SUNflower: a comparative study of the developments of road safety in Sweden, the United Kingdom, and the Netherlands

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Abstract. The paper presents the main results of the SUNflower study – SUN stands for **S**weden, the **U**nited Kingdom and the **N**etherlands - , a comparison of the development of road safety in the SUN countries. The safety records of these three countries are the best among the countries in the world and all three countries made impressive progress in recent decades. The aim of the study was to learn what exactly made road safety improve in the SUN countries and what possibly could be transferred to another SUN country or other countries. The methodology used has proven to be valuable for the comparison of the road safety levels in the SUN countries and probably also will be useful for safety comparisons of other countries. Moreover, the methodology and the findings of such a comparative study can offer guidance for remedial action in other countries. The SUNflower methodology can be used as a benchmark for the safety performance in different aspects of road safety. As a follow-up of the Sunflower study an extended study (SUNflowerplus6) started, comprising nine European countries. SUNflowerplus6 uses the same methodology.

All three SUN countries have achieved similar levels of safety through continuing planned improvements in these levels over recent decades. Policy areas targeted have been similar, but policies implemented have differed at a detailed level. Three 'headline' policies (seat belt wearing, drinking and driving and vehicles safety) resulted in halving the number of fatalities between 1980 – 2000. These reductions are not repeatable. All three countries have ambitious policy plans to improve road safety further. In Sweden the *Vision Zero*, in the Netherlands *Sustainable safety* and in the United Kingdom the strategy *'Tomorrow's roads – safer for everyone'* are the guidance for further action. If the plans are implemented a further reduction in fatalities of about one third is foreseen in the SUN countries in the coming decade.

1. INTRODUCTION

Although the traffic safety records of Sweden, the United Kingdom and the Netherlands are the best among the countries of the European Union and in the world, their accident toll is still unacceptably high. New ways have to be, and are being, sought to further reduce casualties in these countries. Interestingly, the strategies, which have produced the relatively good results, are quite different in these countries. So, the question arose as to what exactly made them work in coping with the traffic safety problem. And further, if specific beneficial patterns of underlying concepts can be determined, is it then possible to interchange them.

A better insight into the development of policies and programmes in these countries might conceivably identify key factors, which could further improve current safety practice in each of them. Moreover, it might offer guidance for remedial action in other countries. Learning from each other and putting that learning into practice, is an indispensable part of gaining maximum improvement in safety. In this context, a study was carried out to assess the background to the safety strategies of Sweden, the United Kingdom and the Netherlands: the SUN countries (Koornstra et al., 2002). The results of this study are of special value in the progress of development of the safety programmes of the three countries. The methodology of the study has been

designed in such a way that it can be used as a basis for comparative studies with other countries or jurisdictions.

2. OBJECTIVES AND METHODOLOGY

Sweden, the United Kingdom, and the Netherlands are searching for ways to further improve their road safety in order to reduce the burden of road traffic casualties, although their road safety records are the best in Europe and in the world, as shown in Table 1, where the fatality rates per billion motor vehicle kilometers and per 100,000 inhabitants for 2000 are given for the SUN countries, the EU (15 countries before the expansion in 2004), the USA, Australia, and Japan.

Fatality rate 2000	Per billion vehicle kilometres	Per 100,000 inhabitants
Sweden	8.4	6.7
Great Britain	7.3	5.9
Netherlands	8.5	6.8
EU all 15 countries	13.6	11.0
USA	9.5	15.2
Australia	10.1	9.5
Japan	13.4	8.2

Table 1. *Fatality rates for SUN- and EU countries, USA, Australia and Japan (source OECD-IRTAD database and estimates from ETSC)*

Also great progress has been achieved in the SUN countries in the past in fatality rate reductions as is illustrated in Figure 1 and Figure 2.

