AIR QUALITY IN CITIES. HOW TO IMPROVE IT?

Air quality is essential for our health, life quality and the environment. Air is polluted by chemical substances that pose health risks for the people and the environment which are coming from different sources

Sources: WHO, ICCT

Households and urban activities

Agriculture and farming activities

Industrial and construction activities

7 MILLION DEATHS

are caused every year to the exposure from air pollution, which causes cardiovascular and respiratory illnesses, affecting the nervous and reproductive systems

NITROGEN DIOXIDE (NO_2)

Reddish brown gas with a pungent odour. This gas reacts with water producing other NO_x group substances: nitric acid and nitric oxide. It critically participates in environmental polluting phenomena i.e. smog exposure and it is a **key precursor of a range of secondary pollutants.**

PARTICULATE MATTER (PM)

Complex mixture with components having diverse chemical composition. The major components are sulphate, nitrates, ammonia, sodium chloride, black carbon, mineral dust, and water. PM vary also in sizes and physical characteristics.

SULPHUR DIOXIDE (SO_2)

Colourless gas soluble in water. It **is produced during the combustion of fossil fuels** of motor vehicles and industrial processes. Its chemical oxidation reacts into the formation of sulphurous and sulfuric SO_x acids.

CARBON MONOXIDE (CO)

Non-irritant, odour, taste, and colourless toxic gas. It origins during incomplete combustions of carbonaceous fuels in different industrial processes (wood, petrol, coal, natural gas and kerosene). It is combustible and can form any explosive mixtures with air.

OZONE (O_3)

Photochemical oxidant formed due to the **reaction of other contaminants** present in the atmosphere nitrogen dioxides (NO_2) molecules and volatile organic compounds (VOCs) when they absorb light from solar radiation.

CARBON DIOXIDE (CO_2)

It appears as colourless, odourless, and incombustible gas. Naturally, it is **exhaled by animals and humans to produce oxygen, but mainly produced during the fuel combustion** in motor vehicles. It potentially affects climate change.

BENZENE

Colourless and flammable liquid with a sweet odour. It is produced from natural activities (i.e. volcanoes and forest fires) but **mostly from anthropogenic activities** such as the combustion of fossil fuels (crude petrol and diesel) and therefore motor vehicle exhaust.

The LIFE CAT4HEAVY project (Grant Agreement no. LIFE17 ENV/GR/000352) has received funding from the LIFE programme of the European Union. This communication reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.

AIR QUALITY IN CITIES. HOW TO IMPROVE IT?

THE MAJORITY OF AIR POLLUTION IS CAUSED BY ROAD TRANSPORTATION FOR URBAN AND INDUSTRIAL ACTIVITIES

Road transport remains as one of the **most concerning** sources of **health and environment effects. Heavy Duty Vehicles (HDVs)** are a **major air quality contributor** within this sector

HDVs are vehicles whose weight is ≥ 4.5 tonnes. Trucks, vans, buses… are widely used in urban areas for freight and public transport purposes

SOURCES: WHO, ICCT

AIR POLLUTION NEEDS DIRECT ACTIONS AT ALL LEVELS OF GOVERNMENT TO ADDRESS WIDESPREAD SOURCES OF POLLUTION

ROADMAP ON EU's LEGISLATION ON EMISSIONS AND AIR POLLUTION FOR HDVs

Efforts to control air pollutants from road transportation and HDVs have become more stringent over the past decades

Regulation (EC) No 592/2009

Approval of motor vehicles and engines with respect to emissions from **HDVs Euro VI** and **access to vehicle repair and maintenance information technical requirements** for the type-approval of motor vehicles, engines and replacement parts

Regulation (EU) 2018/858

Administrative procedures and technical requirements for placing on the market all new vehicles, parts, components, units and equipment that may pose a serious risk **(market surveillance)**

Regulation (EU) 2019/1242

CO_2 emission performance standards for new HDVs. Sets reduction targets to achieve the objectives of the Paris Agreement: **reducing GHG emissions < 30 %** comparing 2005 levels in 2030

Directive (EU) 2019/1161 on the promotion of clean and energy-efficient road transport vehicles

CLEAN VEHICLES DIRECTIVE

RELEVANT FOR POLICYMAKERS

It promotes **clean mobility solutions** in public procurement tenders, providing a solid boost to the demand and further **deployment of low- and zero- emission vehicles**. It defines clean HDVs as the one who uses: hydrogen, batteries, natural gas (GNG and LNG) , biofuels, synthetic and paraffinic fuels, LPG, aiming to improve air quality and decarbonization.

THE **DECARBONISATION** FOR THE HDVs IS A PRIORITY. ELECTRIC VEHICLES (EV) ARE BECOMING A MAINSTREAM SOLUTION TO TACKLE AIR POLLUTION AND TO MAKE THE SECTOR TRULY **CARBON NEUTRAL**

BUT… HOW TO ACCELERATE THE HDV EMISSION REDUCTION WHILE ELECTRIFICATION SOLUTIONS BECOME A REALITY?

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AIR QUALITY IN CITIES. HOW TO IMPROVE IT?

To comply with the European Regulations and Emission Limits, manufacturers have successfully introduced new green technological solutions

The project aims to implement an **emission control system on HDVs** for their motor engine and exhaust which will significantly reduce the air pollutant emission and the associated environmental and health impacts

SCAN ME

LONG-TERM EXPECTATIONS: UP-SCALE THE TECHNOLOGY TO IMPROVE THE GLOBAL AIR QUALITY

Mantua, Italy
*Demonstration on real paths for **5** HDVs*

Genova, Italy
*Demonstration on real paths for **9** HDVs*

Galatsi, Greece
*Demonstration on real paths for **10** HDVs*

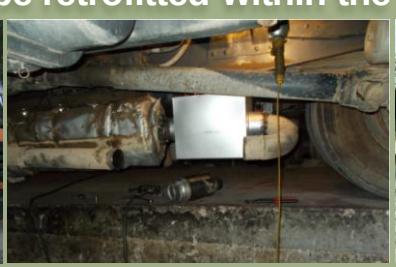
MAIN CAT4HEAVY RESULTS

- IMPLEMENTATION OF THE PROPOSED INNOVATIVE TECHNOLOGY WITH DIRECT POSITIVE IMPACT TO AIR QUALITY AND THE ENVIRONMENT
- REPLACEMENT OF DIESEL CATALYST AND FILTER FOR THE SELECTIVE REDUCTION OF THE MAIN POLLUTANTS: PM, NO_x, CO, HYDROCARBONS
- COMPLETE ELIMINATION OF THE CURRENT REDUCTION CATALYTIC SYSTEM THAT USES AMMONIA (NH_3)
- INTRODUCTION OF POLLUTANTS EMISSION MEASURING AND MONITOR SYSTEM
- RECYCLING AND RETROFITTING FOR ALL THE MATERIALS AND DEVICES

Nano-CATalysts for HEAVY Duty Applications

More than 10 HDVs will be retrofitted within the project






Specific project actions will involve the scaling up of the pilot and testing it on real conditions of Greek and Italian Municipalities to prove the feasibility of the technology and its policy and EURO VI Emission Standards compliance.

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