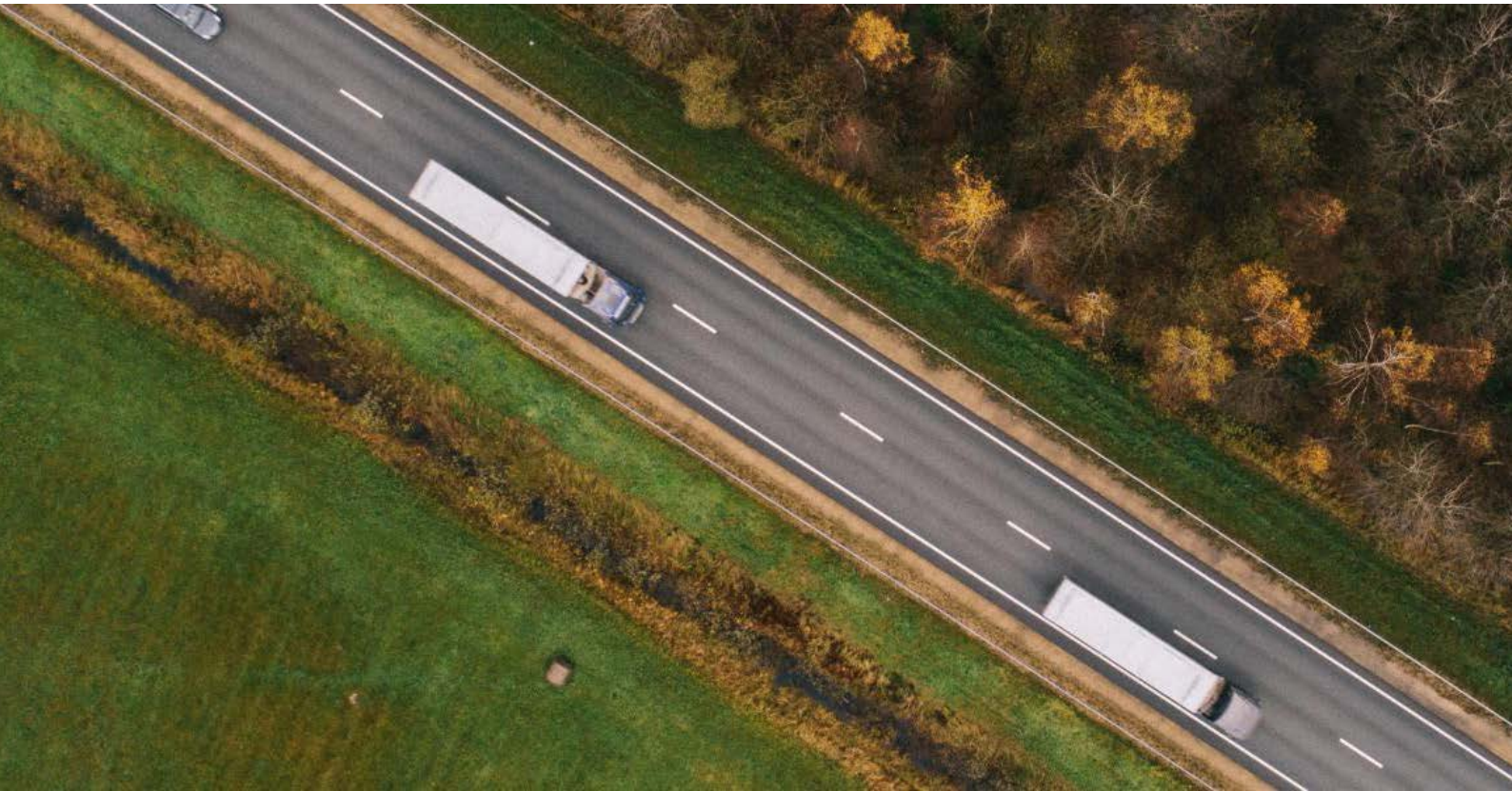
Survey Report

The Perspective on the Use of Alternative Fuels in the Heavy Truck Industry



About LECTURA

LECTURA has been the leading provider of machinery intelligence on the market **since 1984**. Our database contains information and data on more than **147,778 heavy machinery models** and provides evaluation of used machines through our online tools and digital solutions.

