Study on the effectiveness of Directive 1999/94/EC relating to the availability of consumer information on fuel economy and CO_2 emissions in respect of the marketing of new passenger cars

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A Introduction

On 13 December 1999 Directive 1999/94/EC of the European Parliament and of the Council was adopted. This Directive relates to the availability of consumer information on fuel economy and CO_2 emissions in respect of the marketing of new passenger cars.
The purpose is to ensure that information relating to the fuel economy and CO_2 emissions of new passenger cars offered for sale or lease in the Community is made available for consumers in order to enable consumers to make an informed choice.

According to Article 9 of Directive 1999/94/EC, each Member State has to transmit to the Commission, by 31 December 2003, a report on the effectiveness of the provisions of this Directive, covering the period from 18 January 2001 until 31 December 2002.

Purpose of this study is first of all to evaluate the Member States' reports in order to give a survey of the implementation of Directive 1999/94/EC, the compliance of the Directive's provisions as well as the effectiveness of the Directive's provisions in the Member States and the proposals of the Member States for improvements.

In the following, an assessment of the Directive's effectiveness regarding informing and influencing consumers as well as regarding the reduction of the CO_2 emissions is carried out. Therefore, besides the results of the evaluation of the Member States' reports, also the findings of other existing studies, the results of a supplementary survey of European automobile club members as well as the development of the average specific CO_2 emissions of new passenger cars are taken into account. In addition to this, the effectiveness of the energy efficiency labelling Directive 92/75/EEC on household appliances is reviewed, which might be helpful to draw conclusions on the relatively new labelling Directive of new passenger cars.

Based on these findings, options on the improvement of the labelling of new passenger cars are evaluated. Thereby, special attention is paid to the introduction of an energy efficiency rating system as well as to the indication of additional information and data on the label.

But, also other aspects which could be of interest for the labelling work are evaluated within this study. Special attention is paid to N1 vehicles, the additional fuel consumption and CO_2 emissions of air conditioning systems and auxiliary heaters as well as fuel saving car devices.

The study results in recommendations for improvements to increase the effectiveness of Directive 1999/94/EC.

B Evaluation of the Member States' reports according to Article 9 of Directive 1999/94/EC

According to Article 9 of Directive 1999/94/EC, each Member State has to transmit to the Commission, by 31 December 2003, a report on the effectiveness of the provisions of this Directive, covering the period from 18 January 2001 until 31 December 2002.

Based on these Member States' reports, this chapter should give a survey of the implementation of Directive 1999/94/EC, the compliance as well as the effectiveness of the Directive's provisions in the Member States and the proposals of the Member States for improvements.

B.1 Availability and format of the Member States' reports

By 31 December 2004, the Member States' reports from 14 Member States were available. Only the report from Luxembourg is still missing. A Letter of formal notice has been sent out to this country by the Commission, but without any response yet.

The reporting format for completion by Member States in accordance with Article 9 of Directive 1999/94/EC is laid down in the Commission Decision 2001/667/EC of 10 August 2001.
But, not all available Member State reports are in accordance with this Directive. Due to the late implementation into national law, France and Italy for example sent only a short report of the actual situation. And, since in Germany the national law came into force not before 01 November 2004, the report includes only information as far as possible. An assessment of the effectiveness of the Directive is not possible in these countries yet.

Since format and content of the Member States' reports are quite different, it was decided, in arrangement with DG Environment, to prepare a summary report of identical format for each Member State.
This summary report includes the following subjects and is represented in a table in Word format:

- Implementation of the Directive into national law
- Institution and contact person in charge
- Structure of the passenger car market
- Economic policies, government regulations or market arrangements
- Parallel and previous initiatives
- National implementation
- Format of the information tools
- Assessment of the compliance of the Directive's provisions
- Assessment of the effectiveness of the Directive's provisions
- Extension to other media
- Overall assessment and improvements.

The summary report was prepared for the 14 Member States, which already sent their Member States' reports. To avoid mistakes, e.g. due to translation from the national languages or missing information, all Member States, except Spain, which did not indicate the institution and contact person in charge, were asked to check the summary report for its country. The final versions of the summary reports for the Member States are attached in Annex 2.

B.2 Evaluation of the Member States' reports

Based on the Member States' reports, the results, as shown in the following chapters, could be evaluated. A tabular comparison of the most important results of the Member States is shown in Annex 1. For lack of space, the tabular is split in three parts, including five Member States each:

- Part 1: Austria, Belgium, Denmark, France, Finland
- Part 2: Germany, Greece, Ireland, Italy, Luxembourg
- Part 3: Netherlands, Portugal, Spain, Sweden, United Kingdom.

B.2.1 Implementation of the Directive into national law

Directive 1999/94/EC was implemented by all Member States into national law. All cases delivered to the Court of Justice are closed now. At the last, Germany implemented the Directive in Mai 2004 into national law, which came into force on 01 November 2004.

Commission Directive 2003/73/EC of 24 July 2003 amending Annex III to Directive 1999/94/EC was implemented to national law by the most Member States, too. Only Austria, France and Greece have not yet implemented the Directive. In Portugal, the implementation is in process.
This Directive offers the possibility to use modern communication tools (electronic displays) instead of posters.

Commission Recommendation 2003/217/EC of 26 March 2003 on the application of the provisions of Directive 1999/94/EC concerning promotion literature to other media was implemented, at least partly, by Denmark, Germany, Ireland and Sweden. In Portugal, the implementation is in process.
Since Directive 1999/94/EC only includes provisions on promotion literature, this Recommendation should transfer these provisions also to other media, which are used for the marketing, advertising and promotion of vehicles to the general public. Such media includes television, radio and the internet, as well as electronic storage media such as video tapes, DVDs and CD-ROMs.

Details for the single Member States are shown in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

B.2.2 Institution and contact person in charge

In almost all Member States the Ministry of Economics, Environment, Communication or Transport or an agency within one of these Ministries, is the institution which is in charge of this subject. Only in Sweden, the Swedish Consumer Agency "Konsumentverket" is in charge. The institution and contact person in Spain are unknown, because they were not indicated in the according Members States' report.
The respective institution and contact person of the single Member States can be seen in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

B.2.3 Structure of the passenger car market

The structure of the passenger car market including dealer network, registration figures and consumer structure varies from Member State to Member State. Details, as far as available, are shown in the Member States' summary reports, which are attached in Annex 2.

B.2.4 Economic policies, government regulations or market arrangements

In almost all Member States, various fees and taxes, for example vehicle registration fee, car tax, motor tax or fuel tax, based on different factors, as example retail price, engine capacity, emission level or fuel type, have been already implemented since several years. The aim of mostly all of these duties is to influence consumers in their new car purchase decisions or to influence their driving behaviour. Tax reductions or exemptions for particularly fuel efficient or low-emission passenger cars support this aim in some Member States.
Details for the single Member States, as far as available, are shown in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

But also the car manufacturers support the aim of reducing the CO_2 emissions from new passenger cars. The European Commission and the European, the Japanese and the Korean Automobile Manufacturers' Associations - ACEA, JAMA and KAMA - reached an agreement to achieve an average CO_2 emission figure of 140 g/km for all new cars sold in the European Union by 2008 (ACEA) / 2009 (JAMA, KAMA). The commitment of ACEA, JAMA and KAMA is laid down in the Commission Recommendations 1999/125/EC of 5 February 1999 (ACEA), 2000/304/EC (JAMA) and 2000/303/EC (KAMA) both of 13 April 2000, respectively.

B.2.5 Parallel and previous initiatives

In almost all Member States, the various fees and taxes, as described in chapter B.2.4, were already implemented before the national implementation of Directive 1999/94/EC.
In Sweden and the United Kingdom a national regulation on fuel economy information of passenger cars was already implemented in 1977.
In almost all Member States various initiatives and campaigns on energy efficiency driving and other environmental related issues were or are still carried out. Additionally, various information brochures or leaflets on fuel consumption and environmental pollution were or are issued by the Member States. Different brochures or leaflets as well as advertisement campaigns were issued and carried out at the implementation of the Directive by the most Member States, to increase the consumers awareness of the Directive's provisions.
Details for the single Member States, as far as available, are shown in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

B.2.6 National implementation

The following chapters B.2.6.1 and B.2.6.2 give a survey of the persons or institutions, who are responsible for the supply of label, poster and guide as well as for the absorption of costs in the Member States.
Details for the single Member States are shown in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

B.2.6.1 Responsibilities

In general, the labels and posters are supplied by the car manufacturers/importers or the dealers have the possibility to produce them by their own. In this case, the necessary data are made available via an online database.
The guide, however, is generally produced by the Ministries in charge or an authorised institution or organisation. In Portugal, the guide is only available as a download version via internet, which is printed out by the dealers themselves.

B.2.6.2 Cost

The costs for labels and posters are generally borne by the car manufacturers/importers and/or the dealerships. The costs for the guide are borne by the Ministries in charge, the authorised institution or the automobile industry.

B.2.7 Format of the information tools

The following chapters B.2.7.1 to B.2.7.4 give a survey of the different formats of label, poster, guide and promotion literature used in the Member States. Details for the single Member States can also be seen in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

B.2.7.1 Label

- The minimum requirements of the Directive are fulfilled by all Member States. A sample of the label of each Member State is attached in Annex 3.

- In all Member States the label includes data on CO_2 emissions (g/km), fuel consumption (l/100 km) and/or fuel reach (km/l or mpg) as numerical figures.

- Additional data are included in the following Member States:

  - Austria (voluntarily): Noise, emission standard, "NOVA" (standard fuel consumption tax), bio-fuel or LPG/CNG capability.
  - Denmark: "Green motor tax", fuel cost (driving distance of 20,000 km), EuroNCAP frontal-/side impact and pedestrian test ratings, particle filter.
  - Finland (voluntarily): Some technical data on type approval, accessories and equipment, price information.
  - Sweden: "Miljöklass" (national environmental class).
  - United Kingdom (new label introduced by Sept. 2005): VED (graduated vehicle duty), fuel cost (driving distance of 12,000 miles).

- An energy efficiency rating system is introduced in the following Member States:

  - Austria: No "complete" energy efficiency rating system, but for an easier optical comparison, the absolute CO_2 emission value (g/km) is marked with an arrow at a coloured CO_2 emission scale from green via yellow to red.
  - Belgium: 7 energy efficiency classes A-G based on the CO_2 emissions (g/km) with separate CO_2 emission bands for petrol and diesel, identical rating system for all cars, no additional classification into car segments.
  - Denmark: 7 energy efficiency classes A-G based on the fuel reach (km/l) with separate fuel reach bands for petrol and diesel, identical rating system for all cars, no additional classification into car segments.

- Netherlands: 7 energy efficiency classes A-G based on the relative energy efficiency (%) - based on the CO_2 emissions (g/km) - showing the relative energy efficiency of a car in comparison to the average energy efficiency of cars with the same size, separate calculation for petrol and diesel.
- Portugal: 4 energy efficiency classes ”green, yellow, orange, red” based on the fuel consumption (l/100km) with identical fuel consumption bands for all fuel types, identical rating system for all cars, no additional classification into car segments.
- Spain (optional label): 7 energy efficiency classes A-G based on the relative fuel efficiency (%) - based on the fuel consumption (l/100 km) - showing the relative fuel efficiency of a car in comparison to the average fuel efficiency of cars with the same size, separate calculation for petrol and diesel.
- United Kingdom (new label introduced by Sept. 2005): 6 energy efficiency classes A-F based on the CO_2 emissions (g/km) with identical CO_2 emission bands for all fuel types, directly linked to the 6 VED bands, identical rating system for all cars, no additional classification into car segments.

- Modifications are not planned at present by the Member States:

B.2.7.2 Guide

- The minimum requirements of the Directive are fulfilled by all Member States.

- In each Member State only one version of the guide is available. Specifics in some Member States:

  - Belgium: The guide is issued in Dutch, French and German language.
  - Finland: The guide is available in two languages: Finish and Swedish.
  - Portugal: The guide is only available as a download version via internet, which is printed out by the dealers themselves.

- The list of all vehicle models is grouped in general by make and by model/size or by make and in alphabetic order. Specifics in some Member States:

  - Austria, Belgium, Finland, Spain: Separate list for each fuel type.
  - Italy, Netherlands: Vehicle models grouped by make, fuel type and model/size.
  - Sweden: Vehicle models grouped by make, “miljöklass” and by model/size, separate list for each fuel type.
  - United Kingdom: Separate list for Euro3 and Euro4 emission standard.

- In all Member States the guide includes data on CO_2 emissions (g/km), fuel consumption (l/100 km) and/or fuel reach (km/l or mpg) as numerical figures.

- Additional data are included in the following Member States:

  - Austria: List of the 30 most fuel efficient models for diesel and petrol.
  - Belgium: Emission standard, list of vehicle models with CO_2 emissions < 120 g/km.
  - Denmark: “Green motor tax”, fuel cost (driving distance of 20,000 km), reduction of vehicle registration fee, EuroNCAP frontal-/side impact and pedestrian test ratings, particle filter.
  - Germany: List of the 10 most fuel efficient models for diesel, petrol and CNG.
  - France: Fuel cost spreadsheet (driving distance of 15,000 km), “puissance administrative” (fiscal power).
  - Finland: Some technical data on type approval, emission of hydrogen carbon HC (g/km), recommended consumer price.

  - Sweden: "Miljöklass", car tax, some technical data, recommended consumer price, warranty information, list of the 24 most fuel efficient petrol models and the 20 most fuel efficient diesel models, list of available models with alternative engines (e.g. CNG, LPG, hybrid).
  - United Kingdom: Fuel cost (driving distance of 6,000 miles), noise and toxic emission data from the type approval.

- The energy efficiency classes A-G are included in the guides of Belgium, Denmark, the Netherlands and Spain (see "B.2.7.1 Label").

- In general, the guide will be up-dated annually. Specifics of some Member States:

  - Finland, Spain: Update every 6 months.
  - Portugal: Frequent update of the online database.

- Except in Greece, in all Member States the guide is also available via internet; in Italy the internet version is in preparation. Except in Germany and Ireland, also a database with different selective or comparative terms has been set up.

- Modifications are planned at present in the following Member States:

  - Belgium: A more frequent update of the database is negotiated with FEBIAC and FEDERAUTO (associations of automotive industry and retail). An update every 2 months is considered.
  - Netherlands: The internet database, a voluntary initiative of ANWB (Netherlands Touring Club), should get a more official status by involving RDW (Netherlands Type Approval Authority).

B.2.7.3 Poster/Display

- The minimum requirements of the Directive are fulfilled by all Member States.

- Directive 2003/73/EC of 24 July 2003 amending Annex III to Directive 1999/94/EC was implemented into national law by most of the Member States. Only Austria, France and Greece have not yet implemented the Directive. In Portugal, the implementation is in process.

- In all Member States the poster includes data on CO_2 emissions (g/m), fuel consumption (l/100 km) and/or fuel reach (km/l or mpg) as numerical figures.

- Additional data or information are included in the following Member States:

  - SW: "Miljöklass".

- In general, the poster is updated every 6 months. Between the updates, new models shall be added to the bottom of the list. Specifics of some Member States:

  - GER: Update every 3 months if electronic displays are used instead of posters.

- Modifications are not planned at present by the Member States.

B.2.7.4 Promotion literature

- The minimum requirements of the Directive are fulfilled by all Member States.
- In all Member States the promotion literature includes data on CO_2 emissions (g/km), fuel consumption (l/100 km) and/or fuel reach (km/l or mpg) as numerical figures.
- Additional data or information are included in the following Member States:
  - SW: "Miljöklass".
- Commission Recommendation 2003/217/EC of 26 March 2003 on the application of the provisions of Directive 1999/94/EC concerning promotion literature to other media was implemented, at least partly, by Denmark, Germany, Ireland and Sweden. In Portugal, the implementation is in process. The same requirements as for promotion literature apply also to the promotion on the following media in these Member States:
  - Denmark: Internet.
  - Germany: Electronic formats except radio and TV spots according to Directive 89/552/EC Article 1.
  - Ireland: Electronic formats as well as TV and radio in case of engine related performance criterion of a specific model.
  - Sweden: Owners manuals, instruction videos, but not for TV and radio.
- Modifications are not planned at present by the Member States.

B.2.8 Assessment of the compliance of the Directive's provisions

Surveys or studies, e.g. inspection of dealerships, were carried out by Austria, Belgium, Denmark, Finland, Greece, the Netherlands, Portugal, Spain and Sweden.
No formal assessments were carried out by France, Germany, Italy and the United Kingdom. Also in Ireland no formal assessment was carried out, but here, no instances of non-compliance have been reported by local authorities and SIMI (Society of the Motor Industry of Ireland), which regularly visits its members.

The following chapters B.2.8.1 to B.2.8.4 give a survey of the compliance of label, poster, guide and promotion literature used in the Member States with the Directive's provisions. Details for the single Member States can also be seen in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

B.2.8.1 Label

- Except in Spain, the compliance regarding format and content is generally considered good in all Member States. In the Netherlands the compliance regarding format, content and display is even nearly 100 % after the second inspection.
- The main problems are:
  - The label is not displayed on all vehicles or is only badly visible (A, B, DK, GR, SP, SW, UK).
  - In single cases, there are objections regarding the format of the label (P: partial with manufacturer label) or the additional indication of other data (UK: safety standard information by Ford).

- In Austria, dealers would prefer a combination of the label and the regular technical data/price sheet, as it is already done, for example, in Finland. In Finland, the label consists in 25 % of information according to the Directive and in 75 % of technical data and price information.

B.2.8.2 Guide

- The compliance regarding format and content is generally considered very good in all Member States.

- In all Member States, the guide should be available free of charge at the dealerships and in most countries it is also available at other organisations or institutions, like for example the Ministries involved, consumer organisations or automobile clubs.

- Except in Greece, in all Member States the guide is also available via internet; in Italy the internet version is in preparation. Except in Germany and Ireland, also a database with different selective or comparative terms has been set up.

- The main problems are:

  - The availability and the distribution of the guide through the dealers. (E.g. SP: guide only available at 7 % of the dealers, B: available at 25 % of the dealers and only 46 % of them hand out the guide, DK: less than 50 % hand out the guide).
  - The low demand by consumers (A, IRE, NL, UK).

- Interesting is that the Portuguese system is well accepted by the dealers. The guide, which is only available as a download version via internet, is printed out by the dealers themselves. Only ~ 8 % of the dealers have problems with this system.

B.2.8.3 Poster/Display

- Except in Spain, the compliance regarding format and content is generally considered satisfactory in the Member States. Only in the Netherlands, the compliance regarding format, content and display is even nearly 100 % after the second inspection.

- The main problems are:

  - The poster/display is not displayed at all dealerships, does not include all models or is only badly visible (A, B, DK, FIN, GR, P, SP, SW).
  - The poster/display plays a minor role within the provisions of the Directive. The dealers complain about the big effort necessary for up-dating and regard it as of no interest for the consumers (A, DK, P).

B.2.8.4 Promotion literature

- The compliance is generally considered satisfactory or good in all Member States. In the Netherlands, it is considered even very good.

- In single cases, especially in advertisements, none or only incomplete information about the fuel consumption and the CO_2 emissions is included or the data are printed in too small letters (A, B, DK, FIN, GR, P, SP, SW).

B.2.9 Assessment of the effectiveness of the Directive's provisions regarding the reduction of CO_2 emissions

Surveys or studies (e.g. CO_2 monitoring) were carried out only by Austria, Denmark, France, the Netherlands and Spain.
No formal assessments were carried out by Belgium, Finland, Germany, Greece, Ireland, Italy, Portugal, Sweden and the United Kingdom.

Chapter B.2.9.1 gives a survey of the assessment methods as well as the main results in the Member States, which carried out surveys or studies. Details for the single Member States can also be seen in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

B.2.9.1 Assessment methods and main results

The Member States' assessments show that the effectiveness of the Directive's provisions regarding the reduction of CO_2 emissions can hardly be assessed separately, since technical improvements by the car manufacturers as well as fiscal measures also may have a main influence on this development.

- Austria: The development of the average CO_2 emissions of newly registered passenger cars from 2001 to 2002 was assessed. Results:

  - Diesel cars: No reduction was determined.
  - Petrol cars: CO_2 reduction of 2 g/km.
  - Gas cars : CO_2 reduction of 20 g/km. But, since only 32 of these cars were sold, there is no impact on the average CO_2 emission value of the fleet of newly registered passenger cars.

- Denmark: The development of the average fuel reach (fuel consumption) and the registration figures separated by energy efficiency class (A-G) from 1998 to 2002 was assessed. Results:

  - Development of the average fuel reach (fuel consumption) from 1998 to 2002:
    - Diesel cars: 15.7 km/l → 19.8 km/l (6.37 l/100km → 5.05 l/100km)
    - Petrol: cars: 13.1 km/l → 13.7 km/l (7.63 l/100km → 7.30 l/100km)
  - Development of the registration figures separated by energy efficiency class (A-G) from 1998 to 2002:
    - The percentage of class A, B and C increased.
    - The percentage of class D, E, F and G decreased.

- France: The development of the average CO_2 emissions (fuel consumption) of new passenger cars from 1998 to 2002 and the development of the registration figures of new passenger cars with CO_2 emissions less than 120 g/km or 140 g/km from 2001 to 2003 was assessed. Results:

  - Development of the average CO_2 emissions (fuel consumption) of new passenger cars from 1998 to 2002:
    - Diesel cars: 169 g/km → 151 g/km (6.3 l/100km → 5.7 l/100km)
    - Petrol cars: 172 g/km → 163 g/km (7.2 l/100km → 6.8 l/100km)
    - Total: 171 g/km → 155 g/km (6.8 l/100km → 6.07 l/100km)

  - Development of the registration figures of new passenger cars with CO_2 emissions less than 120 g/km or 140 g/km from 2001 to 2003:
    - Diesel cars less than 120 g/km: 5.59 % → 16.02 %
    - Diesel cars between 120 and 140 g/km: 27.53 % → 18.90 %
    - Petrol cars less than 120 g/km: 0.30 % → 1.19 %
    - Petrol cars between 120 and 140 g/km: 8.63 % → 20.10 %

- Netherlands: Since the standard for the energy efficiency classes (based on the average fuel consumption of all newly registered cars) is updated yearly, it is not possible to monitor whether cars become more fuel efficient based on the percentage of the energy efficiency classes (A-G). Changes can only be determined, if the fuel economy standard of a certain year is also used for other years. If the standard for 2002 is taken, the following development of the registration figures separated by energy efficiency class (A-G) from year 2000 to 2003 can be determined:

  - After the implementation of the Directive in 2001, the percentage of class B (2000: 6.5 % → 2001: 9.5 %) and C (2000: 41.4 % → 2001: 45.7 %) increased slightly, the percentage of class D, E and F decreased, class A and G did not change significantly.
  - Due to the BPM (vehicle acquisition tax) refund for environmental-friendly passenger cars of class A (1,000 EURO) or B (500 EURO), the percentage of class A and B increased in 2002 out of all proportion: class A: 0.3 % → 3.2 %, class B: 9.5 % → 16.1 %.
  - After abolishing the BMP refund in 2003, the percentage of class A and B decreased again.
  - Tax incentives as the BPM refund in 2002 are well accepted by consumers and seem to have a great impact on vehicle purchase decisions.

- Spain: The development of the average CO_2 emissions (fuel consumption) of new passenger cars from 2002 to 2003 was assessed. Results:

  - CO_2 emissions: 166.1 g/km → 165.5 g/km
  - Fuel consumption: 6.74 l/100km → 6.69 l/100km
  - Due to the late national implementation, the effectiveness of the Directive can not yet be assessed.

B.2.10 Assessment of the effectiveness of the Directive's provisions regarding informing and influencing consumers

Surveys or studies, e.g. questionnaires, interviews, were carried out by Austria, Belgium, Denmark, Finland, the Netherlands, Portugal, Spain and the United Kingdom.
No formal assessments were carried out by France, Germany, Greece and Italy. Neither in Ireland nor in Sweden a formal assessment was carried out, but in Ireland a feedback from SIMI (Society of the Motor Industry of Ireland) and the local authorities is available, and in Sweden a feedback from consumer protection organisations, "Motormännens Riksförbund" (Swedish Touring Club) and dealers is available.

The following chapters B.2.10.1 to B.2.10.5 give a survey of the effectiveness of the Directive's provisions regarding informing and influencing consumers in the Member States. Details for the single Member States can also be seen in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

B.2.10.1 Consumer awareness and understanding of fuel economy issues

- Fuel economy and environmental impact are in general no major factor in vehicle purchase decisions (A, B, DK, FIN, GR, IRE, IT, NL, P, SP, SW, UK).

- Fuel consumption is mostly only important because of the cost, but not to environmental issues (A, B, DK, IRE, NL, SP, SW, UK).

- Consumers are not well aware of fuel economy and environmental issues. Interest is growing slowly with greater awareness of climate change and CO_2 emission issues (A, B, DK, FIN, GR, NL, P, SP, SW, UK).

B.2.10.2 Major factors in vehicle purchase decisions

- Foremost factors influencing consumer decisions are car reliability, safety qualities, comfort and cost/price. Also size, engine power and manufacturers' image are quite important. Specifics of some Member States:

    - IRE: VRT (vehicle registration tax), ~ 50 % of the newly registered passenger cars have an engine capacity < 1,400 c.c.

- Fuel consumption and environmental impact are generally ranked in the middle or at the end. Fuel consumption is mostly only important because of the cost, but not to environmental issues. (A, B, DK, FIN, IRE, NL, P, SP, SW, UK).

B.2.10.3 Information sources for fuel economy issues

- Foremost information sources in general are dealerships, sales brochures, car magazines and recommendations by family and friends.

B.2.10.4 Effectiveness of the Directive's provisions

- Awareness of label, poster/display and guide is quite small (B, DK, FIN, NL, P, SP, SW) and not regarded as very informative or effective (B, P, FIN).

- Most informative and effective information tools:

    - Austria: Label. Guide and poster/display next most useful in comparative terms. Promotion literature less influential.
    - Belgium: Promotion literature. Label perhaps next most useful, followed by guide and poster.
    - Denmark: Label, due to the easy understanding of the energy efficiency rating system, and guide. Promotion literature less influential and poster/display without any effectiveness.
    - Finland: Promotion literature. Guide perhaps next most useful. Label and poster/display less informative.
    - Ireland: Guide, with background information and overview of all models. Poster/display next most useful in comparative terms. Label less influential because too car specific and without comparative terms.
    - Netherlands: Label, due to the easy understanding of the energy efficiency rating system). Guide quite informative, but not well known by the consumers. Poster/display and promotion literature ineffective because numerical information without meaning for the consumers.

  - Portugal: Promotion literature and guide. Label less influential and poster/display without any effectiveness.
  - Sweden: Effectiveness of the information tools not assessed in details. Label perhaps most useful and informative element. Poster/display and esp. guide less known and less effective.
  - United Kingdom: Effectiveness of the information tools not assessed in details. Guide perhaps most useful and informative element because comparison with other models possible. Label thought to be very ineffective because numerical information without meaning for the consumers.

- Effectiveness of the provisions probably limited in individual cases, but no major effectiveness generally (IRE, P, UK).

B.2.10.5 Comparison of vehicle models, energy efficiency rating

- Most consumers or several institutions and organisations (e.g. environmental institutes, consumer protection organisations, automobile clubs) prefer a label enabling a direct comparison of the fuel efficiencies of the various cars (A, DK, FIN, GER, IRE, NL, P, SP, UK).

- In most Member States, an energy efficiency rating system (A-G), like for white goods, would be preferred by the consumers and the institutions/organisations. More user friendly and immediately informative in comparative terms (A, DK, GER, IRE, NL, P, SP, UK).

B.2.11 Overall assessment

This chapter sums up once more the main Member States' assessments of the compliance with the Directive's provision, the effectiveness of the Directive's provision regarding the reduction of CO_2 emissions from passenger cars as well as regarding informing and influencing consumers, described in the preceding chapters B.2.8 to B.2.10.5.
Details for the single Member States are shown in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

- The compliance with the provisions of the Directive is generally considered satisfactory or good. But, labels and posters/display are not displayed on all vehicles and at all dealerships or are only badly visible. Nor do all dealers hand-out the guide.

- Effectiveness of the provisions probably limited in individual cases, but a major effectiveness in general can not yet be determined. A greater impact on consumer decisions can not yet be noticed.

- The consumers are not well aware of fuel economy and environmental issues. The interest is growing slowly with greater awareness of climate change and CO_2 emission issues.

- The consumers are not well aware of the Directive's provisions.

- Fuel economy and environmental impact are no major factor in vehicle purchase decisions. Fuel consumption is mostly only important because of the cost, but not to environmental issues.

- The major factors influencing consumer decisions are car reliability, safety qualities, comfort and cost/price. Size, engine power and manufacturers' image are quite important as well (IRE: also VRT).

- Most consumers or several institutions and organisations (e.g. environmental institutes, consumer protection organisations, automobile clubs) prefer a label enabling a direct comparison of the fuel efficiencies of the various cars.

- In most Member States, an energy efficiency rating system (A-G), like for white goods, would be preferred by the consumers and the institutions/organisations. This would be more user friendly and immediately informative in comparative terms.

- The guide is probably the most useful and informative element including background information and an overview of all models. A label without energy efficiency rating system is in general less influential, because numerical information only, is without any meaning for the consumer and without comparative terms. The poster/display as well as the promotion literature are considered as ineffective in general.

- The dealerships are not well aware of the Directive's provisions, but the effectiveness of the Directive needs to be accepted by the entire automobile sector. For example, the poster is ineffective, because its production and actualisation needs too much effort and does not fit to the dealer's concept. The labels instead can be printed out easily with the correct content.

- The effectiveness of the Directive's provisions regarding the reduction of CO_2 emissions can hardly be assessed separately, because other provisions (e.g. emission related vehicle tax) may have a main influence on the development of the CO_2 emissions, too. But, tax incentives, for example the BPM refund in the Netherlands in 2002, are well accepted by consumers and seem to have a great impact on vehicle purchase decisions.

B.2.12 Proposals of the Member States for improvements

Except France, Germany, Ireland and Italy, the Member States have several proposals for improving the effectiveness of Directive 1999/94/EC.
This chapter includes the main proposals of the Member States for improvements. Details for the single Member States can also be seen in the tabular comparison (Annex 1) and the Member States' summary reports (Annex 2).

- Increase of consumers awareness of fuel economy and environmental impacts of fuels as well as of the available information tools according to the Directive's provisions at the dealerships (A, B, FIN, GR, NL, P, SP, SW).

- Increase of consumers awareness of fuel economy while driving, e.g. by standard equipment of new passenger cars with fuel consumption indicators or cruise control (NL).

- Advising the dealerships regarding the importance of the Directive's provisions and involvement of the entire automobile sector. For example, the poster is mostly ineffective because its production and actualisation needs too much effort and does not fit to the dealer's concept (B, DK, P, SP, SW).

- EU-wide harmonised provisions for content and design of the information tools (e.g. identical label) in line with the EU-market requirements (A, NL, SP, UK). This would also offer an easier handling and lower cost for the car manufacturers, for example, the labels could be fixed right after the vehicle production (NL).

- Introduction of an EU-wide harmonised label with an energy efficiency rating system (A-G), like for white goods. This would be more user friendly and immediately informative in comparative terms (A, NL, SP, UK).

An energy efficiency rating system is also requested by several institutions and organisations, e.g. environmental institutes, consumer protection organisations, automobile clubs (GER, IRE).

- Since costs generally take priority over environmental issues for consumers, fuel consumption and CO_2 emissions should be expressed as fuel running cost on the label (UK).

- Due to high production costs for the guide and low demand by consumers, it should be considered to cancel or to replace it by a download version (A, DK, NL, SP) as already done, for example, in Portugal. Therefore, the Directive's provisions should be transferred to a Recommendation of the European Commission (NL).

- Due to the ineffectiveness of the provisions concerning poster/display and promotion literature, the Directive's provisions should be transferred to a Recommendation of the European Commission (NL).

- Since the internet is continuing to become an important information source for consumers, the Directive should also account for this media, for example by EU-wide harmonised requirements for data base solutions (A, DK).

- Development of a new labelling system through a voluntary agreement with the automobile industry to enable a faster progress (UK).

- Introduction of a new driving test cycle for fuel consumption measurement that provides for technical solutions influencing the fuel consumption (SW).

C Assessment of the effectiveness of the labelling Directive

In this chapter an assessment of the Directive's effectiveness regarding informing and influencing consumers as well as regarding the reduction of the CO_2 emissions is carried out. Therefore, apart from the results of the evaluation of the Member States' reports, the findings of other studies, the results of a supplementary survey of European automobile club members as well as the development of the average specific CO_2 emissions of new passenger cars are taken into account. In addition to this, the effectiveness of the energy efficiency labelling Directive 92/75/EEC on household appliances is reviewed, which might be helpful to draw conclusions on the relatively new labelling Directive of new passenger cars.

