IR4 : D R L   Project :

DRL implementation scenarios

Report for WP4

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J.J.F. Commandeur & M.P.M. Mathijssen
SWOV Institute for Road Safety Research

Contents

1. Introduction

This interim report is part of project Tender No. TREN/E3/27-2002 for the European Commission on Daytime Running Lights (DRL). The general objective of the present report is to produce various implementation strategies for DRL in the EU, as well as further specific recommendations for implementation maximizing the positive effects, while minimizing the negative effects.

Based on the results of Work Packages 1-3, realistic implementation scenarios are discussed and evaluated. Apart from these results per se these scenarios incorporate additional elements, notably:

- The acceptance of specific scenarios among road users;
- The cost-benefit aspects associated with specific scenarios.

The final results and implementation strategies will be formulated in consultation with a number of national experts as identified in WP1 and with selected relevant international bodies (e.g. ECMT, ECF, FIM, ACEA).

WP4 consisted of the following tasks:

1. The determination, definition and reporting of realistic implementation scenarios based on the results of WP1, WP2 and WP3.
2. The qualitative determination and reporting of the acceptance level of each scenario, based on the results of WP1.
3. The quantitative determination, valuation and reporting of the costs and benefits of various implementation scenarios, based on the results of WP2 and WP3.
4. The production of a deliverable, WP4-report, describing feasible and cost-effective implementation strategies for daytime running lights (DRL).
5. The organization of a workshop of national experts, as identified in WP1, and of selected international bodies, in order to discuss the draft WP4-report.

Chapter 2 of this draft WP4-report presents the road safety effects and environmental impact of DRL, as determined in WP2 and WP3.
Chapter 3 contains an overview of possible DRL implementation scenarios and of arguments against DRL implementation, as expressed by EU countries. The overview results from a literature review and from a questionnaire that has been completed by experts in various EU countries, as part of WP1.
Based on the possible DRL implementation scenarios discussed in Chapter 3, the costs and benefits of five policy options for the mandatory use of DRL in the European Union are presented in Chapter 4. The cost-benefit analysis formed part of WP2.
Chapter 5 contains conclusions regarding the road safety effects and the cost-benefit rates of the five policy options, as well as specific recommendations for DRL implementation that would maximize the positive effects, while minimizing the negative effects.

2. Road safety effects and environmental impact of DRL

The road safety effects of DRL have been investigated in two studies:
1. An updated review of studies that have evaluated the safety effects of DRL on cars and motorcycles, in the form of a meta-analysis of those studies (Elvik et al., WP2-report)
2. An experimental study regarding possible perceptual, cognitive and behavioural side-effects of DRL (Bouwer et al., WP3-report).

In a third study the environmental impact of DRL was investigated (Brouwer et al, WP3-report)

2.1. Results of the meta-analysis

The meta-analysis was aimed at answering the following questions:
1. Are the effects attributed to DRL novelty effects that are likely to erode over time?
2. What is the relationship between the usage rate for DRL and the effects on road safety (dose-response function)?
3. Do the effects of DRL vary systematically, depending on geographical latitude?
4. Do the effects of DRL vary, in terms of accident severity?
5. Do the effects of DRL vary with respect to season (winter/summer)?
6. What are the effects on accidents involving motorcyclists of requiring DRL for cars?
7. What are the effects on accidents involving pedestrians or cyclists of requiring DRL for cars?
8. Are there adverse effects of DRL on cars for other types of accident, in particular rear-end collisions?