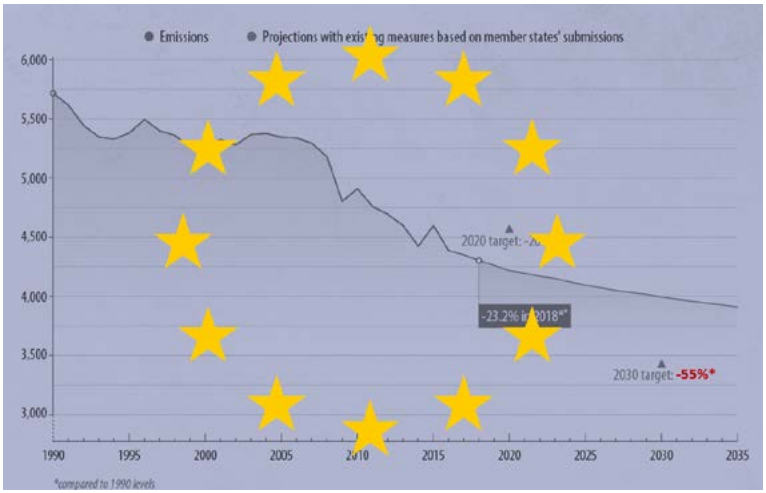
This extensive database of equipment information attracts hundreds of thousands of professional visitors every month, when researching machinery before their purchase decision. This buyers guide represents the perfect platform to reach buyers and decision makers.

Our web portal LECTURA Press provides the latest news from the heavy machinery industry, exclusive interviews with industry experts and market leaders and publishes the quarterly online magazine the DigiMessenger in order to always bring the most relevant information to our readers.

Content Overview

Introduction and Executive Summary

With sustainability becoming more and more a prerequisite for doing business in all sectors, we decided to run this survey to investigate awareness about green solutions for the transport sector, by assessing people's perception on alternative propulsions and future expectations for the heavy commercial vehicle industry (i.e. vehicles above 16t).



Alternative powertrains include propulsion systems that are not based exclusively on the traditional internal combustion engine. This may include hybrids, full battery electrics, hydrogen fuel cells, compressed and liquified gas, and many other types. Major investments in zero-emission vehicles are under development by all Truck Manufacturers who are working to meet the ambitious decarbonization targets set at EU level.

The EU 2030 Climate Plan states as objective to reduce greenhouse gas emissions to at least 55% below 1990 levels by 2030 and the ultimate target of a carbon-free Europe by 2050. Being the transportation sector one of the largest contributors to greenhouse gas emissions, successful transformation of the heavy-duty transport system will be key for achieving the target.

In order to achieve carbon neutrality in road freight transport a number of factors will have to coexist:

- Development and diffusion of alternative powertrains
- Higher capillarity of charging and refuelling infrastructures
- A policy framework supporting investments in green technologies and purchase decisions

Germany's automobile industry association VDA and many industry players say that a clean road transport system will rely on a variety of technologies. Different powertrain technologies will probably coexist and compete. Even the opinions on them will probably be different among the stakeholders. To receive more in-depth insight and to map people´s vision on these, the survey was conducted. We hope it will provide us with both - information about ways people perceive these changes and the attitudes and the behavioral context in general.

Survey results show a big expectation on electric and hydrogen vehicles, which for 47% of the participants, will be among the preferred choices in the period 2025-2030. Still, as shown by 54% of the respondents, the prevailing feeling is that in the medium-term greenhouse reduction for transport will still largely rely on the enhancements of Euro VI diesel engines and on the development of Euro VII solutions. It is clear that refinement of traditional technologies, such as the internal combustion engine, will remain significant contributors to greater eco-friendliness,

whilst alternative powertrains will play an increasing role in the transport policy mix.

Quite surprising there is still few awareness about the opportunities and the potential for internal combustion engines powered by Compressed Natural Gas (CNG) and Liquified Natural Gas (LNG). These solutions are available already today and with the adoption of the biomethane they do offer a ready 0-emission solution which could have a major impact on the EU carbon free targets.

They offer two major advantages versus any other solution:

- Renewable gas is already available, providing a low carbon footprint fully in line with the strictest sustainability criteria.
- Heavy trucks running with this eco-friendly fuel type are already available and the technology is well consolidated.

Nevertheless, only 20% of the respondents do see methane and biomethane as viable solutions in the 2025-2030 time horizon. 23% of the respondents do see it only as a transition technology and 50% not a valid alternative at all.

