THE DECLARATION OF ENVIRONMENTAL ACCEPTABILITY OF ROAD FREIGHT TRANSPORT

Vladimír Konečný[1], Ivana Šimková[2]

Summary: *Into contractual relations in road transport within the responsibility of the carrier there are added the requirements for environmental acceptability of vehicles in terms of perform emission limits but also requirements for declaring of impacts of traffic operations on the environment in terms of proving the quantity of selected pollutants emitted in the exhaust which are produced. It can be, for example, the record about the amount of excreted carbon dioxide into the atmosphere (the record about CO_2).*

Key words: road freight transport, environment, declaration, emissions

INTRODUCTION

Why do customers demand the declaration of emission quantity? Is vehicle operator able to declare the quantity of pollutant emissions for specific transport or cargo unit?

The reasons of issuing environmental declaration are ecological interests of organizations with respect to the impact of their activity on the environment. Environmental acceptability and impact of activities on the environment has become an important tool for quality and competitiveness in recent years.

Societal interests and commitments in the field of the environment are transmitted or they will be more intensively transmitted directly to the organization of road transport in future. Submission of statement on the impact of transport on the environment is directly determined by the eco-labeling of products and also by related declarations.

1. ECO-LABELING AND DECLARATIONS

The eco-labeling and declaration are voluntary, market-based oriented instruments of environmental protection- to ensure transparency and global comparability, the evaluation is adjusted by ISO norms series 14020. ***The aim is to promote the supply and demand for products with lower environmental aspects*** by means of providing verifiable, accurate and not misleading information based on scientific methodology, providing reproducible results. There exist three kinds of eco- labeling and declarations:

- Type I - products meeting the predetermined environmental requirements within specific product categories, which are independently verified by the third party, it comes to eco-friendly products,

[1] doc. Ing. Vladimír Konečný, PhD., University of Žilina, Faculty of Operation and Economics of Transport and Communications, Department of Road and Urban Transport, Univerzitná 1, 010 26 Žilina, tel.: 00421-41-513 3539, E-mail: Vladimir.Konecny@fpedas.uniza.sk

[2] Ing. Ivana Šimková, University of Žilina, Faculty of Operation and Economics of Transport and Communications, Department of Road and Urban Transport, Univerzitná 1, 010 26 Žilina, tel.: 00421-41-513 3523, E-mail: Ivana.Simkova@fpedas.uniza.sk

- Type II - environmental claims about the product which a producer said and those claims are confirmed with confirmation the accuracy of this claim,
- Type III - quantified environmental information involving entire product life cycle which is intended for comparison of products with the same functional properties and independently verified by a third party- environmental product declaration.

2. SELF-DECLARATION ENVIRONMENTAL CLAIMS ABOUT PROPERTIES OF PRODUCTS

STN EN ISO 14021 Environmental labels and declarations - Self-declared environmental claims (Type II environmental labeling), governs the issue, which is valid from December 2002.

Producers, importers, distributors, retailers, or anyone who is likely to benefit from the claim formulates the self-declaration environmental claims about properties of products. The self-declaration may be made without third party certification. The self-declarations environmental are exact, specifically and verifiable, specific for environmental aspect, which is subject of the claim and must be taken into considerations important aspects of product life cycle.

Also the operator can to declare to the customer and supplier impact of its activities on the environment by "Declaration about an impact of road freight transport on the environment". The declaration may also be a tool for gaining competitive advantages.

3. ENVIRONMENTAL PRODUCT DECLARATION –EPD

Companies are putting a pressure on suppliers of transport services and carriers in relation to issuing environmental product declaration, and also in terms of ***STN ISO/TR 14025 Environmental labels and declarations. Type III of environmental declarations. Policies and procedures.*** (in SR, in force since April 2008).

A part of the environmental product declaration is a mode of transport and related performance or transport emissions in relation to the product. Therefore, production and trade organizations are putting a pressure on carriers in order to declare their friendly access to the environment. In transportation contracts, there are increasingly involved under carrier's obligation the requirements not only for environmental acceptability of vehicles in terms of fulfilment of the emission limit (EURO) of ECE Regulation no. 49 Gaseous pollutants of diesel engines, but also the requirements for declaring impact of transport operation on the environment in terms of demonstrating quantity of selected pollutants produced in the exhaust gases. The carrier must demonstrate the impact of its activities on the environment.

