competence to operate as traffic enforcement authorities. Although this type of enforcement appears not to be widespread as yet, it is expected that in the future more municipalities will exercise their role as an enforcement authority. The main advantage of this type of enforcement seems to be the enormous increase in enforcement capacity that can be achieved. The main threats that were identified for this type of enforcement are:

- municipalities making traffic safety objectives subordinate to the financial gain that can be generated by enforcement efforts
- co-ordination problems associated with different authorities carrying out the same enforcement tasks
- problems related to public acceptance

However, (the limited) research results in Germany demonstrated that the selection of enforcement sites in municipalities conducting enforcement is mainly based on traffic safety aspects. Most local authorities report close co-operation with the police concerning enforcement time and location as well as in the prosecution of offenders. Overall, the municipalities report a good acceptance of their enforcement activities by road users. Finally, most of them report speed and accident reductions as a result of the speed enforcement.

Similar considerations apply to the introduction of administrative and fiscal parking enforcement in the Netherlands. To increase police capacity and relieve the workload in courts at the same time, in the nineties traffic law enforcement in the Netherlands increasingly made use of detection and prosecution of violations on the basis of administrative law. The system allows large-scale processing of cases due to its simplified procedure. It is no longer necessary to establish the identity of the offender, as the owner of the vehicle is assumed culpable. In financial terms, the system is very profitable to the state. The temptation, perhaps even policy, consequently may be to maximise profits rather than the objectives of traffic safety.

To further relieve the police from traffic related enforcement tasks, parking violations in a growing number of municipalities in the Netherlands can now be processed under fiscal law. Fiscalising parking violations (non-payment of parking) enables authorities other than police – i.e. local ‘tax’ authorities – to carry out enforcement tasks.

The following threats or possible negative consequences of these ‘innovations in enforcement’ were identified:



- Instead of regulating quality of life and accessibility of cities, taxes and fees might very well be used to regulate the city's budget deficit.
- Surveillance may be concentrated on violations that are simple to register and in areas where registration is straightforward.

Enforcement of offences that do not require direct contact between the enforcement authority and the driver are most eligible for a transfer to non-police bodies. However, a total loss of contact between drivers and the police (or other appropriate enforcement agency) could lead to a decrease the acceptance of the traffic policing.

Conclusions drawn from the Work-package 3 work dealing with the role of non-police institutions and functions in traffic enforcement can be summarised in four main points:

*First, it can be concluded* that the integration of other authorities in enforcement can be a meaningful step towards optimising traffic enforcement and traffic management activities and, at last, to improving traffic safety. The reported experiences suggest that traffic enforcement and related activities by local authorities, specialised governmental agencies or commercial organisations can be an appropriate way to relieve police organisations from at least part of the burden of traffic enforcement, creating the opportunity to allocate more resources to other, high priority activities.

Taking the limitations of administrative and fiscal enforcement into account, a *second conclusion* is that although local authorities can meaningfully supplement enforcement by the police they certainly cannot entirely replace it. A part of enforcement activities will have to rely on personal contact where the authority of the police officer is necessary. Also, for some enforcement activities the exclusive power to use force if necessary will be indispensable.

A *third conclusion* is that the road safety effect alone is not a sufficient criterion to evaluate the changes that are put into effect by non-police based enforcement arrangements. In the transition from traditional enforcement to a situation where enforcement is a mixture of police and non-police work, there are a number of complicated issues at stake that should be covered in an evaluation as well. Obviously, non-police based forms of enforcement need some years to find the right balance. It will take time before the several parties in the traffic domain will have adopted their new roles and found new ways of interaction that optimise the quality of their efforts. It is easy to imagine that some 'process losses' may occur in the first period of transition. Double work by and problems of co-ordination between different authorities are possible bottlenecks in optimising the effects of the total effort. Furthermore, the transition to non-police based enforcement may put the police in the somewhat awkward position of passing on knowledge about enforcement procedures without seeing anything in return for this service. Preferably this should be avoided by making agreements on specific topics, e.g. a long-term planning of the respective activities. To make co-ordination and co-operation work a clear description of allocation of competencies from the legislative side seems to be an important precondition.



A *fourth conclusion* is that in a situation of transition between traditional police enforcement and non-police based enforcement, measures should be taken to safeguard the credibility of enforcement. In the long term the acceptance and credibility of enforcement related activities (by any authority) are essential aspects of the sustainability of behavioural effects. Therefore, besides the aforementioned aspects, the necessity of non-police based enforcement should be understandable to the public. For example, in the case of speed enforcement in Germany part of the solution to this problem is found in the selection of speed enforcement sites. The choice of sites should have a high “face validity”, i.e. near schools, kindergartens, old people’s homes and traffic calming zones.

#### 4.6 CONCLUSIONS

The most important conclusions that can be drawn with respect to traffic enforcement as a safety measure are as follows:

- Improvement of accident registration and evaluation of traffic enforcement should be considered top priorities for the improvement of traffic enforcement in the EU.
- Without target setting and agreement on respective responsibilities between parties involved in the traffic law enforcement process, evaluation of enforcement activities makes little sense.
- Targets for police enforcement should be first and foremost in terms of behavioural compliance rather than solely in terms of accidents.
- Given scarce resources and competing priorities, it is important that traffic enforcement be used (1) selectively, according to a well-considered and elaborated (2) road safety plan, (3) supported by other measures, e.g. publicity, and (4) focused on times, locations and behaviours that optimise both general and specific deterrent effects.
- National targets for traffic enforcement should be broken down into regional targets.
- Besides road safety figures, compliance rates, perceived police activity and safety, and internal performance indicators are important criteria for evaluating the effectiveness of police enforcement in practice.
- Indicators for the quality of traffic policing need to be critically reviewed from time to time to see whether they still truly reflect the original criteria they were meant to capture; in bureaucratic systems, some changes in administrative procedures can lead to a shift in meaning of figures and indicators over time.
- Managers and supervisors of traffic policing should keep in touch with the actual practice of the work and should from time to time confront administrative figures with personal reality checks, since the figures they receive may have shifted away from being a good reflection of actual reality.



- The (traffic) police are an organisation that is best suited for offering traffic enforcement services on the middle ground between highly standardised, repetitive tasks and very specialised enforcement tasks.
- Police enforcement can be effective without the effectiveness showing itself clearly in an accident improvement. This calls for new and alternative evaluation strategies for police enforcement that do not rely solely on the accident criterion. Of course, if possible, it should be attempted to establish the effectiveness of police enforcement also in terms of accident parameters.
- It would seem advisable to create or subsidise a European body that collects the practical experience of various European police forces with enforcement activities and that makes this knowledge freely available by modern technological means (Internet, electronic or personal helpdesk etc.)
- It would seem advisable to produce a European manual containing enforcement guidelines for police operations in the streets, since these guidelines are very important for the quality of actual police work.
- Enforcement of offences that do not require direct contact between the enforcement authority and the driver are most eligible for a transfer to non-police bodies. However, a total loss of contact between drivers and the police (or other appropriate enforcement agency) could lead to a decrease in the acceptance of traffic policing.

## 5 NEEDS FOR LEGAL MEASURES AND ENFORCEMENT

### 5.1 DRIVERS' NEEDS

Driver needs for enforcement may be inferred from behavioural studies or by means of asking drivers how they experience or what they want from enforcement. Driver behaviour, especially concerning speeding, would suggest that drivers do not want enforcement. The issue of individual needs is, however, more complex than what can be concluded from speed behaviour or from other safety performance indicators. Moreover, in certain areas such as seatbelt wearing and drink driving, high compliance levels have been achieved in several European countries but still the need surveys would point to an increasing demand of enforcement in those areas.

Actually, in opinion surveys dealing with traffic safety it is common to find a general sentiment favouring more or more forceful police enforcement on the roads. Public representatives (elected and self-appointed) and the media routinely call for more enforcement and other legal measures to curb non-compliance.

The public might also express support for, or opposition to, *specific* measures intended to limit opportunities for non-compliance, impose more strict demands on vehicle operators or make them more accountable for their behaviour. Politicians, authorities, TLE officials and professionals are sensitive to public opinion because the ability to secure funds and implement programmes depends, in part, on this public support. In ESCAPE surveys, interviews and workshop officials often referred to the lack of 'public acceptance' (real or imagined) as a reason for *them* to give up various new enforcement methods or approaches.

ESCAPE surveys and interviews, GADGET data and especially SARTRE data provided information on the extent of public support for various aspects of enforcement. The SARTRE data are particularly useful, since they come from a representative sample of European drivers and were collected in a uniform procedure based on face-to-face interviews in 13 European Union Member States and interviews with almost 15,000 drivers (ESCAPE Deliverable 7: Cauzard & Quimby, 2000).

The SARTRE study conducted surveys of car drivers who held a full driving licence and still drove regularly (i.e. drivers with a licence but who no longer drove were excluded). The questionnaire contained about 140 questions. Although not designed specifically as a survey to study attitudes to enforcement, a sizeable number of the questions were directly related to this topic, such as:

- attitudes about the desired amounts of enforcement and the size of penalties
- attitudes and behaviour concerning drink driving, and speeding and seatbelt wearing on different types of road



- whether speed limits should be raised or lowered
- expectations about enforcement activity for speeding and drink driving
- their experience of being enforced for drink driving, speeding or not wearing a seatbelt
- a variety of possible enforcement measures
- attitudes towards European ‘harmonisation’ of certain traffic laws.

Concerning the needs of drivers in different countries, the analysis of the SARTRE 2 survey results reveal in general that the primary function of enforcement is to encourage general compliance with the traffic regulations (with respect to things like drink driving and speeding) rather than simply being a means of punishing offenders. Effective enforcement of traffic rules – and the safety and environmental benefits this produces – therefore depends critically on the attitudes of the drivers, as well as the authorities (such as the police) responsible for enforcement.

The surveys (conducted in 19 European countries) identified a high level of concern about road safety, widespread support for more police enforcement of the traffic regulations designed to aid safety, and also for harsher penalties for offenders. This is an important finding for the police who typically have an increasing problem with funding their activities – and have to balance their available resources with their perception of public and social needs as well as the views of the public and politicians. The results clearly show that the driving public strongly supports police enforcement of the traffic regulations and that police concern about this being unpopular with the public is misplaced. However, it is necessary to acknowledge that apart from sample selection bias this type of survey often results in people giving socially acceptable responses. The same people might not support some safety-related actions quite so strongly if they themselves were to be directly inconvenienced (or to be fined or punished in some way). People often ‘lie good’ but typically resist changing their own behaviour, and are unhappy to be inconvenienced in any way. However, they do seem more prepared to accept changes if it is seen as being the same for everyone.

The general results do support the notion of the ‘selfish’ – rather than the altruistic – individual with drivers typically being supportive of their own interests. For instance, drivers who tend to drive over the speed limit and drink and drive more than average, appear to be those who support higher speed limits, and who think that the drink-drive limits should not be lowered (or brought to zero). This highlights the problem of needing to change drivers’ attitudes – either when they are learning to drive or later in their driving career by means of education and publicity – if their behaviour and accident records are to be improved. This approach needs to include engineering and enforcement activity as a way of improving road safety, but also acknowledges that most accidents are the results of driver behaviour and that attitudes can have a strong influence on behaviour. However, this applies only to a part of the driving population, since a number



of accidents are caused by human errors without deliberate risk-taking (Karttunen, 1995).

The results also showed that in some areas current enforcement activity by the police has failed to influence either drivers' attitudes or behaviour in the desired direction. For example, drivers who have actually been penalised for speeding in the 3 years prior to the survey are those most likely to report that they exceed the speed limit more frequently than other drivers. However, these drivers are also those who are not concerned about road safety, do not want more enforcement or harsher penalties for offenders, as well as being those who admit that they are more likely to warn other drivers about speed 'traps'. They report, however, a higher subjective risk of being checked for speeding. It appears that some drivers have attitudes and engage in behaviours that predispose their likelihood of being 'caught' for speeding. However, their experience with enforcement does not change either their attitudes or behaviour to the extent that they become more similar to drivers who have not been penalised for speeding. This suggests that current enforcement strategies are not as effective as they might be and fail to change both attitudes and behaviour in the desired way.

The SARTRE 2 survey re-analysis also reveals that demographic factors such as age and sex have a strong influence on drivers' attitudes and reported behaviours (see D7, Cauzard & Quimby, 2000). This has implications for a number of safety measures. For example, it raises the issue of whether enforcement should be targeted to particular groups of drivers such as young males or whether it should remain neutral and behaviour based. The differences found between individual countries or country groups have very important implications for improving current enforcement activities in Europe. While some of the differences between countries can be explained by differences in traffic laws and current police enforcement activities, the results provide practitioners in individual countries with the opportunity to evaluate their performance, compare it with other countries and, hopefully, identify ways to increase their contribution to safety.

Judging from data from different sources describing driver behaviour and attitudes towards enforcement and behaviour measured on roads, the results seem to be clearly contradictory. On the one hand, drivers seem to give strong support to enforcement by the police and are in favour of more enforcement. On the other hand, drivers are not very observant in terms of traffic rules. This contradiction may be explained by the fact that traffic laws and rules do not always match with drivers' perceived seriousness of traffic violations or with the perceived association with safety. When drivers clearly see and understand what forms of behaviour are likely to increase accident risk, they usually tend to comply with the rules regulating these behaviours. This is also the case with speeding, since excessive speeds are relatively infrequent in any given country. When drivers' own judgements and the actions of the society match, good results have been achieved in several countries, such as is the case with drinking and driving and wearing of seatbelts.



However, the overall support reflects an appreciation of the role of TLE in maintaining orderly traffic behaviour that leads to safe and efficient travel. It is also a reflection of dissatisfaction with existing levels or specific manifestations of non-compliance, annoying driving, and traffic accidents. This support cannot be interpreted by implying an automatic acceptance of every traffic law, police action or punishment practice. Specific TLE rules and practices may seem to the public as being unrelated to safety or as not being applied in a truly equitable and socially fair manner.

## **5.2 NEEDS FROM PRACTITIONERS' POINT OF VIEW**

One of the leading guidelines of the ESCAPE projects was to address traffic law enforcement issues at a practical level and to communicate with enforcement professionals (i.e. experts from police forces, justice departments, ministries of transport, road authorities or other agencies involved in traffic law enforcement) about acceptable solutions. During the project, these interactions took the form of personal interviews with officials in several countries, structured survey questionnaires sent to officials previously contacted in person, and two international workshops (Nice and Brno).

