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Successful online learning for sustainable last mile logistics

CHAPTER 2: Last Mile Distribution logistics operation and impacts

UNIT 1: The equipment & tools of urban logistics

Capsule 2.1.3

Clean vehicles and Zero-Emission vehicles

Co-funded by the Erasmus+ Programme of the European Union

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To be done prior to this capsule:	2.1.1, 2.1.2
Capsule linked with:	1.4.7, 2.2.2, 2.2.3, 2.2.4
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Objectives of the Capsule

The goal of this capsule is that the learner knows what “clean vehicle” and “Zero-Emission vehicle” means and which nomenclature is used to identify them, and also, which environmental badges are being used in SUSMILE Consortium partners countries.

Category	Document, source	EQF		
		4	5	6
		X	X	X

Exercises included	YES

Effort for the capsule	Content 10 Min.	Exercises 3 Min.	Extra material 8 Min.

Contents

1. What is a "clean vehicle"?
2. Alternative fuels
3. Clean vehicles nomenclature
4. Vehicle environmental badges
5. Multiple choice exercise

Instructions for source revision

The first point of this capsule defines what clean vehicles are. However, before being able to understand either of the two sources that have been chosen for it, it is important to clarify some concepts and to know that the definition of clean vehicles is different before and after 12/31/2025, and even according to the category of the vehicle in the case of goods vehicles (N1, N2 or N3).

Thus, after defining what clean vehicles are, it is proposed to browse in the European Alternative Fuels Observatory web site, because the concept of clean vehicles and alternative fuels are related.

Later, this same source will be used to know the nomenclature of clean vehicles and to become familiar with BEV, CNG, PHEV… acronyms.

Finally, the environmental labels or badges that SUSMILE Consortium members states use to categorize and identify the vehicles in their cities are compiled.

The capsule ends with some exercises.

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1. What is a clean vehicle

The European Parliament, as EU's law-making body, in 2019 approved a Directive that defines what is Clean Vehicles.

According to this law, we can not give a general definition, because the “clean vehicle” definition, is different depending on the vehicle category, and even depending on the year, as the definition of clean vehicle is different before and after the 31st December of the year 2025.

31/12/2025

N vehicles =

M vehicles =

N1 vehicles

(not exceeding 3,5 tonnes)

N2 vehicles

(3,5 – 12 tonnes)

N3 vehicles

(>12 tonnes)

1. What is a clean vehicle

Related to **N** Category vehicles, motor vehicles designed and constructed primarily for the carriage of **GOODS** (1), **three concepts are used to define Clean Vehicle term**:

1. Tail-pipe emission expressed in CO_2 g/km
2. Real driving pollutant emissions
3. Alternative fuel

This three concepts are applied to each **N category** vehicle in the following way:

"N" VEHICLES	**N1**	▪Tail-pipe emission expressed in CO_2 g/km ▪Real driving pollutant emissions
	N2 & N3	▪Alternative fuel

1. What is a clean vehicle

Related to **N1 Category vehicles**, where two concepts are used to define Clean Vehicle term:

1. Tail-pipe emission expressed in CO_2 g/km
2. Real driving pollutant emissions

The data allowed for each of them is different before and after the 31st December of the year 2025. It can be assumed that values are becoming increasingly restrictive.

BEFORE 31/12/2025 → LESS RESTRICTIVE

AFTER 31/12/2025 → MORE RESTRICTIVE

1. What is a clean vehicle

After this introduction, you are ready to read the source we have identified. It is the European Commission web site, where Clean Vehicle is defined:

Source (web site): European Commission. (2021). *Mobility and Transport*. Clean Vehicles Directive.

https://transport.ec.europa.eu/transport-themes/clean-transport-urban-transport/clean-and-energy-efficient-vehicles/clean-vehicles-directive_en

Available in all European languages

All the information available in the web site comes from:

Source (web site): European Parliament. (2019, June 20). *Directive (EU) 2019/1161 "Promotion of clean and energy-efficient road transport vehicles*. Clean Vehicles Directive.

https://eur-lex.europa.eu/eli/dir/2019/1161/oj

Available in all European languages

1. What is a clean vehicle

Summary: What are considered “clean vehicles”?

❑N1: Those vehicles that have maximum 50 **tail-pipe emission expressed in CO_2 g/km and real driving pollutant emissions** below 80% until 31 December 2025, and from 1 January 2026, 0 (zero) CO_2 g/km.

