The CO_2 emission standards for new passenger cars and light-commercial vehicles (Vans) set average CO_2 targets for vehicles from categories Ml and N1 with a maximum reference mass of 2840kg. In addition, the Vans Regulation requires Member States to monitor registrations and CO_2 emissions of vehicles from category N2 and M2 up to a reference mass of 2840 kg and based on this information consider extending the scope of the Vans Regulation to also include these vehicles. This would align the scope of CO_2 regulations with legislation setting limits on air pollutants (Regulation (EC) 715/2007) and would result in full coverage of all vehicles type-approved under the light-duty type approval. The mandatory monitoring and reporting on vans started in 2012 and there is still little data regarding registrations of N2 and M2 vehicles in the EU and their CO_2 emissions.

Conversely, heavy-duty vehicles (HDVs) CO_2 emissions (N3-M3) represent around a quarter of road transport emissions but have at this stage not been covered by EU legislation on CO_2 emission mitigation. In May 21st, 2014, the Commission adopted a strategy for reducing Heavy-Duty Vehicles' fuel consumption and CO_2 emissions. (SWD(2014) 159 final, SWD(2014), 160 final). The proposed strategy consists of short-term actions to bring more transparency to the market and foster emission reductions and later on, medium term policy options that shall include the setting of mandatory CO_2 emissions limits for newly registered HDVs.

There is however a group of vehicles in between light-duty and heavy-duty that are currently not covered by any of the abovementioned work streams. Annex II of Directive 2007/46/EC establishing a framework for the approval of motor vehicles defines N1 category as "vehicles designed and constructed for the carriage of goods and having a maximum mass not exceeding 3,5 tonnes", N2 category as "vehicles designed and constructed for the carriage of goods and having a maximum mass exceeding 3,5 tonnes but not exceeding 12 tonnes" and M2 category as "vehicles designed and constructed for the carriage of passengers, comprising more than eight seats in addition to the driver 's seat, and having a maximum mass not exceeding 5 tonnes".

It is therefore evident that despite some overlap with the scope of the Vans Regulation and the Strategy on Heavy- Duty Vehicles there is a gap in category N2, M2 and some heavier N1 vehicles, i.e. N1 vehicles with reference higher than 2610 kg.

"Data gathering and analysis to improve understanding of the fleet, market and CO_2 emissions of N2 and M2 category of vehicles" is project performed by Transport & Mobility Leuven for the European Commission DG for Climate Action in order to provide the Commission with information regarding vehicles of categories N2, M2 and heavier N1. The focus of this study are the market share of these vehicle categories, manufacturers present on this market, characteristics of vehicles and their usage, their estimated contribution to CO_2 emissions, and the concerned emission related approval legislations.

These objectives have been achieved by performing of the following five tasks, i.e. inventory making of key data sources, creating database structure, collecting and analysis the obtained data, reviewing of relevant legislation and estimating the possible contribution of N2, M2, and heavier N1 vehicles to CO_2 emission.

Several key data sources have been identified during the project, i.e. vehicle manufacturers, national authorities, international association such as ACEA, type approval organizations, and previous project conducted by TML from where data on N2 and M2 vehicle markets and characteristics have been collected and put into a structured database.

Briefly, several conclusions have been drawn:

On data gathering: Data on N2 and M2 vehicles are difficult to obtain as no legislation obliges manufacturers to keep the N2 and M2 vehicle characteristics information in a structured and ready for reporting database. When countries' data are available for the national authority, their level of details are in general quite different.

On the share of the existing N2 and M2 vehicles on total vehicle fleet:

The shares of the existing total fleet of N2 and M2 vehicles with regard to total road vehicle fleet in different European countries are relatively small.

On the pattern of shares:

No clear correlation can in fact be drawn between the country's share of the existing N2 and M2 vehicles within the total existing vehicle fleet and the country's share of the new N2 and M2 vehicles within the total new vehicle fleet. Furthermore for both registered new and existing vehicles, almost no similar gross vehicle mass (GVM) classes of N2 vehicle share pattern can be found in different countries..

