

# **i** AIR POLLUTION AND HEAVY DUTY VEHICLES

“Air pollution is the contamination of the indoor and outdoor environment by any chemical, physical, or biological agent that modifies the natural characteristics of the atmosphere.”  
*Sources: WHO and European Environmental Agency*



Transport and industrial emissions are the main sources of air pollution

The largest environmental threat to human well-being and health

**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

## 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.

## NITROGEN DIOXIDE (NO<sub>2</sub>)

Reddish brown gas with a pungent odour. This gas reacts with water producing other NO<sub>x</sub> 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**.

## OZONE (O<sub>3</sub>)

Photochemical oxidant formed due to the **reaction of other contaminants** present in the atmosphere nitrogen dioxides (NO<sub>2</sub>) molecules and volatile organic compounds (VOCs) when they absorb light from solar radiation.

## CARBON MONOXIDE (CO)

**Non-irritant, odour, taste, and colourless toxic gas.** It originates 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.

## SULPHUR DIOXIDE (SO<sub>2</sub>)

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<sub>x</sub> acids.

## CARBON DIOXIDE (CO<sub>2</sub>)

It appears as colourless, odourless, and incombustible gas. Naturally, it is **exhaled by animals and humans to produce oxygen, but it is 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 MAIN POLLUTANTS



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# AIR POLLUTION AND HEAVY DUTY VEHICLES

ROAD TRANSPORT IS RESPONSIBLE FOR ALMOST 13% OF TOTAL AIR EMISSIONS

ROAD TRANSPORT CONTRIBUTES TO MORE THAN 40% OF NO<sub>x</sub> EMISSIONS

AROUND 12% OF THE EU'S PRIMARY PM<sub>2.5</sub> EMISSIONS COME FROM ROAD TRANSPORT

ABOUT 23% OF EU TOTAL CO<sub>2</sub> EMISSIONS ARE DUE TO ROAD TRANSPORT

**HEAVY DUTY VEHICLES (HDVs) are the major NO<sub>x</sub> EMISSIONS contributor**

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

**Efforts to reduce the negative effects on air quality caused for road transportation and HDVs emission control limits have become more stringent**

**EU Commission has put a number of policies and EURO Emission Standards to reduce the air pollutants from this sector**

SOURCES: ICCT, EEA



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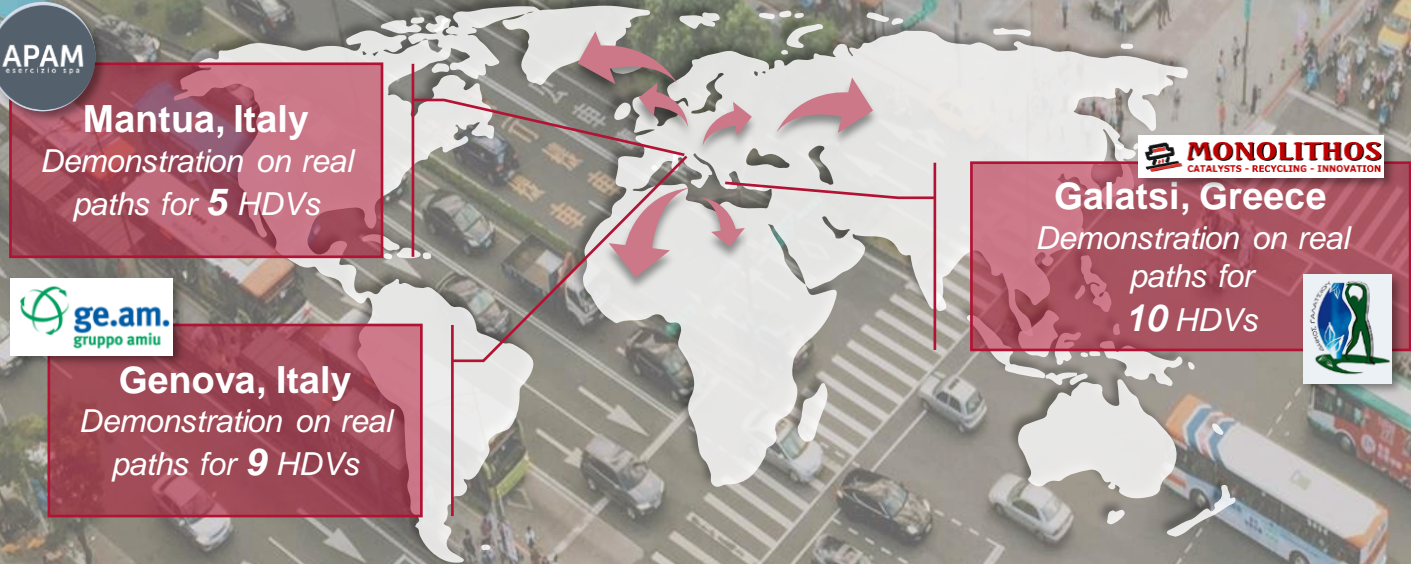
# AIR POLLUTION AND HEAVY DUTY VEHICLES

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



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



### CAT4HEAVY MAIN 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<sub>x</sub>, CO, HYDROCARBONS
- COMPLETE ELIMINATION OF THE CURRENT REDUCTION CATALYTIC SYSTEM THAT USES AMMONIA (NH<sub>3</sub>)
- 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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