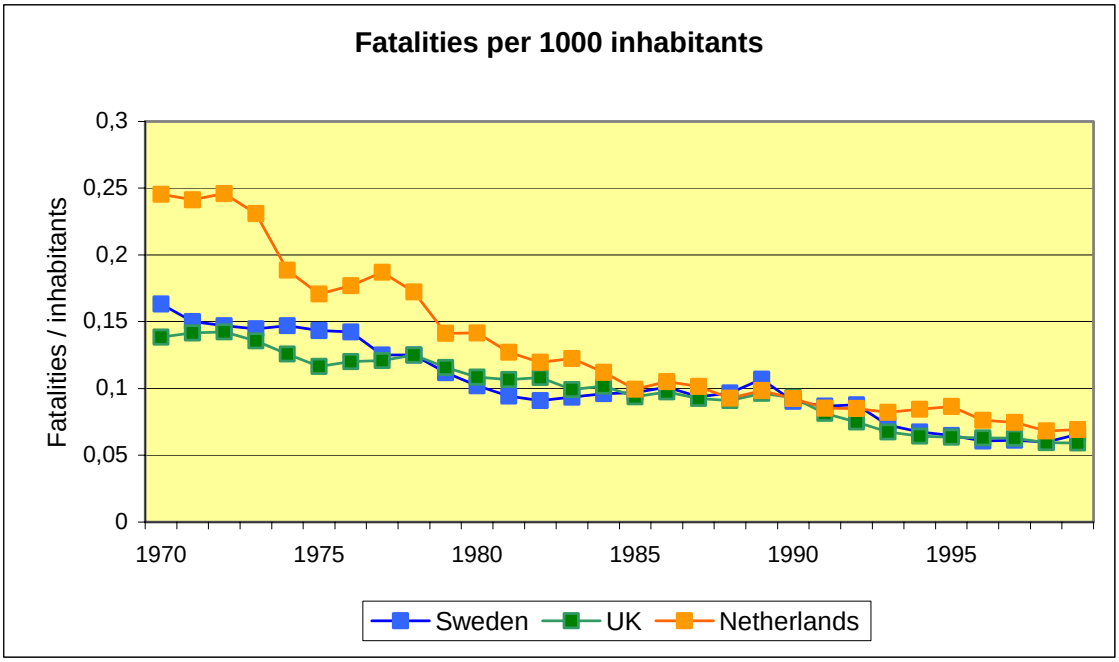

Figure 1. *Fatality rates for SUN countries per 1000 inhabitants.*

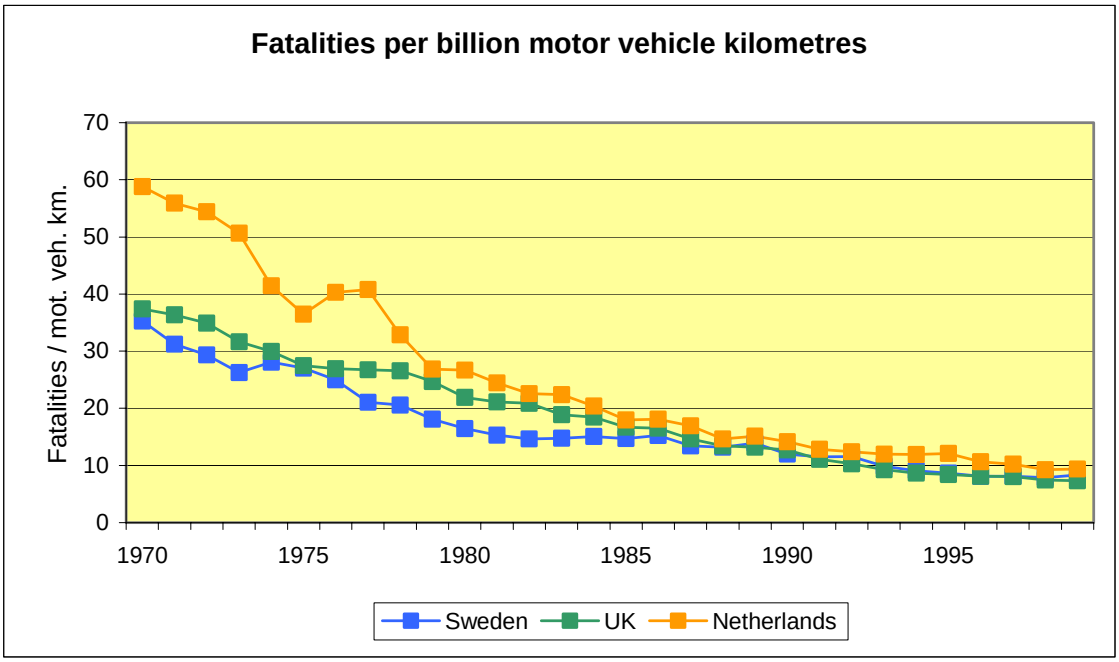

Figure 2. *Fatality rates for SUN countries per billion motor vehicle kilometers*

Despite macroscopic similarities, their road safety strategies and actual activities seem to differ. A better insight into the relationship between the developments of road risks and road safety policies, programmes, and measures in these countries might conceivably identify key factors, which could further improve the current road safety practice in each of the SUN countries. This was the first objective of the SUNflower study, as the comparative study of the SUN countries was called. Moreover, the methodology and findings of such a comparative study might also offer guidance for remedial action in other countries.

The central institutes for road safety research in the three SUN countries performed the study collaboratively, respectively
- the National Road and Transport Research Institute (VTI) in Sweden
- the Transport Research Laboratory (TRL) in the United Kingdom
- the SWOV Institute for Road Safety Research in the Netherlands,
where the SWOV acted as main contractor for the SUNflower research project.

The study uses a kind of a benchmarking approach with respect to road safety for the SUN countries. The relevant benchmarks that have been chosen for the study are:
- the nature and content of national road safety plans and action programmes;
- performance indicators (ETSC, 2001);
- the final outcomes of road traffic fatalities in comparable terms of mortality (road deaths per inhabitant) and death rate per amount of exposure (amount of motor vehicle kilometres).

The thinking beyond the methodological approach is based on a road safety target hierarchy as shown in Figure 3 and that was adapted from the consultation document on the Road Safety Strategy 2010 of New Zealand (LTSA, 2000).