Vehicle categories	Until 31 December 2025		From 1 January 2026	
	CO_2 g/km	RDE air pollutant emissions as a percentage of emission limits	CO_2 g/km	RDE air pollutant emissions as a percentage of emission limits
N1	50	80 %	0	n.a.

Source (web site, Table 2 of the Annex): European Parliament. (2019, June 20). *Directive (EU) 2019/1161 “Promotion of clean and energy-efficient road transport vehicles*. Clean Vehicles Directive. https://eur-lex.europa.eu/eli/dir/2019/1161/oj

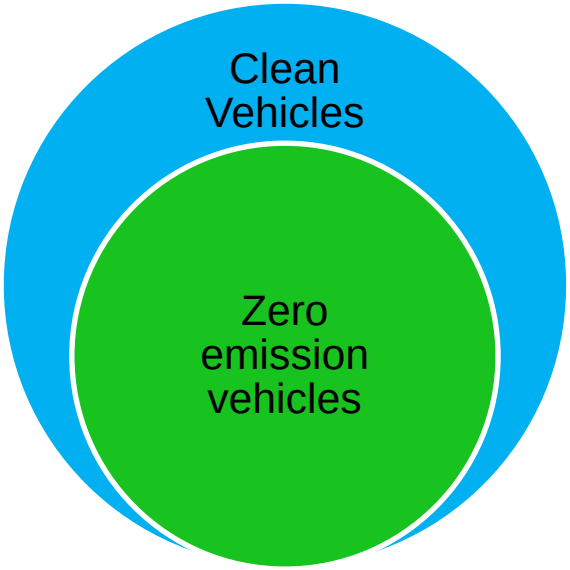
❑N2 or N3 Category vehicles: Those vehicles that use **alternative fuels** according to Directive 2014/94/EU

1. What is a clean vehicle

Summary: What are considered “clean vehicles”?

Those N1 vehicles category (not exceeding 3,5 tonnes), when they don´t generate pollutant emissions, according to the Directive not only considered to be CLEAN VEHICLES; they are also considered to be ZERO EMISSION VEHICLES.

Therefore, Zero emission vehicles are a subcategory of Clean Vehicles.



2. Alternative fuels

N2 and **N3** category of vehicles are considered **Clean Vehicles**, when they use Alternative Fuels.

Definition of "Alternative fuels" (article 2 of the Directive 2014/94/EU (2)):

*It means fuels or power sources that serve, at least partly, **as a substitute for fossil oil sources** in the energy supply to transport and which have the potential to contribute to its decarbonization and enhance the environmental performance of the transport sector.*

2. Alternative fuels

Based on the Directive 2014/94/EU of the European Parliament, there are recognised **six different types of alternative fuels**:

1. Electricity
2. Hydrogen
3. Biofuels
4. Synthetic and paraffinic fuels
5. Natural gas, including biomethane, in gaseous form (compressed natural gas (CNG)) and in liquid form (liquefied natural gas (LNG))
6. Liquefied petroleum gas (LPG)

More information about Alternative Fuels in the The European Alternative Fuel Observatory - EAFO.
Source (web site in EN): European Commission. (2021). *About the European Alternative Fuels Observatory*. European Alternative Fuels Observatory.

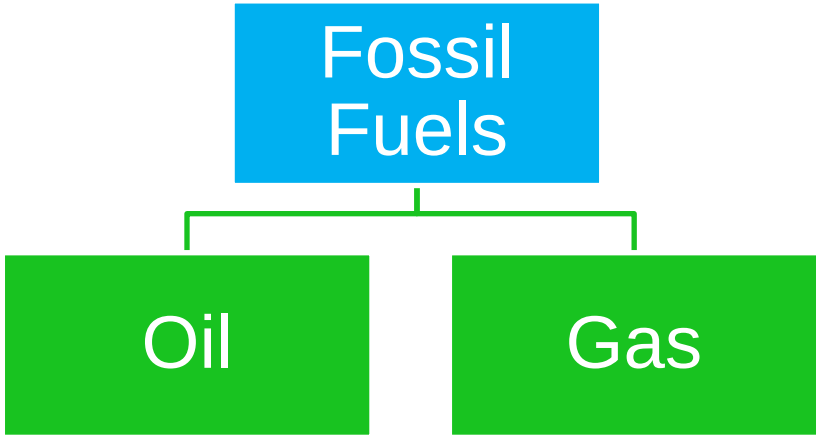
https://alternative-fuels-observatory.ec.europa.eu/general-information/about-european-alternative-fuels-observatory

European Alternative Fuels Observatory

2. Alternative fuels

Idea to highlight:

Alternative fuels priority is to reduce fossil OIL sources, what doesn´t mean, that other fossil sources are not being promoted, as the natural **GAS**, or the blue hydrogen, where its raw material could be also natural gas, for example.