C.1 Assessment of the effectiveness of the Directive's provisions regarding informing and influencing consumers

Based on the results of the evaluation of the Member States' reports, the results of the CLASE project as well as a supplementary survey of European automobile club members (see chapter C.1.2), the effectiveness of the Directive's provisions regarding informing and influencing consumers is assessed in this chapter.

The CLASE project is part of ECLAB a subprogram within the SAVE 2000 programme. It aims at comparing the implementation process of Directive 1999/94/EC in the Member States and consumer awareness and effectiveness on average CO_2 emissions of new car registrations, which is the objective of the consumer information directive in the general policy to lower greenhouse gas emissions of road transport. This study is mainly based on the in depth evaluations that are done by the 5 involved institutions in their countries (E.V.A. Austria, VITO Belgium, DEA Denmark, ADENE Portugal, IDAE Spain) and other available evaluation reports, mainly produced following the Article 9 of the Directive 1999/94/ EC. The CLASE project started in March 2001. The final report was finished by the end of September 2004.

C.1.1 Findings based on the Member States' reports and the CLASE project

Since the findings of the evaluation of the Member States' reports (see chapter B) emphasise those of the CLASE study, the results of both studies are summarised in the following chapters.

C.1.1.1 Consumer awareness and understanding of fuel economy issues

The consumers are in general not well aware of fuel economy and its environmental issues, e.g. greenhouse gas emissions, global warming. The role of CO_2 in this respect is not clear and there is a lot of confusion about the environmental problems. The correlation of fuel consumption and CO_2 emissions is mostly unclear, too. Fuel economy and environmental impact are in general no major factor in vehicle purchase decisions and fuel consumption is mostly only important because of the cost, but not to environmental issues.
Interest, however, is growing slowly with a greater awareness of climate change and CO_2 emission issues.

C.1.1.2 Major factors in vehicle purchase decisions

When purchasing a new car, consumers examine many criteria. The major factors influencing consumer decisions are in general car reliability, safety qualities, comfort and cost/price. But also vehicle size, engine power and manufacturers' image are quite important.
In some Member States, other concerns rank equally high. In Ireland for example, the VRT (vehicle registration tax) appears to have a main influence on vehicle purchase decisions, because approx. 50 % of newly registered cars have an engine capacity less than 1,400 c.c.

Environmental concerns are generally ranked in the middle or at the end. They are considered important by just a small part of the population.
Only in Denmark and Spain fuel consumption/cost are specified as one of the 1st priority factors. But in these two countries as well as in the other Member States, fuel consumption is mostly only important for economical reasons, but not because of environmental issues.

C.1.1.3 Information sources for fuel economy issues

When purchasing a new car, consumers consult a wide range of sources of information. Foremost information sources are basically dealerships, sales brochures, car magazines as well as recommendations by family and friends. But also the internet is becoming a more and more important source of information.
Since the dealerships are one of the most important sources of information, it is extremely important that the Directive's provisions are fulfilled, which means that labels are displayed on all vehicles and that the guide is handed out to the consumers to raise consumers' awareness.

C.1.1.4 Effectiveness of the Directive's provision

General awareness of label, poster/display and guide is quite small and most of these information tools are not regarded as very informative or effective. The highest degree of awareness is seen for the label. Only in Austria the consumers are more familiar with the guide than the label.

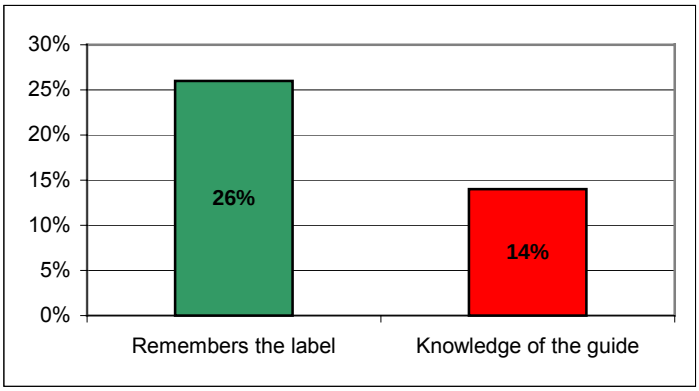

Figure 1: Average awareness of label and guide (A, DK, SP, FIN, P) (Source: CLASE WP4 report)

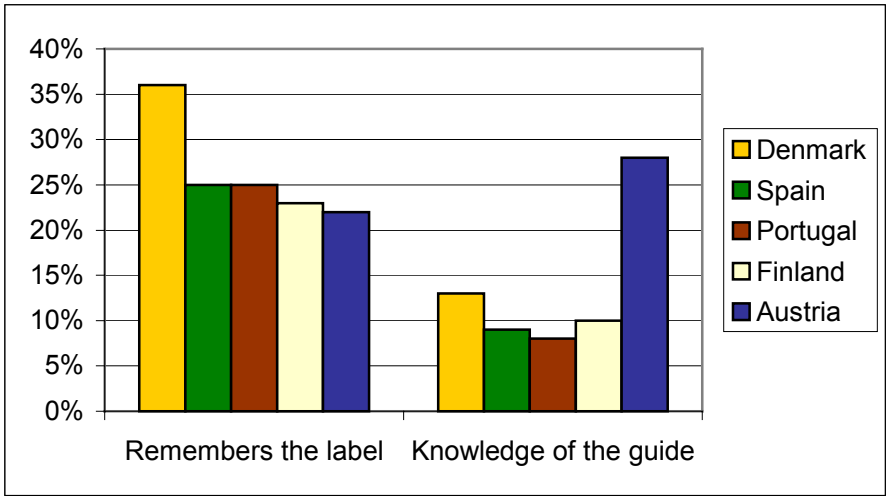

Figure 2: Awareness of label and guide (A, DK, SP, FIN, P) (Source: CLASE WP4 report)

The most informative and effective information tools vary within the different Member States:

- Austria: The label is regarded as the most informative and effective element. Guide and poster/display are next most useful in comparative terms between vehicle models for the consumers. The promotion literature is less influential.
- Denmark: The label and the guide are regarded as the most informative and effective elements, due to the easy understanding of the energy efficiency rating system. The promotion literature is less important and the poster/display without any effectiveness.
- Finland: The promotion literature seems to be the most informative and influential information tool. The guide seems to be the next most useful. Label and poster/display are less informative. But consumers are more aware of the label than the guide.
- Ireland: The guide, with background information and overview of all models, is the most informative element. Poster/display is next most useful in comparative terms between vehicle models. The label is regarded as less influential because it is too car specific and without comparative terms.
- The Netherlands: The label is the most informative and effective element, due to the easy understanding of the energy efficiency rating system. The guide is quite informative, but not well known by the consumers. Poster/display and promotion literature are ineffective because numerical information are in general without meaning for the consumers.
- Portugal: The promotion literature and the guide seems to be the most useful and informative elements. The label is less influential and the poster/display without any effectiveness.
- Sweden: The effectiveness of the information tools was not assessed in detail, but the label seems to be the most informative and effective element. Poster/display and especially the guide are less known and less effective.
- United Kingdom: The effectiveness of the information tools was not assessed in detail, but the guide seems to be the most useful and informative element because comparisons with other vehicle models are possible. The label thought to be very ineffective because numerical information are without meaning for the consumers.

It can be concluded that the Directive's provisions to effectiveness may be limited in individual cases, but there is no major effectiveness in general.

C.1.1.5 Comparison of vehicle models, energy efficiency rating

Most consumers or several institutions and organisations (e.g. environmental institutes, consumer protection organisations, automobile clubs) prefer a label enabling a direct comparison of the fuel efficiencies of the various cars. Often a comparison of similar models, e.g. based on the engine power, vehicle category, price category or vehicle size would be preferred by the consumers.
In most Member States, an energy efficiency rating system (A-G), like for white goods, would be preferred by the consumers and the institutions/organisations. This would be more user friendly and immediately informative in comparative terms.

C.1.2 Members survey

To supplement the results of the Member States' reports as well as of the CLASE study, a survey of European automobile club members on their consumer behaviour when buying a new car with consideration to fuel consumption and CO_2 emissions was carried out via internet. The details and results of this members survey are shown in arithmetic charts in the following chapters. The results as numerical figures as well as the results for the single countries are presented in Annex 5 and 6.

C.1.2.1 Supply via internet and participating European automobile clubs

The questionnaire was supplied on the ADAC website www.adac.de from the beginning of September to mid of October 2004 in 7 languages: Dutch, English, German, French, Italian, Spanish and Swedish.

With the assistance of 7 European automobile partner clubs of the ADAC, the members survey could be carried out in 8 European Member States (see table below).
These partner clubs promoted the members survey on their websites with a direct link to the questionnaire on the ADAC website, where the participants could choose the questionnaire in their native language.

Automobile Club	Country	Website
ÖAMTC "Österreichische Automobil-, Motorrad- und Touring Club"	Austria	www.oeamtc.at
ADAC "Allgemeiner Deutscher Automobil Club"	Germany	www.adac.de
ACI „Automobile Club d'Italia"	Italy	www.aci.it
ACL „Automobile Club Luxembourg"	Luxembourg	www.acl.lu
ANWB "Koninklijke Nederlandse Toeristenbond"	The Netherlands	www.anwb.nl
RACC „Real Automóvil Club Catalonia"	Spain	www.racc.es
Motormännens „Motormännens Riksförbund"	Sweden	www.motormannen.se
TheAA „The Automobile Association"	United Kingdom	www.theAA.com

Table 1: European Automobile Clubs supporting the members survey

C.1.2.2 Questionnaire "Buying a new passenger car"

The questionnaire was elaborated with DG Environment and included the following sections:

1. Personal Data
   - Sex
   - Age
   - Education
   - Number of persons living in the household
   - Available monthly net income of the household/family.

2. Year of new car purchase

3. Criteria for the selection of a new passenger car

4. Sources of information for the selection of a new passenger car

5. "Energy efficiency labelling of new passenger cars" according to Directive 1999/94/EC
   - Awareness of the Directive and its provisions
   - Information source
   - Assessment of the Directive's provisions.

6. Comparison of passenger cars based on CO_2 emissions and/or fuel consumption
   - Importance of passenger car comparisons
   - Preferred comparison (absolute or relative)
   - Preferred comparison criteria, if a relative comparison is favoured.

In each sections different answers were provided, which could be selected by the participants.
The complete English version of the questionnaire is shown in Annex 4.

C.1.2.3 Results

The following chapters C.1.2.3.1 to C.1.2.3.6.2 show the main results of the members survey.

C.1.2.3.1 Participants

In total 7,515 people joined the members survey. After deleting the meaningless answers as well as answers which were send twice or more often 7,168 answers remain for evaluation. The number of participants per country is shown on the table below.

	Number of Participants
Austria	229
Germany	4,255
Italy	368
Luxembourg	108
The Netherlands	1,641
Spain	308
Sweden	137
United Kingdom	83

Table 2: Number of Participants

The figures below show that all social levels regarding sex, age, education, numbers of persons living in the households as well as the available monthly net income of the household are represented within this survey. Even if this survey may not be regarded as representative, the results clearly show that it is compatible to the findings of the evaluation of the Member States' reports and the CLASE study.

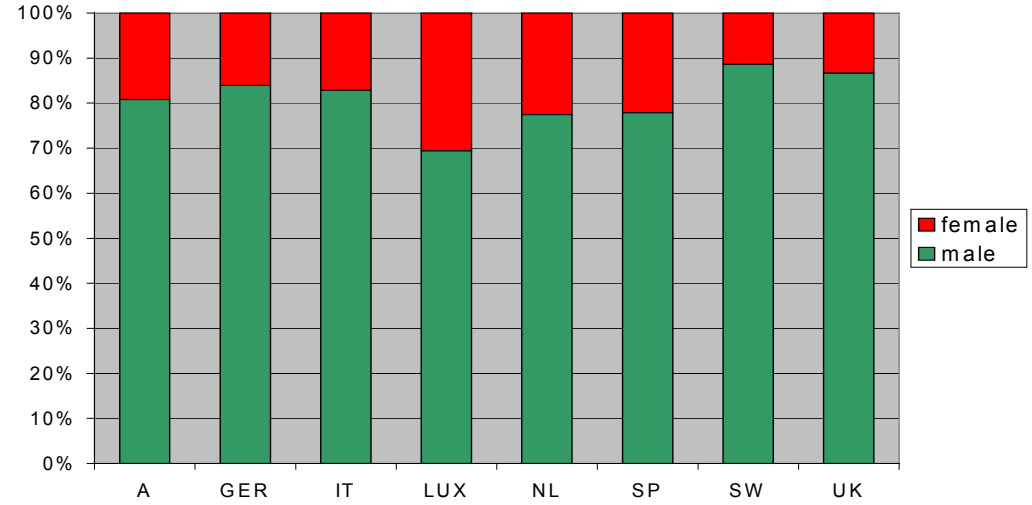

Figure 3: Sex of the participants

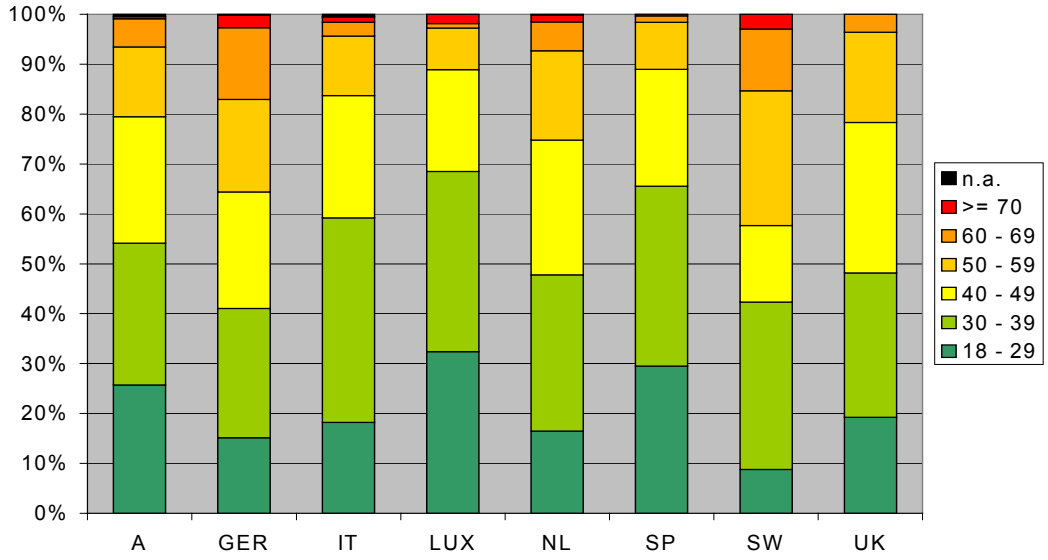

Figure 4: Age of the participants (years)

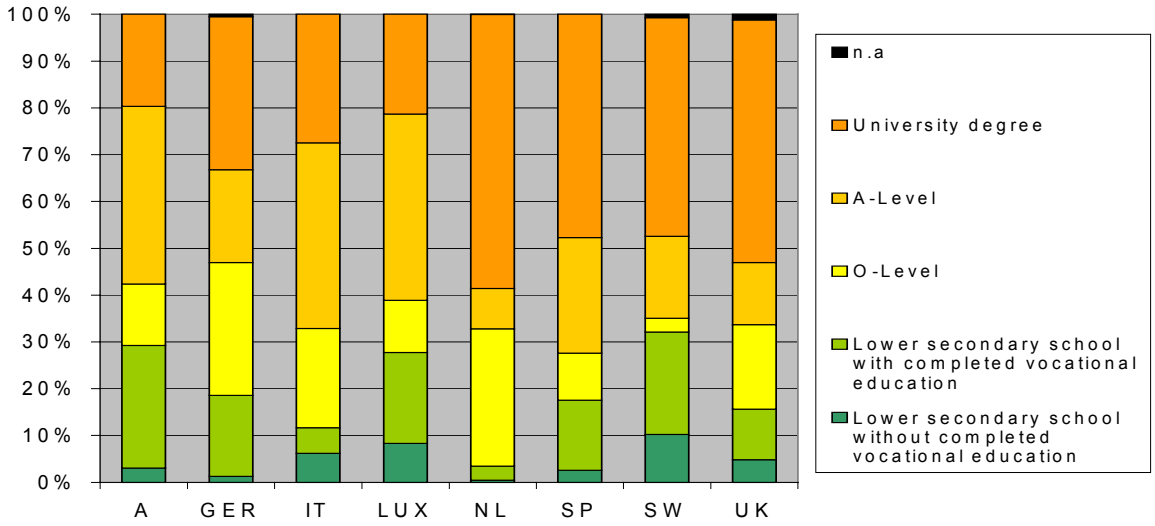

Figure 5: Education of the participants

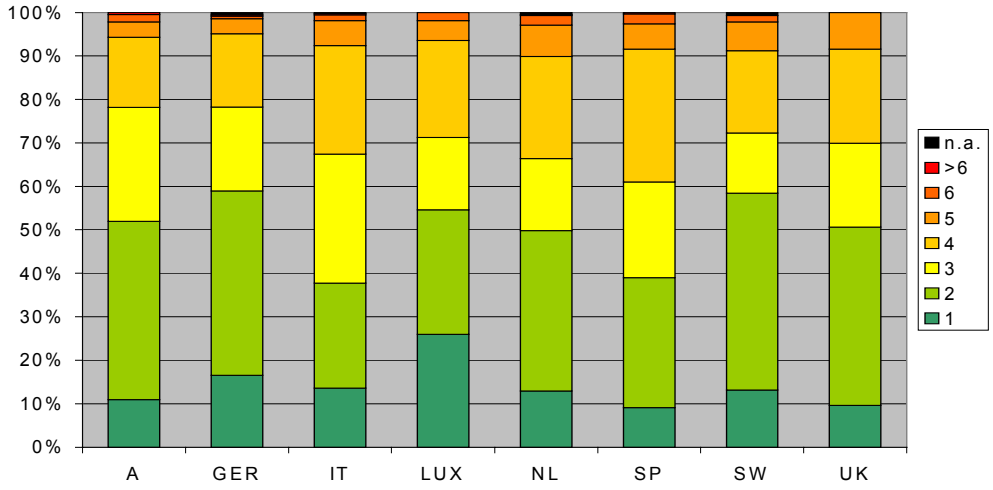

Figure 6: Number of persons living in the household of the participants

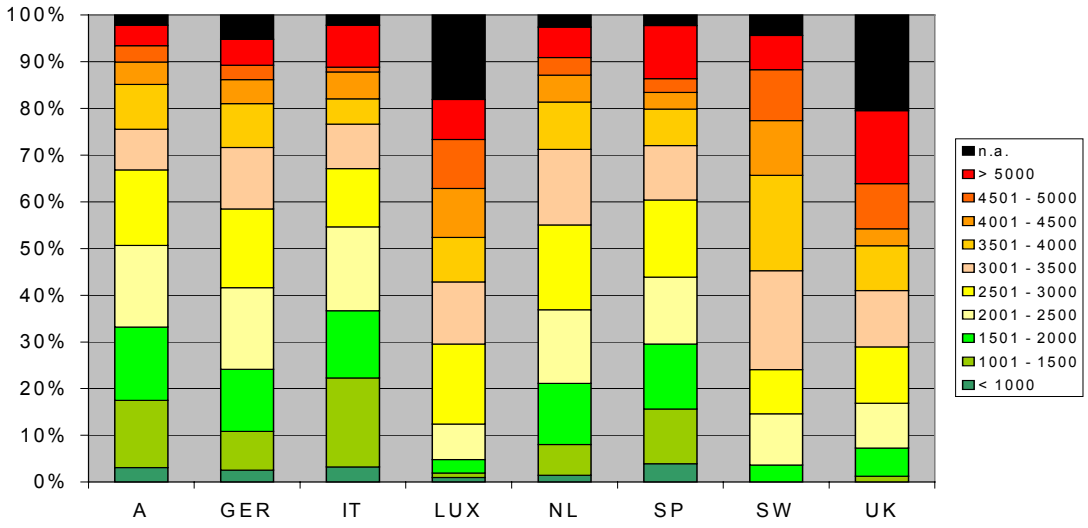

Figure 7: Monthly net income of the household (Euro)

C.1.2.3.2 Year of new car purchase

The survey was to approach consumers who had bought a new passenger car since 2001 or who are planning to buy a new car within the next year.
The results show that the year of car purchase vary widely between 2001 and 2005 (planned).

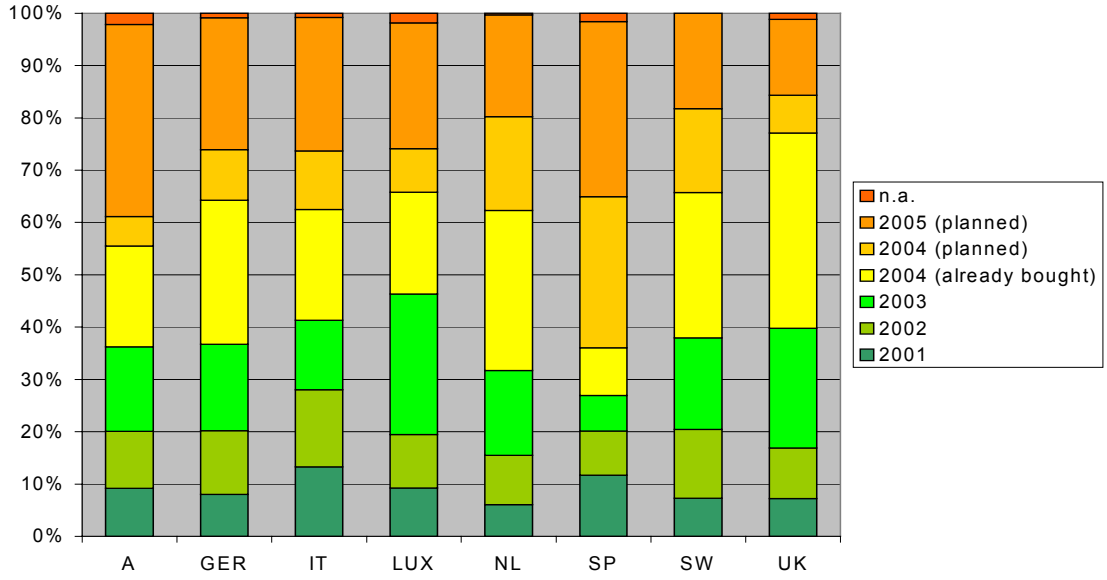

Figure 8: Year of car purchase

C.1.2.3.3 Criteria for the selection of a new passenger car

This section provided the following 14 criteria for the selection of a new passenger car:

- Vehicle type (e.g. notch back, SUV, convertible)
- Number of seats
- Vehicle size (loading/boot space)
- Manoeuvrability and required parking space
- Engine power
- Brand image/prestige
- Design
- Safety standard
- Comfort
- Vehicle price
- Price of optional equipment
- Reliability
- Running cost (total)
  - Insurance cost
  - Tax
  - Maintenance and repair cost
  - Fuel cost
  - Resale value
- Environmental friendliness (total)
  - Low emissions (emission standard)
  - Particle filter (for diesel models)
  - Low CO_2 emissions (greenhouse gas)
  - Low HFC emissions (greenhouse gas from a/c)
  - Fuel consumption

- Alternative fuels (e.g. CNG, hybrid)
- Noise
- Take-back of end-of-life vehicle.

Question: *"Please assess - in a range from 1 (very important) to 6 (unimportant) - how important the criteria were/are for the selection of the new car."*

Findings:

Taking range 1 (very important) and 2 (important) into account, the two major factors in vehicle purchase decisions are car reliability and safety standard, except in the Netherlands were car reliability and the vehicle type (e.g. notch back, SUV, convertible), before safety standard, are the foremost factors influencing consumers. But also vehicle price, running cost and comfort are important criteria for the selection of a new passenger car in all of these 8 countries.

Environmental friendliness is generally ranked in the middle or at the end. Especially in the Netherlands and the United Kingdom, environmental friendliness of a passenger car is quite unimportant for purchasers of a new car.
In the Netherlands environmental friendliness ranks the last but one, only in front of brand image/prestige.
In the United Kingdom, it comes in the third last place in front of manoeuvrability and price of optional equipment. Taking only range 1 (very important) into account, environmental friendliness ranks even last.

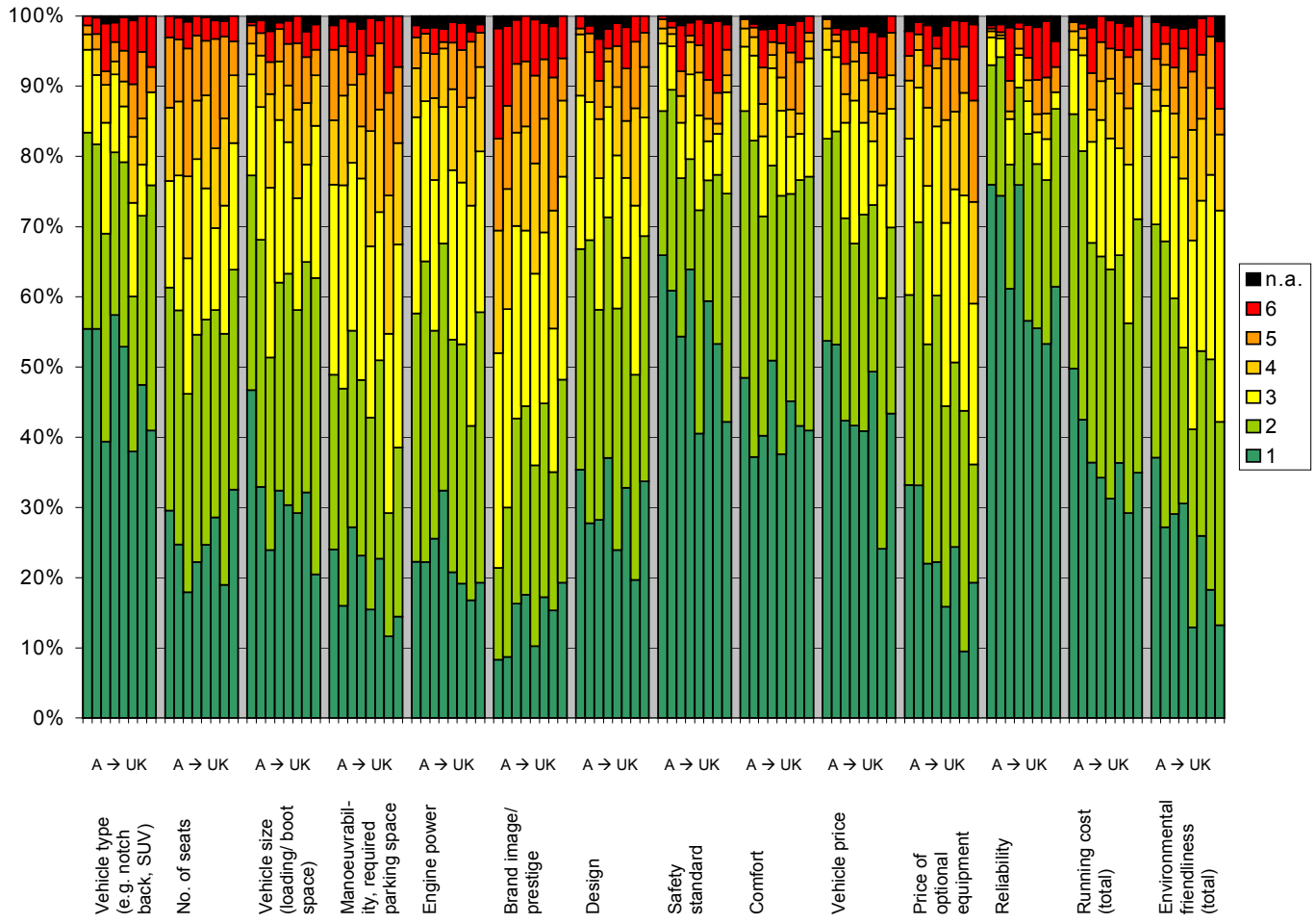

Figure 9: Criteria for the selection of a new passenger car

C.1.2.3.3.1 Selection criteria - Environmental friendliness

Dividing “Environmental friendliness” into the following 8 sub-criteria

- Low emissions (emission standard)
- Particle filter (for diesel models)
- Low CO_2 emissions (greenhouse gas)
- Low HFC emissions (greenhouse gas from a/c)
- Fuel consumption
- Alternative fuels (e.g. CNG, hybrid)
- Noise
- Tack-back of end-of-live vehicles,

it can be noted, that in all countries the fuel consumption is the most important factor in terms of environmental friendliness of a passenger car. Low CO_2 emissions are less important. This shows, that most consumers are not aware of the correlation of fuel consumption and CO_2 emissions of passenger cars and their environmental impact.
Alternative fuels (e.g. CNG, hybrid) have no great importance in any of the 8 countries.

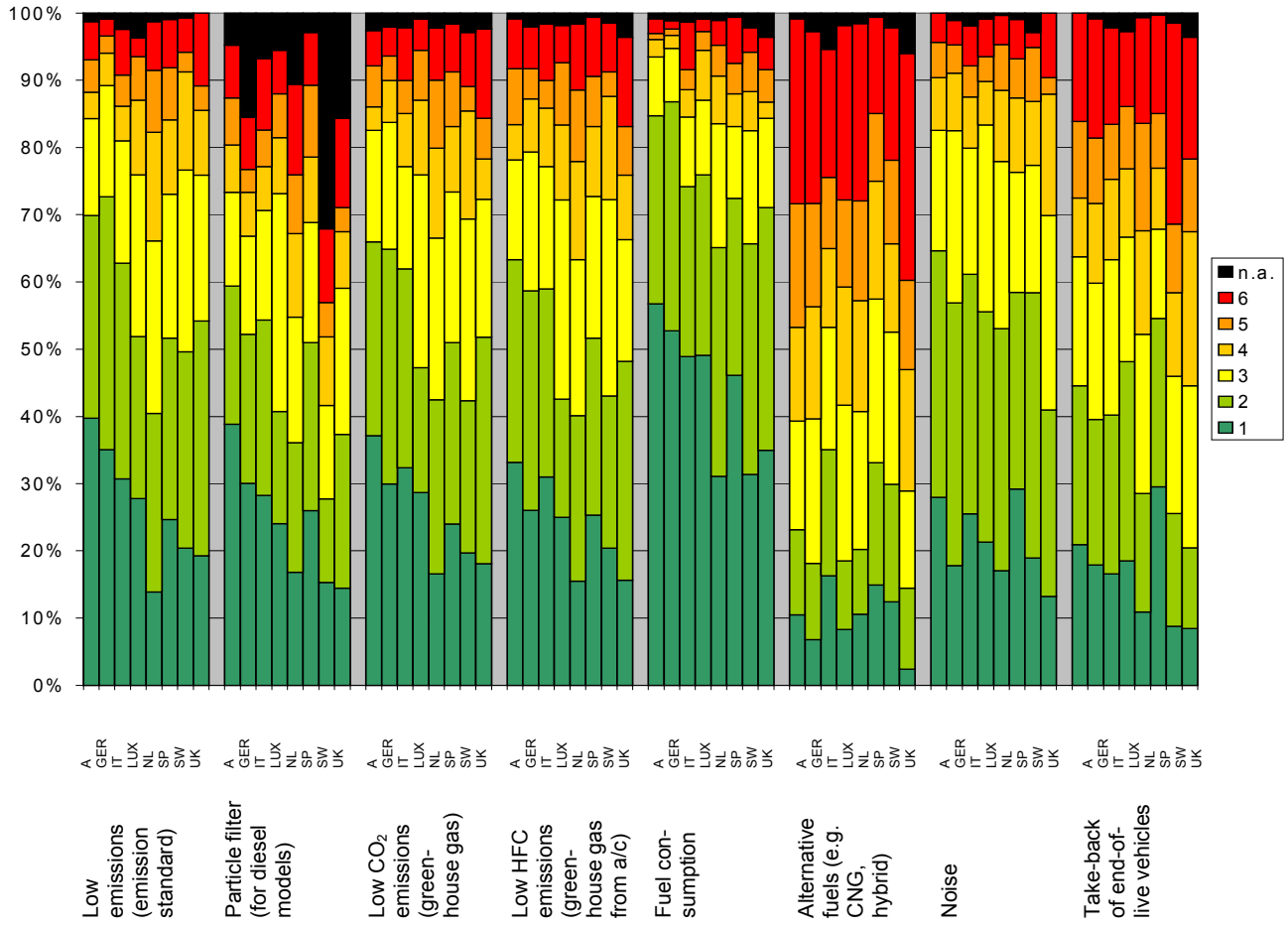

Figure 10: Selection criteria - Environmental friendliness

C.1.2.3.3.2 Selection criteria - Running cost

Dividing the “Running cost” into the following 5 sub-criteria

- Insurance cost
- Tax
- Maintenance and repair cost
- Fuel cost
- Resale value,

it can be noted, that in all countries the fuel cost is the most important factor in terms of the running cost of a passenger car, followed by the maintenance and repair cost.