4. STATEMENT ON THE IMPACT OF ROAD TRANSPORT ON THE ENVIRONMENT

The issue of statement on the impact of road transport on the environment is governed by standard ***STN CEN/TR 14310:2003 Freight transport services. Promulgating and***

reporting the environmental behaviour in freight transport networks. The standard is compatible with ISO 14000 for the environmental requirements in relation to environmental management systems (EMS). The aim of the standard is to provide guidance for the preparation (creating) of the environmental declarations and reports. It contains recommendations related to the content and structure of documentation and impact assessment of road transport on the environment. The standard contains general recommendations as well as specific requirements for statement on the impact of particular modes of freight transport on the environment (road, rail, maritime and water inland transport). This standard was adopted as STN in original English version.

The content of the statement

Under the general recommendations of STN CEN/TR 14310:2003 and also requirements for the content of Statement of environmental acceptability of road freight transport vehicles, the statement should contain following information:

a) vehicle characteristics

Here it is required to identify the basic parameter of vehicle such as EURO emission limit, vintage of vehicle and engine power (kW). It is necessary to indicate the type of vehicle, weights or dimensions (e.g. kerb and gross vehicle weight, loading space). The data source may be a technical license or registration certificate.

b) capacity utilization of vehicles

The capacity can be expressed in percentage of capacity utilization or loading space, percentage of empty rides, and etc. It's necessary to note that the pallets weight, containers or other cargo units are part of the shipment weight.

c) average consumption of vehicle energy

For the purposes of determining the energy intensity of transport of vehicle operation it is necessary to note the consumption of fuel or vehicles energy. For example in liters of diesel per one rides kilometer, km of ride/ 1 liter of diesel, kWh, MJ etc. It is necessary also to define the type of fuel, sulfur content in it, energy content (for example MJ/ kg or MJ/ liter).

d) types of transport

It's necessary, exactly and clearly to know the time or schedule of transport and the customer. In relation to goods is expected to identify the goods´ amount on based of the weight (kg, t), the volume (l, m^3) or the number of pieces. In relation to the operating conditions of transport requires the identification of transport route.

e) basic information about transport

The transportation is necessary to characterize by the realized performance, for example, driving performance (km) and transport performance (tkm).

f) data on fuel consumption or energy for transport

It's possible to express it, for example, in liters, kg, MJ, kWh. The declaration must include also quantity of emissions produced CO_2, NO_X, SO_2, HC, PM (g, kg). The emission calculator can be used for expression of emissions.

Declaration on fuel and energy consumption and exhaust emissions single of road transport vehicle

Information about vehicle/ truck

Vehicle manufacturer and the type	
Type of vehicle	Lorry, N3, 3 axles
Engine power (kW), emission limits (EURO), year of manufacture	350 kW, EURO 4, 2006

Type of fuel	Average fuel consumption (liters per km)	Energy contained in the fuel (kWh per liter)
Eurodiesel	0,32	9,9

Total vehicle weight	Vehicle capacity	Vehicle capacity utilization
26 tons	15 tons	75 %

The calculation of emissions and fuel consumption of an average vehicle use

	NOx (g)	**HC (g)**	**CO (g)**	**PM (g)**	**CO_2 (g)**	**SOx (g)**	**Nafta (g)**
per 1 liter of fuel	25,7	1,56	2,1	0,45	2610	0,65	845
per 1 km	8,22	0,50	0,67	0,145	835,2	0,209	270
per 1 tkm	0,731	0,044	0,060	0,013	74,24	0,019	24,04

The references to the sources used for calculating emissions

ABC- Dopravné laboratória, kalkulácia emisií, s.r.o.

Type of transport/ type of goods

Description of transport type (for example type of goods and source/aim of transport)	Steel plate, start: Žilina, to: Bratislava	
Units	Quantity	Distance (km)
Tons	10	200

Total number of emissions and energy consumption during the transport

NOx (kg)	**HC (kg)**	**CO (kg)**	**PM (kg)**	**CO_2 (kg)**	**SOx (kg)**	**Diesel (kg)**	**Diesel (kWh)**
1,462	0,088	0,12	0,026	148,48	0,038	48,08	563

Information about road transport operator

The business name of operator	Doprava kvalitne, s.r.o.	
Adress	Žilina	
Street	Žilinská 123	
Post code	010 01	
Contact person	Adam Pekný	
Phone	Fax	E- mail
09xx xxx xxx	09xx xxx xxx	adam-pekny@dopravakvalitne.sk

Signatures

Place and date	Signature	Name and last name (handprinting)
Žilina, 28.10.2010		Adam Pekný