### **5.2.1 Main results Nice workshop**

In an expert workshop at Nice, November 8–9, 1999 (ESCAPE Working Paper 5; Christ, 2000), police practitioners and government officials of predominantly Western European countries (Great Britain, France, Germany, Greece, Switzerland, Austria, Netherlands, Finland, Norway) gathered to discuss four broad themes:

- Identification of enforcement needs;
- Acceptance of enforcement strategies;
- Future trends in traffic enforcement, automated enforcement, enforcement support systems and non-police based enforcement;
- Evaluation of enforcement activities, practical issues and pitfalls, evaluation as support for acceptance and police motivation.

#### ***Enforcement needs: Focus on speed and alcohol***

Enforcement of traffic laws is focused on speed and alcohol, and to a lesser extent on seatbelt use. This seems to be the case because these violations are simple to establish and can be enforced efficiently and, in monetary terms, profitably. Given the focus on speed and alcohol it is easy to lose sight of various other violations that may also need attention in order to bring about a significant safety effect. A simple example is priority violations, that are the cause of about half of urban accidents, generally resulting in serious injury or death, but are not an enforcement priority because the means to do so have not been developed. The session on targeted enforcement identified several other





violations relevant for enforcement, e.g. seatbelt use on rear, close following, use of mobile phones, and aggressive driving.

### ***Evaluation of a systematic approach***

In regard to evaluation of enforcement campaigns the following has been concluded:

- Evaluation of police enforcement should be done both internally (management tool) and externally (effects of a campaign on drivers' awareness, behaviour and in some cases even on safety).
- Communication of enforcement strategies and programmes should be regarded as a vital part of the effectiveness of enforcement. The public should be involved in target setting and actively asked to contribute to the achievement of the (National) traffic safety objectives. Various parties, at both national and regional level, should be involved in the issue of traffic safety and should be given the feeling that they are at least partly responsible for road safety.
- One of the great needs is that both police efforts in traffic safety and their evaluation should be embedded in a system that guarantees a systematic and sustainable ap-approach, involving the public. (For example, the UK has set a step in this direction with the yearly Christmas drinking-driving campaign).

### ***Management and data collection***

Police forces, like any other organisation, need information and feedback. Information about accident occurrence and violations as an accident-contributory factor is essential for focusing enforcement efforts on locations that are accident-prone, on violations that are accident-relevant and on driver groups that are violation-inclined. This is essential to manage the activities and get support from public, authorities and politicians.

Feedback is essential for motivating and stimulating forces to target their activities and maintain these. Feedback can be given in terms of accident reduction but because accident data are only meaningful in long-term, area-wide activities, monitoring in terms of changes in violation frequency is even more relevant. It was noted that information collecting, monitoring and dissemination is hardly ever carried out systematically in everyday practice. Here, major advances can be achieved.

### ***Legal measures to support police enforcement***

In regard to improving both general and specific deterrence of traffic policing, it has been concluded that the general application of four legal measures should have high priority:

#### *– Enable random breath testing*

Main argument: It was stressed that in the Nordic countries the world's lowest drink driving figures (in alcohol-consuming parts of the world) are very probably achieved



through a combination of measures in which RBT has a significant role. The UK is favouring so-called “targeted testing” which, in practice, is not that far removed from RBT. The UK thinking about targeted testing is somewhat closer to conventional crime policing, since they are speaking of “hit rates” (for drink drivers 12% and for drug drivers 20%).

– *Enable evidential breath testing*

Main argument: Evidential breath testing means that a breath sample (documented by print from test device) has the same value as a blood sample. Evidential breath testing would speed up procedures. Evidential breath testing has been carried out in Austria since the early nineties. It is seen as important in freeing up police capacity for surveillance (no need to transport suspected drivers to the doctor).

– *Psychologically oriented rehabilitation programmes*

Main argument: Such programmes are already implemented with good results in the UK, Germany, Austria and France. There are several options on how to impose measures (administrative law in Austria, with a penalty point system in Germany, and a judge can oblige instead of a fine in France).

– *Test before licensing reissue;*

Main argument: A test should prevent problem drivers from participating again in traffic once their licence has been withdrawn. However, as Austrian experiences have shown, it is important to guarantee high standards for such tests to avoid people being judged on an unreliable basis.

– *Tailor-made sanctions/treatment for problem drivers, repeated offenders*

Main argument: Tailor-made sanctions are better able to tackle underlying problems that cause rule violations than standard sanctions. The expert group considers rehabilitation programmes and testing before reissue of a licence as tailor-made – since these procedures address the underlying problems. ‘Tailor-made’ also applies to fining according to severity of offence and income of the offender.

**Future trends: acceptance of new technologies**

In some countries, e.g. the Netherlands and the UK, there have been positive experiences in regard to the public acceptance of automated systems of speed enforcement. For instance, in the Netherlands, public support for an enforcement system along a major stretch of motorway that measured the average speed of drivers was quite high. Apparently, the public found it more justified to be fined for speeding when it could be established that the speeding occurred over a longer stretch of road and was not an on-the-spot event.

According to the UK experience, automatic speed enforcement can be accepted by the public as long as it is perceived to be meaningful, appropriate and not profit-oriented. It is purely accepted on the understanding that the enforcement is a road safety measure.



Judging from SARTRE survey data, ESCAPE-workshop discussions and a survey targeted to traffic police representatives in European countries, it can be generally concluded that in France and Latin European countries, the acceptance of automated systems of speed enforcement is far less likely than in the Netherlands, the UK or the Scandinavian countries. In Southern European countries any interference with the free choice of speed may be seen as an infringement on basic individual freedom.

It has been concluded that the traffic police itself would not be rendered obsolete by newly introduced automated systems, since active police interference would still be needed in the case of crashes, or dealing with extreme offenders.

### ***Future trend: Involvement of other parties than police in enforcement of traffic laws***

The main conclusions of the group session were as follows:

- There is quite a large difference between experts from various countries in their appraisal of the likelihood and desirability of a shift in enforcement activities from the police to other organisations.
- In part the resistance of the parties that are currently involved in traffic enforcement (police, governmental bodies, legislators, etc.) arises from the perception that the existing legal situation and division of responsibilities functions adequately.
- There is an urgent need to conduct research on what the police think about the possibility of giving up some of their enforcement roles and also how other organisations could be used to help them.

### **5.2.2 Main results of the Brno workshop**

Early on in the work of ESCAPE it was recognised that traffic law enforcement (TLE) in Central-Eastern European countries (CEE) countries may be faced with needs and challenges different in part from those in most EU countries (see ESCAPE Working Paper 2). A separate workshop on the practice of traffic policing in CEE countries was organised in Brno (April 2000). The objectives and general structure of the workshop at Brno were similar to those of the Nice workshop with EU experts.

A descriptive presentation on TLE structure and operations, along with comparative quantitative data from EU countries, served as a model for comparing traffic enforcement in CEE countries. The usefulness of across country comparisons was clearly noted with respect to the size of traffic police (or police person years dedicated to traffic.) On the spot estimates made by the experts proved that the number of traffic personnel in their countries is similar to that in EU countries; about 8%–10% of the total police force which, in turn, is in a roughly similar proportion to population size. This suggested that effectiveness of traffic policing was not that dependent on the size of the force (as some



have first suggested) but on its efficiency and the level of support it has from other systems involved in TLE.

The special problems CEE countries face are *social-political issues of how to maintain consistent and credible functioning of institutions*, of all sorts, in a social climate that expects large changes in government but also mistrusts many formal institutions, especially those associated with the previous regime. Police and legal institutions are particularly vulnerable to this mistrust. The legal system is often called to arbitrate in challenges put by individuals and interest groups to actions of the executive branches, while it is itself in a process of change. People have learned how to use the legal system to protect their individual rights, and the system is very sensitive to these issues, perhaps overreacting in favour of individual privileges.

Many institutions, the police among them, are in a *transition phase*, having structure and function attributes that are a mix, and not a constant one, between old attributes and newly created ones. The social standing of police is relatively low, which is reflected in low salaries and difficulty in keeping educated and talented personnel in the force. The lack of proper training is another general problem of the police.

Control of information was a common objective and practice in the old regime. Remnants of the practice remain, with *various organisations collecting data but not sharing it with other users* who may need it. Furthermore, as is also the case in many EU countries, certain administrative actions, such as on-the-spot fine collection, are not recorded as traffic enforcement actions (although they are very likely documented as financial transactions to be accounted for.) Therefore, there is lack of knowledge about the factual status of TLE in a country, and somewhat limited ability to manage it by a quantitative performance objective.

*Traffic police bodies in CEE countries have responsibility (or power) for functions that in EU countries are under separate administration.* For example, police may be responsible for issuing driver and vehicle licences, maintaining traffic sign and markings, escorting money transactions between banks, maintaining order at sport and entertainment events, and more. On the other hand, there are also instances of typical police functions that in some CEE countries are performed by other bodies. For example, traffic accident investigations in the Czech Republic are carried out by a non-police authority.

In general, there is an ongoing legislative and organisational process to free police from administrative tasks that can be done by non-police bodies (private or public) and focus more on direct policing.

Due to general economic conditions, *police in CEE countries struggle with lack of resources to an extent not common anymore in EU countries.* Traffic police may lack patrol vehicles, the fuel to run them, basic communication equipment as well as specialised TLE tools. This is one aspect of a general problem of a high rate of motorization

not sufficiently matched by the needed infrastructure and supportive legal and administrative framework.

*Police in CEE countries are challenged by a wide scope of criminal activity that takes precedence, in the public and political eye, over traffic related offences. For the average citizen, the daily hardship of making a living overshadows the problems of traffic safety or the importance of TLE. For the individual, acquiring a car and the means to use it is a personal mobility goal more salient than safety. For the society, building the infrastructure for an advanced transport system is more pressing than enforcing the rules of operating it.*

As in EU countries, *speeding, drink driving and safety belt use are considered major TLE issues in CEE countries.* Young drivers are less a target for special treatment. A set of TLE problems high on their agenda is that of *cross-border traffic* drivers, vehicles, and cargoes. Not only do these countries have to cope with a large volume of such traffic from neighbouring countries which have no uniform or sufficiently high standards, but they also lack the tools to monitor, inspect and sanction transit traffic. Technical and resource issues are further complicated by political restrictions on the range of actions that could be taken.

Enforcement professionals in CEE countries have a keen interest in international cooperation in the form of harmonisation of legislation, exchange of information, joint projects, and personal contacts with colleagues in CEE and EU countries.

### **5.2.3 Survey of the needs for enforcement priorities**

A survey sent to strategically placed enforcement authorities in the policing and legal sectors in the EU countries, Norway and Eastern European countries focused on six different groups of enforcement needs. At first, over 90 survey items were tested with ESCAPE researchers and a few law-enforcement professionals. On the basis of the received feedback, a shorter and more structured version of 78 items was prepared and distributed among enforcement officials in EU and CEE countries. Many of the respondents also participated in the workshops (Zaidel, 2000). The survey addressed the following issues:

- Relative importance of substantially increasing specific enforcement activities,
- Target populations and behaviours needing special attention,
- Legal and administrative problems of the systems,
- Enforcement tools and resources especially needed,
- Legal and administrative measures and resources needed,
- New approaches, solutions and methods.



Thirty-two authorities from 13 different countries completed the questionnaire. There was an agreement among respondents on a number of issues. The target areas for focus-enforcement that were identified in GADGET and other projects, were all rated highly by both EU and CEE officials: drink driving (or random breath testing), speeding (in both urban areas and on inter-urban roads), non-use of safety devices (belts or helmets), and behaviour of young drivers. In addition, dangerous or aggressive behaviour in traffic and handling repeat offenders were rated as priority areas. Experts from EU countries considered two-wheelers (bikes and motorbikes) an important target population, whereas in CEE countries pedestrians were seen as needing more control.

There was also agreement that field officers are under too heavy administrative demands, that enforcement is not necessarily high on the national agenda and that there is not sufficient political support for effective enforcement. Many officials wished for legislation that would widen the responsibility of vehicle owners and they expected that management tools and office automation would greatly improve TLE.

Many of the points revealed in the survey were confirmed in the workshops, but also new ones were raised during the workshops. The officials, perhaps in contrast to researchers, did not consider knowledge about best practices a real issue, implying that they know what to do if given the means. They wanted more personnel for patrolling, as well as other resources, such as speed and RL cameras, to provide for mass ticketing. In CEE countries, police lack basic materials, administrative support and training, to perform traffic enforcement duties. Police chiefs reported that TLE is not a top priority within their own police forces, and that political verbal expressions of support for TLE were not always translated into resources or appropriate legislation.

Another point of agreement was that they do not feel under pressure from politicians or the public to have higher quotas of citations or impose harsher punishments. However, GADGET information suggested that in more than one country funding agencies have clear expectations from the police to deliver larger quantities of fines and that these expectations filter down to the field officers. In some countries the public view of mass ticketing, in any form, is that of a taxing machine rather than a safety measure.

Most officials would like to have simple devices for detecting drugs in drivers, but others expressed the opinion that the drug problem is exaggerated and is not worth a major TLE effort. They acknowledged lack of knowledge about how to identify and handle recidivists. Most considered their personnel as adequately trained, but in the workshop many mentioned the need for special training in traffic policing methods, as well as need for national and international exchange of TLE information.

Cross-border traffic was mentioned as an emerging enforcement issue, particularly among CEE countries. It includes mechanical condition of transit vehicles, control of drivers in general and of professional drivers in particular, multiple licences, difficulties in camera based enforcement, vehicle theft and other crimes.



The importance of monitoring accidents, compliance and the resources and operations of all TLE agencies was recognised by all. Reliable data are important for strategic planning of enforcement, its effective management and for accurate evaluation of its efficiency and impact.

It is interesting to note what was not rated highly or not mentioned at the workshops as important issues. The officials did not request harsher punishments, they did not blame lack of information, knowledge or strategy. Lack of political support was not rated too high. This may mean that TLE officials did not put all the blame on external factors for lack of policing success.

#### **5.2.4 Conclusions from European differences**

When assessing the results of the implementation of traffic law enforcement and impacts of traffic law systems and experiments throughout Europe, we can not take for granted that the enforcement methodologies and systems that have been developed in Northern European countries are *seamlessly* applicable in Southern EU countries and Eastern EU-to-be countries. The magnitude and nature of the accident problem is very different in these countries and also the social and legal context for police enforcement. Therefore, the emphasis should be on developing enforcement measures fitting to these countries. In some situations, methods or strategies from Northern European countries can be adapted. Violations such as excessive speeds, drink driving and neglect of seat belt wearing are common to all European countries. There are countries that have proven best practises to alleviate problems followed by these forms of misconduct. There is no reason why these countermeasures couldn't function universally. It is a matter of commitment rather than cultural differences. Of course, tailor-made, specific solutions should be sought in each country in a detailed implementation of these measures.

However, traffic policing is not the highest priority or the highest status activity in police forces that have a general policing task. The tendency is therefore to assign these tasks to other agencies, either public or private. This is already operative in some EU countries but strongly rejected in most others. Collaboration of police with other agencies is mostly minimal. This contradiction is more apparent in Southern countries, but these also more often have specific traffic police forces.