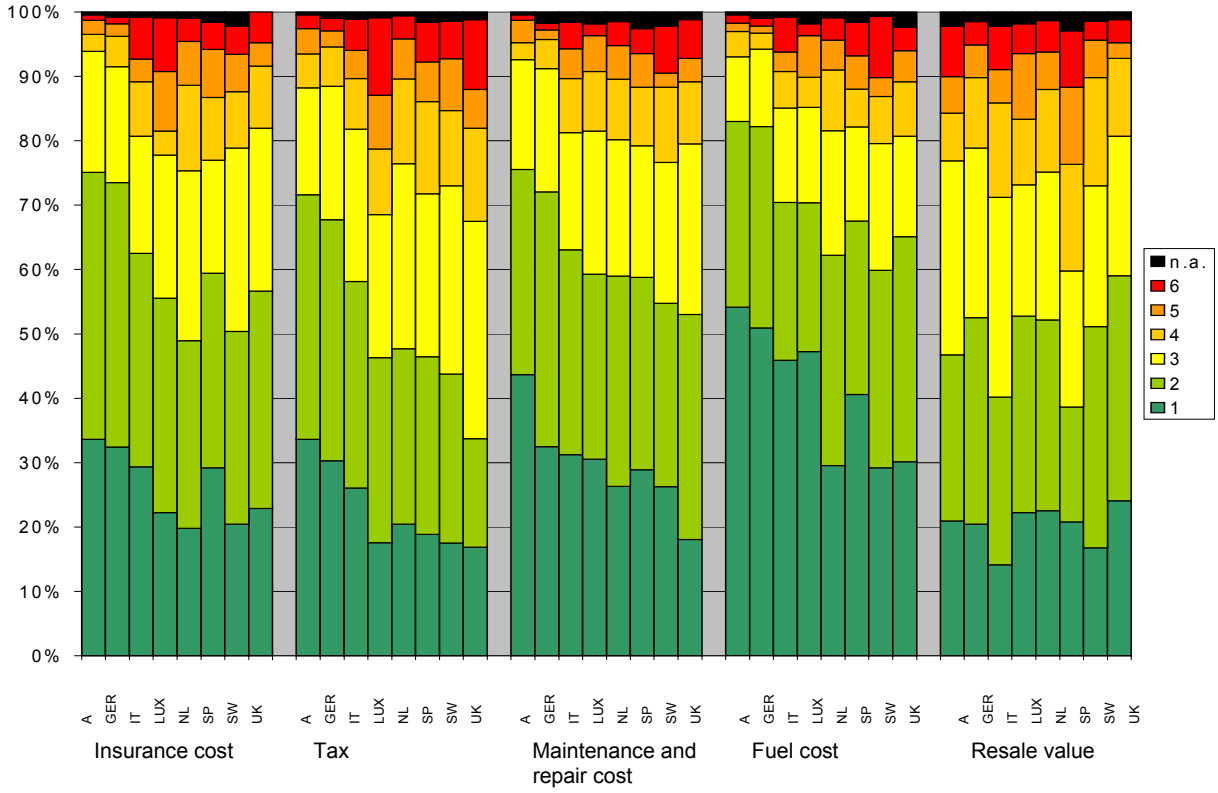

Figure 11: Selection criteria - Running cost

C.1.2.3.4 Sources of information for the selection of a new passenger car

This section provides the following 10 sources of information for the selection of a new passenger:

- Dealer (e.g. face-to-face-advice)
- Sales brochures of the car manufacturers
- Family, friends (e.g. recommendation)
- Automobile club, consumer protection organisation
- Automobile magazines
- TV automobile programmes
- Promotion/advertising
- Website of car manufacturers
- Other (non-manufacturer) websites
- Energy efficiency information on cars.

Question: "Which sources of information did/do you use to get the necessary information for the selection of your new car?
Please assess - in a range from 1 (very important) to 6 (unimportant) - how important the following sources of information were/are for you."

Findings:

The results show that consumers use various sources of information for the selection of a new passenger car.
Taking range 1 (very important) and 2 (important) into account, the foremost sources of information in general are dealerships and the internet, especially the websites of the car manufacturers. But also the sales brochures of the cars, automobile magazines (except in the Netherlands) as well as automobile clubs and consumer protection organisations (expect Italy, Luxembourg and the Netherlands) are preferred information sources. Recommendations by family or friends are also taken into account. TV automobile programmes are of less importance. Promotion/advertising is generally insignificant for all of the participants.

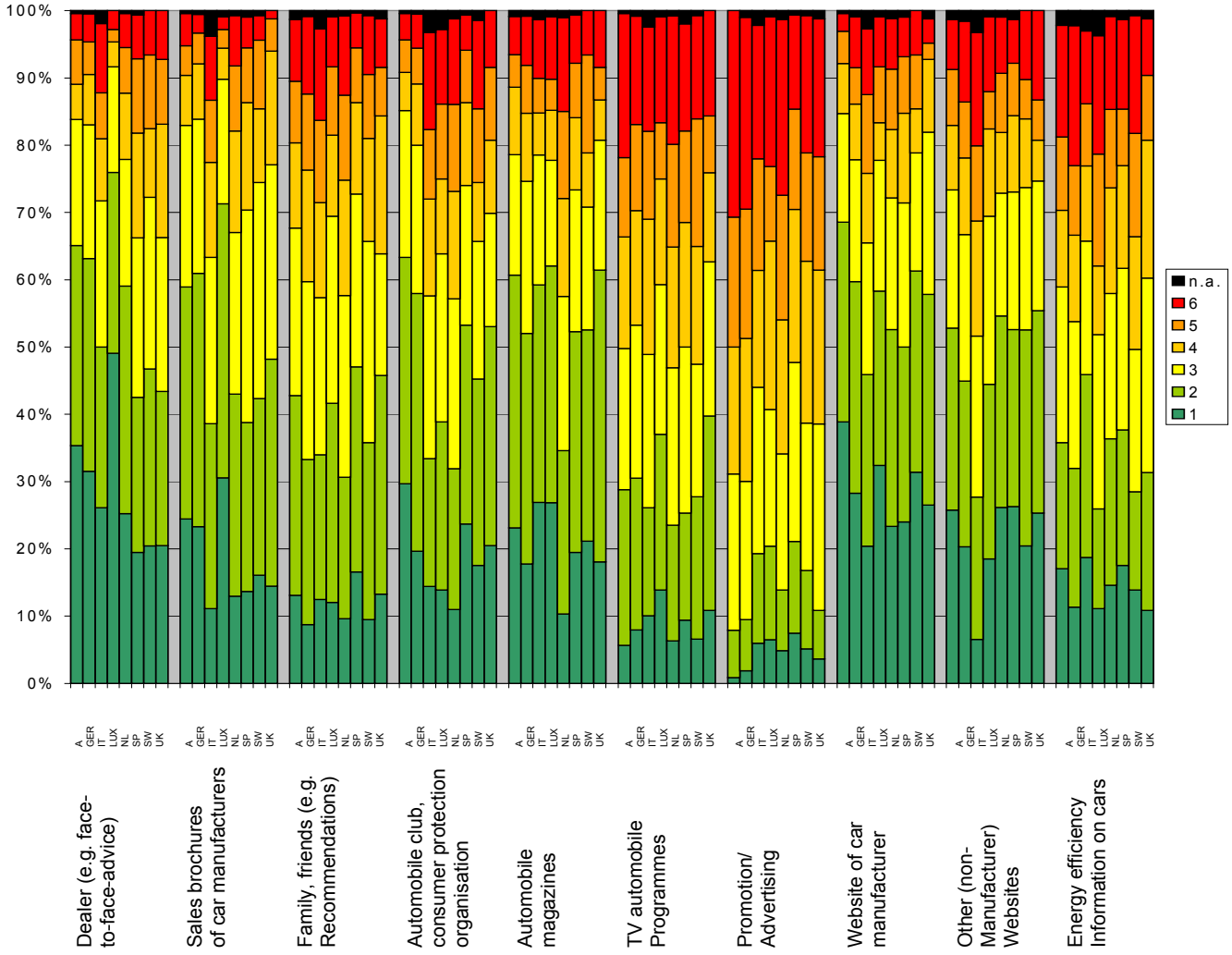

Figure 12: Sources of information for the selection of a new passenger car

C.1.2.3.5 Consumer awareness of "Energy efficiency labelling of new passenger cars" according to Directive 1999/94/EC

Questions:

a) *"Do you know the "Energy efficiency labelling of new passenger cars?"*
b) *"Do you know the "Fuel Economy Label" for showroom cars?"*
c) *"Do you know the "Fuel Economy Poster/Display" in the dealer showrooms?"*
d) *"Do you know the "Fuel Economy Guide"?"*
e) *"Do you pay attention to CO_2 emissions and fuel consumption data in promotion materials for a car model?"*

Remark: Since the national German regulation did not come into force before 01 November 2004, this question was not assessed for Germany.

Findings:

The greatest awareness of the "Energy efficiency labelling" Directive as well as its provisions exists in the Netherlands, where more that 60 % of the participants know the Directive and the label. Nearly 50 % know the poster, but only around 20 % know the guide.
In the other 6 countries however, awareness of the Directive and its provisions is quite small. Only around 25 % of the participants of these countries know them.
Concerning the question "Do you pay attention to CO_2 emissions and fuel consumption data in promotion materials for a car model?" a contrary result can be noted. While in 6 countries more that the half of the participants indicate to pay attention to CO_2 emissions and fuel consumption data, in the Netherlands only 34 % agree. Here, label and poster seem to be more relevant.

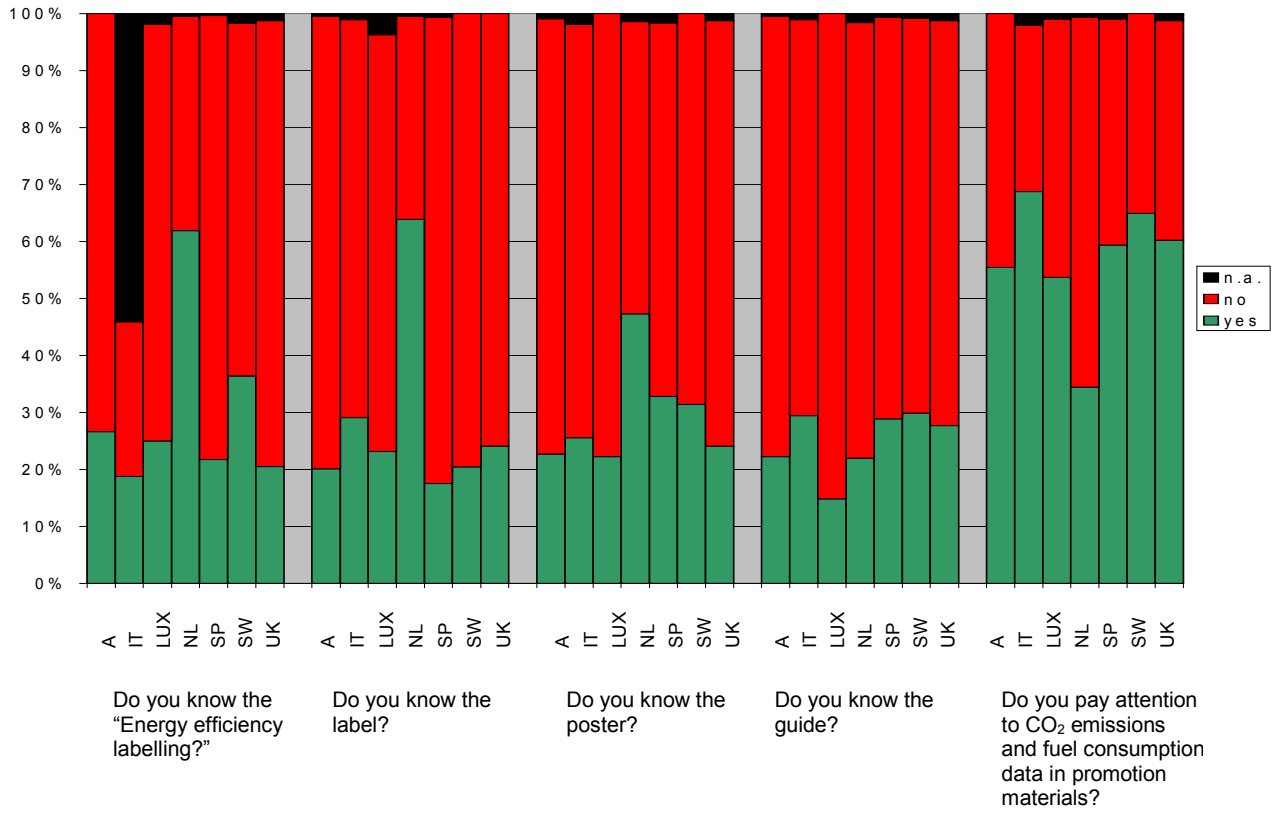

Figure 13: Consumers awareness of "Energy efficiency labelling of new passenger cars" according to Directive 1999/94/EC

C.1.2.3.5.1 Source of information for "Energy efficiency labelling" awareness

This section provides the following 7 sources of information for the "Energy efficiency labelling" awareness:

- Dealer (e.g. face-to-face-advice)
- Automobile club, consumer protection organisation
- Newspaper advertisements
- Internet
- Family
- Automobile magazines
- Radio/TV
- Noticed by yourself.

Question: „If you know the "Energy efficiency labelling of new passenger cars", from whom/where did you get this information?"

Remark: Since the national German regulation did not come into force before 01 November 2004, this question was not assessed for Germany.

Findings:

In the Netherlands more than half of the participants got the information from the dealers. The other information sources are quite irrelevant in this country.
In the other 6 countries, the results vary widely. Besides the dealers (Luxembourg), automobile clubs and consumer protection organisations (Austria), automobile magazines (Italy) as well as the internet (United Kingdom) were the foremost information sources. Especially in Austria and Sweden the participants relatively often (17 % / 16 %) noticed the provisions by themselves. Newspaper advertisements, radio/TV as well as family/friends were in general quite irrelevant as source of information.

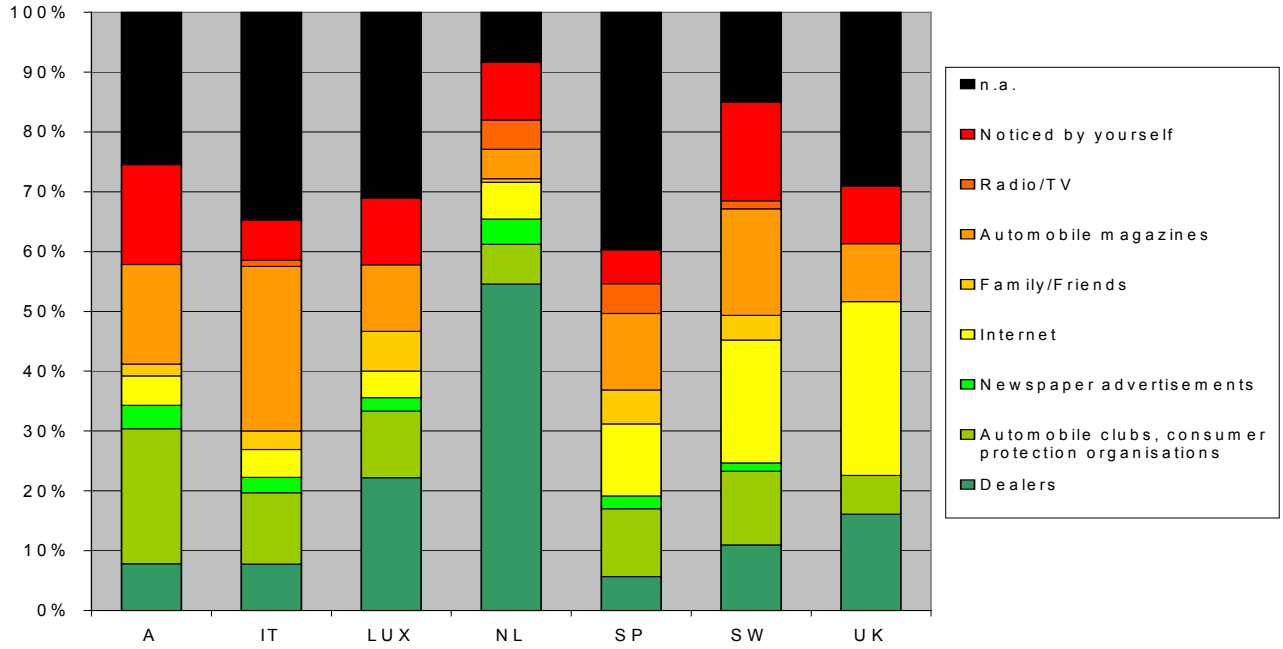

Figure 14: Source of information for "Energy efficiency labelling" awareness

C.1.2.3.5.2 Effectiveness of the "Energy efficiency labelling"

Questions:
"If you know the "Energy efficiency labelling of new passenger cars", please answer the following questions in a range from 1 ("fully agree" or "very important") to 6 ("disagree" or "unimportant")."

a) *"Fuel Economy Label" for showroom cars:*
   - *"Do you find the information on the label comprehensible?"*
   - *"Do you find the information on the label informative?"*
   - *"Does or did the label have an effect on your car purchase decision?"*
b) *"Fuel Economy Poster/Display" in the dealer showrooms:*
   - *„Do you find the information on the poster/display comprehensible?"*
   - *"Do you find the information on the poster/display informative?"*
   - *"Does or did the poster/display have an effect on your car purchase decision?"*
c) *"Fuel Economy Guide":*
   - *"Do you find the information on the guide comprehensible?"*
   - *"Do you find the information on the guide informative?"*
   - *"Does or did the guide have an effect on your car purchase decision?"*

Remark: Since the national German regulation did not come into force before 01 November 2004, this question was not assessed for Germany.

Findings:

In all countries the tendency can be identified that the information tools are regarded comprehensible and widely informative, but with less effect on car purchase decisions.
Taking range 1 (very important) and 2 (important) into account, the label is regarded as the most effective information tool closely followed by the guide in 5 countries. Only in the Netherlands and the United Kingdom the reverse order can be identified. Especially in Italy, Luxembourg and Spain the label is regarded as effective by more than 30 % of the participants. The rating for the guide is quite similar in all of the 7 countries and range between 23 % and 32 %.
The poster in general is regarded as less effective. Only in Luxembourg and in the United Kingdom 29 % / 30 % of the participants regard also the poster as effective.

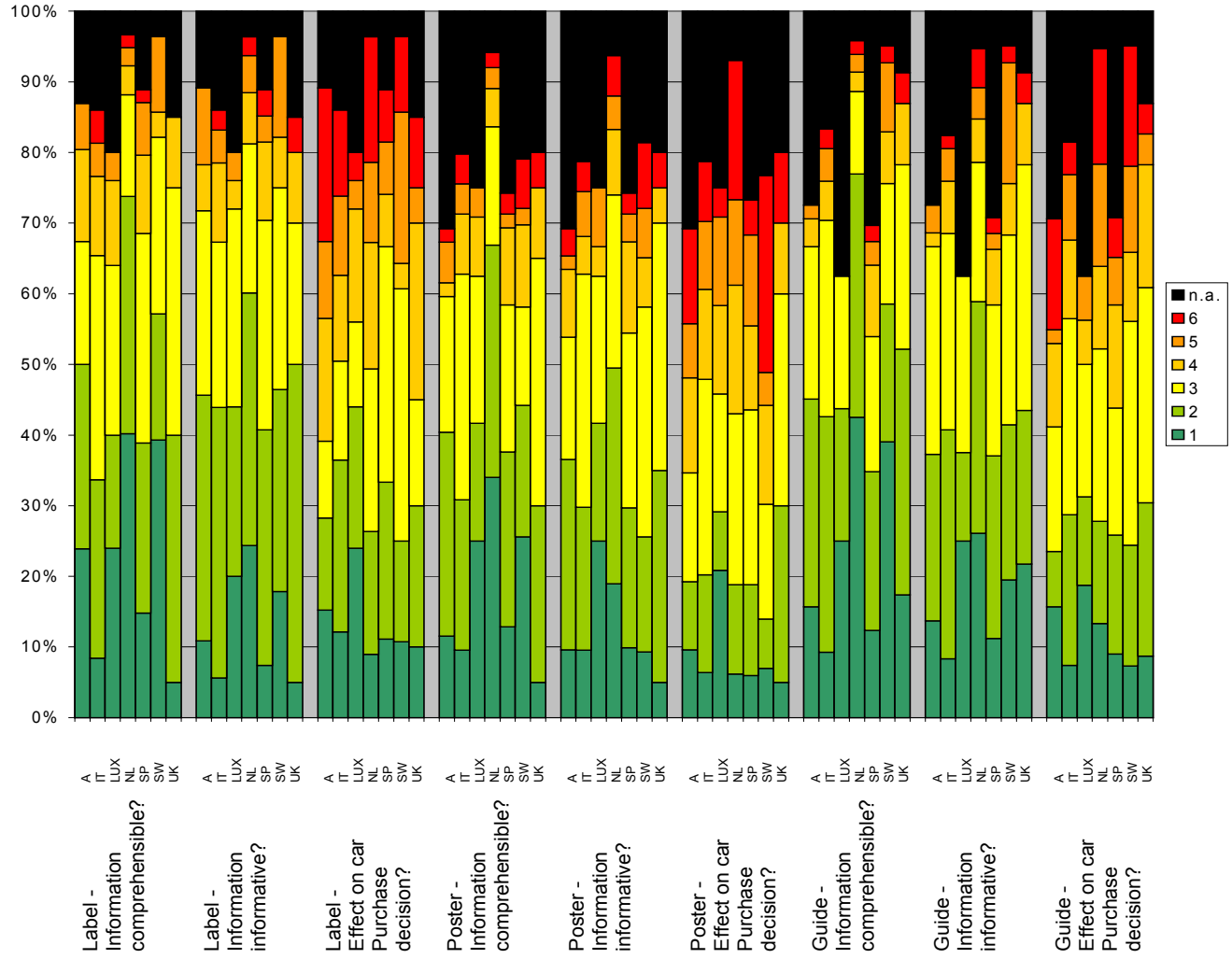

Figure 15: Effectiveness of the "Energy efficiency labelling"

C.1.2.3.6 Comparison of passenger cars based on CO_2 emissions and/or fuel consumption

Questions:
"Please answer the following questions in a range from 1 ("fully agree" or "very important") to 6 ("disagree" or "unimportant")."

a) *"How important is a direct comparison of CO_2 emissions or fuel consumption of passenger cars for you?"*
b) *"Do you consider only to the CO_2 emissions and the fuel consumption of passenger cars of a certain vehicle category (e.g. minis, family cars), which you are interested in?"*
c) *"Would you be willing to choose a passenger car of an other vehicle category due to less CO_2 emissions and lower fuel consumption (e.g. mini instead of small family car)?"*
d) *"Would you prefer a label with an energy efficiency rating system (A-G) similar to the existing one for white goods (e.g. refrigerators, freezers, washing machines) also for passenger cars?"*

Findings:

Taking range 1 (very important) and 2 (important) into account, it can be noted that a direct comparison of CO_2 emissions or fuel consumption of passenger cars is important for nearly half of the participants. The greatest interest exists in Italy and Austria, followed by Germany and Spain. Around 40 % of the participants only consider CO_2 emissions and the fuel consumption of passenger cars of a certain vehicle category (e.g. minis, family cars).
The interest in choosing a passenger car of another vehicle category due to less CO_2 emissions and lower fuel consumption (e.g. mini instead of small family car) is relatively small - about 25 %. Only in Italy, 45 % of the participants would be willing to choose a more fuel efficient car of an other vehicle category. In the Netherlands and Sweden, willingness is less than 20 %.
An energy efficiency rating system (A-G) for passenger cars, similar to the one for white goods, would be preferred by more that half of the participants in Austria, Germany, Italy, Spain and the United Kingdom. Little interest in an energy efficiency rating system exists especially in Sweden, where only 34 % would prefer such kind of rating system.

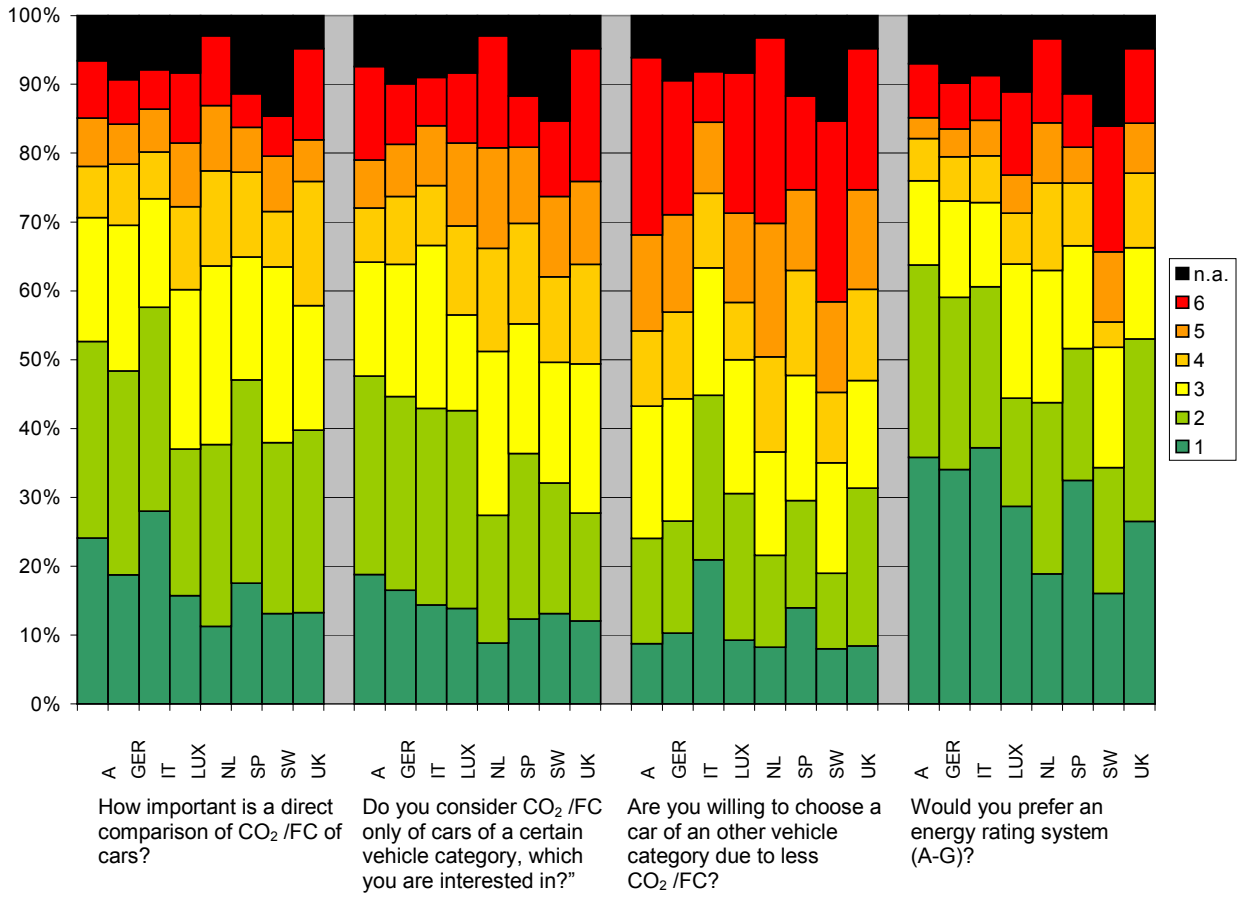

Figure 16: Comparison of passenger cars based on CO_2 emissions and/or fuel consumption

C.1.2.3.6.1 Energy efficiency rating system - Absolute or relative comparison preferred?

Question: "If you favour an energy efficiency rating system (A-G-) for passenger cars, would you prefer a comparison of all passenger cars or the comparison of passenger cars of a certain group (e.g. same vehicles type, same vehicle size)?"

Findings:

In 7 countries, the majority of the participants prefers a "comparison of cars of a certain group". Only in the United Kingdom, the "comparison of all cars" wins by a close vote.

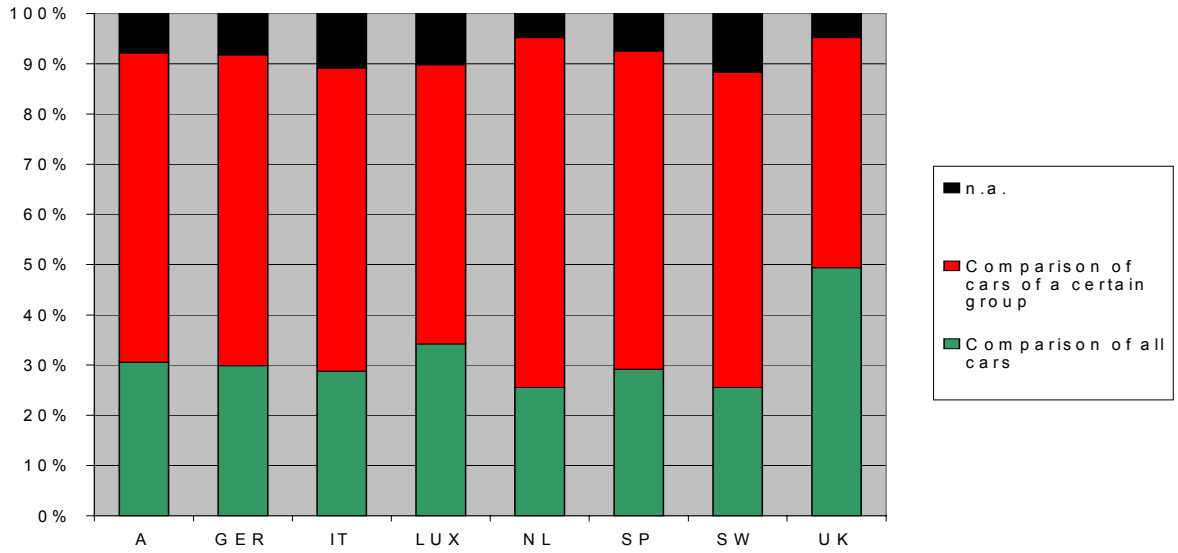

Figure 17: Energy efficiency rating system - Absolute or relative comparison preferred?

C.1.2.3.6.2 Comparison criteria, if a relative comparison is preferred

This section provides the following 6 comparison criteria:

- Vehicle type (e.g. notch back, SUV, convertible)
- Vehicle size
- Vehicle weight
- Vehicle category (e.g. minis, family cars)
- Vehicle floor space
- Engine power.

Question: "If you prefer the comparison of passenger cars of a certain group, which criterion would you prefer for comparison?"

Findings:

In 7 countries, the majority of the participants prefers the "vehicle category" (e.g. minis, family cars) as a basis for a relative comparison. Only in Italy, the "vehicle type" (e.g. notch back, SUV, convertible) is slightly ahead of the "vehicle category".
Besides the "vehicle type", the "engine power" is one of the preferred comparison criteria.

"Vehicle weight" and "vehicle floor space", used for example in Switzerland, the Netherlands or Spain as comparison criteria, are unimportant for the participants and rank at the end in all of these 8 countries far behind the "vehicle size", which ranks fourth.

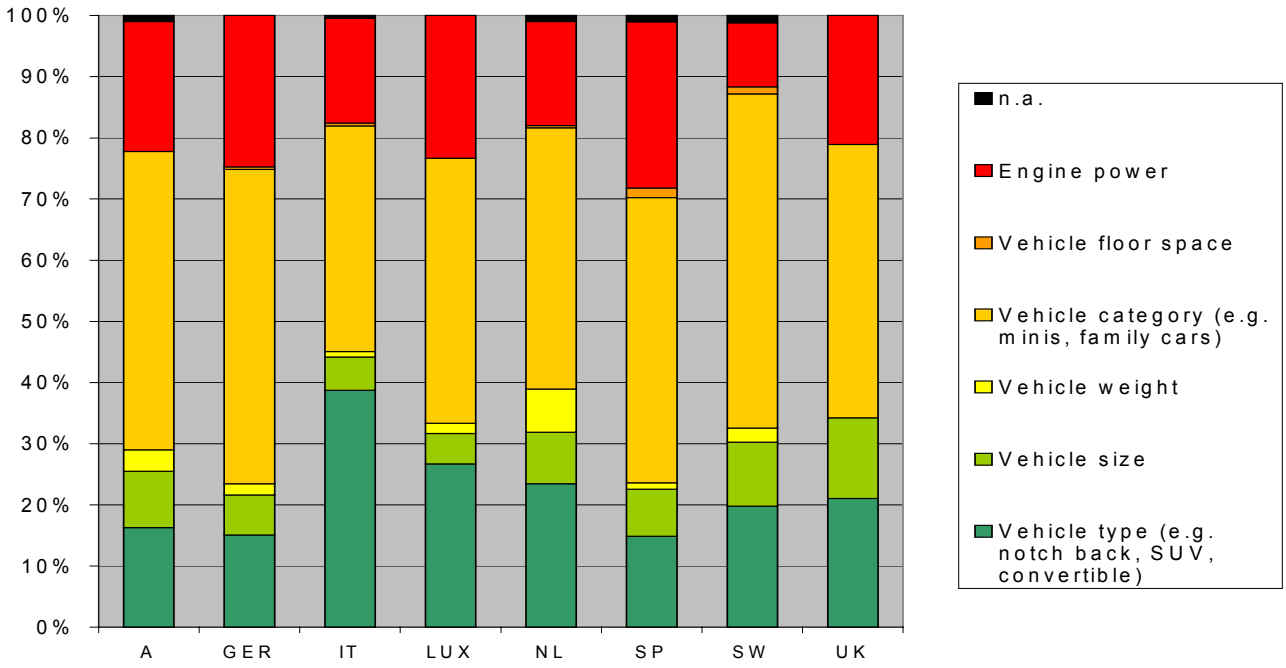

Figure 18: Comparison criteria, if a relative comparison is preferred

C.1.2.4 Summary and conclusions

The findings of the members survey confirm the findings based on the Member States' reports and the CLASE project shown in chapter C.1.1.