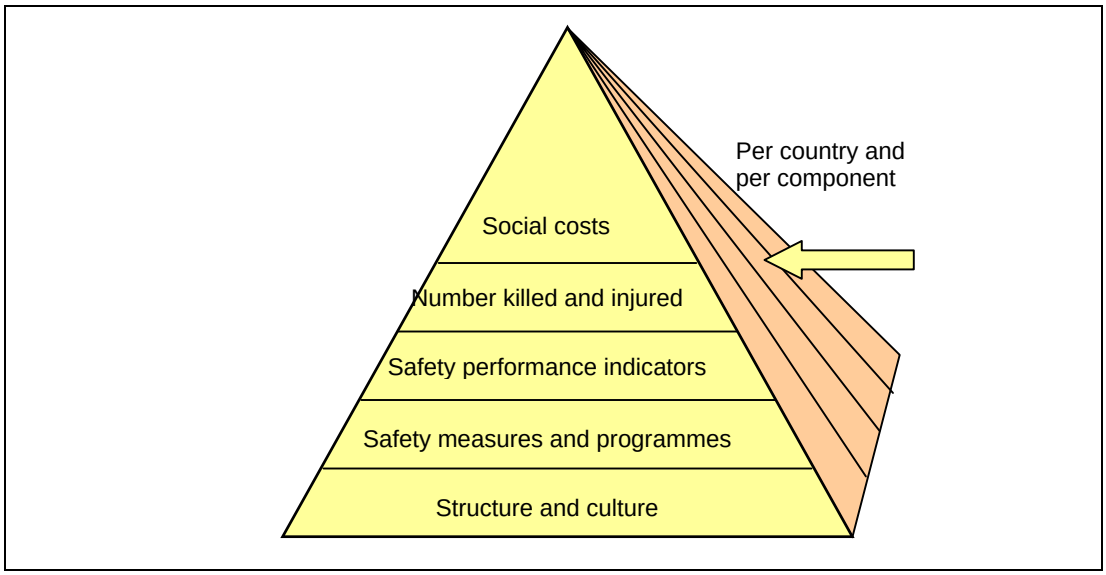

Figure 3. *A target pyramid: target hierarchy for road safety at a disaggregate level*

Each level of this hierarchy may be influenced by external factors (for example demographic differences) and also by accident reporting practices. These influences can make comparisons difficult or even invalid. The system components – the different layers in the pyramid – and their developments over time of the SUN countries are compared. These comparisons are needed in order to understand the impact of interventions on the level of safety measures and programmes on the intermediate outcomes (performance indicators) as well as on the final outcomes (number killed and injured). Four case study subjects have been identified in the SUNflower project: drinking and driving, seat belt and child restraint use, local infrastructural improvements on urban and rural roads and safety on main inter-urban roads. The case study results were embedded in two overviews. One on *Policy and organisation of road safety and the traffic background* and one on an *Analysis of the Traffic safety situation in 2000.*

Many tables and graphs are used to describe the traffic safety situation. As an example, regarding different transport modes there are large and in some cases statistically significant differences.

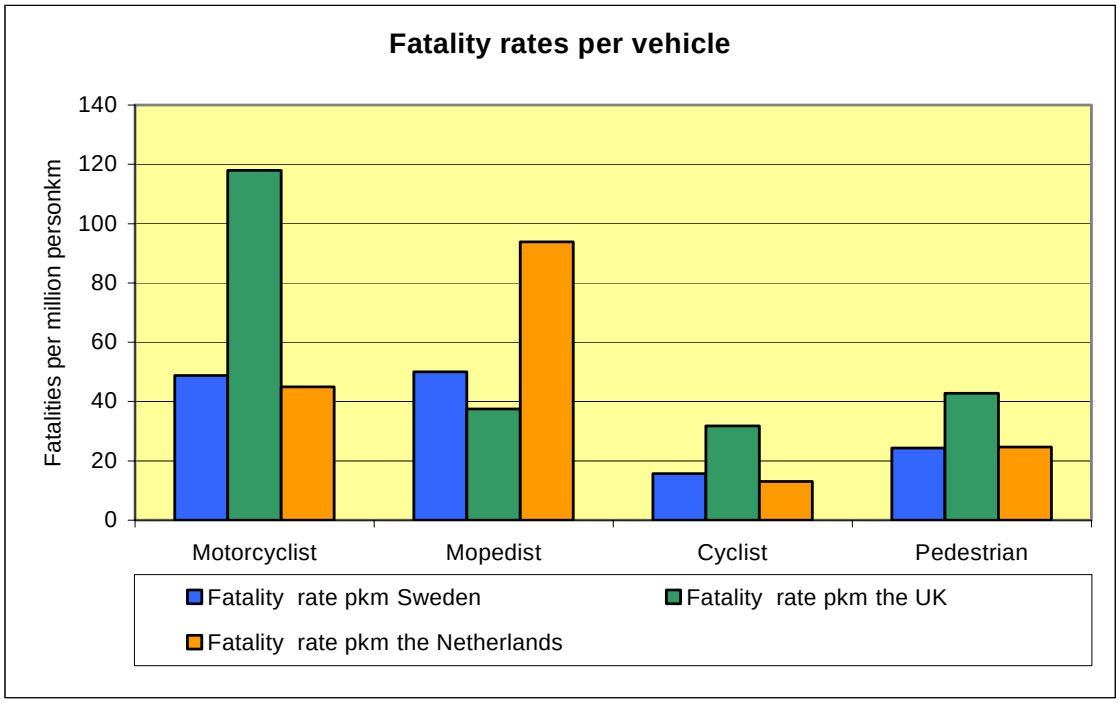

Figure 4. *Fatality rates for motorcyclists, mopedists, cyclists and pedestrians in Sweden, Great Britain, and the Netherlands.*