Fixed penalties are preferred because these increase the effectiveness of enforcement. Yet, police forces wish to maintain their discretionary powers in determining the methods of enforcement and the action followed when violations are detected. There is a general consensus that at least additional, "tailor-made" penalties should remain possible. This puts specific demands on the legislation.

There is general support for European co-operation. Nonetheless, the legal aspects pose some restraints on such EU level co-operation. However, for example TISPOL cooperation in drink driving campaigns have shown that these restraints can in time be overcome. In contrast, it very often appears that within countries there are large disparities in

preferences for methods of enforcement, priority setting and general policy, including punitive action following violation detection. Collaboration and uniform enforcement practices and methods within countries is a prerequisite for European collaboration.

### 5.2.5 Readiness to try out new TLE approaches

Another method for gauging what TLE methods and approaches have a better chance of being accepted by practitioners was to ask them to propose demonstration projects (DP) in TLE for their countries. Subsequently, they rated all proposals regarding their likely acceptance by police, legal and other relevant authorities in their countries. ESCAPE D2: 'The potential for EU-wide demonstration projects in traffic law enforcement' describes this task in detail.

Researchers and enforcement officials generated several DP ideas. Twenty of these underwent more systematic definition and assessment. They were classified into four categories (see Zaidel, 2002b):

- *Violation targeting* – DP focusing on largely improved or intensified enforcement of a specific non-compliance behaviour (drink driving, speeding, and non-use of safety belts);
- *Tactical tools* – DP of effective methods of field operations in already accepted enforcement areas (random breath testing, substance and impairment recognition, monitoring transit traffic, general surveillance and night operations);
- *Management tools* – DP of introducing new organisational concepts and decision tools into traffic policing (performance indicators, different fine collection system, monitoring system for enforcement impacts);
- *Strategic methods* – DP of very different (at least in the national context) approach to TLE, introducing new ways of influencing compliance, some not based on traditional police practices (different concept of sanctions, community based model of drink driving control, compliance management by commercial fleet operators and by road administration, linking vehicle insurance rates to the vehicle's involvement in violations, a tailored point system, and police involvement in phases of young driver training).

In the instructions of the evaluation form, the purpose of a DP was reiterated, and participants were requested to go through the list, rate each DP idea and add their comments. The idea can be an approach, a method, a technical solution, a new organisational structure or process, a new legal device or any combination of these. An idea that involves major changes in social structures and institutions may not be suitable for our purposes. Also one that requires a considerable amount of basic research or development of new technology would be beyond the scope of the present effort.

There is no category of measures or ideas that appears to be favoured. Some measures, like 'Traffic compliance management by road administration', have little support, yet





they are considered to have potential for a wide impact. The measures with the highest level of support – speed cameras, points system, RBT, training for drug recognition – are familiar concepts, being applied in some countries but not in others. Their users support them and others are encouraged to try them out, as they are not entirely new.

In practically all cases, participants estimated that the support by legal and other authorities for any of the DP ideas would be smaller than that of the police. In other words, they saw legal and administrative obstacles to new enforcement ideas as very significant to the possibility of implementing them.

Most DPs listed (see Zaidel, 2000b) were given a wide range of ratings. It would be inappropriate, therefore, to draw strong conclusions about which DPs are best suited for EU-wide application. However, the ratings show that there generally strong interest in doing new things and in collaborating with professionals in other countries who share similar problems and objectives. Almost every DP has strong support by some professionals in some countries.

It would at first appear that demonstration projects focusing on specific violations or on tactical tools would be easier to implement than those involving changes in strategic approach and core management issues. But even there, a legal requisite or substantive social and political support may be required to initiate it, such as in the case of random breath tests, or zero tolerance for speeding and drink driving. A demonstration project within a complex system such as traffic law enforcement is usually not the first step in trying out a new idea. It is often one of the last steps in a long process that is not necessarily all that systematic and is certainly influenced by individuals with visions and power as much as by orderly decision making and institutional choices.

### **5.2.6 Practitioners' view of the role of technology in TLE**

Practitioners did not see technology in TLE as a panacea. It creates possibilities, but the penetration rate is low. Police organisation was not perceived as a leading agency in creating a change. Legal and political institutions were seen as more dominant but also as more conservative and slow to change. The legal component of TLE was generally perceived as more conservative in accepting new enforcement technology. A period of 10–20 years is not an unusually long time, for courts, to approve a new device. In France it took 30 years to gradually introduce digital tachographs, and the work is not even finished. Therefore not much may happen with new technology over a decade.

Many professionals were doubtful that technology would drastically change the nature of compliance and enforcement on a 10–20 year horizon. They pointed out that the technology to accomplish in-vehicle automated control of compliance along lines suggested in the early 90s already exists today, but there is no government ready to use it.

It was claimed that drivers would not accept systems that take over their choice, other than in emergency situations. It was felt that the public would not accept such systems

in principle, invoking basic rights such as “personal freedom” and “civil liberty”. Clearly, legal and social-cultural factors rather than technical issues are seen as more important in the adoption of intelligent, hi-tech compliance solutions.

The experts identified several preconditions for increasing the acceptance (by agencies and the public) of so-called “intelligent”, vehicle-based enforcement systems:

- A Europe-wide registration of car owners.
- Vehicle owner responsibility
- Decriminalisation of most traffic offences or administrative law
- Assurance to the public that the hidden purpose is not revenue making
- Fully automated detection and processing of violations
- Modern digital and wireless technology
- Warning before intervention or recording of offence
- Consideration of duration and frequency of individual’s non-compliance
- Transparency of controlling strategy, use of revenues, etc.
- Extra benefits for vehicle owners (e.g. theft protection), drivers (e.g. navigation) and road operators (e.g. better traffic management.)
- Research to prove the effects on safety.

The majority of preconditions are legal-societal rather than technical. Currently offered technology was seen by some as a first generation of things to come, and they were not eager to adopt it without convincing evidence for cost effectiveness and direct safety benefits. CEE experts were particularly eager for technological solutions, but at the same time concerned that their countries’ economies could not support such solutions.

In the interviews we discussed the possibilities for applying certain familiar stand-alone in-vehicle devices to all vehicles. This concerns speed limiters (fixed or adaptable to prevailing legal limit) that are in use already in the EU following Dir. 92/24/EEC and Dir. 2002/85/EC for certain categories of buses and trucks, tachographs (mechanical or digital) which are also compulsory following EU legislation for certain classes of buses and trucks (Regulation (EEC) 3821/85, amended by Council Regulation 2135/98 introducing the digital tachograph), and breath-test ignition locks for drink driving control.

Advanced concepts of adaptable speed limiters are being tested in Nordic countries. Breath-test ignition locks are being tested in several jurisdictions with drivers convicted of drink driving.

The opinions of professionals ranged from complete acceptance of a device to total rejection of the device and the idea behind it (see Deliverable 8: ‘The attitudes of various agencies towards new enforcement concepts’, for more details). While the specific objections mentioned in connection with each device varied, they belonged to the follow-



ing categories: technical and other practical difficulties; wide use of the device would lead to opposite influences than intended; are inherently unjust, unfair etc.; too costly; their effectiveness has not been proven; there is too strong political opposition to such measures.

Camera technology appears to have taken hold as an enforcement tool. The majority of officials, in all countries, either use it already or expect to extend its use despite many prerequisites. This applies to fixed speed cameras, mobile speed cameras and red light cameras. Officials were also in favour of using cameras to monitor illegal lane use, such as bus lanes. (Red light cameras often detect illegal lane use at junctions.) Although not necessarily a safety measure, this could help improve public transport.

Some officials had hoped that automated technology could allow for reduced manpower and more limited patrolling. With automated cameras, at least, this may not always be the case. For example, in Finland and Netherlands camera enforcement is complementing conventional enforcement, not substituting it. The administrative support needed for the systems vary by country and depends on the degree of automation and organisation of the enforcement procedure. For example, in Netherlands camera enforcement is well organised and almost fully automated so that the system was able to handle some 12 million violations in the year 2002. There, very little administrative support is needed for maintaining the system (Hellemons, 2003). All interviewees pointed out that the new technology would have to function perfectly; otherwise the introduction of new technical possibilities would be counterproductive.

There were also misgivings about overly meticulous monitoring of every move of a traffic participant (being watched by “Big Brother”) and possible manipulation of the evidence. It was further pointed out that the majority of drivers follow the rules and drive decently anyway, and that the technical, financial and manpower investment might not be really cost-effective.

Police chiefs were not worried about police losing their role in the future. Whatever technology can solve in terms of compliance, there are always those people who frustrate the system and police will need to deal with them. The general deterrence effect of a police presence, their educational role, the sense of security they provide to motorists, the handling of incidents and accidents are still important functions of the police.

### 5.3 SOCIETAL NEEDS

It has been calculated that in traffic one out of 80 citizens across Europe dies 40 years too early and that one out of three needs hospital treatment during their lifetime (Commission of the European Communities, 1997). *The inherent problem in any risk communication about transport safety is that it is best perceived on the system level only.* The individual driver is only rarely confronted with a serious accident. The lifetime perspective as illustrated above gives a view that is different from a single driver's perspec-



tive. Moreover, the relationship between many traffic violations such as moderate speeding and accidents is quite abstract. Only on the traffic system level due to vast traffic volumes do low occurrence probabilities accumulate accident tolls amounting to a considerable number of victims. For this reason, also enforcement systems tackling the problem need to have system-level views and strategic tools for governing their own activities.

The societal need for more effective police enforcement is evident in the light of European accident statistics. *The expression of such needs in the form of commitment of European countries to address the problem by means of traffic enforcement is far less explicit.* This may be judged from the description of how traffic enforcement systems are operated, what resources are available and how data-led the operations are. However, recent developments in countries such as Austria (Traffic Safety Programme with quantitative targets), Belgium and France, last year and this year respectively, of an 'Etats-Généraux', a framework in which all ministries and other players involved in road safety are assembled with a view to improving co-ordination amongst them and discussing measures to be taken for improving road safety. In France, this initiative was taken in the context of President Chirac's designation of road safety as national priority number one.

From a societal point of view, legal measures and enforcement are naturally seen as one means of maintaining and promoting transport safety. As was shown earlier (1.2 Traffic behaviour regulation), European societies generally have recognised early in the motorization process the need for regulating the behaviour of road users. Even though there is still space for improvement in the legislation of single countries, *problems in the enforcement process above all is seen in the surveillance of traffic laws* rather than in the legislation or adjudication. Legislation concerning speeding, alcohol, use of safety restraints, access to a driving licence and many other areas of road user behaviour has been at least satisfactorily addressed in almost every European country. When exploring the practical policing in various member countries and elsewhere in Europe, the situation looks much worse.

The data collected in GADGET Work Package 5 describes the functioning of legal measures and enforcement systems in Europe (Zaidel, 2000). The information turned out to be very sporadic, with no country providing a comprehensive picture of its legal measures and enforcement system. It appears that in most countries there are large gaps in the information available on the extent and nature of traffic policing. In addition to administrative difficulties that GADGET partners experienced in gathering the information, there are some inherent reasons why the data may not exist and are difficult to interpret. Several countries have decentralised government structures on a state, region or local level. States within a federal system, regions within a country, or local communities may have their own budgets, police forces, legal administration, and statistics offices. Traffic policing data are not routinely aggregated for the whole country.



Centrally governed and consistently data-led operations are missing in most European countries. Data may exist, but they are dispersed among many agencies and jurisdictions. Another difficulty is caused by the existence of separate police forces co-existing within a country, each with a different structure and under separate control: for example, a civil guard under the control of a ministry of defence, urban police under control of an interior ministry, local police belonging to a community and controlled by the mayor, and transport police controlled by a ministry of transport. There is no one source of information that knows about each force in sufficient detail. In many cases it is impossible to separate traffic policing resources and activities from general policing, because there is no structural or functional separation between them in the police organisation. In particular, the absence of a reference to a fact, a practice, a sanction, etc. in national data does not necessarily mean it is not relevant or is not an issue in a given country; it may be so but it can also be due to lack of information. *However, this reflects that the societal need for systematic and effective enforcement policy is not fully understood.*

Over and beyond the availability of quantitative data, there is the overwhelming difficulty of interpreting data, organisational structures, practices, legal codes, sanctions etc. even outside the linguistic difficulties, as the GADGET working paper data shows. Moreover, the data – where available – shows that the strategy of the police forces in Europe is not very active, aiming at interference with bad road behaviour, since the number of contacts measured as warnings or tickets issued considering the vast number of traffic offences is in many cases small. *Roadside breath test figures from most European countries show how poorly the control of drink driving is arranged* (Biecheler & Cauzard, 1999). The risk of getting caught for drink driving is close to zero in several countries and actually is realised only in the event of an accident. Finally, the results of the GADGET survey concerning the operation of legal measures and enforcement suggest that, in most European countries, there is greater need for centrally governed enforcement operations and more transparent monitoring systems for describing how the traffic police are working.

The situation in terms of data collection and the poor availability of centralised data in many European police forces is surprising, since feedback is essential for motivating and stimulating forces to target their activities and maintain these. It was noted that information collecting, monitoring and dissemination by the police is hardly ever carried out systematically in everyday practice. Here, larger advances can be achieved. Of course, feedback can be given in terms of accident reduction but as accident data are only meaningful in long-term, area-wide activities, monitoring in terms of changes in violation frequency are even more relevant.

The survey focusing on the commitment of European countries in terms of drawing up systematic and structured traffic safety strategies shows that most countries have created a traffic safety plan, and defined either qualitative and even quantitative targets (e.g. Finland, Sweden) for road safety (Mäkinen, 2000) and recently Austria. Also enforcement has been usually integrated in the plan. However, clear target setting for enforce-



ment seems to be lacking in several plans. Moreover, precise quantitative target setting has been realised in action plans the police set for themselves. Most surveyed countries have created an integrated context for the traffic safety work of the police, thus showing a formal commitment to improve road user behaviour by means of enforcement. The figures – also the lack of them – describing the functioning of legal measures and enforcement systems suggest, however, that commitment is not seen in the implementation of plans and strategies in several countries (Zaidel, 2000).

#### 5.4 EUROPEAN NEEDS

In addition to the material collected by the ESCAPE consortium, a succinct analysis was carried out to find out the view – either formally expressed in strategic reports of the European Commission or more informally expressed in the reports of bodies close to the Commission, such as European Transport Safety Council (ETSC).

In 1993 the Treaty on European Union, the so-called Maastricht treaty, was ratified. For the first time, an explicit requirement was made in the modified Article 75 that Common transport Policy should also include measures to promote transport safety (Commission of European Communities, 1999).