Source: Authors

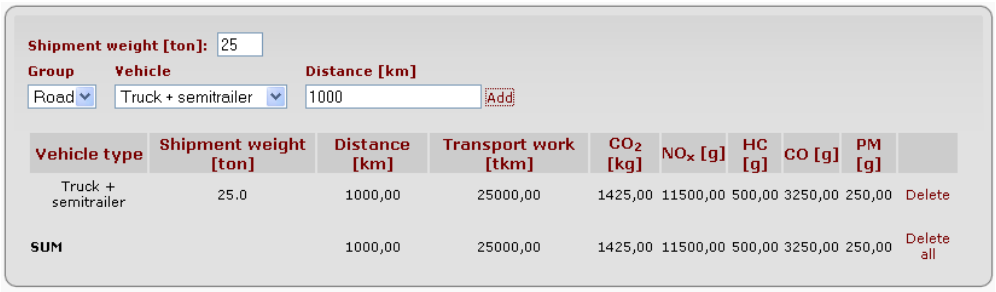
Fig. 1 - Declaration on fuel and energy consumption and exhaust emissions single of road transport vehicle

4.1 Emission Calculators

Emission calculators are support tools in developing statements of environmental impact. Based on input data on vehicle, fuel type and consumption, amount of transported goods or transportation, they can calculate:

- amount of pollutant emissions for specific transport of a particular vehicle or per unit of output,
- amount of pollutant emissions per unit of transported goods,
- amount of pollutant emissions from operating a vehicle or vehicle fleet for a specific time period, e.g. year.

Almost exclusively, the calculators are used for the road transport sector. The calculators provide framework information about amount of emissions produced; some of them enable to choose a category of vehicle from predefined groups of vehicles. Calculations are based on fuel consumption by vehicle for a specific time period (typically, the average vehicle consumption) and the use of particular emission factor related to the consumption of a particular fuel.



Source: Authors

Fig. 2 - Pattern of the emission calculator for calculating amount of emissions for shipments transported by road freight transportation

Based on certified measuring amount of pollutant emissions, some vehicle manufacturers can issue a statement on the typical amount of pollutants emitted in the exhaust gases of the vehicle for operator.

For selected brands of vehicles it is possible to get information about the selected values of emission factors from the technical certificate or vehicle registration certificate. In the case of emission factors expression in g/km, it is sufficient to know the distance for expression of emissions for particular transportation. Table 1 exemplify contains vehicle emission factors of road freight transportation.

Tab. 1 - Emission factors from the vehicle registration certificate

EMISSIONS AND CONSUMPTION									
49	**V.9**	Emissions ES/EHK			**ES 88/77-201/27A**				
50		Smokiness ES/EHK			**ES č.72/306-97/20**				
51.1	**V.1**	CO	**0,400**	$g.km^{-1}$	51.2	**V.2**	HC	**0,090**	$g.km^{-1}$
51.3	**V.3**	NO_x	**4,920**	$g.km^{-1}$	51.4	**V.4**	$HC+NO_x$	**5,010**	$g.km^{-1}$
51.5	**V.5**	Particles	**0,055**	$g.km^{-1}$	51.6	**V.6**	Correl.coeff. of absorption	**0,790**	m^{-1}
51.7	**V.7**	CO_2	–	$g.km^{-1}$	51.8	**V.8**	Fuel consumption	–	l/100km

Source: Authors

5. UNIFIED METHODOLOGY FOR DECLARATION OF GREENHOUSE GAS EMISSIONS

On 8th September 2012 European Committee for Standardization (CEN) approved the European standard EN 16258 Methodology for calculation and declaration of energy consumption and GHG emissions of transport services (freight and passengers). This standard was approved by Slovak Standards Institute on the 1st April 2013.

