

## CARBON LABELLING OF BIOFUELS IN EUROPE

Dominik Rutz<sup>1</sup>, Rainer Janssen<sup>1</sup>, Richard Safford<sup>2</sup>, John Neeft<sup>3</sup>,  
Simon Borg<sup>4</sup>, Charles Buttigieg<sup>4</sup>, Sven Bürkner<sup>5</sup>

<sup>1</sup>WIP Renewable Energies  
Sylvensteinstr. 2, D - 81369 Munich, Germany  
Tel. +49 89 720 12739, Fax +49 89 720 12791  
E-Mail: dominik.rutz@wip-munich.de, rainer.janssen@wip-munich.de  
Internet: www.wip-munich.de

<sup>2</sup>Home Grown Cereals Authority (United Kingdom), <sup>3</sup>SenterNovem (The Netherlands),  
<sup>4</sup>Malta Resources Authority (Malta), <sup>5</sup>Q1 Tankstellenvertrieb (Germany)

**ABSTRACT:** In the framework of the Carbon Labelling project within the EU Intelligent Energy – Europe (IEE) programme, pilot carbon labelling initiatives were implemented in order to contribute to the reduction of GHG emissions in the European transport sector. Firstly, a supportable methodology for the quantification of carbon life cycle reductions was identified in co-operation with recent and on-going activities and methodologies. In a second step, the “CO<sub>2</sub>Star” label was developed and three “CO<sub>2</sub>Star” labelling initiatives were implemented, namely a biodiesel (B100) and an improved lubricants labelling initiative at Q1 fuel stations in Germany, as well as a labelling initiative of low carbon freight services in The Netherlands. The present paper presents main results of the Carbon Labelling project which was implemented from 2006 to 2008 and give recommendations on the applications of labels in the transport sector.

**Keywords:** biodiesel, liquid biofuel, CO<sub>2</sub> balance, socio-economic aspects, labelling, CO<sub>2</sub> emission reduction

### 1 INTRODUCTION

Road transport is the second largest source of greenhouse gas emissions in the European Union (EU) after power generation. Road transport contributes about one-fifth of the EU's total emissions of carbon dioxide (CO<sub>2</sub>) and it is one of the few sectors where emissions are still rising rapidly. Currently, passenger cars alone are responsible for around 12% of EU CO<sub>2</sub> emissions. Thus, measures to reduce greenhouse gas (GHG) emissions in the transport sector have to be detected.

One opportunity to support CO<sub>2</sub> emission reductions in the transport sector is to limit the CO<sub>2</sub> emissions of new cars, which was implemented as European Regulation in April 2009 [1].

Another opportunity is to raise the awareness of consumers through labelling when purchasing new cars. As part of the renewed Community strategy on CO<sub>2</sub> from cars [2], the Commission is currently revising the Directive “relating to the availability of consumer information on fuel economy and CO<sub>2</sub> emissions in respect of the marketing of new passenger cars” (Labelling Directive) [3]. The adoption of the proposal to revise the labelling Directive is foreseen towards the end of 2009.

Finally, consumers could be informed about the CO<sub>2</sub> reduction potential of biofuels when compared to fossil fuels, and thus changing purchase decisions. This approach was investigated by the Carbon Labelling project [4, 5]. The aim was to create, implement, and to

test a European label for CO<sub>2</sub> reductions through biodiesel and fuel efficiency measures in order to contribute to the 10% target of renewable energies in the transport sector stated in the Renewable Energy Directive (RED) which was adopted in June 2009 [6].

### 2 EUROPEAN LEGISLATION ON GHG REDUCTIONS IN THE TRANSPORT SECTOR

In April 2009 the legislation on CO<sub>2</sub> emissions from passenger cars was officially published in the form of Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 [1] setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO<sub>2</sub> emissions from light-duty vehicles. Some key elements of the adopted text are as follows:

- The fleet average to be achieved by all cars registered in the EU is 130 grams per kilometre (g/km). A so-called limit value curve implies that heavier cars are allowed higher emissions than lighter cars while preserving the overall fleet average.
- In 2012, 65% of each manufacturer's newly registered cars must comply on average with the limit value curve set by the legislation. This will rise to 75% in 2013, 80% in 2014, and 100% from 2015 onwards.
- If the average CO<sub>2</sub> emissions of a manufacturer's fleet

exceed its limit value in any year from 2012, the manufacturer has to pay an excess emissions premium for each car registered. This premium amounts to €5 for the first g/km of exceedance, €15 for the second g/km, €25 for the third g/km, and €95 for each subsequent g/km. From 2019, already the first g/km of exceedance will cost €95.