In the European Commission paper “The future development of the common transport policy” (1993) road safety issues are accordingly recognised as being a major health problem in the EU area. However, at that time the Commission was not prepared for more than to launch a programme on road safety that “*proposes an integrated approach based on qualitative targets and the identification of priorities*” (page 40).

In the principles of the programme human behaviour was seen as a major contributory factor to road accidents. The main remedies for improving road user behaviour were improving legislation. The measures already taken were mentioned, such as concerning driving licences and use of safety belts. Measures that had been proposed concerned speed limits of heavy vehicles and blood alcohol limits. However, not even today is there a harmonised blood alcohol level for European countries; rather the divergence in this area seems to be getting greater than ever, where Nordic countries are adopting the 0.2 per mille level and the rest of the Union has 0.5 and 0.8 per mille. Moreover, it was foreseen that consideration should be given to basic rules of the road and road signs, the improvement of the model licence from the enforcement point of view, and measures to protect vulnerable road users in particular. Calm driving was set as a general target, which could be met in part by telematics, especially combining telematic solutions with vehicles and infrastructure.

It can be concluded that the use and development of effective traffic enforcement by the police were *at that stage* hardly touched on at all. It was believed that legislative efforts could help to alleviate safety problems and the subsidiarity principle would be enough to guarantee the efficient enforcement of traffic laws.



The Commission paper “Promoting road safety in the EU – the Programme for 1997–2001” (1997) presents the general policy objectives in which a small step forward was taken. It states what is needed: “*Changing the way cars are used, or increasing the compliance with the rules of the road, are objectives which require changes in attitudes and in drivers’ behaviour, and laws alone cannot achieve that*”. However, improving enforcement is still restricted mainly to legislative actions focusing on commercial transport. Harmonisation of blood alcohol limits the Commission still recognises as belonging to the principle of subsidiarity, and it refuses to make a new legislative proposal on this issue. At this point, the recommendation for more effective enforcement is being made to Member States.

Actually, the Commission’s role in terms of traffic enforcement was clearly put forth in a review of the Common Transport Policy: “Moving forward” (1999). The review acknowledges the failure to achieve a decade-old proposal to reduce the legal drink driving limit throughout the Union to no more than 0.5 per mille. In that context a stand on the role of the Commission in traffic enforcement is clearly taken (page 39): “Ultimately, the Commission is not the Union’s safety enforcement agency and must rely on the agreement of all 15 governments to secure changes”.

Today's official European Commission policy statement for road safety including enforcement is manifest in "White Paper on European transport policy for 2010: time to decide". Currently, also enforcement and associated measures have been clearly recognized in the White Paper, e.g. page 24-25 it is recommended ‘tightening up controls and penalties’ and on page 67 where it says: “Work is needed on the problem of harmonising certain regulations, penalties and controls (particularly regarding speeding and drink-driving). The White Paper also addresses drink driving problem by *recommending* all member states prescribing a general limit of 0,5 mg/ml as the maximum permitted blood alcohol level of drivers, and a lower limit of 0,2 mg/ml for commercial drivers, motorcyclists and inexperienced drivers.

Moreover, the Commission is currently in the process of preparing an enforcement package, consisting of a part to improve the current rules on enforcement in the field of commercial road transport, which are laid down in Directive 88/599/EEC on standard checking procedures for the implementation of Regulation (EEC) 3820/85 on the harmonisation of certain social legislation relating to road transport and Regulation (EEC) 3821/85 on recording equipment in road transport, and a part dealing with enforcement in the field of general road safety especially with respect to speeding, drink-driving and seat belt use.

This package will supplement the existing legislation on speed limitation devices in heavy commercial vehicles, and tachographs for enforcement of driving, resting and working times.

Ultimately, EU legislation might address the use of speed-limiters in all vehicles. The European Union also sees it as its role to promote and exchange best practice. Finally,



the High Level Group of Government Representatives on Road Safety has also addressed issues of legislation and enforcement with respect to alcohol and driving and drugs and medicines and driving.

Also the body “close to the Commission” to address enforcement as a whole integrated area has been European Transport Safety Council (ETSC), when it launched its report “Police Enforcement Strategies to Reduce Traffic Casualties in Europe” (1999).

According to ETSC’s view, the strategic objective of traffic law enforcement is improving road safety. It is achieved by deterring road users from committing offences related to road crashes and injuries. Moreover, it is “not to maximise the number of infringement notices issued” but rather to improve compliance “through increasing road users’ perception of the risk of being caught”.

The key areas identified in the ETSC report were:

- Excess speed,
- Alcohol,
- Drugs and fatigue,
- Seatbelt use,
- Priority/“right of way offences”.

Future trends were also identified and discussed in the ETSC paper. Mainly it was stressed that other important areas of misconduct such as overtaking offences, violating unprotected road users’ rights, tailgating and aggressive driving need to be addressed for traffic enforcement to maintain its credibility in the future.

Some concern was expressed about the efficacy of legal systems. Since traffic law in most countries is a part of criminal law, the massive bulk of most traffic violations cannot be handled in courts without a strong increase in manpower. Consequently, it was seen as a welcome change when several EU countries adopted procedures of processing the offences under civic or administrative law.

Moreover, wider use of automatic detection and registration of violations such as speeding and red light running was recommended, since they have been proven to be cost-effective. Also the use of in-vehicle (speed)-limiters were recommended based on good experiences shown in a number of EU projects.

The needs seen by ETSC in developing traffic law enforcement strategies were summarised in the report in the following recommendations:

- Set specific targets nationally for compliance. The targets specify the offences to be enforced. These offences include, as a minimum, the general target behaviours such as speed, drinking and driving, seatbelt use but also other safety-relevant offences relevant for a given country,





- For each offence, integrate police enforcement activities into the national traffic safety policy relevant for that offence,
- In each country formulate for each offence effective and feasible police enforcement strategies. These strategies should take into account the results achieved in experimental or demonstration projects,
- In each country identify offences that could be dealt with under administrative or civil law rather than criminal law,
- Develop information and training resources in order to increase awareness and competence of police enforcement staff,
- Obtain explicit agreements between the various actors such as legislators, police, prosecuting bodies about the consequences that follow the detection of offenders,
- As part of a EU road safety information system, communicate the results of demonstration projects among policy makers and the police,
- Encourage and support the establishment of an effective network of traffic police in Europe,
- As part of the Fifth Framework Programme, set up an EU-wide monitoring project to allow objective comparison of incidence-specific offences and the incidence of crashes related to these offences.



## **6 IMPROVING LEGAL MEASURES AND TRAFFIC ENFORCEMENT SYSTEMS**

### **6.1 LEGAL SYSTEMS**

The criminal or penal system usually follows three separate stages: detection, prosecution and sanctions (see ESCAPE Deliverables 2, 4, 5, 8, 9). Each stage passes through the hands of a specific competent body such that the sanctioning of an offence is linked by the police, public prosecutor and judge's interventions up to sentencing. In criminal law, usually a large range of penalties can be imposed, from the loss or restriction of liberty (prison penalty) or rights (driving licence), to financial penalties (day-fine, fine-unit, fines based on the offender's social status) or alternative solutions such as community work (day-unit). Provisions of legal procedure are used for controlling the validity of the detection and prosecution stages.

In the administrative systems, the three sanction stages are combined into a single one, there is no prosecution, no judgement and the violation of a regulation is directly sanctioned. The administrative sanction cannot include freedom penalties but can apply the loss or restriction of rights (driving licence) and it mostly uses the financial penalty with fixed or unfixed amounts.

When the administrative legal systems support the action of traffic law enforcement, the responsibility for the whole enforcement process rests on the shoulders of the police bodies (even when the police do not receive the fine payment, and while an appeal in court is possible). Within the administrative frame, the traffic law systems win in autonomy while the role and power of police bodies are highly increased and decisive. Administrative systems bring together many aspects of the deterrence thinking of enforcement. The whole punishment process is condensed to the time of detection, with the subsequent time reduction in the process duration, the automatic application of sanction (under the restriction of police discretion or losses at the stage of fine payment). In table 7 an ideal-type of representation of a global structure of legal systems is presented (Goldenbeld et al. 1999).

**Table 7. Ideal-type representation of a global structure of legal systems (Goldenbeld et al. 1999).**

Domain of law	Specification	Law system	
		Criminal law: ideal-type	Civil law: ideal-type
Traffic behaviour	Variation according to time, circumstance, vehicle type	Focused on infrequent behaviours	Focused on frequent behaviours
Detection of traffic violations	Use of method Use of instrument Procedure	Evidence weighed by court or court personnel	Evidence only in exception weighed by court
Prosecution of traffic violations	Admissible evidence Weighing evidence Mitigating circumstances	Individualised procedure handled by courts	Standardised administrative procedure
Sentencing of offenders	Minimum/maximum Penalties Scale of penalties	Individual (severe) punishment	Standardised (light) punishment

## 6.2 CONVENTIONAL ENFORCEMENT

### 6.2.1 Enforcement systems

Traffic enforcement can be defined as the whole of actions taken by the police or other responsible bodies to ensure compliance of traffic participants with existing traffic rules without a specific suspicion of an offence. Among other tasks (e.g. education, prosecution) enforcement is one of the most important tasks of the police in the area of traffic safety, which is preventive in nature (Hilse, 1995; Koßmann, 1996). Thus, an *enforcement system* can be defined as a set of measures that are routinely taken by the police to enforce a certain type of non-compliant behaviour. The most important target behaviours by motorists are speeding, alcohol-impaired driving, non-use of seatbelts and red-light running although numerous others could be reasonably added to this list (e.g. dangerous overtaking, close following, disobeying priority rules). Among enforcement systems *conventional* and *automated methods* can be distinguished depending on the personal involvement of a police officer in the detection and apprehension of a certain violation. The concept of automated enforcement integrates the following three procedures (ESCAPE Deliverable 6; Heidstra et al. 2000):

- the detection of a certain violation,
- the identification of the vehicle involved,
- the identification of and contact with the owner (and/or driver) of the vehicle.

In practice the detection of the violation is automatic but the identification processes are usually performed with personal involvement.

Moreover, in practice automated methods are usually applied to speed, red-light violations and illegal use of bus lanes, although other target behaviours can be easily identified (Harper, 1991; Heidstra et al. 2000; Rothengatter, 1991). Another related conceptual distinction proposed for the area of speed enforcement is that of *mobile* and *local stationary monitoring* (Lipphard & Meewes, 1993; Meewes, 1993). Suggestions for further improvements of conventional and automated methods will be provided in the next two paragraphs.

Closely linked with enforcement systems are those measures that are designed to monitor enforcement relevant traffic behaviours on the basis of regular surveys. These *behaviour-monitoring systems* are the main source for monitoring the effects of routine police enforcement. Behaviour monitoring systems have been established e.g. in Finland, the Netherlands, France, the UK, Sweden and the US. Annual repetitions of the same measurements enable to observe traffic behaviour trends within the surveyed area and the impact of countermeasures applied. These systems function on a regular basis when they are initiated and supervised by a governmental body, and the data are collected and processed under the supervision of a national research institute or a governmental statistical body. There are experiences from several EU countries (e.g. Finland) that series of behaviour indicators, accompanied by relevant research studies, can serve as a background for the evaluation and development of enforcement measures, especially in the drinking-and-driving area. Within the framework of ESCAPE a number of methodological recommendations relevant for behaviour monitoring systems have been proposed which can be considered as a starting point when improving or establishing such a measure (see Working paper 12 ESCAPE; Gelau, Gitelman, Jayet & Heidstra, 2000).

### 6.2.2 Speeding

From a series of studies in Germany commissioned by the “Institute for Road Traffic”<sup>1</sup> in Cologne to evaluate the effects of mobile speed enforcement (Meewes, 1993), some principles concerning its effectiveness have been derived which can be summarised as follows (Hilse, 1995; Lipphard & Meewes, 1998):

- The maximum impact on average speeds is found when speeding vehicles are stopped and drivers receive an intensive instruction by a police officer.
- If an instruction is impossible e.g. because enforcement is performed by local authorities who are not allowed to stop a vehicle, drivers must be made aware that continuous monitoring takes place also on different road types.

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<sup>1</sup> The “Institut für Straßenverkehr” (Institute for Road Traffic), Cologne, is an organisation of the “Gesamtverband der deutschen Versicherungswirtschaft e.V. (German Association of Insurance Companies)



These recommendations are also indirectly supported by the results of an Israeli study. Comparing the impact of conspicuously marked stationary and moving police units on the speeding behaviour of military drivers, Shinar and Stiebel (1986) found the latter to be more effective. Especially the *halo-effect* was found to be greater for drivers who were made aware of the presence of a moving enforcement unit than for those who passed a stationary police unit. Moving police units caused speeding drivers to make speed reductions to the prescribed limit which were still measurable after 4 km, whereas drivers who were confronted with a stationary police unit started to increase their speeds after passing this point.

Concerning the *distribution of responsibilities* it is recommended that mobile monitoring should be divided between the police and traffic authorities. Therefore the police should stop and charge offenders and give them immediate, intensive instruction. These measures should especially be taken in places with a special need for protection (schools, kindergartens etc.). Traffic authorities should monitor and charge offenders especially in places with a high accident risk according to the police accident-type map (see Lipphard & Meewes, 1998).

In this context it should be stressed that speed enforcement by private bodies is not recommended because it has to be assumed that pure financial interests could dominate their activities in this area (Janker, 1989; Lipphard & Meewes, 1998). The majority of German Federal States also reject private speed enforcement for juridical reasons (Elinghaus & Steinbrecher, 1997).

### 6.2.3 Alcohol-impaired driving

Based on a combined analysis of the data from official accident statistics, KONTIV 89 (a representative survey on driving in Germany) and the German Roadside Survey (GRS) conducted between 1992 and 1994 in two northern regions of the federal state of Bavaria Vollrath (2000), an estimated 0.55% of all trips in Germany are made with BACs of 0.08% or higher. In terms of absolute numbers this means that according to this analysis about 100,000,000 of 18,000,000,000 trips per year in Germany are made with a BAC level above the limit of 0.08% (i.e. so called DWI trips). Furthermore, Vollrath (2000) estimates that 0.6% of all DWI trips result in a contact with the police, either because an accident happened or because the trip was intercepted by the police. Given that a contact with the police has taken place, intoxication must have been detected. For this case Vollrath (2000) estimates that 22% of DWI trips are detected during routine checks whereas the detection rate is 59.7% if an accident has occurred. Although these results indicate that the large majority of drivers behave sensibly with respect to drinking and driving, this situation is not satisfying. From a behavioural viewpoint one can apply basic learning principles and conclude that the low detection rate of DWI trips leads to a reinforcement of those drivers who do not care about the BAC regulation by adapting their alcohol consumption accordingly (Tränkle, 1993). Thus, there is an obvi-



ous need to further improve strategies taken by the police to enforce alcohol-impaired driving (see ESCAPE Working Papers 10 to 12).