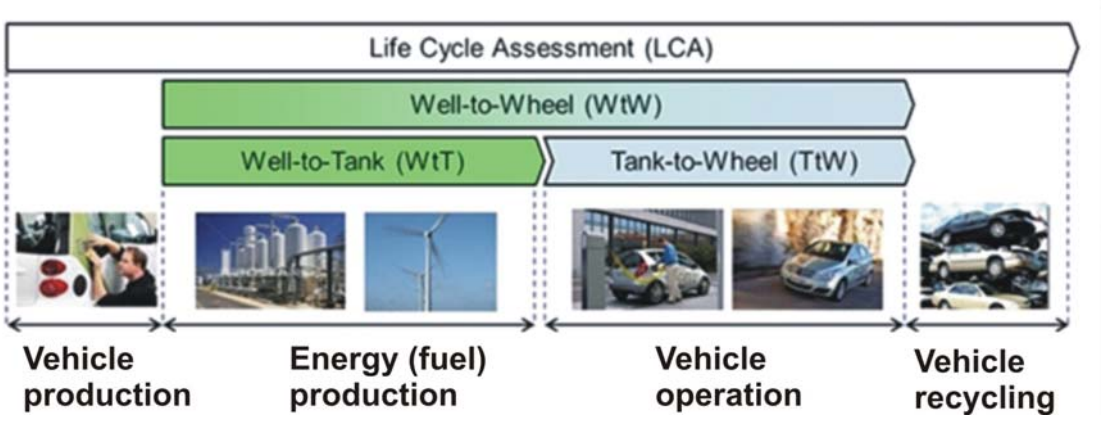
The standard specifies the methodology and requirements for calculating and reporting energy consumption and greenhouse gas emissions (GHG) from transport services. The first edition of the standard focuses primarily on energy consumption and greenhouse gas emissions associated with means of transport (using on land, water and air) during a operational phase of the life cycle. However, when calculating energy consumption and emissions related to vehicles, the energy consumption and emissions related to energy processes for fuels and / or electricity used by vehicles are taken into account (e.g. including the production and distribution of fuel). This ensures that the standard assumes the implementation of a 'well-to-wheel „when calculating and declaring for users of the transport service.

The aim is that the standard will become widely applicable throughout the transport sector and accessible to a very diverse group of users.

The use of the standard will provide common approach and structures for calculating and declaring energy consumption and emissions of transport services regardless level of complexity (e.g. a simple transport service may include one customer with one path, while a complex system may include several sections, several types of vehicles, various transport regimes and a number of companies in the transport supply chain). The standard ensures that declarations have greater consistency and transparency, and that energy and emissions correspond to vehicle load (passenger and/or cargo).

It is assumed that further editions of the standard will have wider quantifiable limits in order to include other aspects such as transport terminals, transhipment and other phases of the life cycle. There is recommended to report results separately from those calculated by the standard and thus provide a transparent description of the applied methodology for those users who would now rather use wider identifiable boundaries without waiting for the new edition of the standard.

The Well-to-Wheel analysis (WtW) comprises two parts: Well-to-Tank (WtT), it relates energy supply and Tank-to-Wheel (TtW) that relates with vehicle efficiency, see figure 3.



Source: elaborated on the basis of (2) and (14)

Fig. 3 - Life cycle assessment of vehicle and vehicle operation

Calculation shall produce the four following results for GHG declaration:

- well-to-wheels energy consumption (Ew)
- well-to-wheels GHG emissions (Gw)
- tank-to-wheels energy consumption (Et)
- tank-to-wheels GHG emissions (Gt)

Calculation of total energy consumption and GHG emissions for the vehicle operation system (VOS) is defined in chapter 7.4 of mentioned standard. Conversion from total fuel consumption for the VOS into quantities of energy consumption and GHG emissions shall be made using following formulas (1), (2), (3), (4):

- for well-to-wheels energy consumption of the VOS:

$$E_w\,(VOS) = F(VOS)\,.\,e_w \qquad (1)$$

- for well-to-wheels GHG emissions of the VOS:

$$G_w\,(VOS) = F(VOS)\,.\,g_w \qquad (2)$$

- for tank-to-wheels energy consumption of the VOS:

$$E_t\,(VOS) = F(VOS)\,.\,e_t \qquad (3)$$

- for tank-to-wheels GHG emissions of the VOS:

$$G_t\,(VOS) = F(VOS)\,.\,g_t \qquad (4)$$

Where:

- F(VOS) is the total fuel consumption used for the VOS (examples: F(VOS) equals five thousand litres of diesel, or F(VOS) equals thirty thousand kilowatt hours)
- ew is the well-to-wheels energy factor for the fuel used (example: for diesel, ew = 42,7 MJ/l)
- gw is the well-to-wheels GHG emission factor for the fuel used (example: for diesel, gw = 3,24 kgCO2e/l)
- et is the tank-to-wheels energy factor for the fuel used (example: for diesel, et = 35,9 MJ/l);

- gt is the tank-to-wheels GHG emission factor for the fuel used (example: for diesel, gt = 2,67 kg CO_2e/l).

Values for energy and GHG emission factors shall be selected in accordance with Annex A of standard STN EN 16258:2013.