The main findings of the systematic review of evidence concerning effects of daytime running lights on accidents can be summarised as follows:
1. A total of 41 studies that have evaluated the effects on road safety of DRL, have been retrieved. 25 of these studies have evaluated the effects for cars, 16 have evaluated the effects for motorcycles. A distinction is made between estimates of the intrinsic effects of DRL and estimates of the aggregate effects. Intrinsic effects are the effects for each car or motorcycle using DRL. Aggregate effects are the effects of an increased rate of use of DRL in a country, brought about, for example, by a law making the use of DRL mandatory.
2. The use of DRL reduces the number of multi-party daytime accidents for cars by about 5-15%. All studies that have evaluated the effects of using DRL for cars have found a reduction of the number of accidents, but the size of the estimated reduction varies from study to study.
3. Laws or campaigns designed to encourage the use of DRL for cars are associated with a 3-12% reduction in multi-party daytime accidents resulting in personal injury.
4. The use of DRL on motorcycles reduces the number of multi-party daytime accidents by about 32%. This estimate is highly uncertain and based on a single study only. Only three studies were found, but two of these studies were so poor that no confidence can be placed in their findings.

5. Laws or campaigns designed to encourage the use of DRL for motorcycles are associated with a 5-10% reduction in multi-party daytime accidents.
6. The robustness of the summary estimates of effect given above have been tested with respect to some potential sources of error in meta-analyses, including:
    a. Publication bias;
    b. Varying quality of the studies included;
    c. The statistical weights assigned to each estimate of effect; and
    d. The contribution of a single study to the overall estimate of effect.

   In general, the summary estimates of effect were very robust. It is therefore concluded that the estimates of effect based on the meta-analysis are the best current estimates of the effects of DRL, given the evidence provided by the evaluation studies.
7. Various sources of variation in the effects of DRL for cars have been examined. It was concluded that:
    a. The effects of DRL are greater for fatal accidents than for injury accidents, and greater for injury accidents than for property-damage-only accidents. Evidence of effects for fatal accidents is, however, highly uncertain.
    b. The effects of DRL are likely to be greater at latitudes further away from the Equator than at latitudes close to the Equator. The evidence for such a relationship is, however, somewhat noisy.
    c. It is likely that DRL has a favourable effect on accidents involving pedestrians, cyclists or motorcyclists. An adverse effect on rear-end collisions has been found in studies of the aggregate effects of DRL. DRL combined with switched-off taillights can counteract this effect, as well as the use of high mounted brake lights.

2.2. Results of the experimental study

In the experimental study, subjects viewed colour slides depicting natural daylight scenes of traffic intersections. The slides contained a vehicle with or without DRL and possibly other road users such as a bicyclist, pedestrian or motorcyclist. Subjects were instructed to determine as fast as possible whether other road users were present or not. Search time was recorded. After each trial, subjects made a non-speeded classification indicating which other road user was present.
The effect of DRL on the conspicuity of other road users was investigated under various conditions, namely:

1. The expectancy of DRL (DRL-expectancy);
2. The expectancy of other road users (OR-expectancy);
3. The type of background;
4. The type of (other) road user; and
5. The distance between the other road user and the car.

In order to investigate the effect of expectancies about the presence of DRL (car with low beam headlights on) and the presence of other road users, the participants were assigned to one of four groups. The groups were based on the occurrence of slides with DRL and the presence of other road users (OR present/not present). Thus, the effect of expectancies was investigated between subjects. The other effects were investigated within subjects.

The main result of the experimental study is that no evidence was found of a reduced conspicuity of road users in the vicinity of a DRL-vehicle. In fact, the evidence pointed in the opposite direction – other road users actually benefited from DRL -, although the effect was small. Apart from this, there were significant effects of OR-expectancy and of DRL on/off itself which were as expected, confirming the positive effects associated with them.
Although the overall effect of DRL on the conspicuity of road users was in the positive direction, this does not prevent a possible negative effect in specific situations. Inspection of the obtained significant interactions involving DRL, however, showed that such a negative effect did not occur. Therefore, it can be concluded that the absence of a negative effect on the conspicuity of other road users was a general phenomenon, at least over the range of situations studied in the experiment.

A similar absence of adverse effects was found with respect to driver visual capacities, as measured in elderly drivers by UFOV (useful field of view) and static visual acuity scores. Again, this was true both in a general sense and with respect to interactions that could have occurred in specific situations.