As a general rule in the area of conventional enforcement of alcohol-impaired driving, all measures which increase drivers' perceived risk of detection seem to be promising. This objective can be met by police operations which are highly visible but also hardly predictable (ETSC, 1999). In other words, there is evidence that *subjective uncertainty* experienced by drivers about the presence of the police and the performance of a check is a key factor in influencing drinking-and-driving behaviour (Gelau, 2001). Vollrath (2000, p. 672) assumes that one reason for the low detection rate of DWI trips is that drivers usually know where and when checks are performed. *This means that for increasing the efficiency of enforcement, not necessarily the number of checks has to be increased but their predictability has to be decreased.* This conclusion is also supported by a recent project commissioned by BASt (Pfeiffer & Hautzinger, 2000). The results of this project clearly indicate that the subjective risk of apprehension for DWI does not differ between cities with comparatively high and low surveillance intensity. This could be explained by the fact that with increasing surveillance intensity also drivers' knowledge about when and where controls took place increased. This enabled them to adapt their driving accordingly (e.g. by avoiding certain routes after the consumption of alcohol).

Along this line *random-breath-testing* (RBT) can be reasonably proposed as an effective enforcement strategy. For example, ETSC (1999, p. 22) summarises experiences from Australia, the Netherlands and Finland which unanimously support the effectiveness of RBT in reducing the proportions of alcohol-impaired drivers and alcohol-related crashes. Correspondingly Zaal (1994, p. 63) concludes on the basis of his extensive review that RBT has *"the greatest potential to deter drinking and driving behaviour and reduce the level of alcohol-related fatalities and injuries. To maximise the benefits of such enforcement operations it is essential that a large proportion of drivers is stopped and ALL are tested for alcohol impairment. Enforcement operations should be highly visible, accompanied by sustained high levels of publicity, rotated among numerous FIXED locations and undertaken for no longer than a one hour period at each location."*

### **6.3 AUTOMATED METHODS AND NEW CONCEPTS**

#### ***Speeding***

Conventional speed (and also other) enforcement methods clearly have inherent limitations regarding detection of non-compliant behaviour, citation processing, and further adjudication. The large size of national traffic systems and the high prevalence of traffic behaviour infringements imply that it may not be realistic, anywhere, to allocate sufficient police and adjudication resources to substantially change the current status. Therefore police agencies have been looking for ways to increase the effectiveness of traffic

enforcement by means other than multiplying their overall resources. Automation is one possible approach (see ESCAPE Deliverable 6; ESCAPE Working Papers 6 and 7). Automation, information technology and new management concepts have been successfully used in many areas of social and economic activity to improve efficiency, productivity, and effectiveness. Similarly, also in the area of traffic law enforcement there are pressures, expectations, and hopes for improving efficiency and having a greater impact on safety, through the use of new technology, especially technology that helps in the automation of the enforcement process (see Zaidel & Mäkinen, 2000).

Rothengatter (1991) summarises the ways by which automated enforcement methods can contribute to increasing the effectiveness of police enforcement (Harper, 1991). According to Rothengatter (1991) *automatic enforcement methods*:

- Can provide support to systematically increase the probability of detection of a violation without requiring a substantial increase in police manpower.
- Can be of use in providing immediate feedback after a violation has been detected.
- May be perceived as more “objective” by road users, thus increasing the perceived fairness and acceptance of police enforcement.

However, in the area of speed enforcement these points need some discussion: First, a significant increase of the probability of detection of a violation can be achieved by automated methods, which rely on local stationary monitoring. This kind of enforcement is also highly predictable to drivers who are inclined to exceed speed limits, and locally-limited short-term reductions of their speed can be predicted. The fact that technical devices like radar detectors are available suggests that at least a limited subgroup of drivers want to anticipate speed enforcement in order to adapt their speeds in the vicinity of a surveillance source (Teed, Lund & Knoblauch, 1993). This does not mean that this kind of enforcement strategy is useless, but that it is not well suited to achieving a long-term behavioural change in the driving strategy of speeding drivers (Gelau, 2001; Rothengatter, 1991).

It has been repeatedly pointed out in the literature that the immediacy of feedback after a violation is detected is crucial for its effectiveness (e.g. Koßmann, 1996; Harper, 1991; Pfeiffer & Hautzinger, 2000; Rothengatter, 1991). In other words, the more rapidly feedback follows the undesired action, the higher the behavioural impact can be expected to be. Pfeiffer and Hautzinger (2000, p. 16) provide a more detailed discussion of the behavioural mechanisms underlying this phenomenon. However, in practice it must be ensured that this is really the case, especially if the measure is designed to achieve long-term behavioural effects. As mentioned above, fully automated enforcement comprises the detection of a violation, identification of the vehicle and the identification and contacting of the owner (and/or driver) of the vehicle. Thus, if the implementation of an automated speed enforcement is aimed to achieve long-term behavioural effects, it must be ensured that its functions are not restricted to immediate detec-

tion and identification, but that they also include the immediate feedback/punishment that has the most behavioural impact in this chain.

Most subsequent applications of automatic speed enforcement have employed basically the same principle of taking still photos of vehicles committing a violation. Over time there have been some minor variations, such as the use of mobile units, and the use of devices other than radar (induction loops, pneumatic tubes, etc.) for measuring speed. However, in the three decades since the first photo-radar was installed, there have followed more substantial extensions and improvements of automatic enforcement systems as well. Automatic enforcement has been extended to several types of violations other than speeding, and new technologies for detecting violations and identifying violating vehicles have emerged. Probably the most notable developments are systems involving the use of digital video recording with image processing, and systems for electronic recognition and identification of a vehicle.

Concepts of automated enforcement of traffic violations can be presented in three types (Heidstra et al. 2000):

- Implemented and evaluated technologies
- Designed and implemented technologies
- Imagined technologies

An obvious way to improve the efficiency and perhaps the effectiveness of the enforcement process is to introduce automation to various steps in the process. While automation is usually associated with technology, it can also be in the form of simplifying manual procedures so that quick decisions can be made in a shorter process. For example, applying a simple scheme of fixed fines and removing a mandatory court appearance for most traffic violations increases the efficiency of policing dramatically.

Automation usually refers to the operating of part of the enforcement process without the presence of a police officer (such as a fixed speed camera). However, it may also refer to a device that integrates several manual operations (such as a hand-held computer that can automatically register personal, vehicle, site and violation data and transmit them to a processing centre).

Historically, the initial move to automated surveillance methods was motivated by the insufficient resources of the police to monitor so-called black spots, where accidents tended to accumulate (e.g. Lamn & Klockner, 1984). However, additional incentives for automating various aspects of traffic enforcement can be identified:

- Reducing administrative load,
- Increasing efficiency of citation delivery,
- Detecting infrequent, yet risky, violations,
- Issuing a large number of citations in a short period.

More recently, other needs have become the driving forces behind new approaches to automating enforcement:





- Management of specific traffic control schemes,
- Reliable fee collection for road use,
- Freight transport and cross-border control.

**Automation and technology in the service of manual operations**

The following is a summary list of the basic ways in which traditional manual enforcement is thought to be accomplished. Italics denote the mechanism the authors believe justify the method (Table 8).

**Table 8. Basic ways in which traditional enforcement is accomplished (Zaidel & Mäkinen, 2000).**

<i>Surveillance</i>	<i>Drive around, be seen, observe without being seen</i>	<i>General deterrence (threat of punishment)</i>
Personal contact	Spot checks (breath tests, vehicle, licences), warnings	Specific and general deterrence, education
Deal with violators	Catch in the act, issue citations, remove serious offenders	Punishment, specific and general deterrence
Active traffic control	Directing traffic, solving problems	Eliminating the conditions for violations

Application of these actions is necessarily selective in terms of place, time, behaviours or violations, drivers, or vehicles. There is simply no practical way that police-based traditional enforcement can maintain a continuous high risk of detection on a road network.

The process of issuing citations is the most visible aspect of traffic police work and it involves a number of steps as described in Table 1. These are detection of a violation, identification of the driver and vehicle, registration of the offence, (in some systems, immediate punishment payment to police officer), processing of the recorded citations at an office, citation issuing by the legal authority and the resulting process of adjudication. In addition, there is considerable administrative work related to the reporting of activities and actions by officers.

This process is mostly manual, costly and not very efficient. It was certainly hoped that automating enforcement would make it more efficient, less costly and more effective.

Most of the attention was given to the function of detecting violations, and automated photo-radar indeed increased the total citation output of police forces and extended the surveillance time of sites covered with fixed cameras. Automation of the rest of the process is lagging, and not enough was done to improve the efficiency of manual citation-giving and the personal contact functions of police work.



As long as manual patrolling and citation-giving are widely practised by police, they could be given the means to do it more efficiently with small computers linked to databases, doing away with filling paper forms by hand. There will be added administrative gains down the line as the digital information will be used to update non-compliance files, be fed into court computers, and generate activity reports automatically. These directions are pursued by many police departments in the UK and as a national project in the US.

In the US, the National Highway Traffic Safety Administration (NHTSA) is working to develop new technology for traffic law enforcement officers. The device, called the Mobile Officer Assistant (MOA), was first tested at the San Francisco Police Department in November 1997. Using a personal digital assistant, the MOA reads the magnetic strip on drivers' licences and bar codes used on VINs and licence plates. The hand-held devices are intended to populate data fields, automatically check violators' driving history, obtain vehicle information, and access criminal history databases and print the citation. The system uses cellular digital packet data transmissions, freeing up standard radio communications, while greatly increasing the officer's efficiency and the accuracy of data collected. After supervisory approval, the data is transferred directly to the municipal court system, greatly reducing the amount of paper records.

In New York, state police enter the traffic citation on a computer form, with the option of obtaining driver and vehicle ID from digital cards and transmitting it directly to the police office and the court system. The office uses the information for internal management and the court for planning hearings and tracking payment of fines. The driver receives a printed citation on the spot.

Some police departments, especially those that started projects years ago, are relying on BIG machines in patrol cars. However, it may be a mistake to link the device to a car when it is now possible to practically assemble hand-held units from existing components. Use of electronic driver and vehicle licences will further facilitate the process of personal contact-type enforcement.

The practice of issuing a warning, written or spoken only, is common in many police forces. Currently there is no legal and administrative framework to deal with warnings and almost no knowledge of their influence. Warning does not involve the court system and, if effective, would be preferable to citations in slight infringements only but can't of course, be a substitute for fines. Usually there is no knowledge about how many warnings are issued (in Finland roughly 10% of regular citations) and no tracking of their consequence.

A citations database should be maintained so citations can be analysed, not just by type (as is commonly done) but also by location, the issuing officer or unit, and other information that may help monitor the nature of offences detected (where, by whom, when etc.). It would also serve for quality control of the work done by police. If citation data



are issued by palm computer, all the data could be automatically sent or downloaded to a central computer and used for both administrative and violation analyses purposes.

Automated enforcement methods can be used for all kinds of violations, which can be related to the traffic regulation at a given spot or at an intersection. There will be less technical limitations for automated control of drivers, which will inevitably result in increasing use of automatic enforcement. This will, however, be followed by political considerations of its extent of use, hidden or announced, lower or normal fines, law systems for the owner/driver responsibility problem etc. It is therefore important to regard traffic as a system of which enforcement is an integral part and not just a safety measure in itself.

In summary, automated speed enforcement based on stationary, permanently located systems can be recommended for use at sites where accidents have repeatedly been caused by drivers exceeding the speed limit, and no immediate structural changes on the spot are foreseen. The goal is then to enforce compliance with the speed limit at this specific site by using the continuous threat of apprehension for a violation. This method is of use in urban and/or rural areas where speeds are especially high (Lipphard & Meewes, 1998).

### ***Alcohol-impaired driving***

As a new concept for the automated enforcement of alcohol-impaired driving, so-called *alcohol ignition interlocks* have been implemented and evaluated in several federal states of the US and Canada since the mid-eighties. Pilot studies were also performed in Australia, New Zealand and Scandinavia (Sperhake, Tsokos & Püschel, 1998). An alcohol ignition interlock is a device which is installed in a vehicle and requires the driver to provide a breath sample every time an attempt is made to start the vehicle. If the driver has a blood alcohol level above a specified low threshold value, the ignition is locked and the vehicle cannot be started.

The rationale behind this strategy of enforcing alcohol-impaired driving is the following: Despite the penalties that are imposed on drivers convicted for DWI, many of them continue to drive also under the influence of alcohol. This concerns those drivers who are not holding a valid driving licence due to withdrawal as well as those who have received their driving licence back again after conviction for DWI. Obviously the threat of losing one's driving licence and severe fines are not sufficient to deter certain drivers from alcohol-impaired driving. Licence disqualification alone seems to be no proper solution because many unlicensed drivers continue driving also under the influence of alcohol.

Compared with conventional enforcement concepts such as RBT, one of the main advantages of this technology can be seen in their economy. RBT stations are clearly very expensive to operate whereas alcohol ignition interlocks can be run on costs that must be paid by the user, i.e. the driver convicted for DWI.

On the other hand there are also a number of problems with this approach. Gilg, Hutzler, Tourneur and Eisenmenger (1998, p. 338) summarise various possibilities of manipulating or misusing the interlock devices. Those that can only be controlled by conventional police enforcement or additional efforts are the use of unequipped cars and breath samples by other (sober) persons. Moreover, there are numerous legal issues (e.g. those of product liability) which have to be resolved before a legally mandatory implementation seems realistic.

In summary, the idea of automatically enforcing alcohol-impaired driving by alcohol ignition interlocks seems at first glance to be appealing. Nevertheless, the question of whether and under which conditions this concept could become applicable (i.e. mandatory for drivers convicted for DWI) in Europe cannot conclusively be answered based on the momentary state-of-the-art. This issue has to be clarified by future research.

#### 6.4 BEHAVIOUR MONITORING SYSTEMS

To apply effective enforcement strategies and tactics in routine enforcement, the enforcement activities need to be systematically monitored. As this largely concerns the enforcement effects, monitoring enforcement implies monitoring the actual levels of non-compliance and assessing the impact of enforcement operations on driver behaviours, opinions and attitudes and road traffic accidents. The monitoring systems should make a clear distinction between policing activities, behavioural/accident measures and violations records. They are all needed when monitoring the effects of enforcement.

Based on the monitoring components developed in different countries and on the experience of studies of the enforcement projects, some basic principles for monitoring routine traffic enforcement were recommended within the framework of ESCAPE Work Package 6 (see Gelau et al. 2000).