The environmental friendliness of a car does not rank among the major factors in vehicle purchase decisions of purchasers of a new car. 1st priority factors are in particular car reliability and safety standard. But also vehicle type (e.g. notch back, SUV, convertible), vehicle price, running cost and comfort are important criteria for the selection of a new passenger car. Environmental friendliness is ranked in general in the middle or at the end.
The fuel consumption is ranked 1st, when taking the "environmental friendliness" and the "running cost" into account separately.
Fuel consumption is the most important factor in terms of "environmental friendliness" of a passenger car. Low CO_2 emissions are less important. This shows that most consumers are not aware of the correlation of fuel consumption and CO_2 emissions of passenger cars and their environmental impact. Alternative fuels (e.g. CNG, hybrid) have no great importance generally.
As to the "running cost" of a passenger car, the fuel cost is the most important factor. This confirms the findings of the Member States' reports as well as of the CLASE study that fuel consumption is mostly only important for economical reasons, but not because of environmental issues.

When purchasing a new passenger car, consumers consult divers information sources, e.g. dealerships, sales brochures, car magazines. The members survey also confirms the increasing importance of the internet as a source of information, especially the websites of the car manufacturers. An interesting finding is that TV automobile programmes are of less importance and promotion/advertising is even insignificant for the consumers.

The members survey also confirms that general awareness of the "energy efficiency labelling" Directive as well as its provisions is quite small (except in the Netherlands).
It is interesting that a contrary result can be noted for the question *"Do you pay attention to CO_2 emissions and fuel consumption data in promotion materials for a car model?"*. While in 7 countries more than half of the participants indicate to pay attention to CO_2 emissions and fuel consumption data, in the Netherlands only 34 % agree. Here, the label and poster seem to be more relevant.

In the Netherlands, more than half of the participants got the information from the dealers. The other information sources are quite irrelevant here. Within the other 6 countries the results vary widely, besides the dealers, automobile clubs and consumer protection organisations, automobile magazines as well as the internet were the most important sources of information, and often consumers noticed the provisions by themselves. Newspaper advertisements, radio/TV as well as family/friends were in general quite irrelevant as information source.

The findings of the members survey also confirms that the tendency can be identified in all countries that the information tools are regarded as comprehensible and extensively as informative, but with less effect on car purchase decisions. The label is mostly regarded as the most effective information tool, closely followed by the guide. The poster is generally regarded as less effective.

A direct comparison of CO_2 emissions or fuel consumption of passenger cars is important for most consumers. But the members survey shows that the interest in choosing a passenger car of another vehicle category, with less CO_2 emissions and lower fuel consumption (e.g. mini instead of small family car) is relatively small - about 25 %. Only in Italy, 45 % of the participants would be willing to choose a more fuel efficient car of another vehicle category. In the Netherlands and Sweden, willingness is less than 20 %.

An energy efficiency rating system (A-G) for passenger cars, similar to the one for white goods, is preferred by most of the consumers.
The majority of the participants prefers a "comparison of cars of a certain group". Only in the United Kingdom, the "comparison of all cars" wins by a close vote. As a basis for a relative comparison the "vehicle category" (e.g. minis, family cars) is the preferred criterion, followed by "vehicle type" (e.g. notch back, SUV, convertible) and "engine power". "Vehicle weight" and "vehicle floor space", used for example in Switzerland, the Netherlands or Spain as comparison criteria, are unimportant for the participants of the members survey and rank in general at the end, far behind the "vehicle size", which ranks fourth.

C.2 Assessment of the effectiveness of the Directive's provisions regarding the reduction of CO_2 emissions

In this chapter, the effectiveness of the Directive's provisions regarding the reduction of CO_2 emissions will be assessed.
Therefore, besides the results of the evaluation of the Member States' reports and of the CLASE project, the development of the specific CO_2 emissions of new passenger cars in the Member States as well as the findings of the DLR (German Aerospace Centre - Institute of Transport Research) for the "Preparation of the 2003 review of the commitment of car manufactures to reduce CO_2 emissions from M1 vehicles" are taken into account.

According to this commitment the target of 140 g CO_2/km must be achieved by technical measures taken by the manufacturers and market changes linked to these developments. The Commission has to report to the Council and the European Parliament whether the reductions achieved are due to such technical measures or due to other measures such as changes in consumer behaviour which are unrelated to any technical measures adopted by the manufacturers.
The aim of the DLR study is to provide the European Commission with information about causes for the CO_2 reduction achieved between 1995 and 2003. It addresses the identification of reasons for already observed changes in CO_2 emissions and the assessment of their contribution to the total reductions achieved up to end 2003. Special attention is given to the question of technological developments and market changes linked to these developments compared to other measures.

C.2.1 Development of the average specific CO_2 emission of new passenger cars

C.2.1.1 Development of the average specific CO_2 emission of new passenger cars in the EU-15

Decision 1753/2000/EC of the European Parliament and the Council established a scheme to monitor the average specific CO_2 emissions of new passenger cars. All member States have to report yearly on the average CO_2 emissions of new car registrations following a fixed format. For the first time, official EU CO_2 monitoring data are used for calculating the 2002 figures. Before 2002, the European Commission used the according figures provided by the car manufacturers associations ACEA, JAMA and KAMA.

Figure 19 shows the development of the average specific CO_2 emissions of new passenger car registrations in the EU-15 Member States between 1995 and 2003.
Compared to 1995, the average specific CO_2 emissions have been reduced by 11.8 % from 186 g/km to 164 g/km. The fuel efficiency improvements for diesel cars (179 g/km → 157 g/km: -12.3 %) are clearly better compared with petrol fuelled vehicles (189 g/km → 171 g/km: -9.5 %).
Since in the same time period the share of diesel cars sold in the European passenger car fleet increased from 22.2 % in 1995 to 44.4 % in 2003, the share of diesel cars as well as the improvements of the diesel technology have to be considered as an important element in the average decrease of the CO_2 emissions.
Based of the almost linear regression of the CO_2 emissions since 1995, it can be noted that a larger annual decrease of CO_2 emissions will be necessary in the future to achieve the voluntary targets of 140 g/km by 2008 (ACEA)/2009 (JAMA, KAMA) and 120 g/km by 2010.

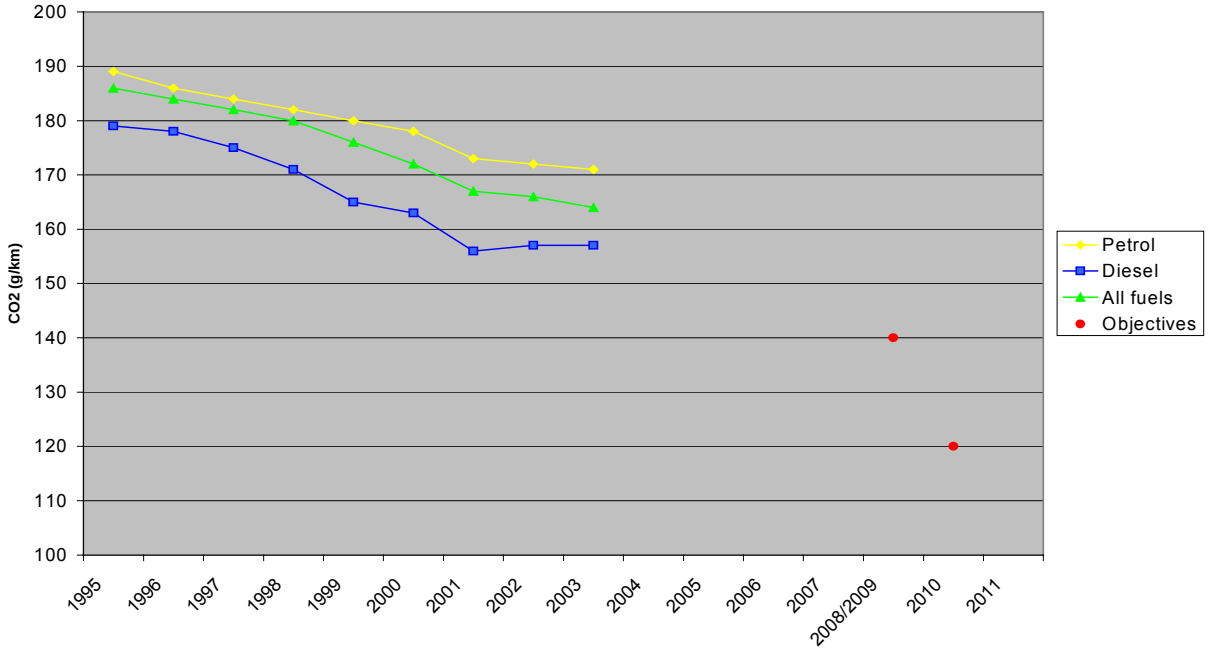

Figure 19: Development of the average specific CO_2 emissions of new passenger car registrations 1995 - 2003 in the Member States (EU15) and the objectives

C.2.1.2 Development of the specific CO_2 emission of new passenger cars in the single Member States

Table 3 shows the development of the average specific CO_2 emissions of new passenger car registrations per Member States between 1999 and 2002. The figures are based on the car sales by the ACEA members, JAMA and KAMA are not included. The percentage of decrease of the average specific CO_2 emissions from the first year of the national implementation of Directive 1999/94/EC are indicated in bold.

	Specific CO_2-emission				Decrease / Increase		
	1999	2000	2001	2002	99-00	00-01	01-02
A	166	163	157	160	-2,2%	**-3,3%**	1,8%
B	168	163	157	158	-3,0%	**-4,0%**	1,0%
DK	182	178	173	168	**-2,2%**	-3,0%	-2,7%
F	166	161	156	153	-3,0%	-3,4%	-2,1%
FIN	-	-	179	178			-0,7%
GER	181	178	173	176	-1,7%	-2,9%	1,8%
GR	-	-	-	166			
IRE	168	164	165	162	-2,3%	0,4%	**-1,7%**
IT	165	159	153	154	-3,7%	-4,0%	0,9%
LUX	181	173	167	170	-4,2%	**-3,5%**	1,9%
NL	176	174	171	171	-1,1%	**-1,9%**	0,2%
P	159	155	154	152	-2,4%	-0,7%	**-1,6%**
SP	165	162	157	153	-1,4%	-3,0%	-2,6%
SW	203	200	199	198	-1,7%	-0,2%	-0,8%
UK	184	180	174	172	-2,4%	-3,1%	**-1,2%**
EU-15	174	170	164	165	-2,5%	-3,1%	0,2%

Table 3: Development of the average specific CO_2 emissions of new passenger car registrations 1999 - 2002 per Member States (EU15) (Source: CLASE WP4 report)

The evaluation of the figures shows that in some Member States (Austria, Belgium, Netherlands), the decrease one year after the implementation of the consumer information seems indeed to be higher than the average decrease of the past and/or following years. In other Member States (Luxembourg, Portugal, UK, Denmark), however, the decrease is not higher one year after the implementation compared to the other years.

Considering the average specific CO_2 emissions of new passenger cars per Member State, it can also be noticed that the average specific CO_2 emissions vary widely from country to country.
While in France, Italy, Portugal and Spain the average value was less than 155 g/km in 2002, in Sweden the average CO_2 emissions was 198 g/km followed by Finland and Germany with 178 g/km and 176 g/km.
Since Directive 1999/94/EC was not implemented into national law at that time by France, Italy and Spain, the Directive's provisions could not have any influence on this development.

Taking the development of the CO_2 emissions - grouped in 7 classes - in the Member States (except Luxembourg) based on the registration figures of the years 2001 to 2003 for the 30 most popular vehicle models (data supplied by JATO Dynamics) into account, the same tendency can be determined, as shown in Figure 20.

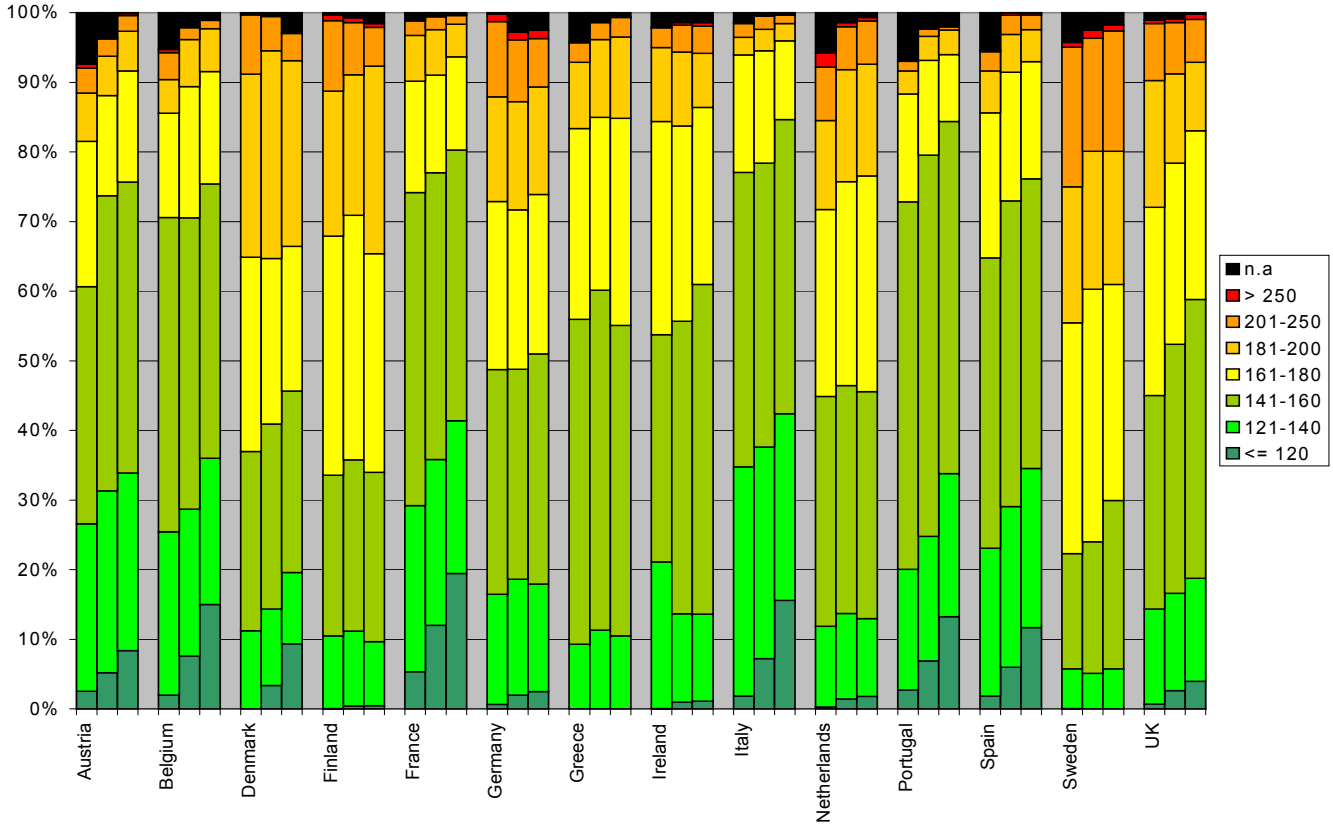

Figure 20: Development of the CO_2 emissions - grouped in 7 classes - per Member State (except Luxembourg) based on the new passenger car registrations 2001-2003 for the 30 most popular vehicle models

C.2.1.3 Conclusion

Assessing the effectiveness of the Directive's provisions by analysing CO_2 emission figures does not seem feasible.
Due to the different elements of the European strategy it is impossible to distinguish the shift in purchase behaviour through the consumer information from the technological evolution agreed in the voluntary agreement of the automobile industry and pricing measures through fiscal incentives.
There is an annual decrease of CO_2 emissions and in some Member States, a larger decrease can be seen a year after implementation of the consumer information. But, this larger decrease can not be seen in all Member States.
A specific difficulty in monitoring the CO_2 emissions is that different data sources have been used since 2002 which makes the comparison with the period before 2002 difficult.

C.2.2 DLR study

The DLR'S investigation intended to identify whether the CO_2 reduction achieved between 1995 and 2003 were due to technical measures or due to other measures such as the changes in consumer behaviour that are unrelated to any technical measures adopted by the car manufacturers.

The procedure and methods applied were mainly divided into three parts, a descriptive one and two econometric analyses, using technical attributes in the one case and non-technical influences in the other case. As data of the Monitoring Report do not provide sufficient information about consumer behaviour, a data set of new registrations on model and version level, provided by POLK, was mainly used for the analysis. Cars have been grouped into segments and power sub-groups. As the study concentrated on issues being relevant for the European average, a description of sophisticated hybrid cars or incentives for alternative fuelled vehicles is not included.
The potential influencing factors as well as the main findings of the DLR study are summarised in the following chapters.

C.2.2.1 Potential influencing factors on the average CO_2 emissions

When assessing the development of the average CO_2 emissions it has to be taken into consideration that there are several potential factors which may have an influence on the reduction of the average CO_2 emissions. Thereby, it can be differentiated between technical and non-technical influences.

C.2.2.1.1 Technical influences

Between 1995 and 2003, car manufacturers introduced several technologies to reduce fuel consumption. At the same time consumer needs and automotive regulations led to additional features, which had a negative impact on cars' efficiencies. The main developments, which concern primarily engine technologies, transmission types and other technical vehicle attributes, are shown in Table 4.

Technical influences		
Engine technologies	Transmission technologies	Other technical vehicle attributes
Petrol engines: • New lightweight materials. • Electronic control systems for ignition and fuel injection • Reduced internal friction, • Change from the singlepoint to the multipoint injection, • Introduction of variable valve train, direct injection and port deactivation.	Improvements of manual gear-boxes.	Vehicle weight
Diesel engines: • Change to direct injection engines, partly by the second and third generation with high pressures.	Introduction of automated manual transmission and continuously automatic transmissions.	Vehicle dimensions: • Length • Width • Height.
Alternative drive-trains: • Introduction of hybrid, CNG or LPG cars.		Other engine related attributes: • Engine power • Cubic capacity • No. of cylinders.

Table 4: Survey of main technical influences

C.2.2.1.2 Non-technical influences

Non-technical influencing factors are measures, which may cause changes in consumer behaviour and which are unrelated to any technical measures adopted by the manufacturers. These are politically motivated measures, socio-economic trends and other possible influences on the new passenger car market. An overview of the most important factors is shown in Table 5.

Non-technical influences		
Politically motivated	Caused by socio-economic trends and consumer preferences	Other influences
Fiscal measures influencing • Car purchase (e.g. registration tax), • Car ownership costs (e.g. circulation tax), • Car running costs (e.g. fuel tax including diesel-petrol differentiation).	Economic influences: • Higher or lower income level of people.	Active influence on the market by extraordinary promotion for certain cars (e.g. phase-out models or sale for manufacturers employees).
Introduction of Labelling	Demographical influences: • More senior car purchasers.	Stimulation of consumers interest by extending or changing the model range (diversity of automobile supply).
Scrapping incentives	Social influences: • More (young) female car purchasers.	
EU-regulations from other fields affecting fuel consumption (e.g. considering emissions and safety).	Trends in lifestyle and car ownership (e.g. higher share of MPV and Off-Road cars etc.).	

Table 5: Survey of non-technical influences, which can affect consumers behaviour

C.2.2.2 Findings of the DLR study

The evaluation of DLR shows that the technical improvements are the main causes for the CO_2 reduction achieved between 1995 and 2003. Remarkable changes in the use of technologies for the reduction of the fuel consumption of new passenger cars have been observed within the period under investigation. The most significant are advanced combustion technologies for diesel engines. Further improvements have been applied to already available technologies (e.g. by friction reduction or electric power steering). The identified improvement in diesel technology is larger than in petrol technology. While the identified improvements in the individual segments for ACEA have caused reductions of up to 17.6 % for petrol vehicles, diesel reductions have been greater, reaching a maximum value of 20.6 %. Individual segments of JAMA reached even higher reduction rates as the upper values were 19.9 % for petrol and 35.5 % for diesel.

Alternatively, an econometric analysis of technical factors on CO_2 emissions revealed significant technical improvements with respect to the attributes kerb weight, engine power, and height. Specifically, for a given range of values for these attributes CO_2 emissions were reduced by 7 to 14 % between the years 1996 and 2002. The largest decreases were observed for the attribute height for diesel cars, which on average had emissions that were 27 g/km lower in 2002 over all possible values for the variable. However, conclusions with regard to the contribution of technological developments to the overall CO_2 reductions can not be drawn due to the limited number of technical indicators available.

As non-technical influences possibly affecting the behaviour of purchasers, politically motivated measures such as taxes, socio-economic trends, e.g. people's income and other factors like the offered model range were analysed.
The most relevant influences were deemed to be per capita GDP, fuel prices and the annual circulation taxes. For these variables, estimates were made that show their effect on the average European CO_2 emissions over the range of values observed in the data. The effect of changes in the market structure was evaluated by the descriptive analysis.

With respect to ACEA automobiles, the GDP had the strongest influence on petrol automobiles, a determinant which was found to increase CO_2 by 2.49 grams over the values analysed. The average CO_2 emissions of the JAMA fleet was also increased by GDP, but by only 1 gram. The remaining differences in CO_2 emissions were considerably smaller, as were discrepancies between the ACEA and JAMA values. This, in addition to the fact that some influences were positive and others negative, led to the conclusion that the non-technical influences analysed played an insubstantial role on net in the overall average CO_2 emission reductions in the ACEA and JAMA fleets.

C.2.3 Findings based on the Member States' reports and the CLASE project

Since there are various factors that have an important but not precisely known effect, such as fiscal measures, shift from diesel to petrol cars or vice versa or the national structure of the car market, it is quite impossible to analyse the impact of the Directive's provisions based on the development of the registration data as well as the development of the average fuel consumption or CO_2 emissions.

Based on the findings in the Member States' reports and the CLASE project, a more detailed analysis is made by the example of Denmark and the Netherlands whereas also their vehicle taxation systems or tax incentives, which are directly linked to the fuel consumption or CO_2 emissions of new passenger cars, will be taken into account.

Since the findings of the evaluation of the Member States' reports (complete results see chapter B) confirm the findings of the CLASE study, the results of both studies are summarised in the following chapters.

C.2.3.1 Denmark

In Denmark the development of the average fuel reach (km/l) and the registration figures separated by energy efficiency class (A-G) from 1998 to 2002 was assessed.
The introduction of the label in DK in 2000 resulted in a 7 % increase in demand for cars labelled "A" to "C", the percentage of cars labelled "D" to "G" decreased accordingly. See figure below.

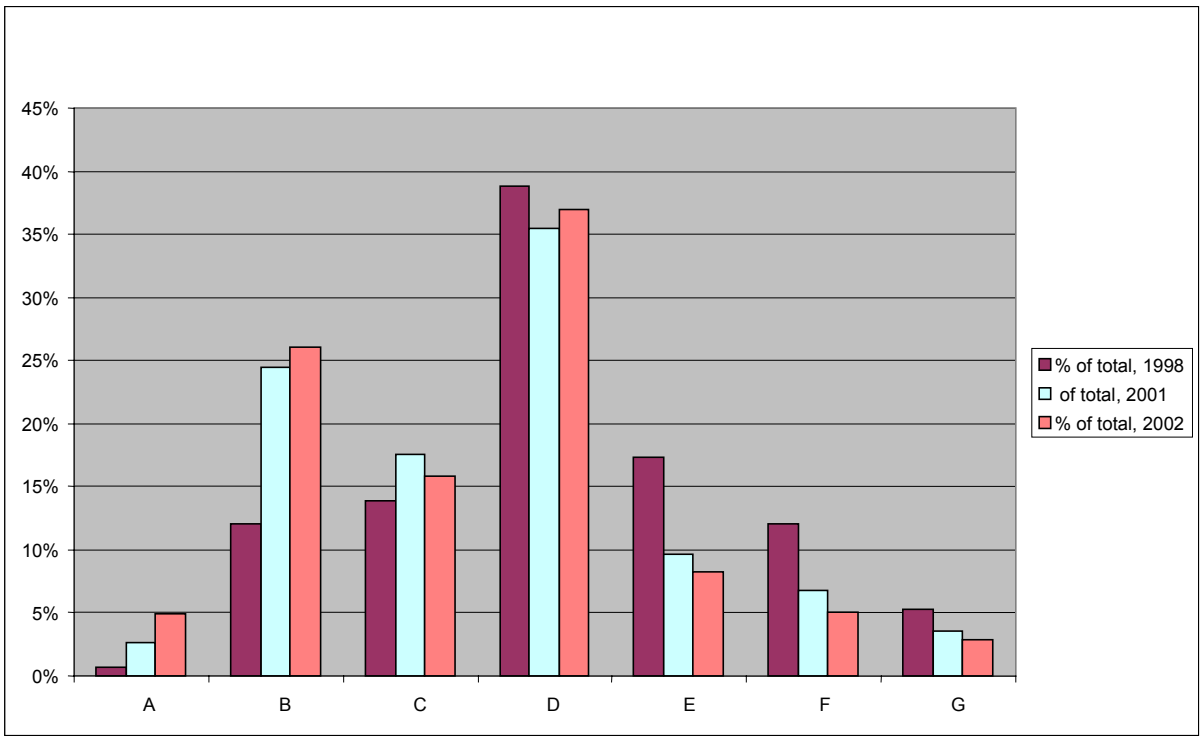

Figure 21: Registration figures separated by energy efficiency class (A-G) in 1998, 2001 and 2002 in Denmark (Source: CLASE WP4 report)

So, the demand for more fuel efficient cars seems to be rising steadily, at the same time, a shift towards diesel cars is visible. The share of diesel cars raised from 4.7 % in 1998 to 19.3 % in 2002.
Also the average fuel reach (km/l) changed from 1998 to 2002. Diesel cars now have a reach of 19.8 km/l instead of 15.7 km/l in 1998 and petrol cars increased mileage from 13.1 km/l to 13.7 km/l.

But it has to be considered that the effectiveness of the Directive can not be assessed separately, because the "Green motor tax", which is also based on the fuel reach, may have a main influence on this development.

„Green motor tax":

In 1997 the Danish annual motor tax was changed from a weight-based system to a new system using the fuel reach (km/l) as a basis. 24 fuel efficiency classes for petrol vehicles were established, ranging from an annual tax of 520 Kr (68 €) for a fuel efficiency rate of more than 20 km/l up to 18,460 Kr (2,400 €) for less than 4.5 km/l. The classification for diesel comprises 27 classes ranging from 160 Kr (21 €) for a fuel efficiency of more than 32.1 km/l up to 25,060 Kr (3,258 €) for less than 5.1km/l.

The aim of the „Green motor tax“ was to provide incentives for the purchase and use of more fuel-efficient cars. The lowest annual taxation rate for both petrol and diesel was significantly lowered to 68 € instead of 183 € and 21€ instead of 280 € respectively. Moreover, the range of annual tax amount has spread.

C.2.3.2 The Netherlands

Since the standard for the energy efficiency classes (based on the average fuel consumption of all newly registered cars) is updated yearly, it is not possible to monitor whether cars become more fuel efficient based on the percentage of the energy efficiency classes (A-G). Changes can only be determined, if the fuel economy standard of a certain year is also used for other years.

If the standard for 2002 is taken, it can be determined that after the implementation of the Directive in 2001, the percentage of class B (2000: 6.5 % → 2001: 9.5 %) and C (2000: 41.4% → 2001: 45.7 %) increased slightly, the percentage of class D, E and F decreased, class A and G did not change significantly. So, a moderate shift towards more fuel-efficient cars could be noted. But besides the implementation of the labelling, the introduction of more fuel-efficient passenger cars by the automobile manufacturers must be borne in mind.

From 01 January 2002, a fiscal incentive was introduced for environmental-friendly passenger cars of class A and B as a reduction from the registration tax (BPM). Buyers of passenger cars labelled “A” received an incentive of 1,000 €, buyers of passenger cars labelled “B” 500 €. In this year, the percentage of class A increased disproportionately from 0.3 % in 2001 to 3.2 %, class B from 9.5 % in 2001 to 16.1 %.
In January 2003 the Dutch government abolished the fiscal incentive again due to budgetary reasons. The market share of “A”- and “B-labelled” cars in 2003 decreased indeed substantially after abolishing the BMP refund (“A”: 0.9 %, “B”: 11.5 %).

	2001	2002	2003
“A-labelled” cars	0.3 %	3.2 %	0.9 %
“B-labelled” cars	9.5 %	16.1 %	11.5 %

Table 6: Market share of “A”- and “B-labelled” cars in the Netherlands, 2001 - 2003

This development points out, that tax incentives like the BPM refund in 2002 - here also directly linked with the labelling - are well accepted by consumers and seem to have a great impact on vehicle purchase decisions.
But since the market share of “A“- and “B-labelled” cars in 2003 still remained higher than in 2001, it can also be noted that the labelling is quite efficient.

C.2.4 Summary and conclusion

Due to the different elements of the European strategy it is quite impossible to distinguish the shift in purchase behaviour through consumer information from the technological evolution agreed in the voluntary agreement of the automobile industry and pricing measures through fiscal incentives.

The evaluation of the new passenger car registrations in the EU-15 Member States between 1995 and 2003 shows that the average specific CO_2 emissions have been reduced by 11.8 % from 186 g/km to 164 g/km. Thereby, the fuel efficiency improvements for diesel passenger cars (179 g/km → 157 g/km: -12.3 %) are clearly better than for petrol fuelled vehicles (189 g/km → 171 g/km: -9.5 %). Since in the same time period the share of diesel cars sold in the European passenger car fleet increased from 22.2 % in 1995 to 44.4 % in 2003, the share of diesel cars as well as the improvements of the diesel technology have to be considered as an important element in the average decrease of the CO_2 emissions.

Taking the development of the average specific CO_2 emissions of new passenger car registrations between 1999 and 2002 per Member State into consideration, an annual decrease of CO_2 emissions and in some Member States, a larger decrease can be seen a year after implementation of the consumer information. A higher decrease, however, can not be seen in all Member States.

The findings of the DLR study support the conclusion that the technical improvements are the main causes for the CO_2 reduction achieved between 1995 and 2003. The most significant improvements are advanced combustion technologies for diesel engines. Further improvements have been applied to already available technologies (e.g. by friction reduction or electric power steering). The identified improvement in diesel technology is larger than in petrol technology. An econometric analysis of technical factors on CO_2 emissions revealed also significant technical improvements with respect to the attributes kerb weight, engine power, and height.
Regarding non-technical influences, the most relevant influences were deemed to be per capita GDP, fuel prices and the annual circulation taxes. The fact that some influences were positive and others negative led to the conclusion that the non-technical influences analysed played an insubstantial role on net in the overall average CO_2 emission reductions.

Nevertheless, as shown by the example of Denmark and the Netherlands other measures like vehicle taxation systems based on fuel consumption or CO_2 emissions as well as tax incentives for particularly fuel efficient passenger cars may have by all means a main influence on the decrease of the average CO_2 emissions.

Especially the BPM refund by the Dutch government in 2002 for “A”- and “B-labelled” cars and its abolishment in 2003, proves that tax incentives are well accepted by consumers and seem to have a great impact on vehicle purchase decisions. Since this incentive was also in direct relationship to the labelling, the interest of the consumers in the labelling could surely be increased. And in comparison with 2001, the market share of “A”- and “B-labelled” cars remained higher in 2003. Therefore an efficiency of the labelling can be quite determined.

It can be assumed that the Directive’s provisions have not yet been implemented long enough to reach their full effect.

Surely, the information on the label will not become the decisive factor in the purchase of a new passenger car. But in general, labelling can draw attention and consumers may start doubting about their choice, especially when the label is orange or red in terms of an energy efficiency rating system.
The information tools should enable the consumers to easily compare different vehicle models, but in practice, consumers do not often get the possibility to use the label to this effect.
The impact is particularly restrained by the low compliance at the dealerships. Dealers show often little interest because they are not asked about this specific information. And the consumers do not ask for this because they are not aware of the information tools. At the same time, the dealers stay the main source of information, so this puts the awareness as well as the effectiveness rising in a dead-lock.