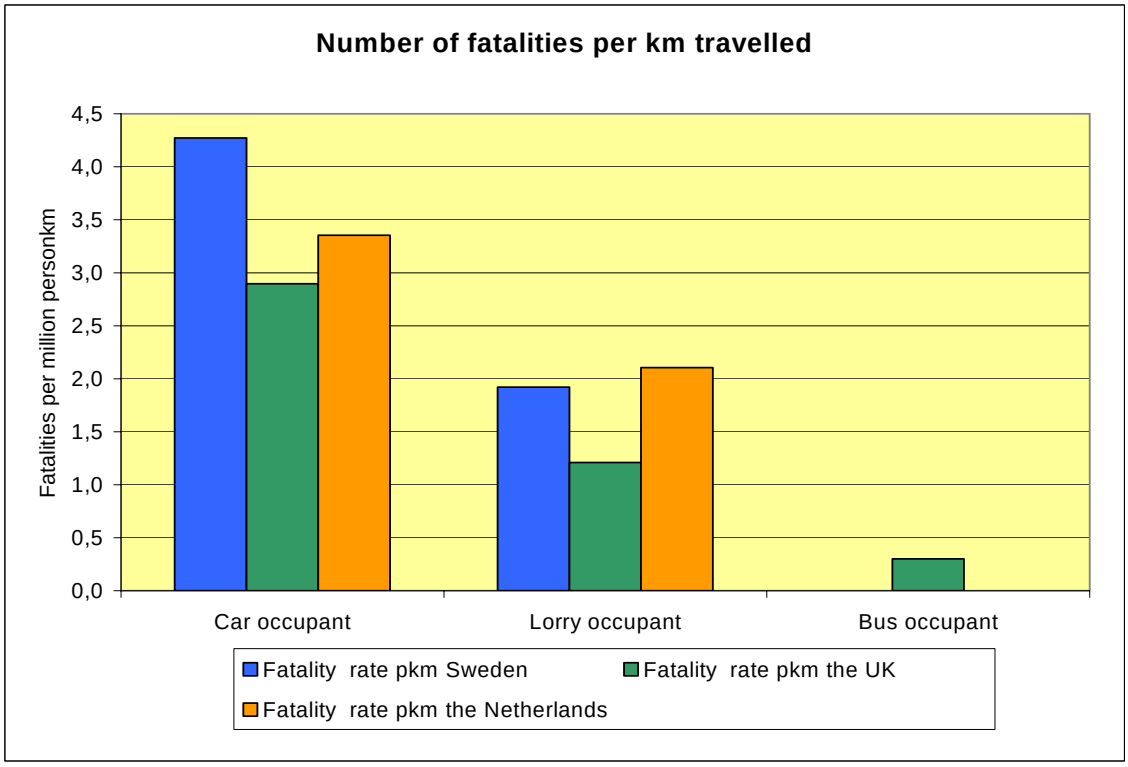

Figure 5. *Number of fatalities per kilometres travelled in Sweden, Great Britain, and the Netherlands; for car, bus and lorry occupants.*

Britain has a much higher motorcycle fatality rate than Sweden and the Netherlands (Figure 4). The Netherlands has higher moped fatality rate than Sweden and Britain.

The Netherlands and Sweden have almost the same fatality rates for motorcyclists, cyclists and pedestrians. These are more or less double in Britain. It is a high level of car occupant safety that makes Britain the safest country in the world.

Sweden has the highest occupant rate (Figure 5). The Netherlands has the highest rate for lorry occupants. The low rates for car and lorry occupants in Great Britain are interesting and need further research.

Both overviews and the four case studies resulted in an explanatory analysis of the road safety developments in the three SUN countries. It presents a quantitative description and analysis of developments in fatalities, related to details of road safety measures for road user modes and road types and growth of exposure.

To summarize: the SUNflower study relies strongly on the use of high quality data that must be (made) comparable. It is thus implicitly and firstly an attempt to get insight in the reliability of the use of national data for international comparisons. Secondly, it is an attempt to define the relevant benchmarks (size and nature of programmes/action plans/measures, intermediate and final outcomes) for a road safety comparison. Thirdly, the study aims to contribute to the science-based understanding of differences between benchmark values. Fourthly, the study tries to customize the findings into 'good practices' for road safety comparisons. Finally, it is aimed at learning how road safety policies and/or actions can be optimised in the SUN countries and how further comparisons of other countries with the SUN countries can be performed.

Based on the recommendations of the successful Sunflower study from 2002, it was decided to continue with this approach. The SUNflowerplus6 project started at the beginning of 2004. This study is, first of all, an extension on road safety comparisons within the SUN countries. Furthermore, a similar comparison between three Southern countries (Greece, Portugal and the Spanish Autonomous Region of Catalonia) and between three Central European Countries (Czech Republic, Hungary and Slovenia) will be made. A last aim of the SUNflowerplus6 study is to produce a series of indicators that can be regarded as a 'footprint' of the safety performance of a country. This SUNflowerplus6 study will be finished by the end of 2005.

3. ROAD SAFETY POLICIES AND THE ORGANISATION

The road safety policies of the SUN countries have been developed over several decades. The level of traffic safety and the progress made is determined to a substantial degree by factors which lie outside the direct influence of its traffic safety policy, or the way those factors can administratively be handled by means of policies. With this in mind, SUNflower made comparisons of safety policies and safety organisation.

An important factor seems to be the different transport systems in the three countries. However, the aggregate traffic indicators seem to differ very little between the countries, because the kilometres traveled and the motor vehicle kilometres per capita are almost the same, as are also the share of cars in the national motor vehicle fleet. Although the numbers of fatalities in the three countries differ, they are also almost proportional to their national motor vehicle fleets. Almost everything else differs between the three countries. Of special interest seems to be the differences in traffic densities (low in Sweden, high in Britain), the use of motorways (low in Sweden, high in the Netherlands) and the position of vulnerable road users (high

risks for pedestrians and motorcyclists in Britain, high risks for mopeds in the Netherlands, high risks – and high speeds – of car drivers in Sweden).