CONCLUSION

It is expected that economic growth in Slovakia after the financial and economic crisis will be continue in the trend prior like before a crisis, it is therefore necessary to consider the growing transport requirements in freight and passenger transport. This fact confirms also the prognosis of performance of transport till 2030. In assessing the environmental impact of road transport or other modes of transport, it is important to know the negatives but also it is necessary to know wider relationships (economic growth, standard of living, globalization) and the negatives to review like a consequence of those wide relationships.

The evaluation of impacts on the environment in developed countries of the world (USA, Great Britain, Australia) takes into account also the production of indirect emissions from their operations. From the reason for achievement of sustainable development goals should follow this trend also the Slovak Republic.

The relevant institutions should put pressure not only on vehicle manufacturers, vehicle operators and their environmental acceptability, but as well as on the refinery and energy companies as well as environmental acceptability of electricity production and refinery products. The transportation systems, which are using electricity, will be also environmentally acceptable in the conditions of the Slovak Republic, if the Slovak Republic follows countries that produce electricity from sources acceptable to the environment. This is the question of economic policy of the Slovak Republic and of her interconnection with transport policy of the state.

Calculation of emissions from freight transport may be an important basis for the calculation of external costs from transport.

In the future with respect to the overall objectives of the environment and international obligations in the Slovak Republic, it is possible to expect further pressure on the environmental acceptability of transport and the ability of carriers to declare the impact measurement of their activities on the environment.

Operation of modern and intelligent vehicles, the application of intelligent transport systems can support improved energy efficiency of transport systems and reduce the impact of vehicles operations onto environment.

REFERENCES

(1) Dopravná politika SR do roku 2015, uznesenie vlády SR č.445 z 8. júna 2005.
(2) EN 16258:2012 Methodology for calculation and declaration of energy consumption and GHG emissions of transport services (freight and passengers)

(3) KONEČNÝ, V.: Analýza produkcie emisií CO_2 z dopravy v Slovenskej republike, In. Zborník z II. konferencie „Doprava, zdraví a životní prostředí“, Centrum dopravního výskumu Brno, 2005, ISBN 80-86502-33-3.
(4) KONEČNÝ, V.: Energetická náročnosť a efektívnosť dopravy vo väzbe na národné stratégie. In: CMDTUR 2012: zborník príspevkov a posterov: 6. medzinárodná vedecká konferencia, Žilinská univerzita v Žiline v EDIS. Žilina, 2012. ISBN 978-80-554-0512-4.
(5) KONEČNÝ, V.: Environmentálna prijateľnosť. Dôležité kritérium kvality. In: Truck & business: štvrťročník pre stratégiu podnikania v cestnej doprave. Roč. 3, č. 4/2010. ISSN 1337-897X.
(6) KONEČNÝ, V.: Výpočet množstva emisií. In: Truck & business : štvrťročník pre stratégiu podnikania v cestnej doprave. Roč. 4, č. 1/2011. ISSN 1337-897X.
(7) KONEČNÝ, V. – GNAP, J.: Výpočet produkcie emisií z nákladnej dopravy. In: Odborná konferencia ZLZ SR 2010. Zväz logistiky a zasielateľstva SR ; Žilinská univerzita v Žiline, 2010. ISBN 978-80-554-0276-5.
(8) MDVRR SR: Informácia o vplyvoch dopravy na životné prostredie, interný materiál Ministerstva dopravy, výstavby a regionálneho rozvoja SR.
(9) Ročenka dopravy, pôšt a telekomunikácií SR 2012, Štatistický úrad SR, december 2009, ISBN 978-80-89358-36-6.
(10) Smernica 2003/30/EC o podpore využitia biopalív v doprave.
(11) *Správa o stave životného prostredia Slovenskej republiky v roku 2011, Ministerstvo životného prostredia SR.*
(12) STN CEN/TR 14310:2003. Služby nákladnej dopravy. Vyhlasovanie a podávanie správ o environmentálnom správaní v sieťach nákladnej dopravy. Slovenský ústav technickej normalizácie, Bratislava, 2003.
(13) Stratégia rozvoja dopravy Slovenskej republiky do roku 2020, uznesenie vlády SR č.158/2010.
(14) http://www.fuel-cell-e-mobility.com

This contribution/publication is the result of the project implementation:
Centre of excellence for systems and services of intelligent transport II.,
ITMS 26220120050 supported by the Research & Development Operational Programme funded by the ERDF.

"We are supporting of research activities in Slovakia / Project is co-financed by the European Union”