C.3 Effectiveness of the energy efficiency labelling Directive 92/75/EEC on household appliances

Since the energy efficiency labelling of household appliances was already implemented in 1995 in the European Union, there is quite a long experience on labelling in this sector. To look at the development and the success of the labelling of household appliances might be helpful to draw conclusions on the relatively new labelling Directive of new passenger cars.

In the past, various studies on the effectiveness of Directive 92/75/EEC were carried out by several institutions. For a more detailed evaluation the following studies are taken into account in the following chapters:

- "Cool Labels - The first three years of the European Energy Label" - University of Oxford, UK, 1998
- "Evaluating the Implementation of the Energy Consumption Labelling Ordinance " - Fraunhofer ISI, Germany, 2001

C.3.1 Legal background

On 22 September 1992, the Council Directive 92/75/EEC on the indication by labelling and standard product information of the consumption of energy and other resources by household appliances was adopted by the Council of the European Communities. Bases on this Directive the Member States are obliged to adopt standardised consumption labelling as national law. According to Article 1 paragraph 1, the Directive applies to the following types of household appliance:

- Refrigerators, freezers and their combinations
- Washing machines, tumble driers and their combinations
- Dishwashers
- Ovens
- Water heaters and hot-water storage appliances
- Lighting sources
- Air-conditioning appliances.

Based on the Council Directive 92/75/EEC, the European Commission defined details of the relevant type of appliance and the obligation to implement the corresponding directives. As yet, directives were adopted for the following electrical household appliances: household electric refrigerators and freezers and their combinations (Directive 94/2/EC with amendment 2003/66/EC), household washing machines (Directive 95/12/EC), household electric tumble driers (Directive 95/13/EC), household combined washer-driers (Directive 96/60/EC), household dishwashers (Directive 97/17/EC and amendment 99/9/EC), household lamps (Directive 98/11/EC), household air-conditioner (Directive 2002/31/EC) and household electric ovens (Directive 2002/40/EC). A further directive on labelling hot water heaters is planned.

Labelling is done with the so-called energy labels which are made up of a generic colour background and a model-specific data strip which is stuck onto this. Size, form and colour design as well as the information displayed are stipulated in law by the European Union. The label contains important energy and environmentally relevant data in tabular form such as electricity and, where appropriate, water consumption, volume capacity, useful capacity, washing performance or noise emissions.
It was not possible to design a completely uniform label for all types of appliance. However, one joint characteristic is the categorisation of the appliance into one of seven energy efficiency classes from A to G, which are standardised throughout the EU.

"A" (green on the label) stands for low energy consumption or for high efficiency, e. g. a high washing performance and drying efficiency in washing machines, and "G" (red on the label) for a high energy consumption and low washing and drying efficiency. The criteria for the categorisation into the individual energy efficiency classes were standardised throughout Europe and are based on studies and market surveys which reflect the market supply at about the time the Directives came into force.
As this was done a relatively long time ago (1994 for refrigerators and freezers), the class categorisation for some types of appliance is based on an outmoded technical state. In these cases, particularly efficient appliances are no longer recognisable from the energy label. Within the Commission of the European Community, therefore, preparations for an adaptation of class categorisation began some time ago. This was at first applied to refrigerators and freezers by the introduction of two additional classes, to be designated as A+ and A++, as an interim arrangement until a comprehensive revision of the energy labelling classes takes place (Amendment 2003/66/EC to Directive 94/2/EC).

C.3.2 Compliance with the Directive's provisions

As shown in chapter C.3.1, there are 7 products which have been labelled since 1995 in more or less the same manner. Hence, in the following especially the labelling of refrigerators and freezers and their combinations according to Directive 94/2/EC is considered in detail.

C.3.2.1 Implementation into national law by the Member States

The implementation of Directive 94/2/EC into national law was similar to the implementation of the labelling Directive for new passenger cars.

Only 4 Member States - Austria, Denmark, Greece and the UK - implemented the Directive on 01 January 1995 as required. Finland, France, Ireland, Portugal, Spain and Sweden implemented later in 1995, Luxembourg and the Netherlands in 1996, Belgium followed at the beginning of 1997 and in Germany the national legislation came into force on 01 January 1998.

Due to this late implementation of the more populous countries in the Community, by 01 January 1995 only about 20 % of the EU population was affected by the directive. Still at the end of 1995 only 55 % of the population of the Community lived in a Member State where the labelling scheme was in force. By the end of 1997 the coverage reached 82 % of the EU population. (Source: "Cool Labels - The first three years of the European Energy Label" - University of Oxford, UK, 1998).

C.3.2.2 Energy efficiency labels at the point of sale

The degree of compliance with the Directive's provisions in the retail sector was rather poor according to the results of the EU evaluation.

In June 1997, an average of 56 % of refrigerators and freezers were completely and correctly labelled. Compliance levels varied substantially between different countries, ranging from 17 % in Italy to 94 % in the Netherlands. In only three Member States (Denmark, the Netherlands and the UK) more than 70 % of appliances were fully labelled even 30 months after the Directive became mandatory.

The low level of coverage meant that consumers in many countries did not have full information on energy efficiency available when choosing a cold appliance. (Source: "Cool Labels - The first three years of the European Energy Label" - University of Oxford, UK, 1998).

C.3.3 Effectiveness on sales and production

C.3.3.1 Sales development of household appliances related to energy efficiency class in Germany

In the Fraunhofer ISI study, the sales development of household appliances with regard to the energy efficiency classes was evaluated for the period from 1995 to 2000 (including September 2000) in Germany.

As shown in Figure 22, over the years, there has been a clear increase in the share of higher efficiency classes and a drop in the share of the poorer classes and non-labelled appliances in all product groups. However, there are considerable differences between the different types of appliance.
Within the refrigerators and freezers, the refrigerators come off best with regard to energy efficiency. Even before the introduction of the labelling obligation in Germany, there was a certain share of A class appliances. Since the introduction of the labelling obligation, this share has increased continuously up to 36 % in 2000. The share of “B-labelled” appliances has also grown considerably and only 17 % of appliances sold still belong to lower energy efficiency classes. Even so, there are still 6 % of all appliances which do not belong to any class, usually older models or those not assigned an efficiency class by the manufacturer. This was hardly the case at all for fridge-freezers and freezers, these product groups do well; although the share of fridge-freezers sold in class A is much lower than the share of refrigerators in this class.
With 54 %, washing machines had the biggest share of energy efficiency class A of all appliance groups in 2000. Only 10 % of these appliances were in classes poorer than B and a mere 2 % were not classified at all.
Washer-driers only constitute a very small share of the total numbers of appliances sold which have to be labelled. In contrast to washing machines, there are no appliances in the energy efficiency class A; the appliances sold are mainly spread across class B and C.
The situation is even worse for tumble driers. Only very few “A-labelled” appliances and no “B-labelled” appliances were sold; more than 70 % of the driers sold are from energy efficiency class C, a further 20 % from class D.
As dishwashers, the share of appliances without labels is the highest of all product groups at 22 %. Only 18 % belongs to energy efficiency class A. The late introduction of the labelling obligation on 01 March 1999 certainly plays a decisive role in this segment, so that further increases in the shares in class A and B as well as a drop in non-classified appliances can be expected.

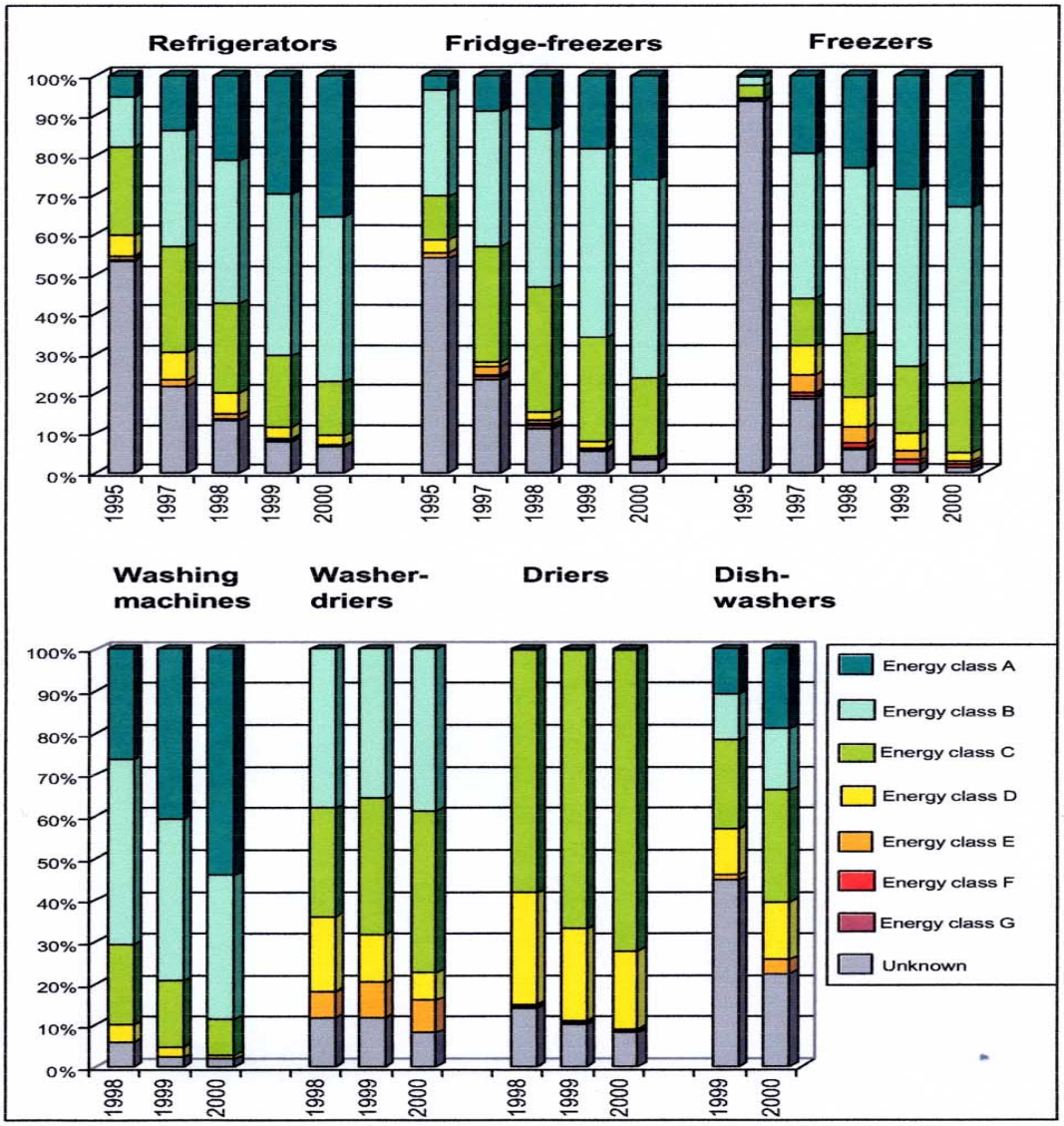

Figure 22: Development of the shares of energy efficiency classes in total sales of household appliances in Germany from 1995 to 2000 (Source: "Evaluating the Implementation of the Energy Consumption Labelling Ordinance" - Fraunhofer ISI, Germany, 2001)

C.3.3.2 Sales development of refrigerators including fridge-freezer combinations related to energy efficiency class in 10 countries of the European Union

In its European-wide evaluation, the Fraunhofer ISI study also evaluated the sales development of household appliance in 10 countries of the EU by the example of refrigerators including fridge-freezer combinations with regard to the energy efficiency classes for the period from 1998 to 1999.

Figure 23 shows, that on average, the share of "A" appliances in the total number of appliances sold in ten countries of the European Union increased from 8.1 % in 1998 to 12.3 % in 1999, the share of "B" appliances also increase from 25.4 % to 32.6 %.

In all of the 10 Member States an increase of "A"- and "B-labelled" appliances could be noticed to a greater or smaller extent.
In Germany, the share of "A" and "B" appliances in 1999 was above average at 26 % and 42.9 % respectively. Austria, Belgium and the Netherlands also have above-average shares

of energy-efficient “A” and “B” appliances. In Portugal, Spain, France, Great Britain and Italy, the share of appliances in the highest efficiency class in particular was still very small in 1999. Above all, in Denmark, the Netherlands and Sweden, accompanying measures on energy consumption labelling had been taken on a larger scale.

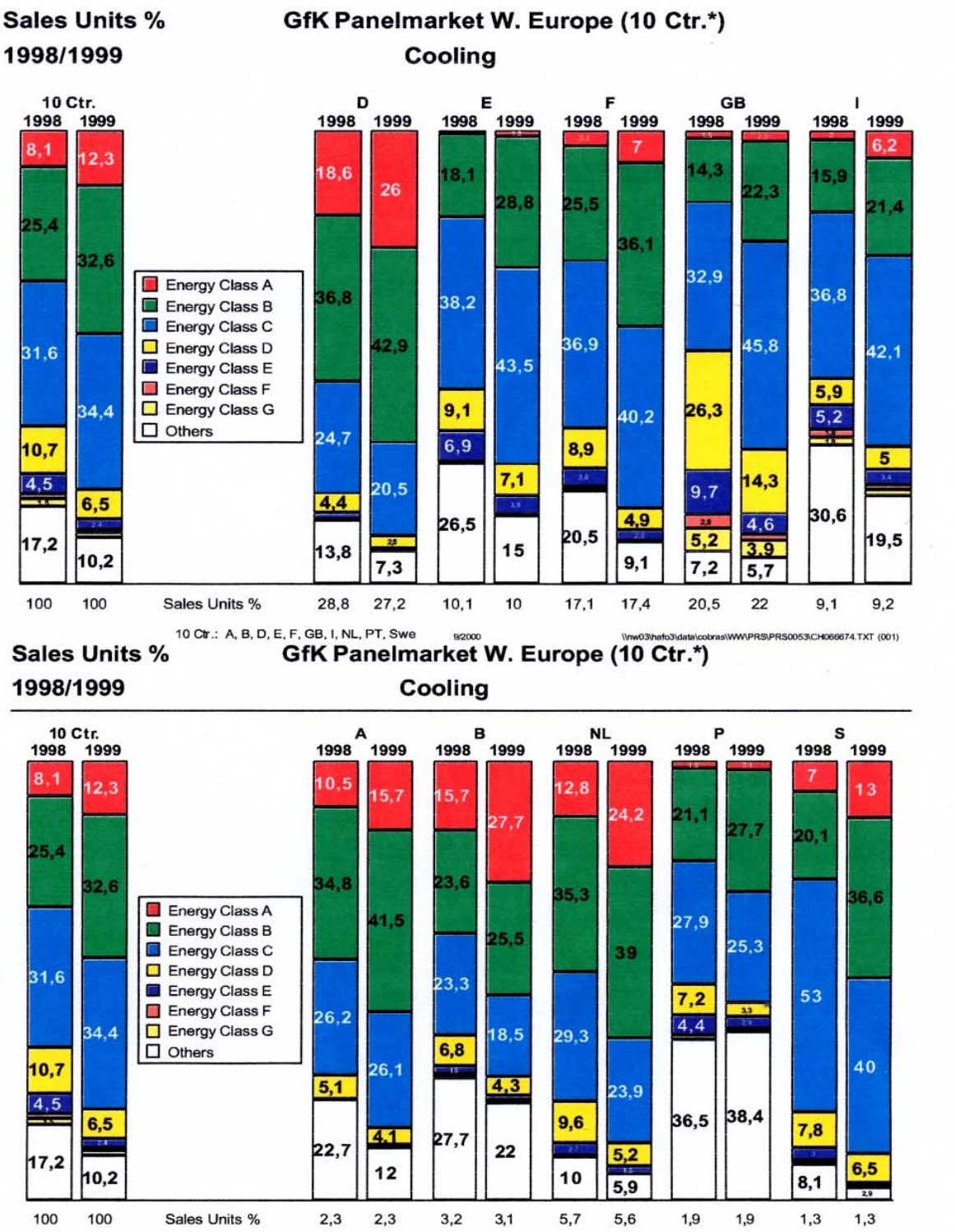

Figure 23: Share of the energy efficiency classes in the total number of refrigerators (incl. fridge-freezer combinations) sold in 10 countries of the EU (Source: “Evaluating the Implementation of the Energy Consumption Labelling Ordinance ” - Fraunhofer ISI, Germany, 2001)

C.3.3.3 Conclusion

Considering the sales development of household appliances related to the energy efficiency class, a continuous increase of more energy efficiency appliances can be determined in all Member States since the implementation of the labelling Directive.

It also gives the impression that more and more household appliance are designed just to satisfy a specific energy label class threshold. Especially the change in the structure of the distribution of the household appliances, with peaks corresponding to a specific energy label class threshold, supports the conclusion that the change in supply is due to the introduction of the energy labelling scheme.

But, the steadily increase of “A”- and “B-labelled” appliances also clearly indicates the problem of not having a dynamic label with a regular review of the energy efficiency class thresholds.
Since more and more household appliances meet the threshold of the higher classes the differentiation of the products offered for sale diminishes steadily.
To counter this development, the energy efficiency classes were reviewed in 2002 and two new classes A+ and A++ were introduced. This was applied at first to refrigerators and freezers, as an interim arrangement until a comprehensive revision of the energy labelling classes takes place (Amendment 2003/66/EC to Directive 94/2/EC).
This is one way of getting the labelling scheme in line with the technological development, but the fact that there are now three different A-classes might not be the best solution if a clear and understandable communication to the consumer is the objective.

C.3.4 Perceptions for the labelling of new passenger cars

The labelling of household appliances shows that the labelling with standard energy efficiency classes has proven to be a success. The market sales and product design have been moved to more energy efficient products by the labelling Directive. Due to a common label design, also the cost for manufacturers and retailers could have been kept low.

But the experience of the household appliance labelling also points out that it takes time to get the provisions running and to become effective.
The most important item therefore is the compliance with the Directive’s provisions at the dealerships and consumer awareness of the provisions. The link between compliance and the rate of consumers that remember the label indicates that there is good reason in trying to increase compliance.

Another important item is the definition of the energy efficiency classes. The sales development of household appliances related to the energy efficiency class clearly shows that the thresholds of the classes have to be reviewed regularly to adjust them to the technical development of the products. Otherwise, more and more products will meet the threshold of the higher classes and the differentiation of the products offered for sale will diminish more and more.
Additional energy efficiency classes e.g. A+ and A++, as introduced for refrigerators and freezers are one solution, but surely not the most effective tool in communicating energy efficiency to the consumers.

Taking the experience of the labelling of household appliances into consideration, it is definitely recommendable to improve the labelling scheme of new passenger cars rather than to drop it.
Even if it will surely be a long way to reach the position the labelling of household appliances has, it is a challenge to develop a common energy efficiency labelling system for new passenger cars similar to the one for appliances. But there is also strong evidence that it could be a very powerful tool to increase the energy efficiency of the passenger car fleet.

D Evaluation of options on the improvement of the effectiveness of the labelling

Based on the preceding findings, options on the improvement of the labelling of new passenger cars are evaluated in this chapter. Thereby, special attention is paid to the introduction of an energy efficiency rating system as well as to the indication of additional information and data on the label.

D.1 Additional indication of energy efficiency classes

D.1.1 Already existing energy efficiency rating systems voluntarily introduced in some European countries

Since numerical information about CO_2 emissions and fuel consumption generally are without meaning for the most consumers, the following Member States already introduced an energy efficiency rating system in addition to the minimum requirements of Directive 1999/94/EC:

- Belgium
- Denmark
- The Netherlands
- Portugal
- Spain (optional)
- United Kingdom (introduced by Sept. 2005).

Also in Austria, for an easier optical comparison, the absolute CO_2 emission value (g/km) is marked with an arrow at a coloured CO_2 emission scale from green via yellow to red. But, since no energy efficiency classes are defined, a comparison with the energy efficiency rating systems of the above-mentioned countries is not possible.

The kind of rating system introduced by the Member States (except Portugal) is already known from the “Energy Labelling Directive” 92/75/EC for household appliances e.g. for white goods. Consumers are already familiar with this kind of rating system, which is more consumer friendly and offers immediately comparative terms.

The energy efficiency rating systems of these countries differ particularly in their comparison method: absolute or relative comparison.

Most of these countries prefer an absolute comparison method, which means that the energy efficiency classes are defined by CO_2 emission (g/km), fuel reach (km/l) or fuel consumption (l/100km) bands valid for all passenger cars offered for sale. An additional classification into car segments (e.g. minis, small family cars, ...) or based on the vehicle size, the vehicle weight or other parameters is not used. These countries are Belgium, Denmark, Portugal and the United Kingdom (introduced by Sept. 2005).
The Netherlands and Spain (optional) instead introduced relative comparison systems, which are based on the vehicle size, defined by the vehicle floor space.

Grouped in absolute and relative comparison, the different rating systems of the six Member States are specified more detailed in the following chapters D.1.2 and D.1.3. In addition to the Dutch and Spanish relative comparison systems also the Swiss comparison system, which indicates the energy efficiency classes in relation to the vehicle weight, is described.

Subsequently, the chapters D.1.4 and D.1.5 show a comparison of the absolute and relative comparison methods as well as their pro and cons. Based on the outcome of these comparisons, chapter D.1.6 shows the conclusion and recommendations.

D.1.2 Absolute comparison method

Most of the Member States, which already introduced an energy efficiency rating system, prefer an absolute comparison method, which means, that the energy efficiency classes are defined by CO_2 emission (g/km), fuel reach (km/l) or fuel consumption (l/100km) bands valid for all passenger cars. An additional classification into car segments (e.g. minis, small family cars, ...) or based on the vehicle size, the vehicle weight or other parameters is not used.

These countries include Belgium, Denmark and the United Kingdom (introduced by Sept. 2005), which introduced an energy efficiency rating system including 7 energy efficiency classes from A to G (B, DK) or at least 6 energy efficiency classes from A to F (UK). Also Portugal uses an absolute comparison method, but the Portuguese rating system includes only 4 energy efficiency classes, which is quite rough. Belgium and Denmark additionally determined two different energy efficiency class bands, one for diesel and one for petrol cars, to avoid an incentive for more diesel cars.

The main arguments for an absolute comparison are:

- An absolute system is the most simple comparison method to handle, especially across the EU market, and easy to understand for consumers.
- An absolute system avoids the arbitrary and contentious issues of defining the categories for an “in class” system and all the related issues. To develop a consistent and fair method for a relative comparison, which is accepted by all involved parties (e.g. government, ministries, environmental agencies, car manufacturers) is quite difficult. An energy efficiency rating system, which groups passenger cars into classes or which uses a relative comparison could be difficult to understand for the consumers, due to the complex calculation basis used for the determination of the energy efficiency classes.
- A relative comparison may be confusing for consumers, if a “small car” with low absolute fuel consumption is labelled for example with energy efficiency class D while a “bigger car” with a higher absolute fuel consumption is labelled with “A”, only because of its “bigger size” or “higher weight”.
- An absolute comparison method encourages the consumers to buy cars with fewer CO_2 emissions most directly, hence it gives an incentive for downsizing within the complete car fleet.
- A relative comparison system could tempt the car manufacturers to upscale possible borderline cases by e.g. increasing the weight, in a weight related system, and in that way to get a more fuel efficient label. This would not only increase actual fuel consumption, but also diminish the public trust in the label and make it more unreliable.
- An absolute comparison method provides the most direct link with, and helps reinforce the message from, fiscal measures which are linked to CO_2 emissions. It avoids the situation where an efficient but highly fuel-consuming car could show up as “red” in terms of the fiscal system, but “green” on an “in class” labelling system - a mixed message being conveyed to car buyers, through two Government-sponsored systems.
- An absolute comparison method also supports the successful delivery of the voluntary agreement of the car manufacturers to reduce CO_2 emissions of passenger cars most directly.

The following chapters provide more details and a comparison of the different rating systems of Belgium, Denmark, Portugal and the United Kingdom.

D.1.2.1 Belgium

The Belgian energy efficiency rating system includes 7 energy efficiency classes from A to G, with additional coloured description from green via yellow to red, based on the CO_2 emissions (g/km) and the fuel consumption (l/100km).
The energy efficiency classes are illustrated as a colour scale on which the CO_2 emissions and the fuel consumption of a car are indicated.
The rating system is identical for all kind of passenger cars. An additional classification into car segments (e.g. minis, small family cars, ...) or based on the vehicle size, the vehicle weight or other parameters was not established.
Each energy efficiency class has a separated CO_2 emission band (g/km) for diesel and petrol cars (see table below).
The definition of the CO_2 emission bands (g/km) is based on the average fuel consumption of all new car registrations in the year 2000, separated for petrol and diesel, which is used as the average value of energy efficiency class D.
The CO_2 emission bands can be revised every year, but they have not changed since the publication of the Royal Decree.

Energy efficiency class	CO_2 emission bands (g/km)	
	Petrol	Diesel
A	$CO_2 < 100$	$CO_2 < 85$
B	$100 \leq CO_2 < 130$	$85 \leq CO_2 < 115$
C	$130 \leq CO_2 < 160$	$115 \leq CO_2 < 145$
D	$160 \leq CO_2 < 190$	$145 \leq CO_2 < 175$
E	$190 \leq CO_2 < 220$	$175 \leq CO_2 < 205$
F	$220 \leq CO_2 < 250$	$205 \leq CO_2 < 235$
G	$CO_2 \geq 250$	$CO_2 \geq 235$

Table 7: Definition of the Belgian energy efficiency classes

Additional data or information on the label:

Besides the energy efficiency class and the numerical data on fuel consumption (l/100km) and CO_2 emissions (g/km), the information on the label includes an extra text in addition to the minimum requirements of the Directive:

- The importance of regular maintenance to keep fuel consumption and CO_2 emissions low is mentioned. This additional recommendation was included on demand of the car industry.

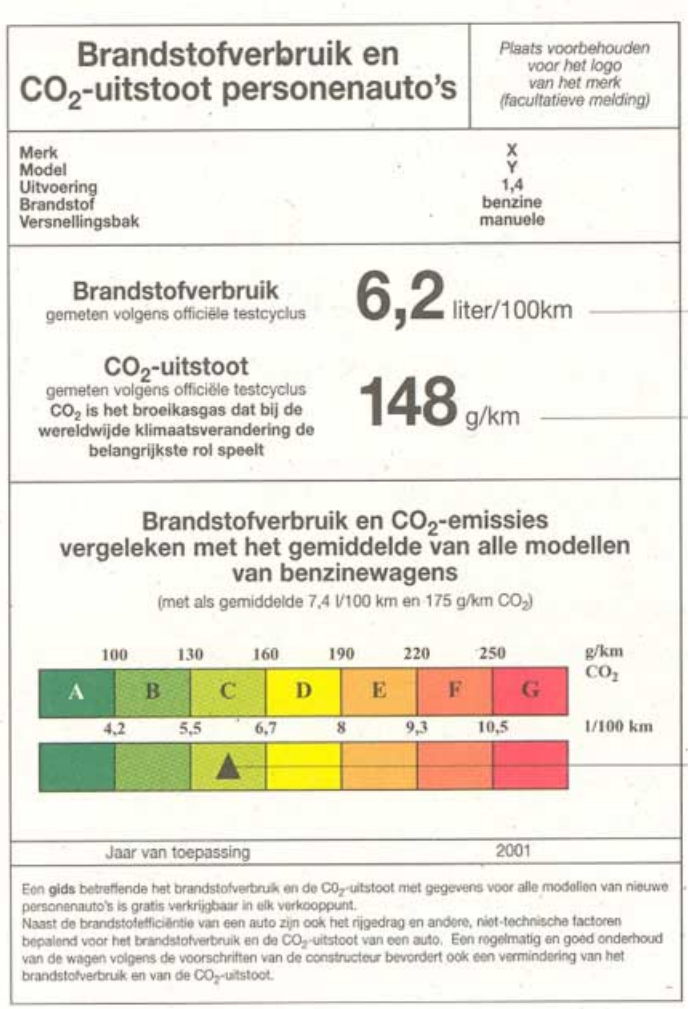

Figure 24: Sample of the Belgian energy efficiency label (petrol car)

D.1.2.2 Denmark

The Danish energy efficiency rating system includes 7 energy efficiency classes from A to G, with additional coloured description from green via yellow to red, based on the fuel reach (km/l), which is calculated based on the official fuel consumption data (l/100km).
The energy efficiency classes are illustrated as arrows named from A to G and coloured from green, via yellow to red, similarity to the format of the energy efficiency label, which is already used for household appliances. This should make it easy for car buyers to understand the meaning of the label.
The rating system is identical for all kind of passenger cars. An additional classification into car segments (e.g. minis, small family cars, ...) or based on the vehicle size, the vehicle weight or other parameters was not established.
Each energy efficiency class has a separated fuel reach band (km/l) for diesel and petrol cars (see table below).
The definition of the fuel reach bands (km/l) results on the following percentage distribution of the cars: A: 5%, B: 10%, C: 20%, D: 30%, E: 20%, F: 10%, G: 5%.

Energy efficiency class	Fuel reach bands (km/l)	
	Petrol	Diesel
A	fuel reach ≥ 18,2	fuel reach ≥ 20,5
B	15,4 ≤ fuel reach ≤ 18,1	17,3 ≤ fuel reach ≤ 20,4
C	14,3 ≤ fuel reach ≤ 15,3	16,1 ≤ fuel reach ≤ 17,2
D	12,5 ≤ fuel reach ≤ 14,2	14,1 ≤ fuel reach ≤ 16,0
E	11,8 ≤ fuel reach ≤ 12,4	13,2 ≤ fuel reach ≤ 14,0
F	10,5 ≤ fuel reach ≤ 11,7	11,9 ≤ fuel reach ≤ 13,1
G	fuel reach < 10,5	fuel reach < 11,9

Table 8: Definition of the Danish energy efficiency classes

Additional data or information on the label:

Besides the energy efficiency class and the numerical data on fuel reach (km/l) and CO_2 emissions (g/km), the label includes further information regarding economy, safety standard and environment-friendliness of the vehicle model:

- "Green motor tax" (Kr/year)
- Fuel cost (Kr/year) for a driving distance of 20,000 km, estimated fuel price per litre: petrol 8.25 Kr (1.07 €), diesel 7 Kr (0.91 €)
- EuroNCAP frontal-/side impact rating (1-5 stars "*")
- EuroNCAP pedestrian test rating (1-5 stars "*")
- Particle filter (yes/no).

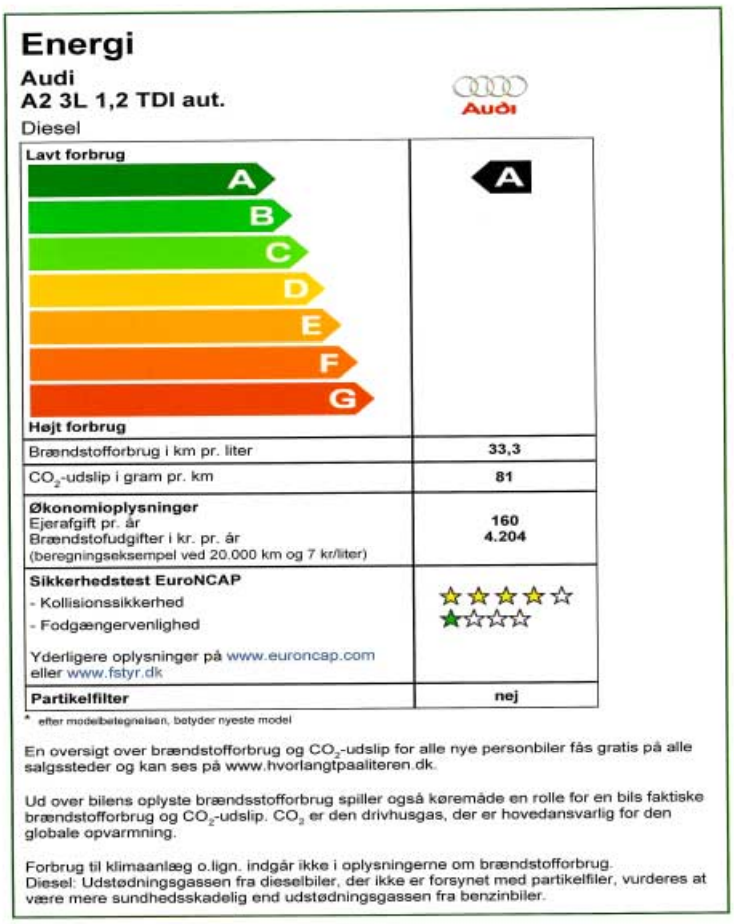

Figure 25: Sample of the Danish energy efficiency label (diesel car)

D.1.2.3 Portugal

The Portuguese energy efficiency rating system includes 4 energy efficiency classes described in the colours green to red, based on the official fuel consumption (l/100km).
The energy efficiency classes are illustrated as a colour scale on which the fuel consumption of the car is indicated.
The rating system is identical for all kind of passenger cars. An additional classification into car segments (e.g. minis, small family cars, ...) or based on the vehicle size, the vehicle weight or other parameters was not established.
Each energy efficiency class has an identical fuel consumption band (l/100km) for all kind of fuel types (see table below).