On the *strategic level*, traffic safety policies in the three countries have much in common. In each, safety programme statements can be found that lack of road safety is not an unavoidable side-effect of road transport, but that it is the transport system which has fundamentally to be arranged in such a way that people can travel without the harm of fatalities and (serious) injuries. Nowadays, and for several years, each of the three countries has set quantified targets (absolute numbers of fatalities and serious injuries), monitors progress on a regular basis, and – what is more – sharpened the targets over time to reach the eventual objective. If compared to the actual safety levels in 2000, and assuming the British target for fatal and serious injuries combined referred directly to fatalities, the targets for 2010 imply that about the same fatality reduction percentages need to be achieved between 2000 and 2010: for Sweden 32.5%, for Britain 37%, and for the Netherlands 29.5%. Two observations have to be made here. First of all, the target for the Netherlands will be revised and most probably, will be made less ambitious. The reason is the lack of enough resources (within the central Government) to implement the foreseen countermeasures. And: compared with the EU target of 50% fatality reduction between 2000 and 2010 (European Commission, 2003), which can be considered as a very ambitious target, all the SUN countries would have to implement additional actions in order to comply with the European target. Target setting proved to be a valuable means to get, and to keep, traffic safety on the political agenda. It is also an efficient managerial tool to define responsibilities for the different levels of administration and among other actors in the field. The actual policies in the three countries also correspond with each other to a great extent.

Interestingly, however, the safety visions of the SUN countries differ. These differences in vision refer to the *Vision Zero* approach in Sweden and the *Sustainable Safety* strategy in the Netherlands on the one hand, and the more problem-oriented and professional practitioner led approach in Britain on the other hand. Although a shift in the application of certain types of solutions and measures can be traced in Sweden and the Netherlands, it is still too early to demonstrate a corresponding difference in the safety profits in practice, whether these are detectable at all.

Nevertheless, it is interesting to introduce both visions shortly here. Both visions have the same roots. 'The approach for deciding how responsibility for safety on our roads should be shared is a pragmatic and ethical one, but with scientific foundations, particularly in the science of ergonomics'. This can be read in the World report on road traffic injury prevention (WHO, 2004) and this report capitalize on findings of effective and efficient road safety policies, especially based on experiences in the SUN countries. The new paradigm of understanding road safety is summarized as follows:
- crash injury is largely predictable and largely preventable;
- road safety policy must be based on a sound analysis and interpretation of data, rather than on anecdote;
- since human error in complex traffic systems cannot be eliminated entirely, environmental solutions (including the design of roads and vehicles) must help in making road traffic systems safer;
- the vulnerability of the human body should be a limiting design factor for traffic systems, i.e. for vehicle and road design, and for setting speed limits;

As said, two countries in particular have formally adopted this 'systems approach' to road safety: Sweden and the Netherlands and in Annex II and I both visions are presented. The British approach is presented in Annex III.

On the *tactical level* we have to deal with the 'toolbox' of policymakers. It basically concerns the funding of the safety programmes, its organisational structure, the planning and decision making, and so on. It also concerns education of professionals, information transfer, enforcement, rules and regulations, guidelines, and so on. Enough expertise on such topics is certainly present in the SUN countries, while their organisational structures, although differing, are covering the same topics and expertise. Public support for safety measures is also essential. That public support is of great importance seems to be a lesson learnt in each of the three countries. All safety programmes refer to it and in each, there is an attempt to create and foster public support.

The *operational level* is concerned with safety actions and specific measures. Looking to a long list of traffic safety actions, which is included in the report, it is clear that most types of remedial action have been taken in all of the three countries. Broadly speaking, the only observable difference is in fact the timing. And sometimes the scale of application is different. The importance of road safety research also has to be stressed. Development of new approaches and publication of evaluations of their effectiveness in a scientific reliable manner has contributed to make progress in the SUN countries and will significantly contribute to effective safety policies.

To summarize: the road safety policies of the SUN countries have been developed over several decades. They have mainly involved the same type of measures. The timing of their implementation and their legal basis are different. They also differ in application intensity of the measures. The general characteristics of the organisation of safety activities is also similar in the three countries, with each having a willingness to debate safety issues in Parliament, a strong coordinating ministry, good vertical co-ordination of safety activities from central government to local groups, with supporting finance, and influential non-governmental/non-profit organisations with a strong interest in safety. A recent major difference between the SUN countries is the development of a road safety vision in Sweden and the Netherlands and not in the United Kingdom. However, the positive safety effects of such a vision have not yet been established.

4. CASE STUDIES

Four case studies are presented in the SUNflower report, on *drinking and driving*, *use of seat belts and other protection devices in cars, low cost infrastructure improvements in urban areas and on minor rural roads* and finally on *infrastructure of high quality inter-urban road network*. These case studies have the same structure: they contain a (historical) overview on policies and describe the common and different aspects of these policies. The present situation and developments, and the common trends and deviations between Sweden, the United Kingdom and the Netherlands are related to policy, tactics and operational differences.

To illustrate this approach the conclusions of the case study on *low cost infrastructure improvements on urban and minor rural roads* are presented here. This case study focuses on the organisation and implementation of road improvement programmes. The conclusions from this case study are as follows.