- A target of 95 g/km is specified for the year 2020. The modalities for reaching this target and the aspects of its implementation including the excess emissions premium will have to be defined in a review to be completed no later than the beginning of 2013.
- Since the test procedure used for vehicle type approval is outdated, certain innovative technologies cannot demonstrate their CO<sub>2</sub>-reducing effects under the type approval test. As an interim procedure until the test procedure is reviewed by 2014, manufacturers can be granted a maximum of 7 g/km of emission credits on average for their fleet if they equip vehicles with innovative technologies, based on independently verified data.

Article 6 of the regulation defines specific emissions target for alternative-fuel vehicles. "For the purpose of determining compliance by a manufacturer with its specific emissions target referred to in Article 4, the specific emissions of CO<sub>2</sub> of each vehicle designed to be capable of running on a mixture of petrol with 85 % ethanol ('E85') which meets relevant Community legislation or European technical standards, shall be reduced by 5 % until 31 December 2015 in recognition of the greater technological and emissions reduction capability when running on biofuels. This reduction shall apply only where at least 30 % of the filling stations in the Member State in which the vehicle is registered provide this type of alternative fuel complying with the sustainability criteria for biofuels set out in relevant Community legislation." For biodiesel no specifications are made in the regulation.

In addition to this regulation on light-duty vehicles, the Commission is currently developing a new legislative proposal to reduce CO<sub>2</sub> emissions from light commercial vehicles (vans and minibuses). This proposal will be part of the Integrated Approach taken by the Commission in its revised strategy to reduce CO<sub>2</sub> emissions from cars and light commercial vehicles [2].

In order to ensure that information relating to the fuel economy and CO<sub>2</sub> emissions of new passenger cars offered for sale or lease in the Community is made available to consumers in order to enable consumers to make an informed choice, the Commission is currently revising the Directive 1999/94/EC "relating to the availability of consumer information on fuel economy and CO<sub>2</sub> emissions in respect of the marketing of new passenger cars" (Labelling Directive) [3]. In the current Directive, the information must be provided to the consumers as follows:

- A fuel economy label for all new cars to be displayed at the point of sale
- A poster (or a display) showing the official fuel consumption and CO<sub>2</sub> emission data of all new passenger car models displayed or offered for sale or lease at or through the respective point of sale

- A guide on fuel economy and CO<sub>2</sub> emissions
- All promotional literature must contain the official fuel consumption and specific CO<sub>2</sub> emission data for the passenger car model to which it refers

In addition, a number of organisations in EU-Member States maintain Internet Sites which display the official fuel consumption and CO<sub>2</sub> emissions of new passenger car models offered on the market. In order to improve the effectiveness of the labelling Directive, a study based notably on reports provided by Member States has been carried out [7].

The Renewable Energy Directive 2009/28/EC (RED) "on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC" was adopted in June 2009 [6]. This Directive contains for the first time worldwide a legal binding methodology for the calculation of GHG emissions and reductions of biofuels from different feedstocks and processes.

Article 17(2) of the RED sets targets for the greenhouse gas emission savings from the use of biofuels and bioliquids which shall be at least 35 %.

With effect from 1 January 2017, the greenhouse gas emission saving shall be at least 50 % and from 1 January 2018 it shall be at least 60 % for biofuels and bioliquids produced in installations in which production started on or after 1 January 2017.

The greenhouse gas emission saving from the use of biofuels and bioliquids shall be determined in accordance with Article 19(1) as follows:

- by using default values specified in the ANNEX of the directive,
- by using an actual value calculated in accordance with the methodology laid down in the directive; or
- by using a value calculated in accordance with the methodology laid down in the directive which includes disaggregated default values for some factors.

The default values are shown in Tables 1 and 2. Other GHG calculation methodologies were elaborated by different researchers from The Netherlands, Germany and the UK which was summarised in [5].

### 3 THE CARBON LABELLING PROJECT

The overall objective of the Carbon Labelling project was to reduce carbon emissions in the European transport sector by promoting the use of biodiesel and improved innovative lubricants to consumers.