Energy efficiency class	Fuel consumption bands (l/100km)
Green	fuel consumption < 6
Yellow	6 < fuel consumption < 10
Orange	10 < fuel consumption < 14
Red	fuel consumption > 14

Table 9: Definition of the Portuguese energy efficiency classes

Additional data or information on the label:

Besides the energy efficiency class and the numerical data on fuel consumption (l/100km) and CO_2 emissions (g/km), no additional data regarding economy, safety standard or environment-friendliness are included on the label.

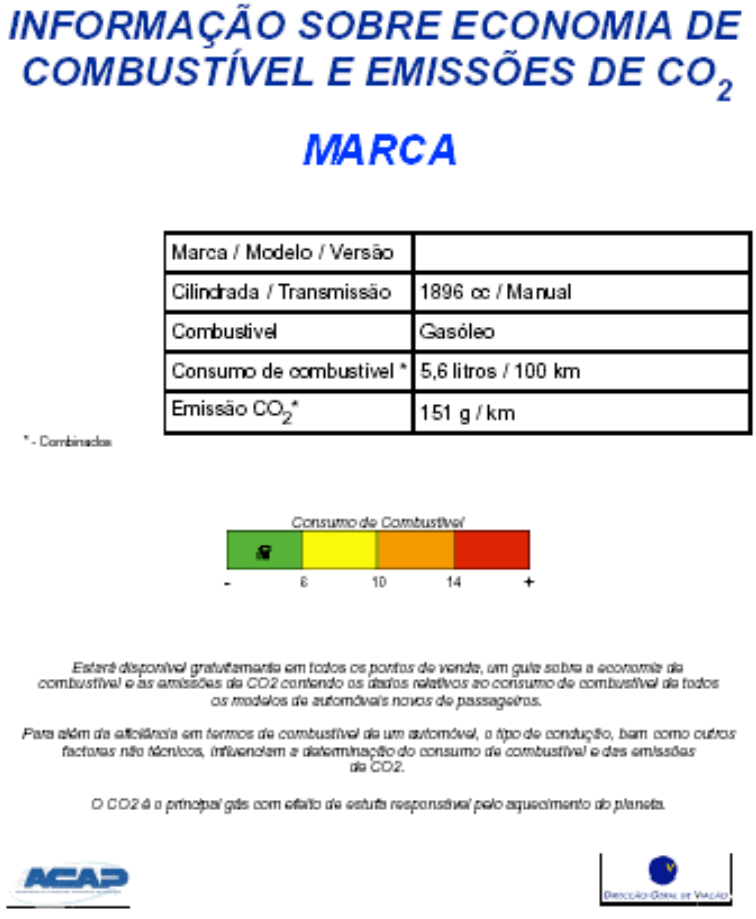

Figure 26: Sample of the Portuguese energy efficiency label

D.1.2.4 United Kingdom (introduced by Sept. 2005)

In February 2005 a new labelling scheme, develop in partnership by industry, NGOs and Government through the LowCVP (Low Carbon Vehicle Partnership), was adopted in the UK. It is voluntary yet achieves full market coverage by having engaged all 42 UK car brands through the national trade association (SMMT). The new colour coded fuel economy label will be introduced across them between July and September 2005.

To provide a direct link to the VED (graduated vehicle excise duty), which is grouped into 6 CO_2 emission bands from AAA to D, the new British energy efficiency rating system also includes only 6 energy efficiency classes from A to F with additional coloured description from green via yellow to red, based on the CO_2 emissions (g/km).
The energy efficiency classes are illustrated as arrows named from A to F and coloured from green, via yellow to red, similar to the format of the energy efficiency label, which is already used for household appliances.
The rating system is identical for all kind of passenger cars. An additional classification into car segments (e.g. minis, small family cars, ...) or based on the vehicle size, the vehicle weight or other parameters was not established.
Each energy efficiency class has an identical CO_2 emission band (g/km) for all kind of fuel types (see table below). The definition of the CO_2 emission bands (g/km) is directly linked to the VED bands.

Energy efficiency class	CO_2 emission bands (g/km)
A	$CO_2 \leq 100$
B	$101 \leq CO_2 \leq 120$
C	$121 \leq CO_2 \leq 150$
D	$151 \leq CO_2 \leq 165$
E	$166 \leq CO_2 \leq 185$
F	$CO_2 \geq 186$

Table 10: Definition of the British energy efficiency classes

Additional data or information on the label:

Besides the energy efficiency class and the numerical data on fuel consumption (l/100km, mpg) and CO_2 emissions (g/km), the new label includes also further information regarding economy and environment-friendliness of the vehicle model:

- Graduated vehicle excise duty VED (Pound/year)
- Fuel cost (Pound) for a driving distance of 12,000 miles, estimated fuel price per litre: petrol 76 p (1.10 €), diesel 78 p (1.13 €), LPG 38p (0.55 €).

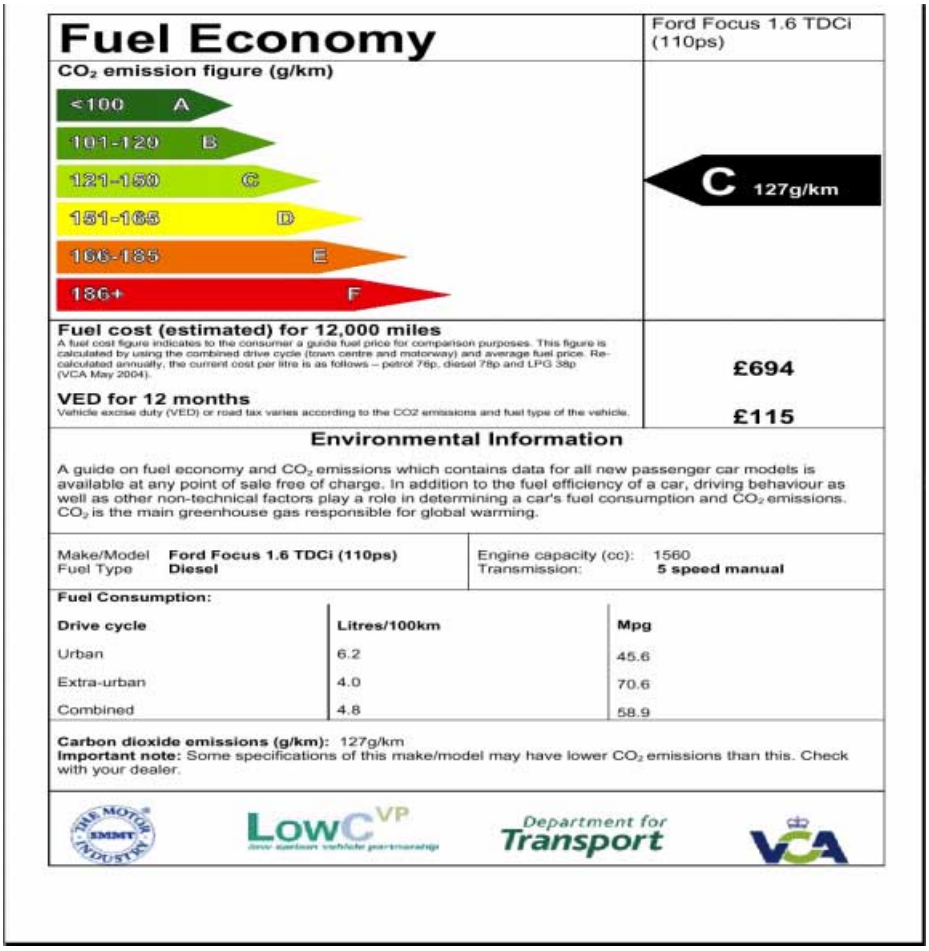

Figure 27: Sample of the new British energy efficiency label

D.1.2.5 Comparison of the different absolute comparison systems

The Belgian, Danish and British (introduced in Sept. 2005) energy efficiency rating systems include 7 energy efficiency classes from A to G (B, DK) or at least 6 energy efficiency classes from A to F (UK) with additional coloured description from green via yellow to red, based on the CO_2 emissions (B, UK) or the fuel reach (DK).

To make it easier for car buyers to understand the meaning of the label, in Denmark and the United Kingdom, the energy efficiency classes are illustrated as arrows named from A to G (DK) or A to F (UK) and coloured from green, via yellow to red, similar to the format of the energy efficiency label for household appliance. In Belgium, the energy efficiency classes are illustrated as a colour scale on which the CO_2 emissions and the fuel consumption of a car are indicated.

Belgium and Denmark introduced two different energy efficiency class bands, one for diesel and one for petrol cars to avoid an incentive for more diesel cars, whereas in the United Kingdom, each energy efficiency class has an identical CO_2 emission band for all kind of fuel types.

Also Portugal uses an absolute comparison method, but the Portuguese rating system includes only 4 energy efficiency classes, described in the colours green, yellow, orange and red, based on the fuel consumption, which is quite rough. Like in Belgium, the energy efficiency classes are illustrated as a colour scale on which the fuel consumption of a car is indi-

cated. Like in the United Kingdom, identical energy efficiency class bands are valid for all kind of fuels.

	Belgium	Denmark	Portugal	United Kingdom
Energy efficiency classes	7 (A-G)	7 (A-G)	4 (green - red)	6 (A-F)
Coloured illustration	Colour scale named from A-G and coloured from green via yellow to red.	Arrows named from A-G and coloured from green via yellow to red, similar to the format of the energy efficiency label for household appliance.	Colour scale coloured from green via yellow to red.	Arrows named from A-F and coloured from green via yellow to red, similar to the format of the energy efficiency label for household appliance.
Basis of the classification	CO_2 emissions (g/km)	Fuel reach (km/l)	Fuel consumption (l/100km)	CO_2 emissions (g/km)
Differentiation of fuel types	Petrol/diesel	Petrol/diesel	No	No

Table 11: Comparison of the absolute energy efficiency rating systems introduced in some EU Member States

The main difference between the absolute comparison systems introduced in these Member States is the definition of the energy efficiency class bands. Taking petrol cars as example, Table 12 and Figure 28 show a comparison of the definition of the energy efficiency classes in Belgium, Denmark and the United Kingdom.

Since in Denmark the definition of the energy efficiency classes is based on the fuel reach (km/l), but not on the CO_2 emissions (g/km) as in Belgium and the United Kingdom, the Danish fuel reach bands were converted according to the formula for the calculation of the fuel consumption of passenger cars determined in Directive 80/1268/EEC Annex 1:

$FC = (0.1154/D)*[(0.866*THC)+(0.429*CO)+0.273*CO_2)]$

With the adoptions CO = 0, THC = 0 and D = 0.745 g/cm³ (density of petrol at 15°C), the CO_2 emissions (g/km) can be calculated from the fuel consumption (l/100km) or the fuel reach (km/l) as follows:

CO_2 emissions (g/km) = 23.6476406 * fuel consumption (l/100km)

CO_2 emissions (g/km) = 2364.76406 / fuel reach (km/l)

Since the Portuguese rating system consists only of 4 energy efficiency classes, which are quite rough, this rating system was not included in this comparison.

	CO_2 emission bands (g/km) for petrol cars		
Energy efficiency class	Belgium	Denmark	United Kingdom
A	$CO_2 < 100$	$CO_2 \leq 130$	$CO_2 \leq 100$
B	$100 \leq CO_2 < 130$	$131 \leq CO_2 \leq 154$	$101 \leq CO_2 \leq 120$
C	$130 \leq CO_2 < 160$	$155 \leq CO_2 \leq 166$	$121 \leq CO_2 \leq 150$
D	$160 \leq CO_2 < 190$	$167 \leq CO_2 \leq 190$	$151 \leq CO_2 \leq 165$
E	$190 \leq CO_2 < 220$	$191 \leq CO_2 \leq 201$	$166 \leq CO_2 \leq 185$
F	$220 \leq CO_2 < 250$	$202 \leq CO_2 \leq 225$	$CO_2 \geq 186$
G	$CO_2 \geq 250$	$CO_2 > 225$	n.a.

Table 12: Comparison of the CO_2 emission bands (g/km) for petrol cars used in the energy efficiency rating systems in Belgium, Denmark and the United Kingdom

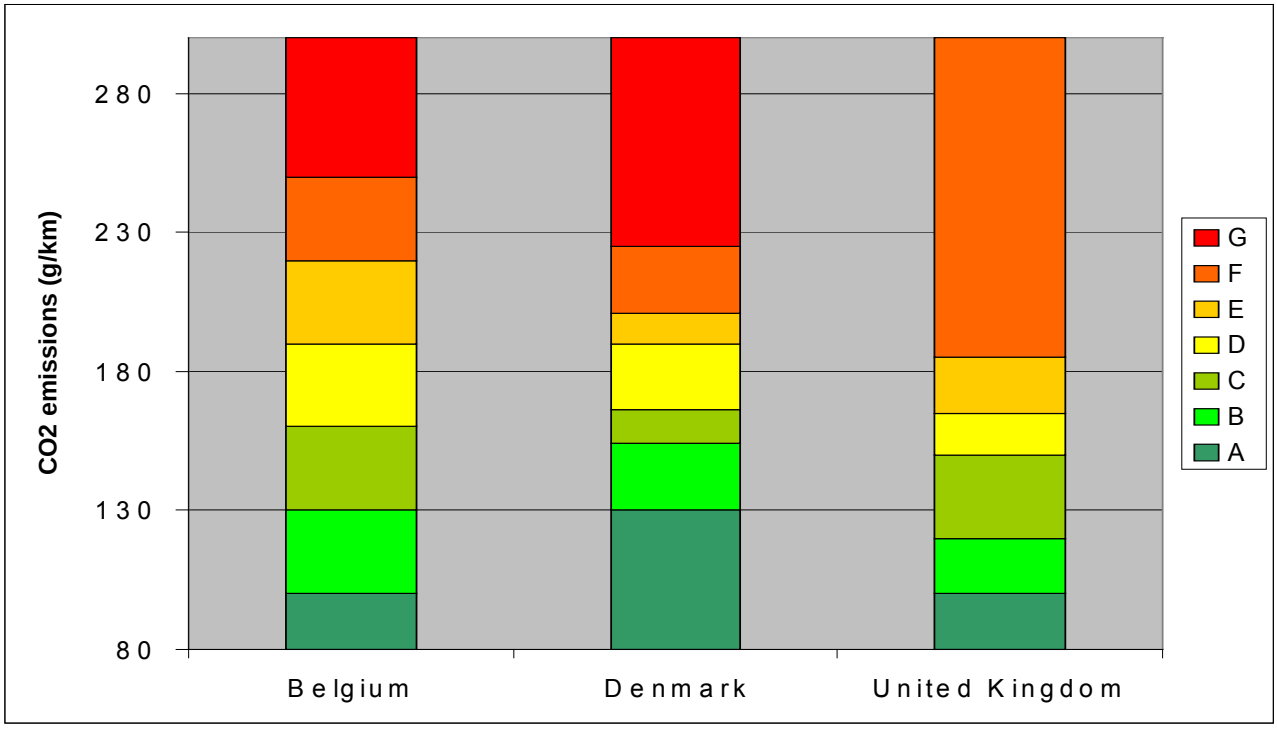

Figure 28: Comparison of the CO_2 emission bands (g/km) for petrol cars used in the energy efficiency rating systems in Belgium, Denmark and the United Kingdom

The comparison shows, that the energy efficiency classes in Denmark and the United Kingdom (introduced by Sept. 2005) are much more narrow than in Belgium. In Denmark and the United Kingdom the classes are equally narrow, but in the United Kingdom they are stricter.

D.1.3 Relative comparison method

Two Member States - the Netherlands and Spain (optional) - as well as Switzerland introduced a relative comparison system.
The three countries use an energy efficiency rating system including 7 energy efficiency classes from A to G. While the Netherlands and Spain use relative comparison systems based on the vehicle size (defined by the vehicle floor space), the Swiss comparison system indicates the energy efficiency classes in relation to the vehicle weight.

The main arguments for a relative comparison are:

- Most consumers interested in buying a new passenger car look for a particular vehicle size, which makes an absolute comparison of all passenger cars meaningless for them. Therefore, the comparison should relate to a specific car segment the consumers are interested in.
- An absolute comparison system provides no useful comparative information for the consumers because most passenger cars of a particular vehicle size category would usually have the same energy efficiency class.
- An absolute comparison system misses the opportunity for helping consumers to choose the more fuel efficient passenger car of the chosen vehicle size.
- Manufacturers of executive and luxury class cars do not find all of their car models in the worse energy efficiency classes, so they also have an incentive to disseminate information and to use the instruments. More generally, it also allows a comparison between high-polluting vehicles.

The following chapters provide more details and a comparison of the different relative rating systems of the Netherlands, Spain and Switzerland.

D.1.3.1 The Netherlands

The Dutch energy efficiency rating system includes 7 energy efficiency classes from A to G, with additional coloured description from green via yellow to red, based on the relative energy efficiency (%).
The energy efficiency classes are illustrated as arrows named from A to G and coloured from green, via yellow to red, similar to the format of the energy efficiency label, which is already used for household appliances.
The relative energy efficiency is defined as the percentage to which the CO_2 emissions of a car is higher or lower than a reference CO_2 emission value. This reference CO_2 emission value is calculated as follows:

Reference CO_2 emission value (g/km) = 0,25 x “Average CO_2 emission value of all new passenger cars” + 0,75 x “Average CO_2 emission value of all new passenger cars of the same size”.

The vehicle size is indicated by the ground surface and expressed by length x width.
Diesel and petrol cars are handled separately. The constants for the regression formulae and the values to be applied for the average CO_2 emissions of petrol and diesel cars are adjusted annually by RDW (Netherlands Type Approval Authority).

The exact calculation method of the relative energy efficiency is defined in Annex 4 of the Dutch decree no. 2000/0317/NL on energy consumption labelling for passenger cars and can be seen in Annex 7.

The 75 % relative and 25 % absolute comparison for the labelling reference CO_2 emissions for petrol cars is visualised in the figure below. In this figure the labelling reference CO_2 emissions for petrol cars is indicated by the line that is slightly turned with respect to the regression line that expresses the average CO_2 emissions for each car size. The reference line for diesel cars shows a different but similar result.

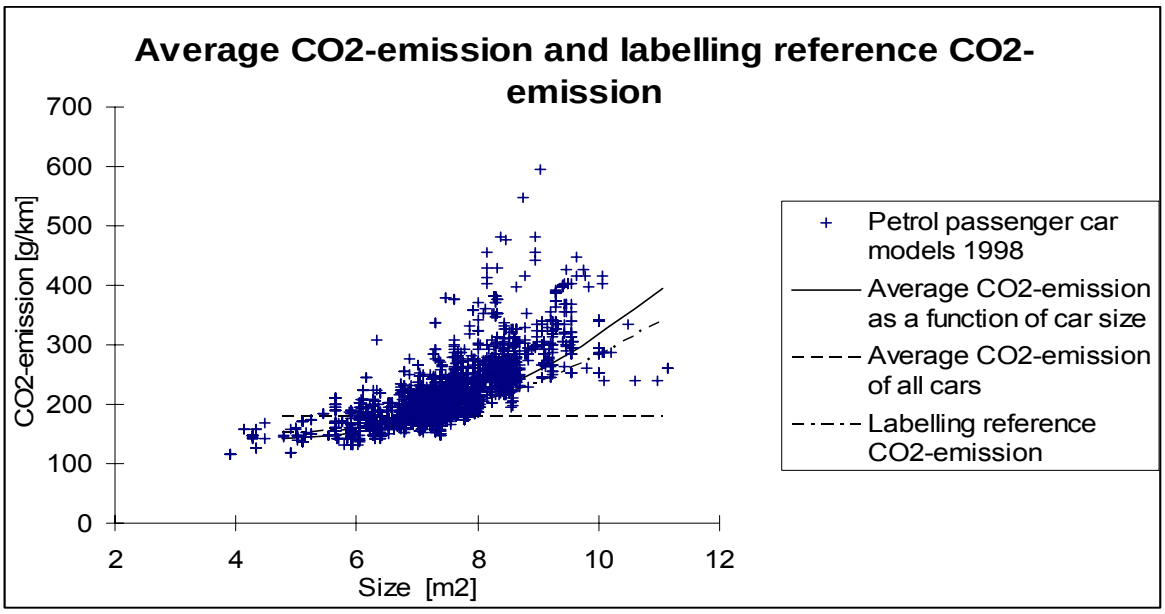

Figure 29: Final reference line for the attribution of the labels for petrol cars (Source: CLASE WP3 Report - The NL).

The energy efficiency class of a passenger car is determined on basis of the relative energy efficiency index of the car in accordance with the table below.

Energy efficiency class	Relative energy efficiency index (%)
A	index < -20%
B	-20% ≤ index < -10%
C	-10% ≤ index < 0%
D	0 ≤ index < 10%
E	10% ≤ index < 20%
F	20% ≤ index < 30%
G	index ≥ 30%

Table 13: Definition of the Dutch energy efficiency classes

Additional data or information on the label:

Besides the energy efficiency class and the numerical data on fuel consumption (l/100km), fuel reach (km/l) and CO_2 emissions (g/km), no additional data regarding economy, safety standard or environment-friendliness are included on the label.

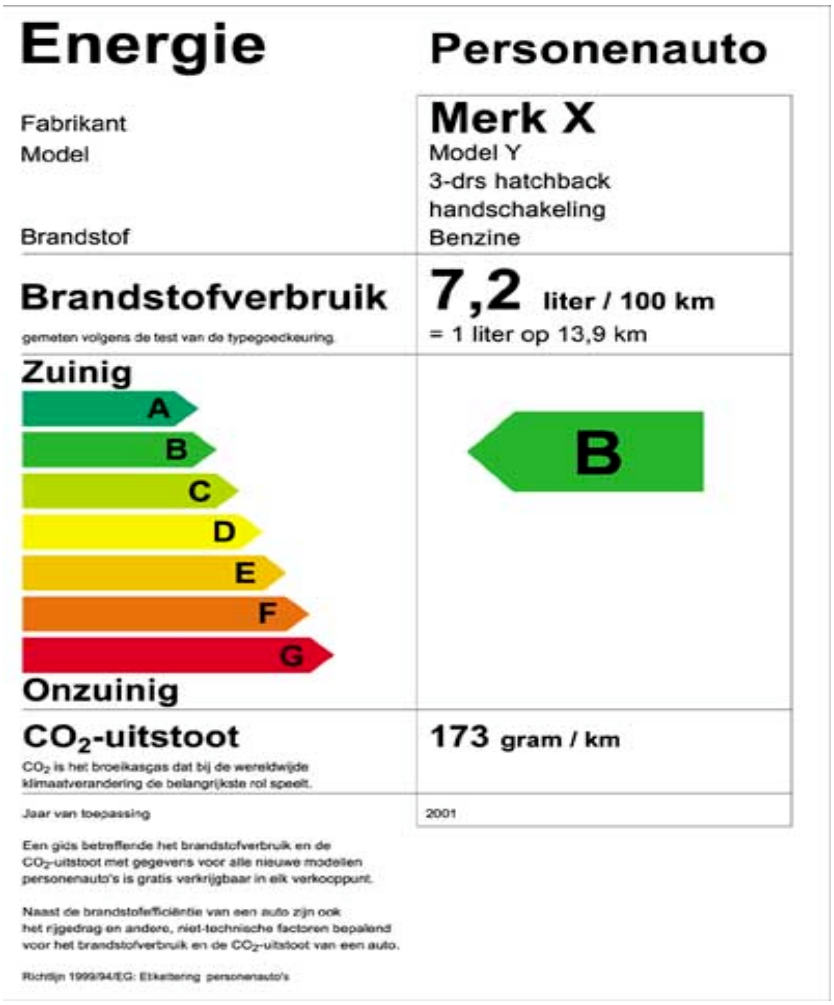

Figure 30: Sample of the Dutch energy efficiency label

D.1.3.2 Spain (optional)

Besides the mandatory label, which meets the minimum requirements of the Directive and includes only numerical data on official CO_2 emissions (g/km) and fuel consumption (l/100 km), the Real Decreto 837/2002 includes also an optional label with an energy efficiency rating system, which can be used by the automobile industry on a voluntary basis.

The Spanish energy efficiency rating system includes 7 energy efficiency classes from A to G, with additional coloured description from green via yellow to red, based on the relative fuel efficiency (%).
The energy efficiency classes are illustrated as arrows named from A to G and coloured from green, via yellow to red, similar to the format of the energy efficiency label, which is already used for household appliances.
The relative fuel efficiency index shows the low or elevated fuel consumption of a passenger car in percent in comparison to the average fuel consumption of all passenger cars of the same size and the same fuel type. The vehicle size is indicated by the ground surface and expressed by length x width. Diesel and petrol cars are handled separately.
The average fuel consumption value is calculated by statistical means amongst all passenger cars of the same size and the same fuel type, on sale in Spain by all manufacturers, as follows:

Average fuel consumption (l/100km) = a x e $^{(bxS)}$,

S= vehicle ground surface (m²), expressed by the absolute vehicle length x width.
e= 2.7183 (Euler no.)
a, b = constants (petrol: a = 2.366, b = 0.1751; diesel: a = 1.786, b = 0.1669)

The formula and constants a and b for petrol and diesel cars are adjusted if necessary. The classification is updated half yearly.

The energy efficiency class of a passenger car is determined on basis of the relative fuel efficiency index of the car in accordance with the table below.

Energy efficiency class	Relative fuel efficiency index (%)
A	index < -25%
B	-25% < index < -15%
C	-15% < index < -5%
D	-5 < index < 5% (average)
E	5% < index < 15%
F	15% < index < 25%
G	25% < index

Table 14: Definition of the Spain energy efficiency classes

Additional data or information on the label:

Besides the energy efficiency class and the numerical data on fuel consumption (l/100km), fuel reach (km/l) and CO_2 emissions (g/km), no additional data regarding economy, safety standard or environment-friendliness are included on the label.

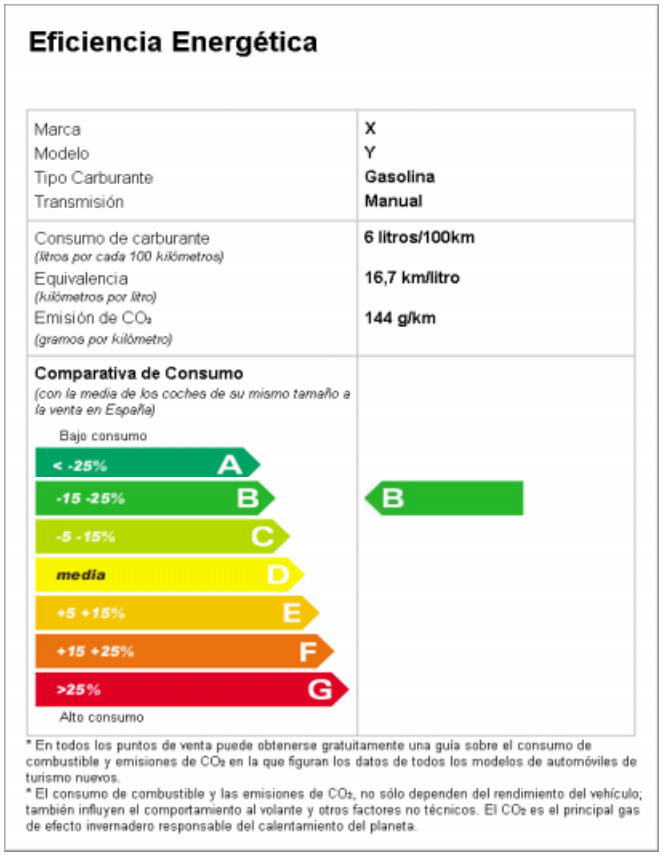

Figure 31: Sample of the optional Spanish energy efficiency label

D.1.3.3 Switzerland

The Swiss energy efficiency rating system includes 7 energy efficiency classes from A to G, with additional coloured description from green via yellow to red, based on the relative energy efficiency, which is expressed by an evaluation index.
The energy efficiency classes are illustrated as arrows named from A to G and coloured from green, via yellow to red, similarity to the format of the energy efficiency label, which is already used for household appliances.
The evaluation index indicates the relative energy efficiency of a car in relation to its curb weight. It is calculated based on the fuel consumption and the vehicle curb weight for each passenger car, as follows:

Evaluation index = (65,400 * fuel consumption) / (4,000 + 9 * curb weight)

Fuel consumption in kg/100km (density at 15 °C: petrol 745 kg/m³, diesel 829 kg/m³, CNG 0.654 kg/m³).
Curb weight in kg including 75 kg for the driver.

The definition of the evaluation index bands (see table below) results on the determination that the evaluation index of energy efficiency class D indicates the average fuel consumption (kg/100km) per average curb weight of all new passenger car models offered for sale in Switzerland. The evaluation index bands of the energy efficiency classes are determined based on the principle that a maximum of 1/7 of all car models are labelled with energy efficiency class A.
The evaluation index bands are revised every 2 years. The latest revision was on 01 July 2004. Due to the change of the evaluation index bands, most car models are classified now one energy efficiency class worse than before.

Energy efficiency class	Evaluation index (until 06/2004)	Evaluation index (since 07/2004)
A	index ≤20,3	index ≤ 18,90
B	20,3 < index ≤ 22,1	18,90 < index ≤ 20,74
C	22,1 < index ≤ 23,9	20,74 < index ≤ 22,58
D	23,9 < index ≤ 25,7	22,58 < index ≤ 24,42
E	25,7 < index ≤ 27,5	24,42 < index ≤ 26,26
F	27,5 < index ≤ 29,3	26,26 < index ≤ 28,10
G	index > 29,3	index > 28,10

Table 15: Division of the Swiss energy efficiency classes

An arithmetic chart of the 7 energy efficiency classes for petrol and diesel cars depending on fuel consumption (l/100km) and vehicle curb weight (kg) is shown in Figure 32.

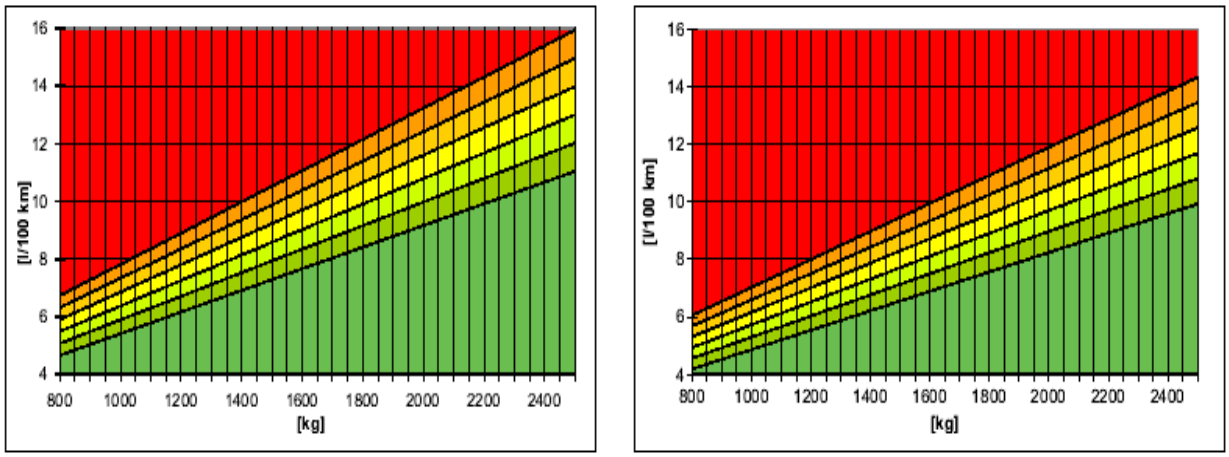

Figure 32: Evaluation of petrol (left) and diesel (cars)

Additional data or information on the label:

Besides the energy efficiency class and the numerical data on fuel consumption (l/100km) and CO_2 emissions (g/km), the label includes further information regarding economy and environment-friendliness of the vehicle model:

- Average CO_2 emission value (g/km), of all passenger cars sold in Switzerland.

Monovalente Benzin- und Dieselfahrzeuge, die mit Treibstoffgemischen ohne biogene Treibstoffanteile betrieben werden

Energieetikette

Marke **Typ**	**XXXXX** **XXXXX**
Treibstoff Getriebe Leergewicht	Benzin oder Diesel XXXXX XXXX kg
Treibstoffverbrauch Durchschnitt: gemessen nach den Vorschriften der EG-Richtlinie 80/1268/EWG	**X,X Liter / 100 km**
CO_2-Emissionen CO_2 ist das für die Erderwärmung hauptverantwortliche Treibhausgas	**XXX Gramm / km**
Durchschnitt aller angebotenen Fahrzeugmodelle	XXX Gramm / km
Energieeffizienz Treibstoffverbrauch verglichen mit allen angebotenen Fahrzeugmodellen gleichen Gewichts	**C**

Informationen zum Treibstoffverbrauch und zu den CO_2-Emissionen, inklusive einer Auflistung aller angebotenen Neuwagen, sind kostenlos an allen Verkaufsstellen erhältlich oder im Internet unter www.energieetikette.ch abrufbar.