The focus of engineering programmes differs somewhat in the three countries**,** as a result of the distribution of accidents and traffic within the road networks. 27% and 33% of fatalities are in urban areas in Sweden and the Netherlands, respectively, compared with 41% in Britain. The pattern of fatalities among road users also varies. Although the total proportion of fatalities among pedestrians and cyclist combined is similar in all three countries, in Britain these are largely pedestrians, with the Netherlands having a high proportion of cyclist fatalities and Sweden more equal distribution between the two groups. The proportion of motorised two-wheeler fatalities is higher in Britain (nearly all motorcyclists) and the Netherlands (motorcyclists and mopedists) than in Sweden.

The key question is how much of the resulting difference in pattern of risk results from the engineering programmes in urban/residential areas that the countries have adopted. This is difficult to identify due to several programmes being implemented simultaneously. It is also made more complicated by measures combining layout changes with speed limit changes. As a result tracking accident patterns associated with particular groups of roads is almost impossible. We will look at the broad evidence for casualty reduction effects in urban residential areas, urban main roads, and local rural roads.

Although significantly more kilometres of 30 km/h road have been introduced in the Netherlands than in the other two countries, this has not had a substantial effect on urban accident rates until recently. This might be caused because much of the 30 km/h limits were on new road sections, rather than converting existing roads. In principle, both Britain and Sweden should be able to gain further accident reduction by extending their lower speed zones. But this will depend on current accident levels, that are already low in Sweden, and in Britain also on the acceptability of reducing speeds when many of the roads with residential development carry high flows, and are therefore seen as significant traffic routes.

It appears that treatment of 50 and 70 km/h roads in the Netherlands has resulted in major casualty reductions, despite lower speed limits not being introduced on these roads. Up to 2000, this programme had more effect on national casualty totals than the programme of introducing 30 km/h zones, although without the latter, casualties might have been expected to increase as new urban roads were built. Despite the differences in urban programmes, the average speeds in urban roads in the three countries do not differ markedly.

Over the last 20 years, the Netherlands have managed, relatively effectively, to improve the safety of cyclists, their largest vulnerable road user casualty group, mainly through provision of additional facilities for them, both on and off road. They have also effected a substantial reduction in pedestrian casualties. Although it is not as clear how this has been achieved, it probably is partially achieved by reducing traffic flows and driving speeds. Britain, however, still has a substantial pedestrian casualty problem. Although part of this might be attributed to the greater frequency of busy roads crossed in British urban areas, more detailed investigation of the relative situations of pedestrian safety would be useful.

It might be expected that fatality rates in urban areas would be reasonably consistent per head of population. Comparison for Britain and Sweden shows overall fatality rates per head to be 60% higher in Britain. Although there are some differences with town size, this difference seems mainly to result from the much higher traffic flows in Britain. Thus the fatality rates per kilometre are double for residential roads and up to

six times higher for main roads in Britain; at the same time, the fatality rates per vehicle kilometre are about a third lower in Britain.

As there is some uncertainty from the national figures on the validity of the comparison of the traffic flows and accident rates for urban roads in the three countries, further investigation at a more detailed level within a small sample of individual towns in each country would be useful.

The results of this case study approach illustrate its usefulness. From this perspective it is important to continue with this approach in SUNflowerplus6. We foresee this including case studies on nine topics: pedestrians, cyclists, mopeds, motorcyclists, accidents involving heavy goods vehicles, speed management, novice drivers, behaviour and enforcement and delivery mechanisms of road safety policies.

5. PAST TRENDS: HOW FAR CAN THEY BE EXPLAINED?

Ideally one would be able to track all the effective road safety measures in each country and show that these explained the reductions in numbers of casualties in each country, having also taken account of the changes in road user activity that occurred over the same period. Such an approach was considered unlikely to be achievable. Although the effects of some of the key measures are well researched and documented, there remains a very large number of smaller initiatives that collectively may change attitudes and behaviour significantly, for which separate measures of effectiveness cannot be assessed. The other major factor in tracking casualty changes is the change in exposure. The relationship between exposure and the often-used indicator (vehicle kilometre) is a complicated one, most probably not proportionally linked.

The approach adopted here was as follows. A comparison was made between the fatalities in the year 1980 and 2000. First estimation was made of the additional fatalities in 1980 if traffic had been at 2000 levels. These additional fatalities are added to the observed one. The next step is to assess the difference in expected and observed fatalities for each vulnerable road user group. The third step is to assess the fatality savings by four policies that have been examined in detail (vehicle safety, seat belt wearing, drinking and driving and local engineering measures). The final step is to subtract the estimated savings from step two and three and assign the remaining difference in fatality numbers to 'other car occupant measures' and to 'other vulnerable road user measures'.

The results are summarized in Table 2. Although it is extremely difficult to identify the effects of individual policies with confidence, the fatality savings from vehicle safety, seat belt wearing, and drinking and driving seem rather reliable.

	Saving in fatalities between 1980-2000 attributed to each source		
	Sweden	Britain	Netherlands
Estimated total fatalities saved	426	3124	1455
Vehicle safety, seat belts, Drinking and driving	48%	54%	46%
Local road engineering	4%	10%	5%
Other vulnerable road users-related measures	38%	29%	31%
Other car occupant measures	10%	7%	18%

Table 2. *Summary of sources of fatality savings in the SUN countries*

These comparisons suggest that 46% to 54% of the estimated savings in fatalities resulted from 'headline' policies of seat belt wearing, drinking and driving, and improved car safety. A substantial part (29% to 38%) of the reduction in fatalities in each country is to be attributed to other measures for vulnerable road users. In Britain this reduction is also associated with reduced exposure, but in Sweden and the Netherlands an increase of exposure would have produced some increase in fatalities among this group of vulnerable road users. Correspondingly it appears that measures to improve safety for these groups have had a larger effect in Sweden and the Netherlands. This might be associated with the penetration of safety facilities for these groups (traffic calming, lower speed limits, etc.). Other measures (education, training and police enforcement besides on drinking and driving and seat belt wearing) appear to have contributed 10% to the reduction of car occupant fatalities in Sweden. In the Netherlands their contribution is 18%, but 11% of this is attributed to the enlargement of the motorway system. Some of the estimated contribution from other car occupant measures may be due to major engineering improvements. So it appears that changes in education, training and police enforcement (other than those linked with seat belt wearing and drink driver education) may only have resulted in a reduction of around 5% in car occupant fatalities.