2.3. Environmental impact of DRL

The following aspects of the environmental impact have been considered:
1. The effect of DRL on fuel consumption and CO_2 emission. For both aspects, an increase in the order of 0.5-1.5 % was estimated.
2. The effect on bulb lifespan, in comparison to corresponding effects of other in-vehicle electrical equipment. It was estimated that bulb replacement would be needed twice as frequently, resulting in € 6.00 extra cost per car per year.

3. Scenario definition

This chapter contains an overview of possible DRL implementation scenarios and of arguments against DRL implementation, expressed by EU countries (Commandeur, WP1-report).

3.1. Possible implementation scenarios

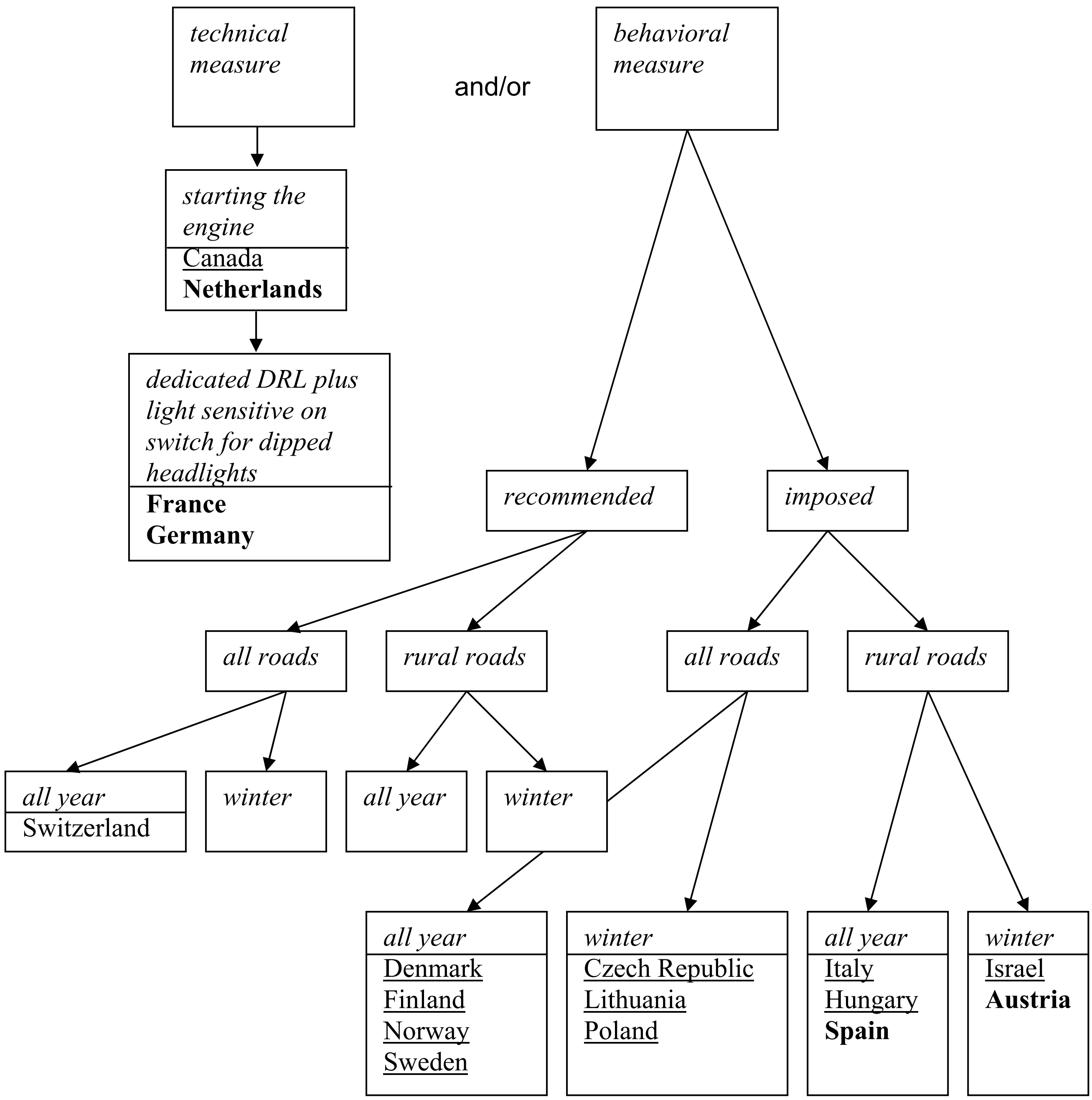

Figure 3.1. Classification of possible DRL implementation scenario's, including those already applied in DRL countries.
Underlined: countries with DRL legislation. Standard: countries without DRL legislation, but DRL recommended. **Bold**: countries without DRL legislation; plans, or expressed scenario preference if DRL proven to be effective.

Figure 3.1 contains a schematic overview of the possible implementation strategies that can be distilled from the completed questionnaires, as well as from the literature discussed in the WP1-report. In this scheme, three types of countries are identified. Underlined countries are those countries that currently have DRL legislation (Canada, Czech Republic, Denmark, Finland, Hungary, Israel, Italy, Lithuania, Norway, Poland and Sweden). The place of their names in Figure 3.1 corresponds to the strategy these countries used to implement DRL. Bold printed countries in the scheme currently do not have DRL legislation for all motorized vehicles (Austria, France, Germany, the Netherlands, and Spain). Their place in the scheme is determined by plans or scenario preference if DRL should be proven to be effective, as expressed in the completed questionnaires or in the literature mentioned in the questionnaires. Finally, the third type of country is where there is currently no DRL legislation, but where the use of DRL is explicitly recommended. There is only one such country, which is Switzerland.

The first distinction in Figure 3.1 is that between the implementation of DRL as a technical versus a behavioural measure. When implemented as a technical measure, DRL are switched on automatically. In this case DRL are de facto imposed on all roads during the whole year. The federal government of Canada is the only government that consequently decided for this implementation strategy, on the grounds that it would be the least costly and the most reliable long-term solution. The Netherlands had plans to use this strategy.