3. Clean Vehicles Nomenclature

We have defined what clean vehicles are and which are the alternative fuels. Now, we go one step more, identifying how are identified those different **vehicles** in the market (BEV, CNG, PHEV…).

Source (web site in EN): European Commission. (2021). *European Alternative Fuels Observatory*.

https://alternative-fuels-observatory.ec.europa.eu/

Clicking in the General Information section, there is the possibility to go to the Glossary.

Summary:
First of all, there are Plug-in electric vehicles (PEV), that can be full electric (BEV), or hybrid, when they use two main technologies, electric and gasoline for example. At the same time, there are fuel cells vehicles (FCEV), in this case, it is related to hydrogen technology. There are also vehicles that work with fossil fuels, such as natural gas, where there are two options, Liquid (LNG) and Compressed (CNG).

See their nomenclatures in the next slide.

3. Clean Vehicles Nomenclature

BEV	Battery electric vehicle	Also known as all-electric or 100% electric vehicle, means an electric vehicle that exclusively runs on the electric motor, with no secondary source of propulsion.
PHEV	Plug-in hybrid electric vehicle	Means an electric vehicle constituted by a conventional combustion engine combined with an electric propulsion system, which can be recharged from an external electric power source
FCEV	Fuel cell electric vehicle	Vehicles powered by hydrogen. More efficient than combustion engine vehicles and don't produce tailpipe emissions.
CNG	Compressed natural gas	CNG is an alternative fuel that pollute less than traditional ones.
LNG	Liquefied natural gas	It is a suitable option to power large long-distance trucks.

More information about different types of electric vehicles:
Video: EV Duniya. (2021, April 4). *Types of Electric Vehicles | BEV | HEV | PHEV | REx | FCEV*.

https://www.youtube.com/watch?v=jM1wTNQERAU

4. Vehicle environmental badges

In large cities, it is increasingly common to find rules that regulate the access of motorized vehicles, including those for the distribution of goods.

This restrictions are made according to the category of the vehicle (individuals, merchandise, passengers), and also according to the type of fuel used by the vehicle: combustion engine, clean vehicle, zero emission vehicle, etc.

To identify the categorization of the vehicles, at European level, each member state has categorized the different vehicles according to their environmental criteria, and they have developed also their won identification badges.

The Environmental badge is a sticker placed on the windscreen of a car and entitles drivers to enter larger cities in Europe. The aim of the badge is to improve the quality of life and of air in the so-called Environmental Zones - usually in city centres – where only vehicles that pollute the environment at a minimum rate are allowed to enter to the cities.

In some of the SUSMILE Consortium partners countries, these environmental badges are in use.

More information about other Member States here https://www.environmental-badge.co.uk/

4. Vehicle environmental badges

SPAIN

Source: DGT Magazine. https://revista.dgt.es/images/DISTINTIVOS-emisiones-ANT-correccion-detalle-grande.jpg

4. Vehicle environmental badges

ANNEXE 1

Classification des véhicules en application des articles L. 318-1 et R. 318-2 du code de la route

Classe	2 ROUES, TRICYCLES ET QUADRICYCLES À MOTEUR	VOITURES	VÉHICULES UTILITAIRES LÉGERS	POIDS LOURDS, AUTOBUS ET AUTOCAR
	Véhicules électriques et hydrogène			
1	Véhicules gaz Véhicules hybrides rechargeables			