Based on the extensive analysis in the SUNflower project the following general conclusions can be drawn.
- over the last 15 years the accident rates in the three countries have been relatively similar, although in the 15 years prior to that, there was a much more substantial reduction in the Netherlands. Apart from motorcyclists, the trends in deaths and serious injuries among the different user groups is also similar in the three countries, although over the last ten years there has been a slower reduction in car occupant casualty rates in the Netherlands.
- all three countries have benefited from substantial improvements in vehicle safety, and have increased their levels of seat belt wearing and compliance with drinking and driving. Over the last twenty years, these three policies have accounted for about half the reductions in expected fatalities.
- specific programmes for treatment of high-risk sites, including the introduction of 30 km/h zones, have made measurable but not substantial contributions to the reductions in fatalities over the last 20 years. But general engineering and other measures substantially reduced the fatalities among vulnerable road users in the Netherlands and Sweden, contributing to about a third of the total reduction in the expected fatalities.

6. CONLUSIONS AND RECOMMENDATIONS

The SUN countries, Sweden, the United Kingdom and the Netherlands, are the countries with the highest road safety level in the world. Each of the three SUN countries have achieved similar levels of safety through continuing planned improvements in these levels over recent decades. The policy areas targeted have been similar, but policies implemented have differed at a detailed level. Differences in focus for safety programmes result from both different relative sizes of accident groups and differences in the structure of road safety capability that influence its ability to deliver different types of policy. Progress has been achieved through directing improved policies to all three areas – vehicle, road and road users. There is room for further improvement in well-established safety fields in all three countries, and scope to learn from each other to ensure collective experience is used effectively. Risk factors are provided for the SUN countries, which can be used by other countries as indicators of the levels of safety that are achievable in relation to different aspects of the road safety problem. Differences in these factors between the three SUN countries indicate how these indicators need to be tailored to national situations.

Detailed conclusions are drawn for the three *SUN countries* individually indicating their strong performances and recommendations for future safety improvements. For Sweden car drivers have a relatively high risk and safety effort should concentrate on car drivers and their speed. Britain would benefit from a lower blood alcohol limit for drinking and driving, more intensively enforced, but with some relaxation of penalties for the new lower limit offences. Britain needs to find an infrastructure that will enable pedestrians and vehicle traffic to co-exist at lower fatality levels, for example by extending the length of urban roads with 30 km/h speed limits. Britain should also give greater emphasis to developing a more extensive high quality road network of similar density to that of the other countries; this could encourage greater acceptance of lower speeds on other roads. The Netherlands need to understand why its moped riders risk is so high, in order to identify an appropriate solution. The Netherlands also needs to review its drinking-driving problem to identify how best to make further reductions in alcohol related fatalities. The Netherlands needs to identify an effective strategy to increase seat belt wearing rates to a similar level as the other two countries.

A methodology for the meaningful comparisons of countries and jurisdictions has been developed and applied in analyses of national road safety strategies, mainly over recent decades and of fatality risks of comparable road types, road user modes and collision between modes. Based on analyses of several more specific risk trends between 1980 and 2000 it was possible to attribute the fatality reductions to road safety measures (vehicle safety, seat belts, drinking and driving and road engineering). Within the study it has not been possible to look at all policy areas in detail, so it is not possible to provide a full explanation of the effects of all policies on national risk levels. Nevertheless the case studies provide an indication of the way in which the more detailed information provide more scope to understand the effect of specific policy models.

Other countries may wish to develop similar analyses in relation to their own national safety problems and policies. The risk indicators for the SUN countries can be used as comparators against which to benchmark their performance in different aspects of road safety, taking into account the characteristics of the different national problems. An extended SUNflower study, combined with 6 other European countries in

SUNflowerplus6, will lead to a so-called 'footprint', a set of indicators that can be regarded as the safety performance of a country.

ACKNOWLEDGEMENTS

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*) to be downloaded from: www.swov.nl

ANNEX I

Sweden's "Vision Zero"

Vision Zero is the philosophy and long-term guideline for traffic safety actions in Sweden after 1997, when the Swedish Parliament approved it. It aims at a future traffic safety structure in which measures have been taken so that no one is killed or seriously injured as a result of a traffic accident. Human life and health are paramount. According to Vision Zero, life and health should not be allowed in the long run to be traded off against the benefits of the road transport system, such as mobility. Mobility and accessibility are therefore functions of the inherent safety of the system, not vice versa as it is generally today. Vision Zero is an ethical approach to safety and mobility.

In the Vision Zero approach, the emphasis is moved away from enhancing the ability of road users to cope with an imperfect system. Instead, it is acknowledged that traffic accidents cannot always be avoided, since people sometimes make mistakes. Therefore, these accidents have to be prevented from leading to fatalities and serious injuries by designing roads, vehicles and transport services in a way that someone can tolerate the violence of an accident, without being killed or seriously injured.