Figure 3.1 also shows an alternative technical measure, as discussed in France and in Germany. According to Robert (2000), if DRL are proven to be effective, then the implementation strategy with the largest acceptance level in France would be an automatic on switch of dedicated daytime running lights with an intensity somewhere between dipped headlights and parking lights, combined with the installation of receptors which switch on the dipped headlights in case of reduced ambient light (and automatically switch off the dedicated daytime running lights).
With a very strong emphasis on the condition that such dedicated DRL should first be proven to be effective in improving road safety, the position of the experts from Germany is identical to that of France. If the latter condition is not satisfied, however, Germany would still be interested in the separate installation of receptors which switch on the dipped headlights in reduced ambient light conditions.

If technical measures are only implemented on new car models, this implies a possibly undesirable transition period with a mixed circulation of old and new cars. If it is found that the “masking” of unlit vehicles by lit ones imposes a safety risk, such a technical measure could either be combined with a second technical measure (e.g., the installation of a DRL switching kit, as was done in Canada) and/or a behavioural measure for older car models.
The advantage of a technical measure is that it results in uniform behaviour, but only in the long run. The disadvantage of course is the time lapse involved before all car models are equipped with automatic DRL, whatever type of technical measure is chosen.

When DRL are implemented as a behavioural measure, there are several options. First, the measure can be either recommended or imposed, or even first recommended and then imposed later. Second, the use of DRL can be recommended or imposed on all roads, or on some roads only (in practice, these are always roads outside built-up areas), and during the whole year or only during part of the year (in practice, this is always winter time). Moreover, the implementation of DRL as a behavioural measure can also be executed using a gradual approach, where, for example, DRL are imposed on rural roads and in winter time only in the first year, on rural roads during the whole year in the second year, and on all roads during the whole year in the third year. Such a gradual approach was applied in Finland and Hungary, for example.