Der Treibstoffverbrauch und damit die CO_2-Emissionen eines Fahrzeugs sind auch vom Fahrstil und anderen nichttechnischen Faktoren abhängig.

Figure 33: Sample of the Swiss energy efficiency label (petrol or diesel monovalent)

D.1.3.4 Comparison of the different relative comparison systems

The Dutch, Spanish and Swiss energy efficiency rating systems include 7 energy efficiency classes from A to G with additional coloured description from green via yellow to red, based on the relative energy (fuel) efficiency.
But each country uses a different definition of the relative energy (fuel) efficiency. While the Netherlands and Spain (optional) introduced a relative comparison system, which is based on the vehicle ground surface, the Swiss comparison system indicates the energy efficiency classes in relation to the vehicle curb weight.
But also the Dutch and the Spain comparison systems are different. While in Spain, the relative fuel efficiency (%), shows the low or elevated fuel consumption of a passenger car in percent in comparison to the average fuel consumption of all passenger cars of the same size, in the Netherlands, the relative energy efficiency (%) is defined as the percentage to which the CO_2 emissions of a car is higher or lower than a reference CO_2 emission value. This reference CO_2 emission value is calculated as the sum of 0.25 x average CO_2 emission value of all new passenger cars and 0.75 x average CO_2 emission value of all new passenger cars of identical size. Petrol and diesel cars are handled separately in all of these countries.
To make it easier for car buyers to understand the meaning of the label, in all of these 3 countries, the energy efficiency classes are illustrated as arrows named from A to G and coloured from green, via yellow to red, similarity to the format of the energy efficiency label for household appliances.

	Netherlands	Spain	Switzerland
Energy efficiency classes	7 (A-G)	7 (A-G)	7 (A-G)
Coloured illustration	Arrows named from A-G and coloured from green via yellow to red, similar to the format of the energy efficiency label for household appliance.	Arrows named from A-G and coloured from green via yellow to red, similar to the format of the energy efficiency label for household appliance.	Arrows named from A-G and coloured from green via yellow to red, similar to the format of the energy efficiency label for household appliance.
Basis of the classification	Relative energy efficiency (%), defined as the percentage to which the CO_2 emissions of a car is higher or lower than a reference CO_2 emission value. The reference CO_2 emission value is calculated as the sum of 0.25 x average CO_2 emission value of all new passenger cars and 0.75 x average CO_2 emission value of all new passenger cars of identical size. The vehicle size is indicated by the ground surface and expressed by length x width.	Relative fuel efficiency (%), showing the low or elevated fuel consumption of a passenger car in percent in comparison to the average fuel consumption of all passenger cars of the same size and the same fuel type. The vehicle size is indicated by the ground surface and expressed by length x width.	Relative energy efficiency, expressed by an evaluation index. The evaluation index indicates the relative energy efficiency of a car in relation to its curb weight. It is calculated, based on the fuel consumption and the vehicle curb weight.
Differentiation of fuel types	Petrol/diesel	Petrol/diesel	Petrol/diesel

Table 16: Comparison of the relative energy efficiency rating systems introduced in some EU Member States and in Switzerland

The main difference between the relative comparison systems introduced in the Netherlands, Spain and Switzerland is the calculation basis of the definition of the energy efficiency classes.
Since each of these 3 countries uses a different calculation method for the "reference CO_2 emissions" or the "reference fuel consumption", which are the basis for the relative comparison, a direct comparison of the energy efficiency classes, as shown in chapter D.1.2.5 for the absolute comparison systems introduced in some Member States, is not possible.

D.1.4 Comparison of absolute or relative comparison methods

One of the main argument for a relative comparison is that in an absolute comparison system most passenger cars of a particular vehicle size category would usually have the same energy efficiency class. Additionally, small cars would be favoured and would mostly be classified in the good classes A or B, while executive and luxury class cars would only obtain a classification in the worse energy efficiency classes F or G. Since most of the consumers interested in buying a new passenger car look for a particular vehicle size, an absolute comparison system would not provide useful comparative information for them.

In the following, this argument should be reviewed by comparing the 3 absolute comparison systems of Belgium, Denmark and the United Kingdom and the 3 relative comparison systems of the Netherlands, Spain and Switzerland taking the VW Golf as an example, one of the most popular vehicle models of the "small family car" category in Europe, as well as representative vehicle models of the popular vehicle categories "small family cars" (hatchback), "mini cars" and "executive cars".

Model / category	No. of model versions	CO_2 range (g/km)	Energy efficiency class range					
			Absolute comparison			Relative comparison		
			B	DK	UK	NL	SP	CH
VW Golf								
- Diesel	9	135 - 159	C - D	B - C	C - D	B - D	B - D	A
- Petrol	11	149 - 276	C - G	B - G	C - F	B - G	A - G	B - G
- All	20	135 - 276	C - G	B - G	C - F	B - G	A - G	A - G
"Small family cars" / 17 vehicle models (Alfa 147 - VW Golf)								
- Diesel	62	117 - 176	C - E	A - D	B - E	A - E	A - D	A - C
- Petrol	91	146 - 287	C - G	B - G	C - F	B - G	A - G	A - G
- All	153	117 - 287	C - G	A - G	B - F	A - G	A - G	A - G
"Mini cars" / 14 vehicle models (Daewoo Matiz - VW Lupo)								
- Diesel	9	81 - 140	A - C	A - B	A - C	A - E	A - E	A - B
- Petrol	38	113 - 182	B - E	A - D	B - E	A - F	B - G	B - F
- All	47	81 - 182	A - E	A - D	A - E	A - F	A - G	A - F
"Executive cars" / 12 vehicle models (Alfa 166 - Volvo S80)								
- Diesel	35	162 - 247	D - G	C - G	D - F	C - G	B - G	A - E
- Petrol	58	202 - 314	E - G	E - G	F	C - G	B - G	C - G
- All	93	162 - 314	D - G	C - G	D - F	C - G	B - G	A - G

Table17: Comparison of the energy efficiency class ranges of B, DK, UK, NL, SP and CH by the example of VW Golf, "small family cars", "mini cars" and "executive cars"

VW Golf:

The comparison includes 18 model versions of the new VW Golf (V) as well as 2 model versions of the VW Golf (IV) R32, subdivided into 9 diesel and 11 petrol model versions.
The CO_2 emissions of the diesel versions range from 135 to 159 g/km and of the petrol versions from 149 to 276 g/km. These data show that the CO_2 emissions of the model versions vary widely in a single vehicle model.
Comparing the energy efficiency classes of the different countries for the model versions, it can be noted that also in the absolute comparison systems the energy efficiency classes of the model versions range from “B” (DK) or “C” (B, UK) to “F” (UK) or “G” (B, DK). Regarding the Swiss system, it is conspicuous that all diesel model versions are classified with “A”.
The detailed comparison can be seen in Annex 8.

“Small family cars” (hatchback):

The comparison includes 17 vehicle models (hatchback) of the most popular “small family cars” category, from Alfa 147 to VW Golf, subdivided into 62 diesel and 91 petrol model versions.
The CO_2 emissions of the diesel versions range from 117 to 176 g/km and of the petrol versions from 146 to 287 g/km. These data show that also within a vehicle category the CO_2 emissions of the vehicle models vary widely.
Comparing the energy efficiency classes of the different countries for the model versions, it can be noted that also in the absolute comparison systems the energy efficiency classes of the model versions range from “A” (DK), “B” (UK) or “C” (B) to “F” (UK) or “G” (B, DK).
The detailed comparison can be seen in Annex 9.

“Mini cars”:

The comparison includes 14 vehicle models of the “mini cars” category, from Daewoo Matiz to VW Lupo, subdivided into 9 diesel and 38 petrol model versions.
The CO_2 emissions of the diesel versions range from 81 to 140 g/km and of the petrol versions from 113 to 182 g/km. These data show that also within this vehicle category the CO_2 emissions of the vehicle models vary widely.
Comparing the energy efficiency classes of the different countries for the model versions, it can be noted that also in the absolute comparison systems the energy efficiency classes of the model versions range from “A” to “E” (B, UK) or “A” to “D” (DK).
The detailed comparison can be seen in Annex 10.

“Executive cars”:

The comparison includes 12 vehicle models of the “executive cars” category, from Alfa 166 to Volvo S80, subdivided into 35 diesel and 58 petrol model versions.
The CO_2 emissions of the diesel versions range from 162 to 247 g/km and of the petrol versions from 202 to 314 g/km. These data show that also within this vehicle category the CO_2 emissions of the vehicle models vary widely.
Comparing the energy efficiency classes of the different countries for the model versions, it can be noted that also in the absolute comparison systems the energy efficiency classes of the model versions range from “C” (DK) or “D” (B, UK) to “F” (UK) or “G” (B, DK).
The detailed comparison can be seen in Annex 11.

D.1.4.1 Conclusion

The comparisons show that within a single vehicle model as well as within a certain vehicle category, representing a certain vehicle size category, the CO_2 emissions of the model versions vary widely.
Also the absolute comparison systems, as introduced in Belgium, Denmark and the United Kingdom, show energy efficiency class ranges over 4 or more classes and offer a good possibility of comparison for consumers.

The comparisons also verify that a relative comparison system can be quite difficult to understand for consumers.
Taking the Alfa 166 2.4 JTD and the Renault VelSatis HDI FAP as example, both representing "executive cars" and both with manual transmission, 110 kW engine capacity and CO_2 emissions of 192 g/km, it can be noted that, as shown in Table 18, these vehicle models are classified in different energy efficiency classes in the energy efficiency rating systems of the Netherlands, Spain and Switzerland. While the Renault VelSatis is classified as "D" in the Netherlands, "C" in Spain, and "B" in Switzerland, the Alfa 166 is classified one class worse in each of these countries. In contrast, in the absolute comparison systems of Belgium, Denmark and the United Kingdom, both models are classified in identical energy efficiency classes in each country, "E" in Belgium and Denmark, "F" in the United Kingdom.

Model	Engine cap. (kW)	FC comb. (l/100km)	CO_2 (g/km)	Energy efficiency classes					
				Absolute comparison			Relative comparison		
				B	DK	UK	NL	SP	CH
Alfa 166 2.4 JTD, MT	110	7,2	192	E	E	F	E	D	C
Renault VelSatis 2.2 dCi MT	110	7,2	192	E	E	F	D	C	B

Table 18: Different classification of 2 "executive car models" - Alfa 166 2.4 JTD and Renault VelSatis 2.2.dCi - with identical CO_2 emissions of 192 g/km within the relative comparison systems

For environmental reasons, doubt has also to be cast on whether vehicle models with CO_2 emissions of more than 215 g/km should be classified with energy efficiency class D, as average, or better, as possible in the relative comparison systems.
Taking the BMW 520i with manual transmission, 125 kW engine capacity and CO_2 emissions of 219 g/km as example, it can be noted, that this vehicle model is classified as "B" in Spain, "C" in the Netherlands and "D" in Switzerland. In contrast, in the absolute comparison systems of Belgium, Denmark and the United Kingdom, this model is classified as "E" in Belgium, "F" in Denmark and the United Kingdom.

Model	Engine cap. (kW)	FC comb. (l/100km)	CO2 (g/km)	Energy efficiency classes					
				Absolute comparison			Relative comparison		
				B	DK	UK	NL	SP	CH
BMW 520i, MT	125	9,0	219	E	F	F	C	B	D

Table 19: "Good" classification of BMW 520i with CO_2 emissions of 219 g/km within the relative comparison systems

It may be even more confusing for consumers when noting that for example the Citroen Xsara 1.6 with manual transmission, 80 kW engine capacity and CO_2 emissions of 160 g/km, a representative of the "small family cars", is classified in the Netherlands, Spain and Switzerland into the same energy efficiency class as the BMW 520i with CO_2 emissions of 219 g/km.

Model	Engine cap. (kW)	FC comb. (l/100km)	CO2 (g/km)	Energy efficiency classes					
				Absolute comparison			Relative comparison		
				B	DK	UK	NL	SP	CH
Citroen Xsara 1.6, MT	80	6,9	160	D	C	D	C	B	D

Table 20: Identical Classification of Citroen Xsara 1.6 with CO_2 emissions of 160 g/km in comparison to BMW 520i with CO2 emissions of 219 g/km within the relative comparison systems

D.1.5 Pro and cons of absolute and relative comparison

Based of the previous comparisons, the following pro and cons regarding absolute or relative comparison system can be resumed:

D.1.5.1 Absolute comparison

Advantages:

- An absolute system is the most simple comparison method to handle, especially across the EU market, and easy to understand for consumers.
- An absolute system avoids the arbitrary and contentious issues of defining the categories for an “in class” system and all the related issues. To develop a consistent and fair method for a relative comparison, which is accepted by all involved parties (e.g. government, ministries, environmental agencies, car manufacturers), is quite difficult.
- An absolute system may create less controversy and offer more reliable information compared to the relative comparison method. It avoids the illogical case that a “small car” with a low absolute fuel consumption is labelled for example with energy efficiency class D when a “bigger car” with a higher absolute fuel consumption is labelled with “A”, due to a vehicle size or weight related relative comparison method.
- An absolute system does not allow manufacturers to upscale possible borderline cases e.g. by increasing the weight, in a weight related system, and in that way to get a more fuel efficient label, which could diminish the public trust in the label and make it more unreliable.
- An absolute comparison method encourages the consumers to buy cars with fewer CO_2 emissions most directly, hence it gives an incentive for downsizing within the complete car fleet.
- An absolute comparison method provides the most direct link with, and helps reinforce the message from, fiscal measures which are linked to CO_2 emissions. It avoids the situation where an efficient but high fuel-consuming car could show up as “red” in terms of the fiscal system, but “green” on an “in class” labelling system - a mixed message being conveyed to car buyers through two Government-sponsored systems.
- An absolute comparison method also supports the successful delivery of the voluntary agreement of the car manufacturers to reduce the CO_2 emissions of passenger cars most directly.

Disadvantages:

- When buying a new car, most consumers have generally already chosen the type of car they want (size, volume, make, etc.) and are interested in comparing cars of similar characteristics but not so much in comparing one car with all other cars on the market.
- An absolute system could be disadvantageous to dealers of certain makes offering in particular executive and luxury class cars with mostly high absolute fuel consumption, grouped in the worse energy efficiency classes, and offers no direct comparison between them, as if no fuel-efficient alternatives were available in these makes.

D.1.5.2 Relative comparison

Advantages:

- A relative comparison system enables a quick comparison between different cars of similar characteristics.
- Most consumers interested in buying a new passenger car have usually already chosen the type of car they want (size, volume, make, etc.) and are interested in a comparison between cars of these similar characteristics. An absolute comparison with all cars on the market could then be meaningless for them.
- Manufacturers of executive and luxury class cars do not find all of their car models in the worse energy efficiency classes, so they also have an incentive to disseminate information and to use the instruments. More generally, it also allows comparison between high-polluting vehicles.

Disadvantages:

- To develop a consistent and fair method for a relative comparison, which is accepted by all involved parties (e.g. government, ministries, environmental agencies, car manufacturers), is quite difficult.
- A relative comparison system could be more difficult to understand for consumers, due to the complicate calculation basis used for determination of the energy efficiency classes.
- A relative comparison system could somehow be “unfair”, especially for “small cars” with low absolute fuel consumption, which, depending on the relative comparison method, could be labelled “D” or “E” - when “bigger cars” with higher absolute fuel consumption would be labelled “A” or “B”. The high CO_2 emissions of executive and luxury class cars are “palliated” by the relative comparison method. This is contradictory to the environmental aim of Directive 1999/94/EC to reduce CO_2 emissions of passenger cars most directly.
- A relative comparison gives no incentive for downsizing within the complete car fleet and it would be very difficult to make the classes consistent if a relative comparison was chosen. The many borderline cases would make the labelling illogical- and misleading regarding for the cars just above or under the borderline between two classes.
- A relative comparison system could tempt the car manufacturers to upscale possible borderline cases by e.g. increasing the weight, in a weight related system, and in that way to get a more fuel efficient label. This would not only increase actual fuel consumption, but also diminish the public trust in the label and making it more unreliable.
- A relative comparison system may not be directly linked with fiscal measures which are linked to the absolute CO_2 emissions. An efficient but high fuel-consuming car might show up as “red” in terms of the fiscal system, but “green” on an “in class” labelling system - a mixed message being conveyed to car buyers through two Government-sponsored systems.

D.1.6 Conclusion and recommendations

D.1.6.1 Energy efficiency classes

Since numerical information about CO_2 emissions and fuel consumption are basically without meaning for the consumers, an additional classification into energy efficiency classes and their coloured illustration would make the label more comprehensible and more attractive.
As consumers are already familiar to the kind of rating system introduced for household appliances, the same design should be used for the passenger car label. This means, that the energy efficiency rating system should include 7 energy efficiency classes from A to G, which are illustrated as arrows and coloured from green, via yellow and orange to red. This would be more user friendly and immediately informative in comparative terms.

D.1.6.2 Absolute or relative comparison?

After balancing the pros and cons of the absolute or relative comparison method, summarised in chapter D.1.5, the absolute comparison method should be favoured.

An absolute comparison system is the most simple comparison method to handle, especially across the EU market, and easy to understand for consumers. But in particular, an absolute system avoids the arbitrary and contentious issues of defining the categories for an “in class” system and all the related issues, as specified in chapter D.1.5. To develop a consistent and fair method for a relative comparison, which is accepted by all involved parties (e.g. government, ministries, environmental agencies, car manufacturers) throughout the EU, is quite difficult.

As determined in the previous comparisons, the relative comparison methods used in the Netherlands, Spain (optional) and Switzerland show their weaknesses by all means.
The Swiss comparison system, which indicates the energy efficiency classes in relation to the vehicle curb weight, could easily tempt the car manufacturers to upscale possible borderline cases by e.g. increasing the weight and in that way to get a more fuel efficient label. This would not only increase actual fuel consumption, but also diminish the public trust in the label and make it more unreliable.
Also a relative comparison method based on the vehicle size, as used in the Netherlands and Spain (optional), are somehow “unfair”, especially for “small cars” with low absolute fuel consumption that, depending on the relative comparison method, could be labelled “D” or “E” - when “bigger cars” with higher absolute fuel consumption would be labelled “A” or “B”. The high CO_2 emissions of executive and luxury class cars are “palliated” by the relative comparison method, although the absolute CO_2 emissions of these cars often exceed 200 g/km. This is contradictory to the environmental aim of Directive 1999/94/EC to reduce CO_2 emissions of passenger cars most directly.
Due to the complex calculation basis used for the determination of the energy efficiency classes, all relative comparison systems are quite difficult to understand for consumers.

As often discussed, basis for a relative comparison method could surely be also the classification of the vehicle models into vehicle categories like e.g. “mini class”, “small family cars”, “executive”.
These vehicle categories are quite popular throughout the car branch and since they are also used by various organisations, automobile clubs and automobile magazines, most consumers are familiar with them. But the problem is, that there is no universally valid definition of these vehicle categories. Each organisation or magazine has its own definition of vehicle categories, which sometimes results in different classifications of identical vehicle models.

D.1.6.3 Definition of the energy efficiency class bands

After choosing the absolute comparison, the next step involves the determination of the CO_2 emission or fuel consumption bands for the 7 energy efficiency classes.

For a direct and fair competition, all kind of engine or fuel types should be handled in the same way. This means that the energy efficiency class bands should be identical for all kind of engine or fuel types.
Taking petrol and diesel engines as example, it can be noted that the CO_2 emissions from 1 litre of petrol are about 2,380 g, from 1 litre diesel fuel about 2,750 g. Thus, CO_2 emissions from 1 litre diesel fuel are 16 % higher than from 1 litre of petrol. But, the advantage of diesel concerning fuel consumption in principle is shown alleviated according CO_2 emissions. Hence, an additional sub-division of the energy efficiency classes for diesel and petrol is unnecessary.
And particularly with regard to the increasingly offered vehicle models with alternative modes of drive, like for example hybrid, CNG/LPG, electric, ..., a direct comparison of all kind of vehicle models should be provided.

The comparison of the absolute comparison systems, introduced in Belgium, Denmark and the United Kingdom, in chapter D.1.2.5 shows that the energy efficiency classes in Denmark and the United Kingdom are much more narrow than in Belgium. In Denmark and the United Kingdom the classes are equally narrow, but in the United Kingdom they are stricter.
Within the comparison of the existing absolute and relative comparison methods in chapter D.1.4 it can be noted that the Danish energy efficiency class bands offer the widest classification of the absolute comparison systems. But the Danish system is less strict regarding the classification of class A and B than the comparison systems used in Belgium or the United Kingdom.

When assessing the energy efficiency class bands, it should be considered that energy efficiency class A should be awarded only to vehicle models with absolute low CO_2 emissions. A threshold value of 130 g/km as used within the Danish rating system for class A may be too high since quite a lot of vehicle models already reach this value. Class A should still remain a challenge for the car manufacturers.

Therefore, the energy efficiency class bands should also bear a relation to the agreement of the European Commission and the European, the Japanese and the Korean Automobile Manufacturers' Associations - ACEA, JAMA and KAMA regarding the reduction of CO_2 emissions from passenger cars laid down in the Commission Recommendations 1999/125/EC of 5 February 1999 (ACEA), 2000/304/EC (JAMA) and 2000/303/EC (KAMA) both of 13 April 2000. The main aims of these agreements are:

- To achieve an average CO_2 emission value of 140 g/km for all new cars sold in the European Union by 2008 (ACEA) / 2009 (JAMA, KAMA).
- To evaluate in 2003 (ACEA, JAMA) / 2004 (KAMA) the potential for additional fuel efficiency improvements with a view to the objective of 120 g/km CO_2 by 2012.
- To place on the market vehicle models emitting 120 g/km CO_2 or less, by the earliest possible date after the year 2000.
- To achieve collectively an intermediate CO_2 emission target in the range of 165 to 170 g/km CO_2 by 2003 (ACEA, JAMA) / 2004 (KAMA).

Remark: According to the official EU CO_2 monitoring data for the year 2003 the average CO_2 emission values of all newly registered passenger cars in 2003 were: 163 g/km for ACEA, 172 g/km for JAMA, 179 g/km for KAMA and 164 g/km for the EU-15 Member States.

Taking all these perceptions into consideration, an energy efficiency rating system based on an energy efficiency index (%), showing the low or elevated fuel consumption or CO_2 emissions of a passenger car offered for sale in percent in comparison to the average fuel consumption or CO_2 emissions of all passenger cars newly registered in a certain reference year, in the EU or in a single Member State, should be defined. One possible solution is shown in Table 21.

Energy efficiency class	Energy efficiency index (%)
A	Index ≤ -25%
B	-25% < index ≤ -15%
C	-15% < index ≤ -5%
D	-5% < index < 5% (average)
E	5% ≤ index < 15%
F	15% ≤ index < 25%
G	25% ≤ index

Table 21: Possible absolute comparison system based on an energy efficiency index (%), showing the low or elevated fuel consumption or CO_2 emissions of a passenger car offered for sale in percent in comparison to the average fuel consumption or CO_2 emissions of all passenger cars newly registered in a certain reference year, in the EU or in a single Member State

This kind of definition of the energy efficiency classes is similar to the energy efficiency rating systems of the Netherlands and Spain, but the average fuel consumption or CO_2 emission value of all passenger cars newly registered in a certain reference year should be used as reference value.

This definition of the energy efficiency classes also offers the possibility to easily review and adjoint to the technical development through an actualisation of the reference value. How important a regular review is, shows the experience of the household appliance labelling (see chapter C.3).

If an EU-wide harmonised rating system is preferred (see also chapter D.1.6.4), the average CO_2 emissions for the EU-15 Member States of a certain year could be used as reference value.
Taking for example the average CO_2 emission value of 164 g/km for the EU-15 Member States in 2003 into account, the energy efficiency classes as shown in Table 22 could be defined.

Energy efficiency class	CO_2 emission bands (g/km)
A	$CO_2 \leq 123$
B	$123 < CO_2 \leq 139$
C	$139 < CO_2 \leq 156$
D	$156 < CO_2 < 172$
E	$172 \leq CO_2 < 189$
F	$189 \leq CO_2 < 205$
G	$CO_2 \geq 205$

Table 22: Possible absolute comparison system based on the average CO_2 emission of 164 g/km of all new cars sold in the EU-15 Member States in 2003

If the Member States do not agree on an EU-wide harmonised rating system, the same definition of the energy efficiency class bands, as shown in Table 21, would be used in all countries, even though the reference values are different. One possible solution would be the average fuel consumption or CO_2 emissions of all passenger cars newly registered in the single Member State.
This solution in particular would take into account the wide variation of the average CO_2 emissions of newly registered passenger cars per Member State as shown in chapter C.2. (France, Italy, Portugal, Spain: < 155 g/km in 2002, Sweden: 198 g/km, Finland: 178 g/km, Germany: 176 g/km).

Using the proposed EU-wide harmonised rating system based on the average CO_2 emission of 164 g/km of all passenger cars newly registered in the EU-15 Member States in 2003, as shown in Table 22, for a comparison of different vehicle models by the example of VW Golf as well as representative vehicle models of the popular vehicle categories “small family cars” (hatchback), “mini cars” and “executive cars”, similar to the comparison in chapter D.1.4, it can be noted that within a single vehicle model as well as within a certain vehicle category, representing a certain vehicle size category, the proposed rating system shows energy efficiency class ranges over 4 or more classes and offers a good possibility of comparison for consumers. The detailed comparisons can be seen in Annex 8 -11.

Model / category	No. of model versions	CO_2 range (g/km)	Energy efficiency class range Proposed Absolute comparison
VW Golf			
- Diesel	9	135 - 159	B - D
- Petrol	11	149 - 276	C - G
- All	20	135 - 276	B - G
“Small family cars” / 17 vehicle models (Alfa 147 - VW Golf)			
- Diesel	62	117 - 176	A - E
- Petrol	91	146 - 287	C - G
- All	153	117 - 287	A - G
“Mini cars” / 14 vehicle models (Daewoo Matiz - VW Lupo)			
- Diesel	9	81 - 140	A - C
- Petrol	38	113 - 182	A - E
- All	47	81 - 182	A - E
“Executive cars” / 12 vehicle models (Alfa 166 - Volvo S80)			
- Diesel	35	162 - 247	D - G
- Petrol	58	202 - 314	F - G
- All	93	162 - 314	D - G

Table 23: Energy efficiency class ranges of the proposed rating system by the example of VW Golf, “small family cars”, “mini cars” and “executive cars”

D.1.6.4 EU-wide harmonisation

In a Europe that is characterised by the growing mobility of its citizens, a multinational car industry and great ease in purchasing all kinds of cars in different Member States, an identical labelling system used in all Member States would surely be the most effective measure. A harmonised system would clearly support general awareness throughout the EU, and it would equally avoid distortions and create synergies between the Member States. This would also offer an easier handling and lower cost for the manufacturers, for example the labels could be fixed right after the vehicle production.

Contrary to the introduction of the energy efficiency classes and their coloured illustration, which could be realised very easily, as well as the acceptance of an absolute comparison method by all Member States, the major difficulty will be the identical definition of the energy efficiency class bands (see also chapter D.1.6.3).

Since in some Member States the energy efficiency rating system is or should be directly linked to fiscal measures (e.g. UK: VED), EU-wide identical energy efficiency class bands may lead in these countries to different classifications within these two systems. A mixed message would be conveyed to car buyers through two Government-sponsored systems.
However, this problem could finally only be solved by an adaptation of both systems or ideally by the introduction of EU-wide harmonised fiscal measures.

D.2 Additional information and data on the label

D.2.1 Comparison of the labels used in the Members States

The comparison of the labels used in the Member States shows that the minimum requirements of the Directive are fulfilled by all countries.

In all Member States the label includes data on CO_2 emissions (g/m), the fuel consumption (l/100 km) and/or the fuel reach (km/l or mpg) as numerical figures.

Besides an energy efficiency rating system, implemented already in Belgium, Denmark, the Netherlands, Portugal, Spain (optional) and the United Kingdom as described in chapter D.1, other additional data are included in the following Member States:

Austria (voluntarily):

- Noise data
- Emission standard
- "NOVA" (standard fuel consumption tax)
- Bio-fuel or LPG/CNG capability.

Belgium:

- Additional information regarding the importance of regular maintenance to keep fuel consumption and CO_2 emissions low, included on demand of the car industry.

Denmark:

- "Green motor tax" (Kr/year)
- Fuel cost (Kr/year) for a driving distance of 20,000 km, estimated fuel price per litre: petrol 8.25 Kr (1.07 €), diesel 7 Kr (0.91 €)
- EuroNCAP frontal-/side impact rating (1-5 stars "*")
- EuroNCAP pedestrian test rating (1-5 stars "*")
- Particle filter (yes/no).

Finland (voluntarily):

- Some technical data from the type approval
- Accessories and equipment
- Price information.

Sweden:

- "Miljöklass" (national environmental class).

United Kingdom (new label introduced by Sept. 2005):

- Graduated vehicle excise duty VED (Pound/year)
- Fuel cost (Pound) for a driving distance of 12,000 miles, estimated fuel price per litre: petrol 76 p (1.10 €), diesel 78 p (1.13 €), LPG 38p (0.55 €).

D.2.2 Conclusion and recommendation

Comparing the different labels used in the Member States, it can be noted that some of them contain all kind of information. Besides some information, which is directly linked to the fuel consumption or CO_2 emissions of the vehicle model, like for example fuel cost or vehicle tax, also a lot of other data ranging from toxic emissions, noise data, safety standard to price information and the vehicle specification are mentioned.

To avoid that the label becomes too complex and loses its proper meaning, the label should focus on fuel consumption and CO_2 emissions. Unnecessary extra data such as vehicle specification, price information, safety standard, emission standard should be avoided to keep the label clear and attractive.

But, since the numerical information about the fuel consumption and especially the CO_2 emissions are without meaning for most consumers and the fuel consumption is mostly only important for them because of the cost, but not to environmental reasons, the fuel consumption and CO_2 emissions should be expressed additionally as fuel running cost on the label, e.g. estimated fuel costs per year or per 15,000 km, taking into account an average fuel price which surely requires frequent review.

If fiscal measures, which are directly linked to the fuel consumption or CO_2 emissions of passenger cars, are introduced in a country, information about the tax bands or tax deduction should also be mentioned on the label.

A sample of a possible design for the label is shown in Figure 34.

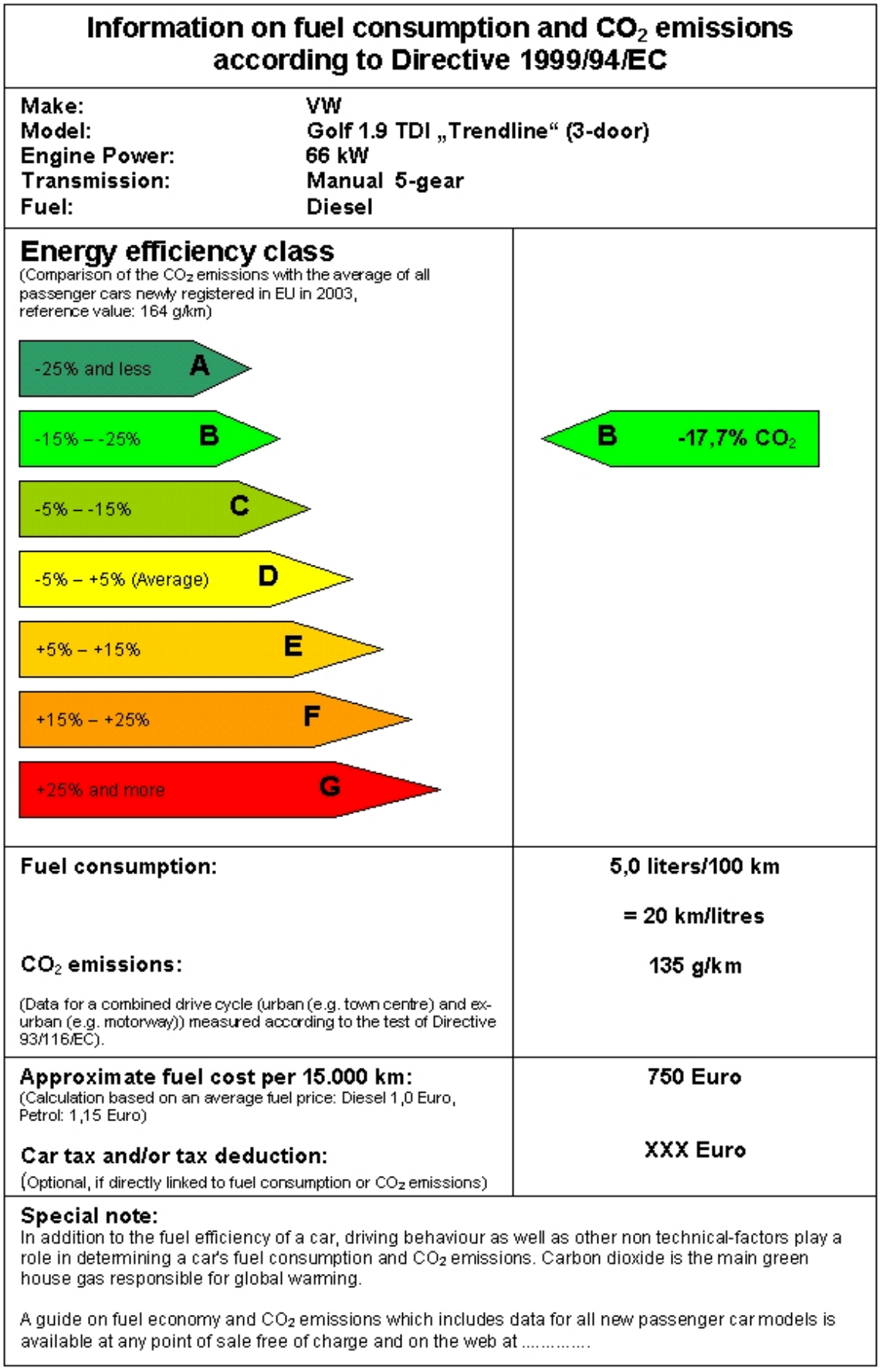

Figure 34: Proposed energy efficiency label

E Evaluation of options to incorporate other aspects which could be of interest for the labelling work

In this chapter other aspects which could be of interest for the labelling work are evaluated. In the following, special attention is paid to N1 vehicles, the additional fuel consumption and CO_2 emissions of air conditioning systems and auxiliary heaters as well as fuel saving car devices.