The Carbon Labelling project ([www.co2star.eu](http://www.co2star.eu)), was coordinated by WIP Renewable Energies (Germany) and was supported by the European Commission under the Intelligent Energy – Europe Programme (October 2006 to September 2008). All results of the Carbon Labelling project are summarised in a report available on the Carbon labelling website [8].

Figure 1 shows the logo selected by the project consortium for the promotion of CO<sub>2</sub> reduction in transport through biodiesel and fuel efficiency measures.

**Table I:** Typical and default values for biofuels if produced with no net carbon emissions from land-use change in the RED

| Biofuel production pathway  | Typical greenhouse gas emission saving               | Default greenhouse gas emission saving |
|---|--|--|
| sugar beet ethanol  | 61 %   | 52 %                                   |
| wheat ethanol (process fuel not specified)  | 32 %   | 16 %                                   |
| wheat ethanol (lignite as process fuel in CHP plant)                                | 32 %   | 16 %                                   |
| wheat ethanol (natural gas as process fuel in conventional boiler)                  | 45 %   | 34 %                                   |
| wheat ethanol (natural gas as process fuel in CHP plant)                            | 53 %   | 47 %                                   |
| wheat ethanol (straw as process fuel in CHP plant)                                  | 69 %   | 69 %                                   |
| corn (maize) ethanol, Community produced (natural gas as process fuel in CHP plant) | 56 %   | 49 %                                   |
| sugar cane ethanol  | 71 %   | 71 %                                   |
| the part from renewable sources of ethyl-tertio-butyl-ether (ETBE)                  | Equal to that of the ethanol production pathway used |  |
| the part from renewable sources of tertiary-amyl-ethyl-ether (TAEE)                 | Equal to that of the ethanol production pathway used |  |
| rape seed biodiesel   | 45 %   | 38 %                                   |
| sunflower biodiesel   | 58 %   | 51 %                                   |
| soybean biodiesel   | 40 %   | 31 %                                   |
| palm oil biodiesel (process not specified)  | 36 %   | 19 %                                   |
| palm oil biodiesel (process with methane capture at oil mill)                       | 62 %   | 56 %                                   |
| waste vegetable or animal (*) oil biodiesel   | 88 %   | 83 %                                   |
| hydrotreated vegetable oil from rape seed   | 51 %   | 47 %                                   |
| hydrotreated vegetable oil from sunflower   | 65 %   | 62 %                                   |
| hydrotreated vegetable oil from palm oil (process not specified)                    | 40 %   | 26 %                                   |
| hydrotreated vegetable oil from palm oil (process with methane capture at oil mill) | 68 %   | 65 %                                   |
| pure vegetable oil from rape seed   | 58 %   | 57 %                                   |
| biogas from municipal organic waste as compressed natural gas                       | 80 %   | 73 %                                   |
| biogas from wet manure as compressed natural gas                                    | 84 %   | 81 %                                   |
| biogas from dry manure as compressed natural gas                                    | 86 %   | 82 %                                   |

(\*) Not including animal oil produced from animal by-products classified as category 3 material in accordance with Regulation (EC) No 1774/2002 of the European Parliament and of the Council of 3 October 2002 laying down health rules on animal by-products not intended for human consumption (!).

**Table II:** Estimated typical and default values for future biofuels that were not on the market or were on the market only in negligible quantities in January 2008, if produced with no net carbon emissions from land-use change in the RED

| Biofuel production pathway  | Typical greenhouse gas emission saving                | Default greenhouse gas emission saving |
|---|---|--|
| wheat straw ethanol   | 87 %  | 85 %                                   |
| waste wood ethanol  | 80 %  | 74 %                                   |
| farmed wood ethanol   | 76 %  | 70 %                                   |
| waste wood Fischer-Tropsch diesel                                   | 95 %  | 95 %                                   |
| farmed wood Fischer-Tropsch diesel                                  | 93 %  | 93 %                                   |
| waste wood dimethylether (DME)                                      | 95 %  | 95 %                                   |
| farmed wood DME   | 92 %  | 92 %                                   |
| waste wood methanol   | 94 %  | 94 %                                   |
| farmed wood methanol  | 91 %  | 91 %                                   |
| the part from renewable sources of methyl-tertio-butyl-ether (MTBE) | Equal to that of the methanol production pathway used |  |