As Figure 3.1 shows, all Scandinavian countries currently impose year round DRL on all roads, while the Czech Republic, Lithuania and Poland impose DRL on all roads but during winter time only, Italy and Hungary impose year round DRL but on rural roads only, and Israel imposes DRL on rural roads and in winter time only. Moreover, Spain expressed plans for the strategy already implemented in Italy and Hungary, while Austria expressed plans for the strategy implemented in Israel. Finally, Switzerland is the only country where the use of year round DRL on all roads is only recommended.

When compared to a technical measure, the advantage of a behavioural measure is that the use of low beams can be imposed straight away for all motorized vehicles, thus avoiding the possible problem of mixed circulation of lit and unlit vehicles. This advantage no longer strictly applies, however, if the use of dipped headlights is only imposed on some roads, and/or part of the year. In the latter situation the risk of mixed circulation of lit and unlit vehicles may well increase due to inconsistent behaviour. At the same time, the enforcement efforts required from the authorities could be considerably larger than in the case of a technical measure. On the other hand, experience in the Scandinavian countries shows that DRL usage is also enforced by car drivers themselves, by flashing their lights when they encounter a motor vehicle with switched-off lights during daytime.

As discussed in the report for WP1, most DRL countries used a gradual approach to the implementation of DRL, either by encouraging the voluntary use of DRL before the introduction of DRL legislation, or by a gradual extension of compulsory DRL usage over more and more types of roads, over more and more months of the year, and/or for more and more types of road users.

Such gradual implementation strategies allow road users to gain personal experience in the visual workings of DRL, thus probably also contributing to obtain broader public acceptance for DRL legislation.

These findings, combined with the experience that most of the opposition against DRL greatly subsided in countries after DRL legislation was implemented, lead us to recommend that the implementation of DRL in non DRL countries is preceded with a period of recommended DRL usage, accompanied with media campaigns clearly explaining how the visual workings of DRL contribute to the improvement of road traffic safety.

3.2. Arguments against DRL implementation

Table 3.2 contains an inventory of all the arguments against DRL that were mentioned in the completed questionnaires and in the reports sent by both DRL and non-DRL countries.

Table 3.2. Inventory of all the arguments against DRL, and suggestions for solving the problems.

Arguments against DRL	*(Partially) resolved with*
Reduced conspicuity of pedestrians, cyclists and moped riders	Dedicated reduced intensity DRL on cars
Reduced conspicuity of motorcyclists	Dedicated reduced intensity DRL on cars plus low beam DRL on motorcycles
Glare	Dedicated reduced intensity DRL on cars
Increased fuel consumption	Dedicated reduced intensity DRL on cars in combination with switched-off taillights
Increased CO_2 emission	Dedicated reduced intensity DRL on cars in combination with switched-off taillights
More frequently burned out bulbs	1. Dedicated reduced intensity DRL bulbs in combination with switched-off taillights 2. Reduced voltage DRL
Flat batteries	Warning device or automatic switch-off when stopping the engine
Brake lights less conspicuous	Switched-off taillights in good daytime visibility conditions
Automatic dedicated DRL will make drivers forget to switch on low beams in reduced visibility conditions	Automatic light-dependent de-activation of DRL and activation of low beams
'Masking' of unlit vehicles by lit ones	Dedicated reduced intensity DRL on new cars, in combination with mandatory low beam DRL on all other motorized vehicles in all EU countries

The list of arguments against DRL is important since these have to be dealt with if DRL implementation in all EU countries is recommended.
The term ‘dedicated reduced intensity DRL’ in Table 3.2 is defined as: DRL using lamps with an intensity somewhere between low beam headlights and parking lights. As the table indicates, the use of dedicated DRL has a number of important advantages. It allows for the minimisation of the adverse environmental effects of DRL (i.e., increased fuel consumption, increased CO_2 emission and more frequently burned out bulbs). It prevents flat batteries (by automatically switching off the lights when the engine is stopped). It allows for the optimisation of the luminous requirements of the DRL in terms of glare, and in terms of the possibly reduced conspicuousness of vulnerable road users. Finally, it allows for dedicated daytime taillight specifications, and for the installation of an automatic on switch for the low beam headlights in reduced visibility conditions.