FRANCE

Classe	DATE DE PREMIÈRE IMMATRICULATION ou NORME EURO							
	2 ROUES, TRICYCLES ET QUADRICYCLES À MOTEUR	VOITURES		VÉHICULES UTILITAIRES LÉGERS		POIDS LOURDS, AUTOBUS ET AUTOCAR		
		Diesel	Essence	Diesel	Essence	Biodiesel	Diesel	Essence
1	**EURO 4** À partir du : 1er janvier 2017 pour les motocycles 1er janvier 2018 pour les cyclomoteurs	-	**EURO 5 et 6** À partir du 1er janvier 2011	-	**EURO 5 et 6** À partir du 1er janvier 2011	**EURO VI** A partir du 1er janvier 2014	-	**EURO VI** À partir du 1er janvier 2014
2	**EURO 3** du 1er janvier 2007 au : 31 décembre 2016 pour les motocycles 31 décembre 2017 pour les cyclomoteurs	**EURO 5 et 6** À partir du 1er janvier 2011	**EURO 4** du 1er janvier 2006 au 31 décembre 2010	**EURO 5 et 6** À partir du 1er janvier 2011	**EURO 4** du 1er janvier 2006 au 31 décembre 2010		**EURO VI** À partir du 1er janvier 2014	**EURO V** du 1er octobre 2009 au 31 décembre 2013
3	**EURO 2** du 1er juillet 2004 au 31 décembre 2006	**EURO 4** du 1er janvier 2006 au 31 décembre 2010	**EURO 2 et 3** du 1er janvier 1997 au 31 décembre 2005	**EURO 4** du 1er janvier 2006 au 31 décembre 2010	**EURO 2 et 3** du 1er octobre 1997 au 31 décembre 2005	**EURO V** du 1er octobre 2009 au 31 décembre 2013	**EURO V** du 1er octobre 2009 au 31 décembre 2013	**EURO III et IV** du 1er octobre 2001 au 30 septembre 2009
4	**Pas de norme tout type** du 1er juin 2000 au 30 juin 2004	**EURO 3** du 1er janvier 2001 au 31 décembre 2005	-	**EURO 3** du 1er janvier 2001 au 31 décembre 2005	-	**EURO IV** du 1er octobre 2006 au 30 septembre 2009	**EURO IV** du 1er octobre 2006 au 30 septembre 2009	-
5	-	**EURO 2** du 1er janvier 1997 au 31 décembre 2000	-	**EURO 2** du 1er octobre 1997 au 31 décembre 2000	-	**EURO III** du 1er octobre 2001 au 30 septembre 2006	**EURO III** du 1er octobre 2001 au 30 septembre 2006	-
Non classés	**Pas de norme tout type** Jusqu'au 31 mai 2000	**EURO 1 et avant** Jusqu'au 31 décembre 1996	**EURO 1 et avant** Jusqu'au 31 décembre 1996	**EURO 1 et avant** Jusqu'au 30 septembre 1997	**EURO 1 et avant** Jusqu'au 30 septembre 1997	**EURO I, II et avant** Jusqu'au 30 septembre 2001	**EURO I, II et avant** Jusqu'au 30 septembre 2001	**EURO I, II et avant** Jusqu'au 30 septembre 2001

Source: Crit'Air official web site. https://www.certificat-air.gouv.fr/files/tableaux_classement.pdf

Exercises

Select the correct answer for each question, only one:

1. Clean vehicles:

a) To define *clean vehicle* three concepts are used, and they are applicable in all vehicles categories.

b) The meaning is only different for N1 motor vehicles before and after the 31st December of the year 2025.

c) There is not a general definition, because “clean vehicle” definition, is different depending on the vehicle category, and even depending on the year.

Exercises

Select the correct answer for each question, only one:

2. Alternative Fuels:

a) It is the used criteria to define clean vehicles in N1 and N2 vehicles category.

b) It means fuels or power sources that serve, at least partly, as a substitute for fossil oil sources.

c) Alternative fuels can be fossil fuels like gas and oil.

Exercises

Select the correct answer for each question, only one:

3. Zero emission vehicles:

a) Zero emission vehicles are those vehicles that have maximum 50 tail-pipe emission expressed in CO_2 g/km and real driving pollutant emissions below 80%.

b) Zero emission vehicles are a subcategory of Clean Vehicles.

Exercises

Select the correct answer for each question, only one:

4. Battery electric vehicle (BEV):

a) Means an electric vehicle constituted by a conventional combustion engine combined with an electric propulsion system, which can be recharged from an external electric power source.

b) Vehicles powered by hydrogen. More efficient than combustion engine vehicles and don’t produce tailpipe emissions.

c) Also known as all-electric or 100% electric vehicle, means an electric vehicle that exclusively runs on the electric motor, with no secondary source of propulsion.

Exercises

Select the correct answer for each question, only one:

5. Environmental badge:

a) It is a sticker that categorized the different vehicles according to their power.

b) It is a sticker placed on the windscreen of a car and entitles drivers to enter larger cities in Europe according to their environmental criteria.

c) The Environmental badge is a sticker placed on the windscreen of a car and entitles drivers to enter small cities in Europe according to their environmental criteria.

References

(1) European Commission. (2018, May 30). *Regulation (EU) 2018/858 (art. 4).* https://eur-lex.europa.eu/eli/reg/2018/858/oj
(2) European Commission. (2014, October 22). *Directive 2014/94/EU (art. 2).* https://eur-lex.europa.eu/legal-content/ES/TXT/?uri=celex%3A32014L0094