On the pattern of manufacturers' shares:

We have been able to identify the biggest manufacturers in each vehicle category, N2 and M2 based on the vehicle registration data that we have collected. We have found however noo single pattern of N2 vehicle manufacturers' market shares in different countries and in different GVM classes. Each manufacturer seems to choose a particular market segment characterized by countries and GVM classes and this trend is confirmed by both new vehicle registration data obtained from national authorities and new vehicle sales data from manufacturers.

On the vehicle characteristics:

Information in mass in running order seems to be more used as the mass related variable in the new N2 vehicles registration data than the reference mass. With more than 90% shares, diesel fuel appears to be the most dominant fuel type used within the new N2 vehicles registered in all of GVM classes. Variation of alternative non-diesel fuel seems to be more available in the lower N2 vehicle GVM classes. We can also remark that registered new N2 vehicle engine size seems to increase with the increase of GVM class.

On the concerned legislations:

Manufacturers' data show how each of them has different policy in selling their N2 vehicles i.e. in term of share between incomplete and complete vehicles..

The shares of new sold N2 and M2 vehicles type-approved under LD legislation are high. In most cases the share of N2 vehicles whose reference mass are lower or equal to 2840 kg are found only in the GVM class between 3,51t and 5t.

The phenomenon above is also confirmed by analysing data from national authorities. Light N2 vehicles are spread in all N2 vehicles GVM classes with a decreasing trend with the increase of GVM classes. However the pattern differs from one country to another.

On the CO_2 emission:

Availability of CO_2 emission factor data of new N2 and M2 vehicles registered or sold are limited as no legislation obliges the monitoring of this emission factor. Dutch data allows us however to remark a

decreasing rate of around 4,5% annually of the average combined CO_2 emission factors from 2009 to 2014 which is also reflected by the decreasing fuel economy data.

Simple calculation performed based on the available country new vehicle registration data and assumptions taken from TREMOVE model has allowed us to estimate the contribution of N2 and M2 vehicles in term of CO_2 emission for the period 2012 to 2014. Based on our calculation in five European countries, N2 vehicles roughly contribute in totality between 8,5% to 10,5% to the total CO_2 emissions from freight road transport. The totality of M2 vehicles' CO_2 emission contribution in five observed countries, on the other hand, range from 7,4% to 12,6% with regards to all buses and coaches CO_2 emission. In both cases the structure of vehicle fleet in a particular country plays an important role in determining the magnitude of N2 or M2 vehicles' contribution to CO_2 emission.

Finally, our simple calculation show how heavier N1 vehicles contributes at least 10,6% to the total CO_2 emission from all N1 vehicles in Europe. This share might differ largely from country to country depending on the fleet structure and average mileage per year.

Several recommendations are worth to mention here in order to continue study in this research axe to further improve our understanding of M2 and N2 vehicle fleet, their market and CO_2 emissions:

O*n data gathering*:

While obtaining data from manufacturers is rather a difficult task, we can continue to cooperate with national or country authorities. More extensive collection and elaboration of new vehicle registration data from national authorities will help us to fill the gap caused by the lack of data that can be provided by manufacturers.

Highly detailed data on vehicle characteristics are available by type approval organizations. With some dedicated effort, it is possible to make a linkage between the detailed vehicle characteristics from these databases with the registration data or sales data obtained previously from manufacturers and national authorities. This kind of linkage will fill information gap from data provided by manufacturers and national authorities.

O*n the direction of future research works*:

The existence of complete market and characteristics data of N2 and M2 vehicles alone does not allow to estimate the contribution of these vehicle categories to CO_2 emission as information on CO_2 emission factors are rarely available. More extensive technical studies are needed to obtain CO_2 emission factors values of N2 and M2 vehicles. This type of research should give us more precise information on CO_2 emission factors related vehicle characteristics.

Finally, gathering information on multi-stage approved vehicles is the objective of the project that we have been able to achieve. All manufacturers, national authorities, organizations, bodybuilders and/or up-fitters that we have contacted claimed that they are not in possession of this information, i.e. initial and final registered category together with changes in gross vehicle mass, reference mass, and other characteristics. Omitting these multi-staged approved vehicles risks to underestimate the total road vehicles' CO_2 emission and fuel use.