In accordance with the relevant research literature the *deterrence effect* was assumed to operate as the most fundamental behavioural principle which was described and analysed in some detail. Based on this analysis a review of the literature and expert questionnaire practices for monitoring police enforcement in the European countries were then analysed. As a main result the following recommendations for monitoring routine traffic enforcement were drawn up (see Gelau et al. 2000 for details and further discussion):

- *Responsibilities:* The need for monitoring traffic police enforcement should be realised by both the Police Commands and the overseeing agencies (National Road Administration, National Road Safety Authority, and Ministry of Transport). Both parties should co-operate in planning the enforcement activity, collecting the relevant data, evaluating the effects and distributing the results.
- *Target setting:* Long-term enforcement targets should ensue from the national safety targets defined by the national safety programme. Annual targets should

be specified, based on the analysis of recent accident and behaviour data. The analysis should relate to three key issues: problematic locations (where most casualties occur) at problematic times (when most casualties occur); problematic road users (e.g. rogue haulage companies); and problematic behaviours (e.g. speeding). Selection of high priority enforcement sites should be based on a standardised procedure, which has to be accepted by the police and the overseeing agency and which has resulted from preceding research work. The targets accepted by the police are supposed to be ambitious but attainable and definitely given in quantitative figures. Even realising the problematic character of this point, the long-term targets are usually given in accident/casualty terms. To be more applicable, the enforcement targets should also be given in terms of behaviour changes in the main enforcement areas, e.g. speeding, alcohol-impaired driving, seatbelt use. Figures on enforcement intensity (e.g. working hours, number of controls) should also be included into the plans.

- *Co-ordination:* The annual police plan and annual targets should be co-ordinated with the governmental body responsible for the national safety programme. If, being dictated by the administrative structure of the police, the plan is originally developed on a regional level, a corresponding co-ordination should take place with the regional government. The disaggregation of the annual plan should continue down to the local police units.
- *Reporting:* Within the police, regular reporting of performed enforcement activities should take place. As the best solution, a multi-level information system should be established for this purpose. Such a system enables both quick data input, being performed by each police officer after a shift is completed and producing periodic data summaries for internal and other evaluating purposes. The periodic activity reports can be produced by the police, or by a governmental statistical body.
- *Distribution of evaluation results:* Governmental or statistical bodies usually publish summaries of accident, behaviour and offence figures in the respective country on an annual basis. These are usually presented to the public, through the mass media. These summaries should be accomplished by other enforcement figures and by the estimates of enforcement effects (performed by research bodies). Semi-annual and quarterly figures (with regard to enforcement activity, driver behaviour and opinion surveys when available) are essential for presentation on a regional/local level.
- *Feedback mechanisms:* As to relevant feedback for the police forces, the police should have direct access to the accident/behaviour figures, even prior to their official publication. These data can be applied by the police for internal (intermediate) estimates. Besides, special summary reports on enforcement activity and effects should return to the police regions and local units, to provide a basis for a new cycle of enforcement activity.

For evaluation of the quality of police enforcement both “effort” and “outcome” indicators are important (Christ, 2000). Table 9 presents a short overview of main indicators.



**Table 9. Possible targets/indicators for evaluation of police enforcement (Christ, 2000).**

<b>Possible Targets</b>	<b>Type of indicator</b>
1. Resources spent	“Effort” indicators
2. Activities performed (e.g. number of drivers checked, tickets issued etc.)	
3. Number of tickets/sanctions imposed	“Outcome” indicators
4. Perceived safety	
5. Non-compliance	
6. Accidents	

Setting key objectives (targets) for enforcement activities by authorities is the first necessity, priority or premise for evaluation. Without these objectives there is simply nothing to evaluate.

Very important is the level of target setting. If targets are only set on a national level, this provides an inadequate reference for regional or local decision-making about policing priorities.

Therefore there should be some rational and equitable method of breaking down the national target to local levels. Local objectives should be set by local authorities. These objectives should then be translated into targets set by the police management. Given the fact that police enforcement is first and foremost a measure that intends to influence compliance rates, targets for police enforcement should not be set in terms of safety (accidents, fatalities) but rather in terms of level of non-compliance (e.g. Christ, 2000).

Zaidel (2000) points out a very practical concern regarding the comparison of violation data between countries. If accident data are often suspect because of variation in injury definitions and completeness of reporting, the issues of comparability of violation data are far more complex and perhaps intractable. It appears that an independent monitoring system using similar definitions and methods is a better way of obtaining meaningful non-compliance data across EU countries.



## 7 SUMMARY AND CONCLUSIONS

### 7.1 MAIN OBJECTIVES AND ACTIVITIES

The objectives of ESCAPE were to identify important issues of traffic law enforcement in the EU, examine traditional and innovative enforcement approaches and tools, and assess their potential to improve compliance and thus contribute to safety on European roads. More specifically, ESCAPE addressed the following main issues, with each work package focusing on one or more of them:

- The extent of non-compliance with traffic laws and its contribution to accidents;
- How is enforcement organised and carried out in practice in EU countries?
- TLE needs, issues and constraints, old and new;
- The potential for new approaches, technologies and tools to improve compliance through more efficient enforcement.

On the basis of previous related work it was possible to pre-select a number of particular issues relevant to each of these main objectives. Regarding non-compliance, emphasis was put on speeding, drink driving, non-use of personal safety devices (belts, child seats, helmets) and “aggressive” driving.

The analysis of the enforcement systems operating in EU countries was to a large extent qualitative, and focused more on the policing function as compared to the legal functions. This was necessitated by the complexity of the systems, their intricate social context, and lack of quantitative data.

In assessing the needs and issues of enforcement, attention was given to organisational and legal issues of the system and not only to policing tactics and the behaviours targeted for enforcement. Other foci were anticipated enforcement issues in a larger, more integrated and even more motorised EU, and the special needs of CEE countries.

In examining new approaches and tools, it was planned in advance to specifically consider the potential of automated camera systems for enforcement of speeding and other violations, the possible role of non-police organisations in enforcement, the necessity for monitoring tools, the application of a cost benefit analysis tool to enforcement, and the extent of professional and public support to various traffic enforcement practices and initiatives.

One of the leading guidelines of the project was to address traffic law enforcement issues at a practical level and to propose potential solutions with a good chance of being accepted by enforcement professionals. Therefore, consultation with enforcement professionals from police forces, justice departments, ministries of transport, road authorities or other agencies were undertaken in all ESCAPE work packages. The consultation



took the form of personal interviews with officials in several countries, structured survey questionnaires sent to officials previously contacted in person, and international workshops with participants from national TLE agencies, the international TISPOL network, and ESCAPE researchers.

Three specific practical tools were developed, or adapted for enforcement purposes, in the project: a simplified cost-benefit analysis tool to assess the effectiveness of specified enforcement methods; guidelines for monitoring routine enforcement efforts, outcomes, and non-compliance levels; a list of innovative traffic law enforcement ideas addressing different needs, and assessed to be suitable for application in demonstration projects in different countries in Europe.

## **7.2 THEORETICAL BASIS OF ESTABLISHED ENFORCEMENT SYSTEMS**

The prevailing model underlying TLE is shown in Figure 1 (p. 27). It links legislation, police force, and compliance by individual drivers. Legislation sets the rules of conduct in traffic and the sanctions for non-compliance. Many road users comply willingly with the rules. Others, however, would not comply if it were not for fear of being detected (subjective risk of detection) by police and the wish to avoid being punished by the legal system. The business of policing is to impress these individuals that the likelihood of being detected is high and that punishment is sure to come and hurt. Police tactics and media support are designed to enhance the impression.

In practice, in existing TLE systems, the likelihood of being detected and sanctioned for a traffic law violation is very small. Therefore, the model needs to assume the operation of two mechanisms (they are hypothetical constructs) to explain how the actions affecting few, impress many. The mechanisms are referred to as “specific and general deterrence”. These terms are also used to describe legal and policing actions that are assumed to activate one or the other mechanism.

Specific deterrence requires actual detection of offending drivers and their punishment. The persons affected are presumed to be less likely to break the law in the future. The impact of a personal experience with the law depends on the nature and severity of punishment.

The actions of specific deterrence, when made publicly visible and known, are expected to serve as a warning to others, influencing their perception of the likelihood of being detected and punished. This is how the general deterrence mechanism is activated. This mechanism may be further enhanced by general deterrence actions designed to primarily prevent the occurrence of non-compliance. The most common actions are surveillance (such as cruising around), breath tests for alcohol, fixed cameras, annual vehicle inspections, information and opinion campaigns.

The psychological assumptions linking intensity of enforcement to compliance through perceived likelihood of detection was verified, in a general sense, in controlled field ex-





periments trying out various enforcement tactics, primarily regarding speeding. By and large, the assumptions have not been systematically tested throughout the traffic system. However, the prevalence of recidivism, even immediately after being ticketed or fined, demonstrates the limitation of the model even with respect to specific deterrence.

Similarly, the psychological assumptions about factors determining the effectiveness of sanctions derive primarily from laboratory studies with animals and not from studies with humans in a true social context. If anything, evidence suggests that most of the conventional assumptions about punishment, such as the importance of immediate sanctions or the impact of severity, need further verification in the case of traffic related sanctions.

As a guide for TLE policy the model is rather limited. It is unlikely that compliance is determined only by what the police do about detection and the private translation of these actions to subjective risk of detection. The model does not consider other likely determinants of compliance, such as how sensible or how fair a regulation may seem to people. It is not that clear whether the model applies to the whole population of road users (most of whom perhaps observe the law out of conviction rather than fear) or just to the non-complying users. How many specific deterrence actions need to be taken in order to achieve desirable general deterrence effects? Can general deterrence activities substitute for less specific enforcement actions (detection and punishment)?

### **7.3 TRAFFIC LAW ENFORCEMENT SYSTEMS IN EU COUNTRIES**

#### ***Legal context***

Traffic enforcement is just one aspect of a country's legal system and of policing in general. EU countries differ in their legal systems and present several ways of organising internal security and policing functions. To a large extent, traffic law, policing, and adjudication must fit these general structures. In many cases, changes in traffic enforcement were a result of general changes in the organisation of government, of courts or of the police.

GADGET reviews provide detailed information on TLE systems in Europe. In most countries, non-compliance with traffic laws constitutes a criminal offence. In all countries, violations defined as serious, and all injury accident related violations are always treated as criminal. This status of traffic infringements makes them not only the most common criminal acts but also one that is committed by the majority of the driving population.

EU countries have a similar range of sanctions imposed on offenders and a generally similar process of adjudication. Sanctions include fixed fines, driving licence suspension, and court procedures that may lead to fines, driving restrictions, suspension and prison terms. In all countries, certain classes of violations, and all cases involved in in-



jury accidents must be referred to the courts and cannot be resolved by administrative actions of the police or public prosecutors. Appeal venues are available to cited and prosecuted drivers in every country, but the systems operate under the practical assumption that the large majority of cited (ticketed) drivers accept the cost of the sanction and refrain from appealing. In most cases, appeals are turned down.

Adjudicating traffic violations has never had a high status or priority in the court system. The legal system of each country found ways to streamline the processing of traffic violations and to substantially reduce the load on the courts. In a few countries the decision was made to decriminalise most traffic offences and consider them as civil misdemeanours subject to fines. However, even countries that retained the criminal status of traffic violations adopted measures such as fixed fines or having a default whereby the driver is assumed to have admitted guilt unless requesting a trial. Such measures help reduce the load on the legal system and the police. Differences in the legal approach come to light, however, when dealing with specific issues, such as how to handle the identity of a driver in the case of a violation detected by an automatic photo radar camera.

Most countries found it useful to add various special consequences (other than fines and prison terms) to non-compliance with traffic law, as well as designing special mechanisms for their application. Driving licence suspension, mandatory medical and psychological tests, re-licensing requirements, rehabilitation programmes, remedial courses, and community work are some of the possible other consequences of traffic related non-compliance. While the courts can apply any of these, often there are non-legal authorities, such as the licensing office in a Department of Transport, which will administer the punishment (or treatment). In many cases the administration is in the context of a demerit point system.

### ***Policing traffic-police structure, size and effort indicators***

#### *Police structure*

Regarding policing, a mix of organisational structures of police can be seen in EU countries. A typical organisation may consist of three parts: A central Traffic Police force, under the control of some national command, is responsible for traffic control on main national highways. Another force, which may or may not have special traffic units, is responsible for rural roads and small communities in between. A third element is a local police force in larger communities, which in the case of large cities will also have special traffic units. The degree of centralisation of command and control, the level of autonomy of local forces, and the degree of personal specialising in traffic control, vary from country to country and within regions and police forces within a country.

It should be noted that traffic policing has a broader scope than just dealing with traffic violations and their consequences. It usually also involves a role in the prosecution of traffic offences, traffic accident registration, accident investigation, traffic management,



traffic planning, transport crime prevention, VIP and special cargo escort, and traffic education. Where there is no special traffic police force or speciality, traffic function is but one item – and often not a high priority one – on a force's task list.

Dedicated traffic units have the advantage of specialising and focusing on their tasks. However, with scarce resources dedicated forces are under increasing scrutiny to prove their success. It is tempting to hypothesise that dedicated and specialised TLE structures may indicate an increase in the relative importance of TLE and may result in “more” or more effective TLE. However, there is no easy way to test such hypotheses with available data. It is clear, for example, that the size of a country, its political structure, and its social-cultural history all play a crucial role in shaping the structure, functions, and size of traffic policing.

### *Police size*

The resources allocated to traffic policing in EU countries are considerable. They include personnel, a highly motorised and mobile force and a whole range of dedicated enforcement equipment such as cameras, speed detecting radar and laser units, alcohol meters and other analysis tools. Accurate and complete data are difficult to obtain, primarily because most countries do not have such data. However, in public organisations such as the police the number of personnel is a leading measure of size, which determines allocation of other resources. Based on personnel estimates, it appears that 7% to 10% of police personnel (or a corresponding proportion of person-years) in a country are dedicated to traffic control – patrolling and surveillance, violation handling, accident handling, and traffic directing. In the 15 EU countries, perhaps 80,000 police persons are dealing primarily with traffic. Material resources and the legal infrastructure supporting enforcement are also substantial.

An examination of police force size in relation to either population size or total annual kilometrage (which is a measure of traffic activity, or the need for TLE, influenced by population size, motorization, size of country and the roadway network) suggested that small countries have, proportionally, larger police forces compared to large and populous countries. For example, Finland with a population of 5.2 million allocates one traffic police man-year to every 3,000 inhabitants, or one per 25 million km exposure, whereas in the UK, with 60 million population, police allocation to traffic is one per 5,300 inhabitants or one per 40 million km exposure.

It is not simple to interpret national differences in police resources. They may reflect priorities, efficiency, and other policing tasks of varying nature and size. The fact that countries with different road safety standing can be found in each police size category suggests that absolute size of a police force in general, and that allocated to traffic in particular, may not be a determining factor in managing traffic safety successfully.