**Figure 1:** CO<sub>2</sub>Star logo of Carbon Labelling

#### 4 ACTIVITIES IN THE CARBON LABELLING PROJECT

The work programme of the Carbon Labelling project included the following work packages which were implemented by project partners from Germany, United Kingdom, The Netherlands, and Malta:

- Carbon Life Cycle Assessment
- Carbon Label for Fuels
- Carbon Label for Freight Services
- Carbon Label for Lubricants
- Support for Biofuels in New EU States
- Consumer Survey
- Dissemination Activities

In the Carbon Labelling project, firstly a supportable methodology for the quantification of carbon life cycle reductions was identified in co-operation with recent and on-going activities and methodologies by European and worldwide expert groups such as SenterNovem (NL), Ifeu Institute (DE) and Imperial College (UK).

In a second step, the “CO<sub>2</sub>Star” label was developed and the Carbon Labelling initiative actively promoted the carbon reduction potentials to consumers. The following three “CO<sub>2</sub>Star” labelling initiatives were implemented:

- Biodiesel labelling initiative at Q1 fuel stations in Germany
- Improved lubricants labelling initiative at Q1 fuel stations in Germany
- Labelling of low carbon freight services in The Netherlands

Several consumer surveys were conducted in order to assess the success of these labelling initiatives and the public recognition of GHG labels. In addition, managing directors and CEOs of fuel retailers as well as freight service and forwarding companies were interviewed about their attitudes towards carbon labels.

Furthermore, co-operation links with other on-going European initiatives involved in labelling activities for biofuels and low carbon transport services were established including the LowCVP (Low Carbon Vehicle Partnership) initiative on the development of a biofuels sustainability label, and the lubricant labelling initiative of the campaign “Ich und mein Auto” launched by the German Energy Agency (dena).

Apart from these three core labelling activities, the Carbon Labelling project targeted to overcome barriers of biodiesel use in smaller EU countries by information campaigns. Due to their lower capacities and limited infrastructure, smaller EU countries the use of pre-

blended biodiesel were assessed.

#### 5 CARBON LABELLING ACTION PLAN

Based on the results and experiences from the Carbon Labelling project the following section presents a list of activities for the successful implementation of national and/or EU wide carbon labelling initiatives.

Thereby, the focus was placed on the labelling of alternative fuels (e.g. biofuels) to achieve GHG emission reductions in the transport sector.

The integration of other measures for efficiency improvements (such as lubricants, additives, tyres, air conditioning, etc.) was omitted due to the high level of complexity and the difficulty in quantifying and monitoring various efficiency improvements. Furthermore, surveys performed in the framework of the Carbon Labelling project showed that there is very low interest in carbon labelling of lubricants by consumers as well as by fuel retailers. It is expected that integrated GHG emission reductions for passenger cars are best governed by a EU regulation specifying acceptable levels of GHG emissions per km (for average car fleets), accompanied by fiscal incentives such as CO<sub>2</sub> taxes introduced by the national governments.

The following activities need to be implemented to set-up labelling initiatives for biofuels on national and/or EU level. Thereby, it may be advisable to implement a Sustainability Label for biofuels instead of a label solely focussing on GHG emission reductions.

##### *(1) Set-up a sustainability certification scheme in the framework of the EU Renewable Energy Directive*

An important pre-requisite for the set-up of labelling initiatives for biofuels was the entry into force of the EU Renewable Energy Directive [6] including its sustainability criteria for biofuels. This legislation provides a stable legal and regulatory framework for stakeholders active in the biofuels sector including the definition of mandatory GHG emission reduction targets and appropriate methodologies for the calculation of GHG emission reductions of biofuels. The challenge is now to set up a practicable sustainability certification scheme for biofuels including GHG issues.

##### *(2) Increase of Consumer Awareness about Biofuels*

Currently, the level of knowledge about biofuels among the general public is very low. Specifically, consumers are not aware of the potential GHG emission benefits offered by biofuels. Thus, an ambitious dedicated effort is needed to raise the level of knowledge about biofuels, both on national and on EU level. Thereby, strategies need to be developed with different messages targeted at different segments of society. An increased awareness of the benefits offered by biofuels may also lead to a larger willingness to pay a higher price for environmentally friendly fuels.