E.1 Incorporation of N1 vehicles (light commercial vehicles) into the labelling Directive

According to the fourth annual report on the effectiveness of the Community strategy to reduce CO_2 emission from cars (reporting year 2002), around 20 million N1 vehicles (light commercial vehicles) are estimated to be on the market. There has been a steady growth of newly registered N1 vehicles from just above 1 million in 1995 to over 1.5 million in 2000. Diesel engines dominate the majority of the N1 vehicle market with around 95 % penetration of new sales. The sales of N1 vehicles in the European Union are expected to grow by 2 % annually.

Since N1 vehicles are the third largest category of on-road CO_2 emitters after passenger cars and heavy-duty vehicles, it surely makes sense to introduce similar labelling requirements as those for M1 vehicles by Directive 1999/94/EC also for this vehicle class. In particular, when taking their CO_2 emissions into consideration, which accounted for about 13 % of total on-road CO_2 emissions in 2000, emitting about 90 Mt CO_2. On current trends, it is predicted that these emissions will increase both in absolute and relative terms in the coming decade.

Due to the amendment of Council Directive 70/156/EEC and 80/1268/EEC by Directive 2004/3/EC of 11 February 2004, the necessary basis for the measurement of CO_2 emissions and fuel consumption of N1 vehicles was provided.
This amendment prescribes the implementation of mandatory CO_2 and fuel consumption measurements

- for new N1 vehicle models (granting of the type approval) from 01 January 2005 (N1, class I) or rather 01 January 2007 (N1, classes II and III),
- for all N1 vehicles (first registration) from 01 January 2006 (N1, class I) or rather 01 January 2008 (N1, classes II and III).

Thus, the CO_2 labelling of N1 vehicles could be implemented already successively from 01 January 2005 on, starting with the new N1 vehicle models of class I.
But, since the N1 vehicles vary widely in their vehicle weight, the N1 vehicles of class I (reference mass not exceeding 1.305 kg), class II (reference mass greater than 1.305 kg, but not exceeding 1.760 kg) and class III (reference mass in excess of 1.760 kg) should be handled separately if an energy efficiency rating system is introduced.

E.2 Additional fuel consumption and CO_2 emissions caused by air conditioning systems and auxiliary heaters

Aside from the benefits on comfort and safety, the use of air conditioning and auxiliary heaters requires additional energy to operate them. This results in additional fuel consumption and CO_2 emissions.

As part of the TNO study "Options to integrate the use of mobile air conditioning systems and auxiliary heaters into the emission type approval test and the fuel consumption test for passenger cars (M1 vehicles)", which was carried out on behalf of the European Commission, DG ENV between January and September 2002, the magnitude of these effects has been established at an average fuel consumption of 0.28 l/100 km (7 g/km of CO_2) for Central Europe, 0.21 l/100 km (5 g/km CO_2) for Northern Europe and 0.44 l/100 km (11 g/km CO_2) for Southern Europe taking into account the different daily temperature distribution of the European regions.
For auxiliary heaters, the fuel consumption and CO_2 emissions are probably in the same order of magnitude or considerably lower, depending on the type of heater used.
Based on these figures, the additional fuel consumption and CO_2 emissions due to the use of these auxiliaries in relation to the average fuel consumption (6.7 l/100 km) and CO_2 emissions (164 g/km) of the European new car fleet (ACEA 2002) can be deemed significant and they range from 3.1 % for Northern Europe and 4.2 % for Central Europe to 6.6 % for Southern Europe.

These results show that the use of auxiliaries has a main influence on the increase of fuel consumption and CO_2 emissions, which leads to a definite need to control these negative effects on the environment.
A way of enabling this control is addressing the CO_2 emissions and fuel consumption due to the use of air conditioning and auxiliary heaters during type approval. Incorporating this into the type approval procedure could facilitate the following items:

- The consumers' right to know about and their awareness of the vehicle's additional fuel consumption when using auxiliary equipment such as air conditioning and heaters.
- The possibility for consumers to identify efficient systems by means of labelling vehicles and systems.
- Encouraging the industry to develop and market efficient air conditioning and heating systems.

E.2.1 Measuring the additional fuel consumption and CO_2 emissions of air conditioning systems and auxiliary heaters within the scope of the type approval

E.2.1.1 Findings of the TNO study

In order to facilitate the items mentioned above and next to establishing the magnitude of the problem, the TNO study has evaluated the possibilities for integrating mobile air conditioning and auxiliary heaters in the type approval test for CO_2 emissions and fuel consumption from passenger cars (M1 vehicles).

The most straightforward approach to establishing the environmental performance of any auxiliary system during type approval would be to perform the fuel consumption test twice, once with the auxiliary system switched off and then with the auxiliary system switched on under certain conditions. The effect of the auxiliary system results from the subtraction of the

values of the first test from those of the second test. However, this set-up would lead to at least doubling the amount of testing to type approve a vehicle. The financial- and timing implications of such a procedure would have severe negative effects for the automotive industry.

Taking these implications into consideration, TNO looked for intelligent options in order to decrease the amount of actual test work, without compromising the basic requirements of the procedure. This led to a set-up in which car types on the market are grouped into certain families, enabling one test set-up per family (instead of one test per type). This family building process is based on the similarities between vehicle types. These similarities in vehicle engineering fall into 3 groups (subsystems):

- Subsystem I: the power generation system
- Subsystem II: the air conditioner system
- Subsystem III: the vehicle body and its environment.

By establishing typical parameters for each subsystem (within a certain family) in relation to certain environmental conditions while executing the type approval fuel consumption test on a “parent vehicle”, the actual amount of tests needed to address the topic under investigation can be reduced significantly. In order to live up to the fundamental requirement of the procedure of being able to rank systems (combinations of the three subsystems) based on their environmental performance, the testing in a climatic chamber under stabilised conditions is required.

To this end, a general but nevertheless sufficiently detailed approach for a measurement procedure was developed, not, however, a fully elaborated procedure itself. It was finally agreed that the TNO study would result in a report that could serve as a solid basis for a discussion between the Commission and the stakeholders (i.e. the relevant industry and the Member States). The outcome of that process could then serve as the necessary input for the next phase – the detailed development of the actual procedure and its evaluation. This evaluation would encompass:

- A check on the practicability of the procedure in the laboratory.
- The exact definition of the requirements for the procedure.
- Insights into the values of parameters and the variability of the values in relation to surrounding conditions.
- Insights into the possibility of using default values for certain parameters based on the knowledge of the variability and the level (of importance) of the parameters.
- A detailed calculation of the actual cost-effectiveness based on actual measured data in a more final procedure set-up. The additional costs for executing the procedure at this stage is roughly calculated between 0.09 and 14 Euro/vehicle sold, whereas the benefits could not be calculated within the framework of the TNO study because of the large influence of socio/economic parameters on the actual benefits.

Unfortunately, the results of the further evaluation by TNO are not yet available. Hence it is not yet possible to assess, if the proposed test procedure can be used in practice for the measurement of the additional fuel consumption and CO_2 emissions caused by the use of air conditioning and auxiliary heaters.

E.2.1.2 UBA (German Federal Environmental Agency) research project no. 20145105

The German Federal Environmental Agency UBA has also concluded a research project regarding the adjustment of Directive 80/1268/EEC on CO_2 emissions and fuel consumption of passenger cars by taking into account mobile air-conditioning and drivers assistance indicators. This project is presently carried out by RWTÜV. Since the first results of this UBA research project will not be available before March 2005, an assessment within this study is not possible.

E.2.2 Summary and conclusion

The TNO study shows a significant additional fuel consumption and CO_2 emissions due to the use of air conditioning, which range from 0.21 l/100 km (5 g/km CO_2) for Northern Europe and 0.28 l/100 km (7 g/km of CO_2) for Central Europe to 0.44 l/100 km (11 g/km CO_2) for Southern Europe taking into account the different daily temperature distribution of the European regions.
For auxiliary heaters the fuel consumption and CO_2 emissions are probably in the same order of magnitude or considerably lower, depending on the type of heater used.

With regard to the envisaged reduction of CO_2 emissions of passenger cars, there is a definite need to control these negative effects on the environment. A way of enabling this control is addressing the emissions and fuel consumption due to the use of air conditioning and auxiliary heaters during type approval.

Unfortunately, the results of the further evaluation by TNO are not yet available. Hence it is not yet possible to assess, if the proposed test procedure can be used in practice for the measurement of the additional fuel consumption and CO_2 emissions caused by the use of air conditioning and auxiliary heaters.

In parallel to the further evaluation of the TNO proposals, the results of the UBA research project no. 201 45 105 have to be assessed. Maybe this study, done by RWTÜV, proposes an other possible method of measuring during type approval the additional fuel consumption and CO_2 emissions caused by the use of air conditioning and auxiliary heaters.

If so, the proposals of TNO and RWTÜV have to be compared and assessed to find the more practical and cost efficient solution. Since the first results of this UBA research project will not be available before March 2005, an assessment within this study is not possible.

Incorporating into type approval procedure the measurement of the additional fuel consumption and CO_2 emissions caused by the use of air conditioning and auxiliary heaters, could facilitate the following items:

- Increasing consumers' awareness of the vehicle's additional fuel consumption when using auxiliary equipment such as air conditioning and heaters.
- Enabling consumers to identify efficient systems by means of labelling vehicles as well as systems.
- Encouraging the industry to develop and market efficient air conditioning and heating systems.

E.3 Fuel saving car devices

This chapter should give a survey of already available fuel-saving car devices. Special attention is paid to low-friction tyres, high-lubricity engine oils as well as fuel consumption and gear shift indicators and their possible positive impact on fuel consumption and CO_2 emission reduction.
Therefore, findings of the Association of German Automobile Manufacturers VDA as well as the ECO-DRIVING project are taken into account.

The ECO-DRIVING Europe project is supported by SAVE, the Energy Efficiency Programme of the European Union. The project is co-ordinated by the Austrian Energy Agency E.V.A. and the main actors of the ECO-DRIVING in Europe are partners in this project. The demonstrations of ECO-DRIVING Europe approached different target groups:

- Driving Schools (Spain): Integration of ECO-DRIVING into the driving licence curriculum,
- Driving Schools (Portugal): First steps with one driving school,
- Car Fleet (Belgium): Experience in big car fleets,
- Public Transport (Austria): More Comfort, less fuel, less cost,
- Public Transport (Greece): ECO-DRIVING with GPS-monitoring system,
- Experienced private Drivers (Netherlands): A software application to train drivers through the internet.

The aim of this project is to accelerate the establishment of economic and ecologically compatible driving styles, a cheap method for saving fuel and money whilst contributing to road safety. Special attention is given to training lessons in economical driving, the integration of ECO-DRIVING in the driving licence curricula in European countries as well as to the use of fuel economy indicators. ECO-DRIVING Europe started in April 2001. Completion of the project was scheduled for the end of 2004.

E.3.1 Low-friction tyres

Low-friction tyres are tires featuring more fuel efficiency by a reduced rolling drag and a reduced noise development. Compared with conventional tyres, these tyres have a 20 to 30 % lower rolling resistance.
According to the publications of the Association of German Automobile Manufacturers VDA, this translates into a fuel saving of between 2 and 5% in the new European driving cycle. It is a purely theoretical quantity, though, as driving resistance is made up of a number of different factors. In actual use, low-friction tyres can contribute a fuel saving of around 1.5 % on passenger cars.
Low-friction tyres are already fitted as original equipment today by a large number of manufacturers and are part of the automotive industry's package of measures to reduce CO_2 emissions from passenger cars.

E.3.2 High-lubricity engine oils

By reducing friction inside the engines, in particular during cold starting, the so-called high-lubricity engine oils can contribute towards reducing CO_2 emissions. As published by the VDA, compared with the conventional and outdated "15W40" oil, high-lubricity engine oil can provide fuel savings of up to 2.5 % measured according to the new European driving cycle.
A large number of automobile manufacturer have already been using low-friction oils for a number of years.

E.3.3 Fuel economy indicators – Results of ECO-DRIVING Europe

Since 1990, a large number of demonstration projects and field tests with various fuel economy indicators have been carried out in the Netherlands. The most important fuel economy indicators are briefly described in the following:

Revolution or rev counter
A revolution counter informs the driver when it is wise to shift (i.e. at a certain number of revolutions). It also assists the driver in avoiding driving at excessive and therefore very inefficient, engine speeds (i.e. high revolutions).

Cruise control
Cruise control makes it easy for a driver to maintain a steady speed. This saves fuel and exhaust emissions, contributes to a relaxed driving style and helps avoiding fines for unintentional speeding.

On-board computer
Nowadays many new cars have an on-board computer with a variety of options, such as average and actual fuel consumption. The actual fuel consumption display gives the driver immediate feedback on his/her driving behaviour and its influence on fuel consumption.

Fuel consumption meter
A fuel consumption meter or econometer or economy meter shows the driver actual information on the amount of fuel the car is consuming at the moment. Fuel consumption meters can be found in some, mostly older cars of the seventies and early eighties. But they also appear in new cars making sophisticated use of the engine management system data.

Shift indicator
A shift indicator alerts the driver when it is most-fuel efficient to shift up. In the past the signal was usually given by one or more lights. Nowadays modern engine management systems can provide the driver with sophisticated information on when to shift, taking into account circumstances like e.g. outside temperature, engine temperature and load.

Primary conclusions were drawn from the results of the tests:

- Equipping a fleet of cars with fuel economy indicators may reduce their fuel consumption by around 5 % on average and this is before any kind of ECO-DRIVING training for drivers has taken place.
- Fuel-savings with fuel economy indicators can be substantially higher in combination with ECO-DRIVING courses, estimated 10 % on average.
- In order to be efficacious, the functionality of the fuel economy indicators has to meet certain criteria in regards to display and operability.

The results tend to show that fuel economy indicators support ECO-DRIVING and stimulate fuel efficiency.
Fuel economy indicators are already commonly used in the ECO-DRIVING training to emphasise that ECO-DRIVING really works and to analyse individual driving styles after the training.
They could also support the implementation of ECO-DRIVING in day-to-day driving practise. Because the training capacities for ECO-DRIVING are limited even with large national programmes, only a few percent of advanced drivers can be reached. Therefore, equipping cars with fuel economy indicators play a strategic role in promoting a fuel-saving driving style. It is a possible way to reach all drivers.

ECO-DRIVING Europe therefore recommends the following strategies:

- Within a few years, all new cars should be equipped with fuel economy indicators. This task has to be addressed on a European policy level.
- Existing car fleets should be equipped with fuel economy indicators. This can be achieved by the development of cheap and easy-to-install devices and support by national ECO-DRIVING programs.

E.3.4 Summary and conclusion

The findings of the ECO-DRIVING project show that fuel economy indicators may help to reduce fuel consumption and CO_2 emissions while driving. Fuel economy indicators seem to have the greatest impact in this respect.
But, while the use for instance of low-friction tyres and high-lubricity engine oils demonstrates its effect without any input from the driver him/herself, fuel economy indicators can show their full impact only if they are used effectively by the drivers.

The study “Fuel saving in-car devices in passenger cars: A European market survey” from NEA Transport research and training on behalf of NOVEM, shows that only 44 % use the fuel consumption meter “often” when available. On-board computer are used by 56 % when available, but primarily for monitoring the outside temperature (75 %) or the remaining driving range (41 %). Only 36 % use the on-board computer to monitor the actual fuel consumption and 29 % use it to monitor the average fuel consumption.

Hence it can be assumed that the request of fuel economy indicators as standard equipment of new passenger cars may only lead to the desired aim in fuel consumption and CO_2 reduction, if the consumers are also aware of their use. This can only be achieved by further educational advertising. Therefore, merely mentioning the availability of fuel economy indicators within the scope of the CO_2 labelling will surely not be sufficient.

F Conclusion and recommendations

The assessment in chapter C of this study clearly indicates that Directive 1999/94/EC does not yet show the desired effectiveness, neither regarding informing and influencing consumers nor regarding the reduction of the CO_2 emissions of passenger cars.
Thereby, besides the evaluation of the Member States' reports according to Article 9 of Directive 1999/94 EC, also the findings of further projects like the CLASE or DLR project as well as the development of the average specific CO_2 emissions of new passenger cars were taken into account. To supplement the results of the Member States' reports as well as the CLASE study, a survey of European automobile club members on their consumer behaviour when buying a new car with consideration to fuel consumption and CO_2 emissions was carried out via internet.

At first glance, the poor result could create the impression that the CO_2 labelling of new passenger cars is unsuccessful and can be dropped again.
But the experiences with the labelling of household appliances (see chapter C.3) clearly prove that an energy efficiency labelling system can be quite successful. In the light of the experiences with household appliance labelling, improving the labelling scheme of new passenger cars is definitely recommendable over dropping it.
Even if it will surely be a long way to reach the position the labelling of household appliances has, it is a challenge to develop a common energy efficiency labelling system for new passenger cars similar to the one for household appliances. But there is also strong evidence that it could be a very powerful tool in increasing the energy efficiency of the passenger car fleet.

In order to increase the effectiveness of Directive 1999/94/EC, two main items need to be improved: the awareness of consumers and dealers on the one hand and the provisions of the Directive on the other. Recommendations on this end are described in the following chapters.

F.1 Increasing the awareness of consumers and dealers

The study clearly verifies that generally consumers are not well aware of fuel economy and its environmental issues, e.g. greenhouse gas emissions, global warming. The role of CO_2 in this respect is not clear and there is a lot of confusion about the environmental problems. Also, the correlation of fuel consumption and CO_2 emissions is mostly unclear. Generally, fuel economy and environmental impact are no major factor in vehicle purchase decisions. Environmental friendliness is generally ranked in the middle or at the end and fuel consumption is mostly only important because of the cost, but not to environmental issues.

But also the dealers are not well aware of this subject and do not take stock in the Directive's provisions. While for most of them labelling means additional work, however, it does not also mean additional earnings.

Thus it is absolutely necessary to considerably raise the awareness of all stakeholders. Consumers as well as the whole automobile sector must be aware of the aim of the Directive and its provisions, the negative impacts of fuel consumption and CO_2 emissions, and the direct relationship between fuel consumption and CO_2 emissions.

Surely, the information on the label will not become the decisive factor in the purchase of a new passenger car. But in general, labelling can draw attention and consumers may start doubting about their choice, especially when the label is orange or red in terms of an energy efficiency rating system.

But in order to enable consumers to compare different vehicle models at all, it is mandatory that the information tools are available at all dealerships. Therefore regular controls of compliance at the dealerships have to be carried out by the authorities in charge and, definitely, penalties have to be issued in case of repeated offences, at least in the initial phase. Once consumers are aware of the information tools and demand them, the dealers and the car industry in general will obviously be motivated to provide these materials.

To raise the awareness of consumers and their interest in the information tools, supportive information campaigns by automobile clubs and consumer protection organisations may help in order to achieve the desired objective.

F.2 Improvement of the information tools

F.2.1 Harmonisation of the information tools

The evaluation of the Member States' reports shows that most countries would prefer EU-wide harmonised provisions for content and design of the information tools (e.g. identical label) in line with the EU-market requirements. Especially with regard to the growing mobility of its citizens, a multinational car industry and great ease in purchasing all kinds of cars in different Member States, an identical labelling system used in all Member States would surely be the most effective measure.
A harmonised system would clearly support general awareness throughout the EU, and it would equally avoid distortions and create synergies between the Member States. This would also offer an easier handling and lower cost for the manufacturers, for example the labels could be fixed right after the vehicle production. The success of a common label is proven by the labelling of household appliances.

F.2.2 Limitation of the provisions to the most effective information tools

Although the study shows that the general awareness with regard to label, poster/display and guide is quite small and these information tools are not regarded as very effective, the label and the guide are demonstrably deemed to be the most informative and useful information tools.
Since sales brochures are one of the foremost information sources besides dealerships, car magazines and recommendations by family and friends when purchasing a new car, the promotional literature is regarded as important, too. Whereas the poster/display on the other hand do not seem to be very effective.

It could therefore be of interest to focus on the design and the promotion of the three most informative and effective information tools: label, guide and promotion literature.
The poster/display could be dropped from the Directive's provisions or could be given voluntary status instead.

F.2.3 Introduction of an energy efficiency rating system

Since numerical information about CO_2 emissions and fuel consumption are basically without meaning for the consumers, an additional classification into energy efficiency classes and their coloured illustration would make the label more comprehensible and more attractive.

As consumers are already familiar to the kind of rating system introduced for household appliances, the same design should be used for the passenger car label. This means, that the energy efficiency rating system should include 7 energy efficiency classes from A to G, which are illustrated as arrows and coloured from green, via yellow and orange to red. This would be more user friendly and immediately informative in comparative terms.

F.2.3.1 Absolute or relative comparison?

Based on the comparison of the energy efficiency rating systems that already exist and were introduced on a voluntary basis in some Member States and after balancing the pros and cons of absolute or relative comparison method (see chapter D.1), the absolute comparison method should be favoured:

An absolute comparison system is the most simple comparison method to handle, especially across the EU market, and easy to understand for consumers. But in particular, an absolute system avoids the arbitrary and contentious issues of defining the categories for an “in class” system and all the related issues.

Developing a consistent and fair method for a relative comparison, which would be accepted by all involved parties (e.g. government, ministries, environmental agencies, car manufacturers) throughout the EU, would be quite difficult.

As determined in the comparison of the already existing absolute or relative comparison methods in chapter D.1, the relative comparison methods used in the Netherlands, Spain (optional) and Switzerland show their weaknesses by all means.
The Swiss comparison system, which indicates the energy efficiency classes in relation to the vehicle curb weight, could easily tempt the car manufacturers to upscale possible borderline cases by e.g. increasing the weight and in that way to get a more fuel efficient label. This would not only increase actual fuel consumption, but also diminish the public trust in the label and make it more unreliable.
Also a relative comparison method based on the vehicle size, as used in the Netherlands and Spain (optional), are somehow “unfair”, especially for “small cars” with low absolute fuel consumption that, depending on the relative comparison method, could be labelled “D” or “E” - when “bigger cars” with higher absolute fuel consumption would be labelled “A” or “B”. The high CO_2 emissions of executive and luxury class cars are “palliated” by the relative comparison method, although the absolute CO_2 emissions of these cars often exceed 200 g/km. This is contradictory to the environmental aim of Directive 1999/94/EC to reduce CO_2 emissions of passenger cars most directly.
Due to the complex calculation basis used for the determination of the energy efficiency classes, all relative comparison systems are quite difficult to understand for consumers.

If preference should be given to a relative comparison system, the best solution would then surely be the classification of the vehicle models into vehicle categories like e.g. “mini class”, “small family cars”, “executive cars”.
These vehicle categories are quite popular throughout the car branch and since they are also used by various organisations, automobile clubs and automobile magazines, most consumers are familiar with them. But the problem is, that there is no universally valid definition of these vehicle categories. Each organisation or magazine has its own definition of vehicle categories, which sometimes results in different classifications of identical vehicle models.

F.2.3.2 Definition of the energy efficiency bands

Contrary to the introduction of the energy efficiency classes and their coloured illustration, which could be realised very easily, as well as the acceptance of an absolute comparison method by all Member States, the major difficulty will be the identical definition of the energy efficiency class bands.

Since in some Member States the energy efficiency rating system is or should be directly linked to fiscal measures (e.g. UK: VED), EU-wide identical energy efficiency class bands may lead in these countries to different classifications within these two systems. A mixed message would be conveyed to car buyers through two Government-sponsored systems.
However, this problem could finally only be solved by an adaptation of both systems or ideally by the introduction of EU-wide harmonised fiscal measures.

One possible solution for an absolute comparison method is described in chapter D.1.6.3.

F.2.4 Label

To avoid that the label becomes too complex and loses its proper meaning, the label should focus on fuel consumption and CO_2 emissions. Unnecessary extra data such as vehicle specification, price information, safety standard, emission standard should be avoided to keep the label clear and attractive.

In addition to showing the absolute fuel consumption (l/100km), fuel reach (km/l) and CO_2 emissions (g/km) values of the vehicle model, the label should also mention its energy efficiency class. As consumers are already familiar to the kind of rating system introduced for household appliances, the same design should be used for the passenger car label. This means, that the 7 energy efficiency classes from A to G should be illustrated as arrows and coloured from green via yellow and orange to red.

Since the fuel consumption is mostly only important because of the cost, but not to environmental reasons, the fuel consumption and CO_2 emissions should be expressed additionally as fuel running cost on the label, e.g. estimated fuel costs per year or per 15,000 km, taking into account an average fuel price which surely requires frequent review.

If fiscal measures, which are directly linked to the fuel consumption or CO_2 emissions of passenger cars, are introduced in a country, information about the tax bands or tax deduction should also be mentioned on the label.

A sample of a possible design for the label is shown in Figure 34 in chapter D.2.

F.2.5 Guide

Member States mostly criticise the guide because of the high production cost and the low demand by the consumers. Hence they request to cancel or to replace the paper version by a download version as already done for example in Portugal.
Since the guide is a useful tool which offers the possibility for consumers to compare all types of passenger cars, without visiting several showrooms, it should surely not be dropped completely from the Directive's provisions. Furthermore it has to be considered that the low demand by the consumers is primarily caused by its low level of recognition and its unavailability at the dealerships.

Regarding the question, if the paper version of the guide should be replaced by a download version, the national culture and attitude of the citizens has to be taken into account. Of course, the use of electronic media is steadily increasing in all countries, but there still is quite a significant number of citizens who are not aware of the new media (e.g. internet) and prefer the "old-fashioned" paper version.

Hence the Directive's provisions should be revised to that effect that each Member State has the possibility to choose the best solution for its country - download or paper version. But, even if a download version is indeed preferred, it has to be guaranteed that persons who are not aware of the new media (e.g. internet) will also be able to receive the guide.

F.2.6 Internet - Database solutions

When purchasing a new car, consumers consult a wide range of sources of information. Foremost information sources are basically dealerships, sales brochures, car magazines as well as recommendations by family and friends. But in most Member States the internet has also become an important source of information and its importance is increasing rapidly. Moreover, internet databases offer the possibility to provide the consumers with the most up to date information.

With regard to a harmonised EU market for passenger cars, a centrally hosted database and website that covers the whole European passenger car market would certainly be the most efficient. But due to the differences that currently still exist among the national car markets (e.g. different car taxation systems, different consumer preferences), common data collection will remain an objective for the distant future.

But nevertheless, for the short term a network of national databases which share information based on a common methodology could be most feasible and efficient. Furthermore, common tools could considerably help to reduce maintenance costs. Since this information network has already been developed as a result of other European research projects (5FP, Cleaner Drive), there is good basis which should be maintained in projects to follow.

F.3 Further measures aimed at reducing CO_2 emissions

In addition to increasing the awareness of consumers and dealers and improving the Directive's provisions, further measures could help to reduce the CO_2 emissions of passenger cars. The most important and maybe most effective are briefly described further down.

F.3.1 Fiscal measures

That fact that fiscal measures which are directly linked to the fuel consumption or CO_2 emissions of passenger cars may have a great impact on consumers' vehicle purchase decisions is clearly proven by the example of the Dutch BPM (registration tax) refund in 2002.
From 01 January 2002, a fiscal incentive was introduced for environmental-friendly passenger cars of class A and B as a reduction from the registration tax (BPM). Buyers of passenger cars labelled "A" received an incentive of 1,000 €, buyers of passenger cars labelled "B" 500 €. In this year, the percentage of class A increased disproportionately from 0.3 % in 2001 to 3.2 %, class B from 9.5 % in 2001 to 16.1 % (see chapter C.2).

F.3.2 Additional fuel consumption and CO_2 emissions caused by air conditioning systems and auxiliary heaters

As described in chapter E.2, the use of air conditioning shows a significant additional fuel consumption and CO_2 emissions, which range from 0.21 l/100 km (5 g/km CO_2) for Northern Europe and 0.28 l/100 km (7 g/km of CO_2) for Central Europe to 0.44 l/100 km (11 g/km CO_2) for Southern Europe taking into account the different daily temperature distribution of the European regions (source: TNO study). For auxiliary heaters the fuel consumption and CO_2 emissions are probably in the same order of magnitude or considerably lower, depending on the type of heater used.

With regard to the envisaged reduction of CO_2 emissions of passenger cars, there is a definite need to control these negative effects on the environment. A way of enabling this control is addressing the emissions and fuel consumption due to the use of air conditioning and auxiliary heaters during type approval.
In order to find an acceptable solution, it is necessary to assess whether the test procedures proposed by TNO or RWTÜV can be used in practice. Therefore, it is recommended to carry out the necessary additional tests as soon as possible.

Incorporating into type approval procedure the measurement of the additional fuel consumption and CO_2 emissions caused by the use of air conditioning and auxiliary heaters, could facilitate the following items:

- Increasing consumers' awareness of the vehicle's additional fuel consumption when using auxiliary equipment such as air conditioning and heaters.
- Enabling consumers to identify efficient systems by means of labelling vehicles as well as systems.
- Encouraging the industry to develop and market efficient air conditioning and heating systems.

F.3.3 Awareness of fuel consumption while driving

Since the driving behaviour as well as non-technical-factors play a major role in determining a car's fuel consumption and CO_2 emissions, it is of particular importance that consumers be aware of the effective fuel consumption while driving.

Projects such as ECO-DRIVING Europe may help to achieve this objective. Thereby, special attention is given to training lessons in economical driving, the integration of ECO-DRIVING in the driving licence curricula in European countries as well as to the use of fuel economy indicators. Economic and ecological driving styles are certainly the cheapest method of saving fuel and money.

The findings of the ECO-DRIVING project show that fuel economy indicators may help to reduce fuel consumption and CO_2 emissions while driving. Fuel economy indicators seem to have the greatest impact in this respect.
Equipping a fleet of cars with fuel economy indicators may reduce their fuel consumption by around 5 % on average and this is before any kind of ECO-DRIVING training for drivers has taken place. In combination with ECO-DRIVING courses, fuel-savings with fuel economy indicators can be substantially higher, estimated 10 % on average.

The results show that fuel economy indicators could support the implementation of ECO-DRIVING in day-to-day driving practise. Because the training capacities for ECO-DRIVING are limited even with large national programmes, only a few percent of advanced drivers can be reached.

But it also has to be taken into account, that the request of fuel economy indicators as standard equipment of new passenger cars may only lead to the desired aim in fuel consumption and CO_2 reduction, if the consumers are also aware of their use.
This can only be achieved by further educational advertising. Therefore, merely mentioning the availability of fuel economy indicators within the scope of the CO_2 labelling will surely not be sufficient.

F.3.4 Incorporation of N1 vehicles (light commercial vehicles) into the labelling Directive

As described in chapter E.1, N1 vehicles are the third largest category of on-road CO_2 emitters after passenger cars and heavy-duty vehicles. Therefore, it makes sense to introduce similar labelling requirements as those for M1 vehicles by Directive 1999/94/EC also for this vehicle class.

Due to the amendment of Council Directive 70/156/EEC and 80/1268/EEC by Directive 2004/3/EC of 11 February 2004, the necessary basis for the measurement of CO_2 emissions and fuel consumption of N1 vehicles was provided.

Thus, the CO_2 labelling of N1 vehicles could be implemented already successively from 01 January 2005 on, starting with the new N1 vehicle models of class I.
But, since the N1 vehicles vary widely in their vehicle weight, the N1 vehicles of class I (reference mass not exceeding 1.305 kg), class II (reference mass greater than 1.305 kg, but not exceeding 1.760 kg) and class III (reference mass in excess of 1.760 kg) should be handled separately if an energy efficiency rating system is introduced

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