### *Policing effort indicators*

TLE by police primarily involves passive and active surveillance, catching violators in the act and issuing them a citation, removing serious offenders off the road, directing traffic and handling accidents. How much of it is taking place on EU roads? The GADGET review provides some indicators of policing activities. The definitions, thresholds, and recording rules of the indicators vary considerably among police forces and countries. The numbers reflect these practices as well as policing strategy and (in the case of citations) the prevalence of non-compliance.

Indicators included number of patrol hours, number of drivers suspended, number of tickets (citations) for speeding, DUI, non-use of belt, other violations, and number of breath and other alcohol tests.

There are many differences among countries in both the absolute numbers of the indicators and their relative share within each country. This applies also to the quality and availability of data. These differences are beyond the expected differences due to country size. We do not know to what extent the indicators reflect the prevalent behaviour of traffic in a country or the strategy of TLE. We suspect that it is mainly the strategy that is reflected.

Traffic surveillance is indicated by millions of km driven by patrol vehicles. This, however, should be seen in relation to the size of the road network. Field studies estimated the probability of observing a police car engaged in enforcement as less than one per 100 km, or per hour of driving, during daytime. Analysis of actual deployment of police forces showed that at any given time there is only small number of patrol cars on very large road networks.

The other large-number indicator of activity is citations. Receiving a ticket is perhaps the single most common contact between citizens and law enforcement authorities. There are hundreds of thousands to millions of traffic citations issued annually in the EU countries. However, the extent of ticketing varies greatly among countries, from a number corresponding to 45% of the population to just 2.4%. The majority of the values are under 10% and they are not related to country size. The majority of moving citations are for speeding. In only a few countries are large proportions of speeding and red light violation citations obtained with an automated fixed camera system.

The other major indicators of police activity are driver licence suspensions and random breath tests. The number of random (not connected to accidents or other violations) breath tests also varies considerably among countries. In the Nordic countries it is over a million and in large proportion to population size, but smaller in other countries even though most allow for some form of random breath testing. It is a preventive measure, similar in purpose to annual vehicle inspections, which are carried out by non-police authorities. Police-initiated licence suspensions, vehicle removals and other direct actions are in small numbers, yet they are claimed to have a large impact.



Police forces in all countries lack both compiled and structured information on the extent of their other traffic related activities, important as they may be.

#### **7.4 LEGAL AND ADMINISTRATIVE INSTITUTIONS AND MEASURES SUPPORTING TRAFFIC LAW ENFORCEMENT**

Effective formulation and implementation of enforcement policy is not only determined by the internal functioning of a police force, but also by the way in which different organisations, such as legal institutes, transport and road authorities, and publicity organisations work with the police in a co-ordinated and supportive manner. The quality of traffic law enforcement is determined by the whole professional network and the total chain linking police with the supporting measures and organisations.

In practice, in almost every European country the legal system for processing of traffic violations is a mix of criminal and administrative procedures. The criminal or penal system usually follows three independent stages – detection, prosecution and sanctioning – performed by the police, public prosecutor, and judge, respectively. The courts can impose a wide range of sanctions to fit each case individually. No criminal legal system can handle efficiently and justly the large number of offences in traffic that are detected by police. Automated methods of detection can easily overload any legal system based on summons to court.

In the administrative systems, the three stages are essentially combined into a single one, with a smaller range and fixed set of sanctions. The whole enforcement process is under the control of police with legal and administrative support by other bodies. Administrative traffic law tries to bring together many aspects of the general deterrence aspects of the prevailing theoretical model of enforcement.

Many EU countries have laws allowing certain traffic infringements to be treated under civil law with simplification of procedures and possibilities of appeal. At first, this has been applied to parking violations and road taxes but it is being extended to most traffic violations excluding certain severe violations and accident related ones. Most countries apply fixed fines, and in many cases they can be settled on the spot. Even in countries with strict criminal traffic law, simplifications and default shortcuts were instituted regarding the processing of traffic offences and imposing of sanctions.

Nevertheless, the legal system still lags behind the fast technological developments that would enable implementation of new enforcement methods. For example, automated detection of speeding and other violations still creates a bottleneck in several countries, since the issue of owner liability has not been satisfactorily solved. Another example is the use of alcohol interlock systems, which requires legislative changes to even make installation and experimentation possible.



Other significant administrative support systems common in EU countries are those that handle driver offender recidivism. Whereas the police usually deal with each violation as an independent case, other organisations monitor the accumulated violation record of drivers, and based on accumulated demerit points or other specified criteria impose on drivers administrative licence suspensions, training or rehabilitation programmes. Most EU countries have such support programmes.

Rehabilitation programmes have been developed to counteract high risk driving and they target primarily drunk driving. German-speaking countries have the most developed rehabilitation programmes, embedded in their driver licensing systems. Because of their wide and publicised application it is believed that they have a general deterrent effect in addition to individual improvement. Other EU countries are experimenting with such systems.

In all European countries there are basically three frames of reference that determine basic parameters for police enforcement: (1) the road safety situation, (2) compliance with the law by road users, and (3) the resources and tasks of police forces. These frames of reference need to be combined in order to reach a useful perspective on road safety benefits of police enforcement and how the police should be supported to achieve these benefits. In practice, the only way to achieve such a perspective is for several governmental agencies to work together in establishing a planned and agreed approach to police enforcement. At present, in many countries such co-operation is mainly for dividing areas of responsibility and exchanging information, but less so for planning a joint and mutually supportive enforcement approach.

## **7.5 IMPACT OF ENFORCEMENT ON COMPLIANCE**

There is a definite belief, shared by police and the public, that the appropriate kind of enforcement will result in improved compliance. Intensified and targeted enforcement campaigns (accomplished by shifting of police resources) often result in temporary and localised compliance improvement across the board. There are certainly enough testimonials to the fact that the simple presence of traffic police inhibits non-compliance.

The quantification of this relationship requires more precise definition of the nature of enforcement and the measurement of its extent, as well as reliable measures of compliance (or non-compliance). With the exception of speeding, drink driving and non-use of safety belts and helmets, there are practically no measures and no data on the true extent of non-compliance. Citation statistics give a biased and incomplete picture of compliance. Similarly, there are only a few very general measures for quantifying the extent of enforcement, such as the indicators of police effort described above. However, the actual impact of police efforts expressed in expenditure of resources depends also on enforcement strategies, tactics and support systems.



In the area of speeding, according to GADGET estimates, at any given time 15% to over 50% of vehicles in EU traffic are speeding at least 15 km over the posted speed limit. It was further estimated that only a very tiny fraction of speeding vehicles are issued citations. Legal speed limits set a general context for traffic speed, but within each context compliance may be low and it is not clear whether enforcement has any substantial impact. However, a number of *experiments* show that the volume of enforcement when substantially increased over long periods of time, will also reduce the number of traffic accidents. For example results from fixed speed camera sites in a number of countries and from a so called traject control area in the Netherlands clearly indicate that permanent enforcement (= high volume enforcement in a given area) have a strong effect on compliance and results in fewer accidents. The problem is how to transform the results of *experiments* and experiences from isolated areas into permanent *practises* in policing.

The vast majority of research on the impact of enforcement has focused on tactics of surveillance and speed control. The studies give a fairly uniform picture of the immediate effects of speed control. In the immediate vicinity of the surveillance unit (police officer, patrol car, camera) compliance is very high. As soon as the surveillance site has been passed, speeds start increasing. Thus the duration of the surveillance effect on speed is short in either time or space. In terms of the deterrence model, conventional speed control tactics achieve mainly a specific rather than general deterrence effect.

Results of local experiments in speed control have little national level application. Often it is not possible to extrapolate the tactics used in experiments or demonstrations because they had involved temporary shifting or concentration of policing resources onto a specific location or target behaviour at the expense of other targets and locations. Sometimes, special resources have been added temporarily but society was not willing to maintain the increased support for an indefinite period and on a national scale. In a few cases were policing resources increased permanently (e.g. doubled, in Israel), there was a definite increase in recorded violations, but little evidence for wide or permanent changes in compliance levels.

Non-compliance with drink driving laws is very low compared to speeding – perhaps few percentage points in most EU countries, and less than 0.5% in the Nordic countries. The countries with low non-compliance rates pursue an enforcement strategy based on large scale, random or quasi-random breath screening tests and the use of evidential breathalysers. The likelihood of being apprehended for drink driving is perceived to be higher than that for speeding and higher than objective data would imply. After years of continued and persistent enforcement in this area it appears that when combined with other, educational measures, it has had a substantial impact on compliance.

Non-compliance with safety belt laws by drivers and passengers on EU roads was estimated at 8% to 30%. The rates vary greatly among countries, regions, types of roads, and types of vehicles. The rates apply mostly to front seat passengers; they are considerably lower for the back seats. Seatbelt enforcement is not a primary target for the po-



lice. Citation rates for non-use of the safety belt vary considerably and in many countries it is a minor violation that is not recorded. With few exceptions, the police in each country consider belt-use rates (80–95% on inter-urban roads, 70–85% in urban areas) as satisfactory, and the role of the police in maintaining or increasing the rate as minimal. The police participate in various education efforts to increase awareness of the use of safety belts and child restraints.

As in other legal areas of non-compliance, the severity of sanctions, as such, does not have a clear-cut effect on compliance, contrary to the simple deterrence model. Some censure may be necessary (sometimes a warning letter was sufficient) but increasing the severity of sanctions has not proved consistently effective with either recidivism or as a deterrent to others.

There is clearly a lack of factual knowledge about all facets of the association between enforcement and compliance. There are limited data on just a few traffic behaviours, perhaps the most important ones, but very little about other behaviours or how to collect such data. For example, how to quantify the extent of compliance with priority rules, or with overtaking regulations. How high should non-compliance be before it is considered a “serious problem”? With the large number of vehicles, drivers, km exposure, and traffic events, even a small percent could mean a very large number. Authorities seem not fully to appreciate that improvement in compliance of even a few percentage points may have a larger impact on safety.

## **7.6 IMPACT OF ENFORCEMENT ON ACCIDENTS AND HOW COST EFFECTIVE IT IS**

The direct objective of TLE is to ensure compliance with traffic law. However, the social justification for investing in TLE and imposing restrictions and sanctions on people rests on the assumption that TLE is contributing to efficient traffic and to safety. Demands for more, or more effective, TLE are almost always linked to a decrease in safety and promises to improve it.

There is considerable evidence that substantial changes in the extent of police enforcement are correlated to changes in the number or severity of traffic accidents; more enforcement is associated with fewer accidents. Some of the evidence is based on direct comparisons of accident levels on roads that had different levels of enforcement, and some of the evidence is based on projections of what would happen to accidents if certain types of violations were eliminated through more or better police enforcement.

Joint re-analysis of scores of separate evaluation studies of changes in enforcement levels suggests that increased enforcement may have reduced injury accidents by an average of 6% to 17%. There was a wide variability in the results, depending on the method of enforcement, type of roads, baseline of compliance level, target behaviours, size of the project, and many other factors. For example, increases in enforcement targeting speed enforcement with stationary methods, drink driving, or safety belt use, achieved





6%, 7% and 8% injury accident reduction, respectively; intensified use of fixed speed cameras, or increased use of licence revocation sanction both resulted in a –17% impact on accidents.

Many of the studies indicate that there is a dose-response relationship between police enforcement and safety. Increasing the amount of enforcement further reduces the number of accidents. However, the marginal effect of increasing the amount of enforcement becomes gradually smaller. The common wisdom is that there may be a threshold level for an enforcement increase to have an impact on accidents, over the existing level. Most estimates of the threshold begin at a 3- to 4-fold increase in enforcement level. The new analysis did not support this conclusion. There was also limited evidence that reducing the amount of enforcement may lead to more accidents.

Most of the evidence for the impact of increased police enforcement on safety (as separate from new legislation accompanied by matching enforcement) comes from enforcement projects restricted to either selected roads, to few behaviours or to a limited period. In practice this means that in most projects there was a shifting of resources and concentration of policing efforts to fewer areas. It is not obvious that safety in other areas would not have been reduced, or that a nation-wide increase in policing resources would multiply local effects rather than result in a restored equilibrium between police, the legal system and the public.

Another point of caution is that many of the studies have been carried out in various regions in the US and in Australia rather than in European countries, and many of the studies are from past decades with different legal, roadway, and other traffic related contexts. Therefore, it is not clear that with comparable increases in enforcement to those in the past, similar safety impacts would be achieved at present in EU countries.

Safety impact estimates based on the potential of reducing various types of accidents, if specific violations were eliminated through improved enforcement, tend to be rather high (up to 48% reduction in fatalities) and, most likely, overly optimistic. The overestimate is both about the contribution of the violation to accidents, and about the possibility of eliminating the violations by conventional enforcement. Nevertheless, it is quite certain that more safety benefits can be attained with improved enforcement leading to better compliance.

The practical issues are which enforcement methods are likely to give the best value for money, and at what point the marginal benefits of more enforcement are too small to be socially justified because, for example, other methods can improve safety at a lower cost. These are policy issues of setting priorities. One way of setting priorities for police enforcement is to conduct cost-benefit analyses of alternative levels and forms of enforcement. Such analysis requires detailed data and exact specifications of the many assumptions and choices that need to be made during the analysis. In ESCAPE, a demonstration of the analysis was carried out on Norwegian data. The methods considered were those found earlier as having the largest impact on safety:



- Speed enforcement by stationary methods
- Drink driving enforcement by RBT
- Seatbelt enforcement
- Speed cameras

For each of these types of enforcement, four levels of increased enforcement, compared to the current level, were considered – current level x2, x3, x6, and x10 (times 10 the current level). The conventional framework for cost-benefit analysis, as given by economic welfare theory, was modified to better suit police enforcement. For example, violator benefits from violations and outlays for traffic tickets were not included in the analyses.

For Norwegian conditions it was concluded that it is cost-effective to increase all types of enforcement. Marginal benefits exceed marginal costs for substantial increases in speed enforcement, seatbelt enforcement and the use of speed cameras. With respect to random breath testing, a more modest increase in the amount of enforcement is cost-effective. It can be stated with a very high degree of confidence that increasing traffic police enforcement in Norway today is cost-effective. This conclusion is likely to apply to most EU countries where speeding, drink driving and not wearing seatbelts are common violations and TLE methods are similar to those in Norway.