##### *(3) Involvement of Biofuel Stakeholders*

Successful biofuel labelling initiatives can only be implemented with the strong support of stakeholders such as fuel retailers, oil companies, freight service providers, and respective industry associations. In future labelling initiatives approaches are needed to ensure that the involved companies feel that there is a need to use labels

to promote 'clean fuels' and/or 'clean transport' to customers or the general public. Thereby, additional detailed consumer surveys may be needed to assess the added value of labels for involved companies and consumers.

*(4) Development of Standards (Compliance with RED or "Gold Standard")*

Once the support of biofuel stakeholders and consumers is guaranteed, the standard (set of criteria) has to be developed, and the performance level that needs to be achieved to qualify for the label has to be defined. Standard development needs to be done by a respected standardisation body such as the European Committee for Standardisation CEN. Thereby, it needs to be decided whether the biofuel label shall mandate performance criteria (e.g. level of GHG emission reduction) as specified in the RED, or whether higher performance levels are required, thus establishing a "Gold Standard" for biofuels. A "Gold Standard" could for instance require a GHG emission reduction of 50% compared to the current target of the RED of 35%.

*(5) Selection of Label Application*

Consumer surveys of the Carbon Labelling project indicate that labelling initiatives for biofuels will only be of value for consumers if a choice of products exists. As biofuels will be subject to (mandatory) sustainability requirements under the RED, future mandatory low blends of biofuels in fossil fuels (e.g. B5, E5) will not involve "choice" for consumers. In this case a label would fulfil an affirmative role (creating a "good feeling"). Applying labels to high biofuel blends (e.g. B100, B30, E85), however, would promote environmental benefits of biofuels with respect to an alternative (i.e. fossil fuels, low blends).

*(6) Selection of Chain of Custody*

The practical feasibility of a biofuel label faces challenges presented by the fuel logistics. For the production of current biofuels it is often difficult to know the specific origin of the various feedstocks. Furthermore, biofuels from different origins may also be mixed in later stages of the fuel supply chain. Currently, three different chain of custody systems (systems for passing information through the supply chain) are under discussion, namely "book and claim", "mass balance", and "track and trace". In the last option, the labelled biofuel sold at the retailer can be tracked back to the origin of the feedstock. Such systems are ambitious, but would provide clear and trustworthy information to consumers. On the other hand, systems with a physical separation of the biofuel and the information carried by the label offer higher flexibility and lower costs for the industry. For the development of a biofuel label, the appropriate chain of custody system has to be selected in close cooperation with the biofuel stakeholders and consumers. According to the RED the mass balance chain of custody has to be applied. This has to be field tested.

*(7) Selection of the Institution Operating the Label*

The consumer surveys performed in the framework of the Carbon Labelling project indicate that the selection of the institution owning and operating the label is crucial for its credibility towards consumers. Potential candidates identified include governmental agencies on

national and/or EU level, NGOs and industry associations. However, preferably a biofuel label should be operated by a well reputed organisation which is already successfully implementing other labelling schemes. Examples include the Kitemark, a registered British Standards Institute (BSI) voluntary certification label, the Swan Ecolabel introduced by the Nordic Council of Ministers, and the Forest Stewardship Council (FSC) label for certified wood products.

*(8) Definition of Certification and Accreditation Schemes*

Verification and certification are essential aspects of labelling initiatives, as they provide the basis for the credibility of the label. Typical procedures involve a certification body performing an audit and verifying whether the biofuel meets the requirement set by the standard of the label. A positive certification decision leads to the right to carry the label. In order to ensure that the certification body has the required expertise and competency, they need to be accredited by a respected existing accreditation body. It is recommended that the certification body is an entity different from the owner of the label.

The abovementioned 8 specific activities are crucial for the set-up of a successful (carbon) labelling initiative for biofuels. However, at the present stage it can not be guaranteed that biofuel labelling offers a valuable opportunity due to the current low interest of both biofuel stakeholders and consumers.

## 6 CONCLUSION OF THE CARBON LABELLING PROJECT

Based on the results and experiences from the pilot CO<sub>2</sub>Star carbon labelling initiatives the following main conclusions and recommendations can be summarised:

(1) Currently, the involvement of stakeholders from industry, NGOs, and consumer organisations in the implementation of carbon labels is very difficult due to the existing uncertainties with respect to the legal, regulatory, and economic framework conditions, as well as due to the on-going public discussion about sustainability aspects of biofuels.