According to Vision Zero, everyone shares responsibility for making traffic safer: politicians, planners, road maintenance organisations, municipalities, transport service providers, vehicle manufacturers, and road users. The operational translation of the Vision Zero philosophy was not yet specified in 1997, nor was the deadline to meet the ultimate objective set, but an interim target was specified. The target for 2007 is a 50% reduction in fatalities, compared with the 1996 level. In 2001 the Government presented an infrastructure plan, where the traffic safety work will fulfill the target of 2007.

According to the policy, if the inherent safety of the system cannot be changed, then the only radical way to reduce the road toll is to lower travel speeds. On the other hand, if a substantial reduction in vehicle speed is unacceptable, the alternative has to be investment to improve the inherent safety of the system, at a given desired level of mobility

The work on turning Vision Zero into reality is being implemented in many different ways. Some measures are:
- centre guard rails ('cable barriers') which prevent head-on collisions on a rural road;
- safe roadside areas without fixed obstacles or with guardrails;
- safer traffic in built-up areas, appropriate speed limits, roundabouts;
- support to EuroNCAP (New Car Assessment Programme);
- travel policies in companies and safe transport of goods and people;
- installing seat belt reminders and using cycle helmets.

Source: www.vv.se

ANNEX II

"Sustainable safety" in the Netherlands

The starting point of the concept of 'sustainable safety' is to drastically reduce the probability of accidents in advance, by means of infrastructural design. In addition, where accidents still occur, the process that determines the severity of these accidents should be influenced in such a way that serious injury is virtually excluded. The concept, which has been launched in 1992, is based on the principle that "man is the measure of all things". A sustainable safe traffic system has an infrastructure that is adapted to the limitations of human capacity, through proper road design, vehicles equipped with tools to simplify the tasks of man and constructed to protect the vulnerable human being as effectively as possible, and a road user who is adequately educated, informed and, where necessary, will be deterred from undesirable or dangerous behaviour.

The key to arrive at a sustainable safe traffic system lies in the systematic and consistent application of three safety principles:
- functional use of the road network by preventing unintended use of roads
- homogeneous use by preventing large differences in vehicle speed, mass and direction;
- predictable use, thus preventing uncertainties amongst road users, by enhancing the predictability of the course of the road and the behaviour of other road users.
The three safety principles require specification of the intended function of each road and street. Roads should be built with one of the three major functions in mind:
- the flow function: enabling high speeds of long distance traffic;
- the distributor function: serving districts and regions;
- the access function: enabling direct access to properties alongside a road or street.

Road users must be prepared to accept the restrictions of their individual freedom in return for an improved level of safety. Education could and should play an important role in the transition period from the traffic system of today to the sustainable safe system. Education could concentrate on the why and the wherefore of sustainable safety. Public awareness, public participation, and education should create support for implementation and find their place alongside implementation of other key elements of this vision. With respect to vehicles, the diversity of vehicles should be kept to a minimum. Furthermore, the various types should be clearly distinguished. When used in the same traffic area, vehicles should demonstrate the same behaviour as far as possible, or otherwise be provided with separate facilities.

With a view to promoting and enhancing the implementation of measures of this kind, the central government, the representative bodies of the provincial and the local administrations, and the Union of Water Boards agreed upon an action programme for the period 1997-2002. This so-called Start-up Programme defined the accepted tasks and shared responsibilities for the execution of the planned programme of measures. An almost 100% participation was created. A revised plan for the future is now being drawn up and is to be expected in 2005: *Sustainable Safety version 2.0.*

Source: www.swov.nl

ANNEX III

"Tomorrow's Roads – Safer for Everyone"

In 2000, a new road safety strategy was published by the British Government, which set new casualty reduction targets for 2010. These targets are a 40% reduction in the number of people killed and seriously injured in road accidents, a 50% reduction in the number of children killed or seriously injured, and, a 10% reduction in the slight casualty rate per vehicle kilometre all compared to the average for 1994-1998. As stressed in the programme, the Government cannot achieve such targets without co-operation of all stakeholders. The main spirit behind the programme is that road crashes are not solely random events and that serious outcomes of road crashes are avoidable to a large extent.

The programme itself addresses 10 main themes, each clearly elaborated in a strategy, a set of specific actions or points of attention, and a timetable for their implementation. The themes are:
- safer for children
- safer drivers - training and testing
- safer drivers – drink, drugs and drowsiness
- safer infrastructure
- safer speeds
- safer vehicles
- safer motorcycling
- safer pedestrians, cyclists and horse riders
- better enforcement
- promoting safer road use.

The British Department for Transport has published the first review of the Government's Road Safety Strategy in April 2004. The review charts the progress to date on achieving the Government's road safety targets and shows that in the first three years of the strategy there has been:
- a 17% drop in the number of people killed or seriously injured on the roads, and
- a 33% reduction in the number of children killed and seriously injured.

The strategy review highlights the areas where real successes in road safety have been achieved (banning the use of hand-held mobile phones, roll out of safety cameras, introduction of hazard perception test to the driving test, significant reductions in pedestrian and cyclist casualties, continuing effectiveness of Local Safety Schemes). It also details the areas which will require continuing attention. For example the number of deaths, which has not fallen significantly since 1998, the number of car occupant deaths, the number of motorcyclist deaths and injuries and the rise in drink-drive related deaths and injuries.

Source: www.dft.gov.uk

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