4. DRL policy options

Based on the possible DRL implementation scenarios discussed in Chapter 3, it was decided to further investigate the following five policy options for the mandatory use of DRL in the European Union (Elvik et al., WP2-report):

1. The use of DRL is required by all motor vehicles from a certain date. This is a simple behavioural measure, which does not include any new technical standards for vehicles. Drivers are simply required to turn on headlights at any time. This option will be referred to as the behavioural option.
2. The use of DRL is required by all motor vehicles from a certain date. In addition, new motor vehicles sold after the same date will be required to have an automatic switching-on of low beam headlights. This option will be referred to as the behavioural plus low beam option.
3. The use of DRL is required by all motor vehicles from a certain date. In addition, new cars sold after the same date will be required to have dedicated DRL that are switched on automatically. This option will be referred to as the behavioural plus dedicated DRL option.
4. New cars sold after a certain date are required to have an automatic switching-on of low beam headlights. Cars that do not have automatic DRL will not be required to turn on low beam headlights. This policy option will be referred to as the technical low beam option.
5. New cars sold after a certain date are required to have dedicated DRL that are turned on automatically. Cars that do not have dedicated DRL will not be required to turn on headlights. This policy option will be referred to as the technical dedicated DRL option.

A cost-benefit analysis was performed for each of these five options. The results are summarized in Table 4.1.

Table 4.1. Results of cost-benefit analysis of five alternative DRL policy options.

	Alternative policy options				
Benefits and costs	**Behavioural measure**	**Behavioural + low beam**	**Behavioural + dedicated**	**Automatic low beam only**	**Automatic dedicated**
Benefits (negative amounts denote negative benefits – million Euro, present values)					
Accident reduction	47,076	49,430	49,430	38,355	38,355
Increased pollution	-12,619	-13,250	-10,252	-10,276	-6,371
Total benefit	34,458	36,181	39,178	28,059	31,964
Costs (million Euro, present values)					
Installation of automatic DRL	0	2,728	6,829	2,728	6,829
Fuel consumption	9,014	9,465	7,324	8,630	5,350
Light bulb consumption	8,562	8,990	8,562	8,436	8,436
Total costs	17,576	21,183	22,715	19,794	20,615
Ratio of benefits to costs					
Benefits/costs	1.96	1.71	1.72	1.42	1.55

For all five options, the benefits are clearly greater than the costs, but there are rather great differences between the C/B-rates of the various options (See table 4.1).
The highest B/C-rate is that of option 1 (1.96), followed by options 2 and 3 (1.71 and 1.72, respectively). The B/C-rates for options 4 and 5 are substantially lower (1.42 and 1.55, respectively).
But the B/C-rate is not the only, and maybe not even the most important selection criterion, since the main goal of DRL implementation is road accident reduction. Another important criterion is the increase of pollution.
With regard to accident reduction, options 2 and 3 score better than option 1: an accident-related cost reduction of € 49,430 million for options 2 and 3, versus a reduction of € 47,076 million for option 1. With regard to pollution, option 3 is superior to options 1 and 2, the increased pollution of option 3 being 19% lower than that of option 1 and 23% lower than that of option 2.

5. Conclusions and recommendations

The objective of the present report was to produce various implementation strategies for DRL in the EU, as well as further specific recommendations for implementation that would maximize the positive effects, while minimizing the negative effects.