It should be recognised that cost-benefit analysis can not, and indeed should not, be a sole guide to policy decisions. For example, even if such analysis were to show that it is not cost-effective to enforce a certain law, police may still be required to enforce the law in order to maintain compliance as well as respect for laws. Another example is that police enforcement not being the only way to improve safety, the cost-benefit of policing may be weighed against alternative methods for improving compliance, or against methods that bypass the compliance issue. In the case of Norway, comparative analyses have shown, however, that increased police enforcement is the most cost-effective (3.3) road safety measure compared to alternatives such as improving road maintenance, especially in winter (2.5), traffic control, including new speed limits (2.2), new motor vehicle safety standards (1.3) or road safety audits (1.1). The results of these cost-benefit analyses can hardly be generalised to other countries. The basic approach to cost-benefit analysis is, of course, universal. However, the numerical values for costs and benefits put into the analyses are likely to vary widely from one country to another.

## **7.7 PUBLIC SUPPORT FOR ENFORCEMENT**

### ***Perceived level of enforcement***

There is little doubt that the public is aware of TLE activities through direct experience, observing others, hearsay, and the media. Their attitudes towards TLE are shaped by experience as well as by learned views about traffic safety, driver behaviour, and the legal system. Most TLE agencies are responsive to public opinion and prefer to work in



concert rather than in opposition to it. By and large, the public in EU countries supports the efforts of TLE despite the fact that on an individual level, most drivers commit violations and attempt, as best they can, to avoid detection and sanctions.

According to GADGET and SARTRE data, active drivers in the EU countries perceived the chance of being checked for speed as 5% to 30%. The corresponding values reported for actually receiving a speed ticket vary from 1.5% to 13%. A country by country comparison with police-reported tickets suggests a correspondence between police documented speed tickets and the percentage of drivers reporting the experience. BAC checks were experienced by 11% to 40% of drivers in different countries, and DUI tickets were reported by 0.007% to 0.47% of drivers. Safety belt tickets were reported by < 1% to 2% of drivers. The large differences among countries reflect variations in legal requirements, compliance rates, enforcement priorities and practices. The actual significance and impact of these national experiences are further compounded by differences in sanctions and their application.

A study in Israel assessed encounters with traffic enforcement, independent of any specific behaviour. Over 1000 drivers were interviewed regarding their same-day experiences, at strategically located petrol stations on representative sections of the major inter-urban network. Thirty percent of the drivers reported seeing a patrol car engaged in some enforcement activity, a figure consistent with the upper boundaries of the home-based survey mentioned above. The probability of observing a police car on major IU roads was 3–4 per 100 km of travel. The probability of observing a patrol car actually involved in overt enforcement was 0.75–1.7 per 100 km of travel. These reports fit generally well with estimates based on systematic observations of the presence of police cars on roads.

In the same survey drivers were also asked about their past experiences.

- 20% reported receiving at least one ticket in the last 12 months.
- 38% were charged in a traffic court in the (general) past.
- 16% had been suspended from driving in the past.
- 40% had to take the compulsory training course as a consequence of demerit points.
- 60% personally knew drivers suspended “this year”.

These quantitative aspects of drivers’ contacts with TLE authorities provide a context for what conventional enforcement (or more of it) might imply for individual drivers. Drivers are clearly aware of TLE and its consequences and, presumably, can understand the potential implications of more forceful enforcement.

### **Support for legislation**

Based on the SARTRE survey and various local surveys, there is clear public support for existing traffic legislation in the four focus areas of speeding, alcohol, belts, and young drivers. Sixty-five percent of the respondents expressed a wish for lower permis-



sible BAC level, and 68% were in favour of a zero BAC level for new (typically young) drivers. The vast majority of drivers accept safety belts laws.

There is little support for stronger legislation regarding speeding. In several countries drivers support the current speed limits but in some countries they express a wish for higher limits, or even no limit, on motorways. Nevertheless, about half of the respondents are in favour of in-vehicle devices to restrict a car's top speed or devices to assist drivers not to exceed the limit. It appears that drivers are ambivalent about the legal approach to speed control. They recognise the importance of not speeding but also of the difficulty of not doing so, in practice. It is for that reason, perhaps, that they would have preferred a technological solution to speeding rather than one based solely on law and conventional police control of drivers.

On the question of harmonisation of traffic legal requirements across Europe, the majority of drivers favour similar requirements across countries, the preferred standard often being the one in their own countries.

### ***Support for police***

For most people TLE means primarily the actions of police. National studies as well as the SARTRE survey found strong public support for more police enforcement of traffic regulations. The level of general support ranges from 60% to 80% across the EU countries. Specific non-compliance behaviour may have greater or lesser support. It is tempting to ascribe national differences to cultural differences, but the actual level of enforcement must also play a role.

The almost universal support for more police enforcement may not necessarily mean that the public wants more traffic tickets. It is likely that more detailed questioning would discover that what drivers are asking for is better enforcement. They wish to have police at locations where and when serious violations are committed in order to prevent them from occurring. The public accepts that this may mean more police officers dedicated to traffic work.

### ***Support for sanctions***

While as individuals drivers attempt to avoid and fight the sanctions imposed on them as a consequence of being caught as traffic violators, collectively they support the sanction or punishment mechanisms. They appear to accept at face value the deterrence theory underlying current TLE systems. Overall, 22% of respondents in the SARTRE survey supported current levels of sanctions, and 56% were in favour of more severe penalties for traffic violations in their countries. Support of sanctions by country varied from 44% to 74%, with no clear relation to existing severity levels.

The support of sanctions may not necessarily mean a desire to see everyone punished more severely; it may be an expression of a wish to see very serious and repeat violators



punished more effectively than at present. The generally strong public support, in all countries, for establishing a demerit point system is another way of saying that repeat offenders should be punished more severely.

In summary, the extent of public support for TLE in EU countries is generally strong. Understandably, the support is less enthusiastic from drivers who report themselves as being less compliant with traffic laws. The overall support reflects an appreciation of the role of TLE in maintaining orderly traffic behaviour that leads to safe and efficient travel. It is also a reflection of dissatisfaction with existing levels or specific manifestations of non-compliance, annoying driving, and traffic accidents. However, this support does not imply an automatic acceptance of every traffic law, police action or punishment practice. Specific TLE rules and practices may seem to the public as not related to safety or as not being applied in a truly equitable and socially fair manner.

## 7.8 FUTURE OF TRAFFIC ENFORCEMENT

### *Enforcement is a part of safety management*

It can be concluded that there is no doubt that the subjective risk of detection as an underlying factor in the mechanism of traffic enforcement can to a considerable extent explain driver behaviour. However, considering the traffic system as a whole, including the role and resources of the police, it is clear that enforcement based solely on subjective detection probabilities will not be able to achieve full or even a satisfactory level of compliance of all traffic rules. No country could afford such massive enforcement systems that would guarantee considerably better compliance rates than is presently the case. Moreover, very extensive monitoring of road user behaviour based on the fear of punishment would probably raise such strong public resistance that extensive implementation would become impossible. There are currently available systems that can be used directly preventively without the fear of punishment, such as speed limiters. Moreover, the use of such “directly preventive” systems can be realised with much lower costs than extensive monitoring systems requiring manpower even when fully automated.

Consequently, the fundamental issue when assessing traffic enforcement is not the principle of deterrence, but the need for increasing enforcement based on deterrence. Even though we can show that the deterrence principle is working in practice and enforcement is cost effective, we can also put forward that a transport management system has failed when massive enforcement systems are needed. Controlling driver behaviour by means of a threat of punishment is a clear indication that safety management is insufficient, and that the traffic management systems are not functioning as integrated wholes. There are a number of examples outside the transport system, in which the infrastructure has been designed and built in a way that to a large extent the possibility for the human operator to make fatal errors is eliminated. This is not the case within the transport systems. On the contrary, the transport systems provide us with ample opportunities to



make errors – either intentional or unintentional – which increase the likelihood of an accident.

The limitations of road users are well known and recognised. These are above all associated with the functioning of human cognition, i.e. the way road users acquire, process and use information while driving. In addition to drivers' inability to increase their information processing quality when speed increases, the motivational system of drivers is not prepared for incidents with a low occurrence probability, which hazards represent. Moreover, drivers are guided by feedback received from the consequences of their own behaviour. Actually, speeding and some other violations are rewarding, making it possible for us to fulfil so-called extra motives of driving not inherently belonging to traffic. For this reason, speeding is very commonplace, since for a given individual it leads more often to positive than to negative consequences. It is only on the system level that the problems of speeding may best be seen. The motivational system of an individual driver simply cannot support – except for short time periods like when seeing a patrol car – such behaviour that does not “make sense”. That principle is simply a part of the way the human mind operates.

A considerable amount of traffic violations are committed accidentally and do not involve deliberate risk taking. Many of these violations could be eliminated simply by means of improving the road infrastructure rather than punishing drivers for something their perceptual-motivational system is not fit for. Based on the Accident Investigation Team's reports it has been estimated that even in serious head-on collisions, less than one third (30%) can be classified as including deliberate risk taking (Karttunen, 1995). In the remaining 70% of cases a number of measures other than police enforcement – often associated with improved road infrastructure – could have prevented the accident.

It can be even maintained that too much is expected from the police. By improving the road infrastructure the need for enforcement could be considerably decreased. There are actually a number of measures available that, when applied extensively, could to a large extent substitute enforcement. These include road humps, small roundabouts, more sophisticated traffic signal systems, and the introduction of in-vehicle/infrastructure supported telematics systems such as intelligent speed-limiters or alcohol-interlocks.

### **Zero vision**

Sweden was the first country to introduce the zero-tolerance principle (see Tingvall, 1999). This is based on the ethical principle derived from road users' abilities and needs. The transport system has been designed and constructed in such a way that all citizens are served and that a human error in traffic will not lead to severe injury. This principle means that the ultimate goal of traffic safety work is zero fatalities. Consequently, it means that the commitment of the authorities to improve transport safety must reach a new level. It also includes that the authorities responsible for the infrastructure must improve it in a way that either makes it impossible for drivers to make fatal mistakes or so that mistakes will not result in fatal accidents. Moreover, zero toler-



ance also means sharing the responsibility for safety. It means that the traffic police are still needed, but that they can operate in an environment so designed that they can concentrate primarily on serious misconduct and have a more educational role in traffic than at present.

### ***Sustainable safety***

Another road safety philosophy, in many respects quite similar to the zero-tolerance vision, is the concept of sustainable safety. According to this concept road safety can best be guaranteed by tackling the causes underlying accidents, and by removing areas of conflict or making these controllable by road users. Where accidents still occur, the risk of serious injury should be virtually excluded.

In the Netherlands the concept of sustainable traffic safety has been adopted by the Dutch Government as an official policy, together with a programme for implementation. According to the sustainable safe traffic vision, control of vehicle speeds should preferably be arranged by intrinsic parameters of the traffic system such as road design, vehicle design, and road-vehicle interaction rather than measures such as enforcement that are mainly intended for flanking support. In the short and medium term police enforcement is still needed to influence speeding. Once speeding is part of a better functioning safety management system, traffic enforcement can concentrate on fewer problem areas without the need for ever-increasing resources that increased traffic volumes create.

One of the great challenges currently facing traffic enforcement is to recognise that it is impossible to essentially improve traffic behaviour by means of police forces alone. Without seeing police enforcement as a part of traffic safety management where also other measures are needed, the situation will not change, and the vast number of speeding and other bulk offences are likely to continue to generate accidents.



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## Reports presented in the ESCAPE project

### *Deliverables:*

- D1 Enforcement needs on European roads (Author: David M. Zaidel)
- D2 The potential for EU-wide demonstration projects in traffic law enforcement (Author: David M. Zaidel)
- D3 The impact of enforcement on accidents (Author: David M. Zaidel)
- D4 Traffic law enforcement by non-police bodies (Authors: Jelle Heidstra, Charles Goldenbeld, Christhard Gelau, Tapani Mäkinen, Marie-Chantal Jayet, Claudia Evers)
- D5 Legal and administrative measures to support police enforcement of traffic rules (Authors: Charles Goldenbeld, Jelle Heidstra, Rainer Christ, Tapani Mäkinen & Shalom Hakkert)
- D6 New concepts in automatic enforcement (Authors: Jelle Heidstra, Charles Goldenbeld, Tapani Mäkinen, Göran Nilsson & Fridulv Sagberg)
- D7 The attitudes of European drivers towards the enforcement of traffic regulations (Authors: Jean-Pierre Cauzard & Allan Quimby)
- D8 The attitudes of various agencies towards new enforcement concepts: a qualitative survey conducted in four European countries (Editors: Panos Papaioanou, Joanna Vasiliadou & Allan Quimby)
- D9 Methodological recommendations for the evaluation of traffic police enforcement (Authors: Christhard Gelau, Victoria Gitelman, Manfred Pfeiffer)
- D10 Traffic enforcement in Europe: Effects, measures, needs and future. Final report of the ESCAPE consortium (Authors: Tapani Mäkinen, David M. Zaidel; Gunnar Andersson Marie-Berthe Biecheler-Fretel, Rainer Christ, Jean-Pierre Cauzard, Rune Elvik, Charles Goldenbeld, Christhard Gelau, Jelle Heidstra, Marie-Chantal Jayet, Göran Nilsson, Panos Papaioanou, Allan Quimby, Vlasta Rehnova and Truls Vaa)

### *Working Papers:*

- Wp1 Cost-benefit analysis of police enforcement (Author: Rune Elvik, TØI)
- Wp2 Consultation with enforcement professionals: workshops, interviews and surveys (Author: David M. Zaidel)



- Wp3 Non-compliance and accidents (Author: David M. Zaidel)
- Wp4 Review of enforcement support systems in EU countries (Charles Goldenbeld, Jelle Heidstra, Tapani Mäkinen, Rainer Christ, Panos Papaioannou, Joanna Vasiliadou, Christhard Gelau)
- Wp5 Workshop on acceptance of new enforcement concepts: Expert Workshops Nice, France, November 8–9, 1999 (Authors: Rainer Christ (KfV), based on input from: Cauzard, Goldenbeld, Heidstra, Klemenjak, Mäkinen, Quimby, Rothengatter, Zaidel)
- Wp6 Automatic enforcement use and its issues across EU-countries (Göran Nilsson, VTI)
- Wp7 Automatic enforcement technologies and systems (Author: Fridulv Sagberg)
- Wp8 Individual differences in attitudes to enforcement of traffic regulations (Authors: Jean-Pierre Cauzard & Allan Quimby)
- Wp10 Review of descriptive variables for evaluating police enforcement (Authors: Christhard Gelau, Victoria Gitelman, Marjan Hagenzieker, Jelle Heidstra, Marie-Chantal Jayet, Marie Berthe Biecheler-Fretel, Peter Fischer & Thomas Macoun)
- Wp11 Methodological guidelines for evaluating police enforcement projects (Authors: Christhard Gelau, Peter Fischer & Manfred Pfeiffer)
- Wp12 Development of guidelines for monitoring routine enforcement (Authors: Christhard Gelau, Victoria Gitelman, Marie-Chantal Jayet & Jelle Heidstra)