(2) Results of the consumer surveys show that the majority of consumers are not willing to pay a premium price for fuels with reduced GHG emissions, efficiency improvements, and 'low carbon' freight services. Furthermore, the price of a fuel is the main factor influencing the purchasing decision of consumers in Europe. Therefore, currently the added value of carbon labelling initiatives for fuel retailers and freight companies is limited.

(3) Furthermore, there is very little knowledge of the public about biofuels in general, and more specifically on the potential for GHG emission reductions offered by biofuels. Thus, significant efforts are needed to increase public awareness of biofuels and other options to reduce GHG emissions in the transport sector. Thereby, strategies need to be developed with different messages targeted at different segments of society.

(4) Carbon labelling of biofuels and efficiency improvements will only be effective if there is a choice of

products for consumers. In this respect the labelling of the biofuel fraction in mandatory blends (e.g. B5, E5) is not recommended. Carbon labelling of fuels shall focus on high blends of biofuels (e.g. B100, B30, E85) or other alternative transport fuels.

(5) Additionally, the level of GHG emission reductions is only one of the sustainability criteria integrated in the new EU Renewable Energy Directive. Therefore, it may be advisable to implement a Sustainability Label for biofuels instead of a label solely focussing on GHG emission reductions.

(6) Finally, the potential contribution of biofuels to achieve GHG reductions in the transport sector is limited. Therefore, the focus of GHG reductions in the transport sector should be a combined strategy on measures which are decreasing fuel consumption, such as higher vehicle efficiencies (improved traffic management, speed limits, interactive traffic lights, etc.), and alternative mobility concepts (public transport, car sharing, etc.), as well as on the use of best-practice biofuels and improved lubricants.

## 7 ACKNOWLEDGEMENTS

The authors would like to thank the European Commission for supporting the Carbon Labelling project as well as to acknowledge the support of the Carbon Labelling Advisory Board for the valuable input on carbon LCA calculation methodologies and the identification of scientifically proven CO<sub>2</sub> emission reduction numbers. Current members of the Carbon Labelling Advisory Board are: Birger Kerckow (Agency of Renewable Resources FNR, Germany), Don O'Connor (S & T Squared Consultants Inc., Canada), Dr. Guido Reinhardt (ifeu-Institute, Germany), Dr. Jeremy Woods and Dr. Rocio Diaz (Imperial College London, United Kingdom), Prof. Dr. Martin Mittelbach (University of Graz, Austria) and Uwe Fritsche (Öko-Institut, Germany).

## 8 REFERENCES

- [1] REGULATION (EC) No 443/2009 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO<sub>2</sub> emissions from light-duty vehicles. - Official Journal of the European Union
- [2] COM/2007/0019 final: Communication from the Commission to the Council and the European Parliament 6 Results of the review of the Community Strategy to reduce CO<sub>2</sub> emissions from passenger cars and light-commercial vehicles {SEC(2007) 60} {SEC(2007) 61}
- [3] DIRECTIVE 1999/94/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 December 1999 relating to the availability of consumer information on fuel economy and CO<sub>2</sub> emissions in respect of the marketing of new passenger cars
- [4] RUTZ D., JANSSEN R., HELM P., GERAGHTY R., BLACK M., WASON B., NEEFT J., VAN THUIJL E., BORG S., BÜRKNER S. (2007): The EU Carbon Labelling Initiative. - Proceedings of the 15th European Biomass Conference and Exhibition
- [5] JANSSEN R., RUTZ D., GRIMM H.P., HELM P., SAFFORD R., GERAGHTY R., WASON B., NEEFT J., VAN THUIJL E., BORG S., BUTTIGIEG C., BÜRKNER S. (2007): Results from the European Carbon Labelling Initiative CO<sub>2</sub>Star. - Proceedings of the 16th European Biomass Conference and Exhibition
- [6] DIRECTIVE 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC. - Official Journal of the European Union; L 140/16 - L 140/62
- [7] GÄRTNER A. (2005) Study on the effectiveness of Directive 1999/94/EC relating to the availability of consumer information on fuel economy and CO<sub>2</sub> emissions in respect of the marketing of new passenger cars. – Study for the European Commission, Directorate-General for Environment Contract No.: 07010401/2004/377013/MAR/C1; ADAC
- [8] JANSSEN R., RUTZ D. (2008) Carbon Labelling in Europe - Final Report of the Carbon Labelling Project. - <http://www.co2star.eu/final-documents/Annex3-1-Publishable%20summary%20report.pdf>