5.1. Conclusions

5.1.1. Road safety effects

In Chapter 4, the road safety effects of the following types of mandatory DRL implementation have been discussed:
1. *The behavioural option*: drivers are simply required to switch on low beam headlights at any time.
2. *The behavioural plus low beam option*: all drivers of existing cars are required to switch on low beam headlights at any time and new motor vehicles are required to have an automatic low beam activation device.
3. *The behavioural plus dedicated DRL option*: all drivers of existing cars are required to switch on low beam headlights at any time and new motor vehicles are required to have an automatic dedicated DRL activation device.
4. *The technical low beam option*: new cars are required to have an automatic low beam activation device. Drivers of cars without such a device will not be required to switch on low beam headlights.
5. *The technical dedicated DRL option*: new cars are required to have an automatic dedicated DRL activation device. Drivers of cars without such a device will not be required to switch on low beam headlights.

A meta-analysis of studies that have evaluated the safety effects of DRL comes to the conclusion that all five options will result in a significant decrease of road accidents (Elvik et al., WP2-report). Other conclusions of the meta-analysis are:
1. The effects of DRL are probably greater for fatal accidents than for injury accidents, and they are greater for injury accidents than for property-damage-only accidents.
2. The effects of DRL are likely to be greater at latitudes further away from the Equator than at latitudes close to the Equator.
3. It is likely that DRL have a favourable effect on accidents involving pedestrians, cyclists or motorcyclists. This finding was confirmed by the results of a special experimental study (see paragraph 2.2).
4. An adverse effect on rear-end collisions has been found in studies of the aggregate effects of DRL. This effect can be counteracted, though, by using high mounted stop lamps.

5.1.2. Costs and benefits

A cost/benefit analysis has been conducted, mainly based on the meta-analysis mentioned in paragraph 5.1.1. A special study of the environmental impact of DRL has been conducted, considering the aspects of fuel consumption, CO_2 emission and light bulb consumption. It is estimated that DRL will increase fuel consumption and

CO_2 emission by approximately 0.5-1.0%. The lifespan of (low beam) bulbs is estimated to be halved, which would result in an extra cost of € 6.00 per car per year (Brouwer et al., WP3-report).
The results of the cost/benefit study show, that for all five DRL implementation options mentioned in paragraph 5.1.1, the benefits are clearly greater than the costs, although there are differences between the various options (Elvik et al., WP2-report). Option 1 has the highest benefit/cost-rate of 1.96, but option 3 results in a greater accident reduction and a smaller increase of pollution, while still having a benefit/cost rate of 1.72 (See chapter 4). Furthermore, option 3 to a high degree meets the arguments against DRL-implementation of EU-countries like Germany and France (See paragraph 5.1.3).

5.1.3. Arguments by EU-countries against DRL implementation

In paragraph 3.4, an inventory was made of all arguments in EU-countries against DRL-implementation (Commandeur, WP1-report).
The most serious objection is probably that DRL on cars would make pedestrians, cyclists, moped riders and motorcyclists less conspicuous. No evidence for this was found, however, neither in the meta-analysis nor in the special experimental study. The risk for all these road user categories of being less conspicuous would be further reduced, however, if cars use dedicated reduced intensity DRL. The conspicuity of motorcyclists would be improved by their use of low beam DRL.
A realistic objection against DRL concerns increased fuel consumption, CO_2 emission and bulb consumption. Although the estimated increases are relatively small, they would be even further reduced by the use of automatic dedicated DRL for headlights in combination with switched-off taillights. The latter would also reduce the risk of possible reduced conspicuity of brake lights, which might result in an increase of rear-end collisions.
The possible 'masking' of unlit vehicles by lit ones would be prevented by the mandatory use of DRL by all motorized vehicles.

5.2. Recommendations

5.2.1. Preferable policy option

The preferable policy option for DRL implementation is the technical measure of automatic dedicated DRL for new cars, combined with a behavioural measure requiring the mandatory use of low beams for existing cars. The light intensity of dedicated DRL is somewhere between the intensity of low beams and the intensity of parking lights. As a technical measure, automatic dedicated DRL are preferred above automatic low beams because dedicated DRL not only result in the highest accident reduction and the lowest increase in pollution (CO_2 emission), but also in the fairest distribution of road safety benefits over the various road user categories. For these reasons, the proposed technical measure of automatic dedicated DRL is expected to result in the highest level of public acceptance.
Defining the exact technical specifications of dedicated DRL, especially regarding light intensity, was outside the scope of this research project. It should be left over to technical specialists. The following features, however, are recommended:

- In order to prevent reduced conspicuity of unlit vehicles, the implementation of dedicated DRL on new cars should be accompanied or preceded by mandatory low beam DRL on all other motorized vehicles
- In order to prevent the possible 'masking' of brake lights, which might result in an increase of rear-end collisions, automatic dedicated DRL for headlights should be combined with switched-off taillights (see § 5.1.3). This will also reduce pollution and bulb consumption.
- In order to prevent drivers from forgetting to switch-on low beams under reduced visibility conditions, automatic dedicated DRL should be combined with automatic low beam activation at a predetermined reduced level of ambient light intensity.
- In order to prevent flat batteries, both dedicated DRL and normal lights should automatically be switched on/off when starting/stopping the engine.

5.2.2. Implementation scenario

Since the use of DRL is controversial in some EU-countries, a gradual approach may be desirable in order to give people time to adjust to the changes and accept these as an improvement. In some countries with DRL legislation, the use of DRL was recommended before it became mandatory. In other countries, DRL was first required in winter before it became mandatory during the whole year. This implementation scenario is not feasible, though, if the *behavioural plus dedicated DRL policy option* is chosen. Another possible implementation scenario is to require automatic DRL for new cars first, and then after a while, require all cars to use it (Elvik et al., WP3-report). This scenario option, however, is not very attractive since it would involve an unnecessary delay in the expected road safety benefits of DRL usage, especially if the technical part of the implementation cannot be realized within a reasonable time span. We therefore recommend to implement the behavioural part as soon as possible.

The most logical starting point for mandatory low beam DRL use is somewhere between the beginning of autumn and the beginning of winter. During a preceding period of one year maximum, it might be advisable to only recommend low beam DRL in order to allow people to adjust to the new situation and accept DRL as an improvement. This might especially be advisable in EU countries that currently have a very low degree of voluntary DRL use.

5.2.3. Publicity campaigns

The introduction of recommended DRL should be preceded and accompanied by a large-scale publicity campaign on TV, radio and in the newspapers, emphasizing the importance of contrast in aiding visual perception and the resulting road safety benefits (Commandeur, WP1-report). The campaign should also meet the arguments that pedestrians and two-wheeled road users would not benefit from DRL. And, finally, the campaign should stress that these road user categories will benefit even more as increasing numbers of new cars equipped with dedicated DRL emerge on the roads.

Another important element of the publicity campaign should be the placing of billboards along main roads, reminding drivers and motorized riders of recommended/mandatory low beam DRL use.

References

Brouwer, R.F.T., Janssen, W.H., Duistermaat, M. and Theeuwes, J. (2003). Do other road users suffer from the presence of cars that have their daytime running lights on? Investigation of possible adverse effects of daytime running lights. TNO report xxx. TNO Human Factors, Soesterberg.

Commandeur, J.J.F. (2003). State of the art with respect to DRL implementations. Final report of WP1. R-2003-xx. SWOV, Leidschendam.

Elvik, R., Christensen, P. and Olsen, S.V. (2003). Daytime running lights. A systematic review of effects on road safety. TOI report xxx/2003. Oslo.

Robert, C. (2000). La question de l'allumage des feux de croisement de jour. Rapport pour le Ministre de l'équipement, des transports et du logement. Paris: Conseil Général des Ponts et Chaussées (CGPC).