Lack of awareness on methane and biomethane may result from communication, which should be further enhanced, although only 11% of the participants do declare product information being a key factor affecting purchase decision on alternative fuel trucks. Today there is a big noise on the electric and hydrogen solutions, which as confirmed by this survey, are recognised as the future of road transport. Due to the investments required in terms of infrastructure and technological development, arguably they will still require a significant time before being available at reasonable cost for the heavy-duty, long-haul mass market, whilst will increasingly have a faster penetration in the short-haul, last mile missions.

In order to achieve a massive increase in the number of alternative trucks on the road and to make the business model affordable, huge investments are required. Looking at the factors affecting the purchase decision, product development by all manufacturers must further accelerate to lower the difference in the purchase price vs the traditional engines (14% of answers); the creation and availability of a charging infrastructure for all vehicle categories is also a must, as confirmed by 27% of answers from survey participants.

But also looking at the infrastructure, the difference in the perception of the respondents in terms of preferred choices versus current availability raises questions about the real awareness of current technological solutions. Europe already has an extensive natural gas transportation network, which can be exploited for the distribution of biomethane by lowering development costs. Leading vehicle manufacturers have developed an increasing number of gas-powered models and together with major energy players opened-up dedicated refuel stations. Biomethane could substantially contribute to the decarbonised transport sector, not only tomorrow but starting from today. The consolidated technology is further advancing year upon year and, unlike the electric and hydrogen transport solutions which will be the likely future, the mature natural power technology applied to

transport does not require further big investments and innovation to be deployed. CNG and LNG can provide a bridge technology for passenger cars and an ultimate solution not only for heavy duty vehicles, but also for agricultural applications.

Methane powered production tractors are now available in the market with the same performance of the gasoline and diesel powered traditional machines. Farmers can make use of agricultural or animal waste, as well as specifically grown energy crops, to generate biomethane, which powers the tractor, which, in turn, helps to grow those very crops. Using biomethane and natural gas in transport also has the indirect environmental advantage of contributing towards a circular economy for our cities and farms.

Some resistance in applying solutions different from the traditional engines may be recognized, by slowing down the introduction of any greener vehicle and ultimately the efforts to achieve the decarbonization targets. Waiting for even more performing or advertised solutions, betting on the next developments rather than fully exploiting current potentials, may be a barrier for the introduction of all new technologies. As shown by the survey, only 50% of the respondents would buy a used vehicle running with alternative propulsions, confirming some fears in the adoption of engines different from the well-known diesel ones.

Reaching the ambitious CO2 standards proposed by the EU, will only be possible with a fast and massive answer from the market in the uptake of low-emission trucks, new and used. Transition to zero-emission mobility requires a full range of powertrain options and a strong acceleration is expected in the coming years supported also by public investments in the framework of the EU Recovery Plan.

However, the future is now! Exploitation of existing solutions and focus on existing alternative propulsion systems must become the new normal. The pace in their adoption is still too slow. Biomethane and natural gas, both compressed and liquified, are concrete solutions for both private vehicles and freight transport by road, as well for agricultural applications and fot the construction sectors, that can make an important contribution to the transition, while also being complementary in the future to other alternative powertrains and fuel options.

Information and awareness on available solutions is key. The survey we run and this document aim providing a contribution to the diffusion of knowledge and to a rapid transition towards a sustainable development model in the heavy-duty transport sector.

Methodology

Speaking about the survey itself, it ran from 22nd February to 22nd March and primarily targeted those respondents who marked themselves as either working in the transportation sector, agricultural sector, and construction sector. Anyway, even the responses from people who indicated they work in other sectors were inspected, because, despite the main focus on the three mentioned groups, the vision of any stakeholders on the heavy machinery industry, in general, was valued.

Regardless of the sector of activity, all respondents were provided with the same version of the questionnaire. In total, it consisted of 11 questions (see the appendix). From these, four questions were demographic questions exploring who the respondents are (sector of activity; type of stakeholder; job function; fleet size). The following four questions focused on the current behavior when speaking about alternative fuels and were submitted only to respondents working with a heavy vehicle fleet; the last three questions were about people's attitude and opinion about alternative fuels. Questions were prepared in 6 different languages (DE,EN,ES,FR,IT,PL).

In total, 18365 respondents agreed on participation. Due to the high numbers, we believe in obtaining somewhat relevant results and the potential to reflect the situation in the real world, thus, exceeding the frame of our survey sample.

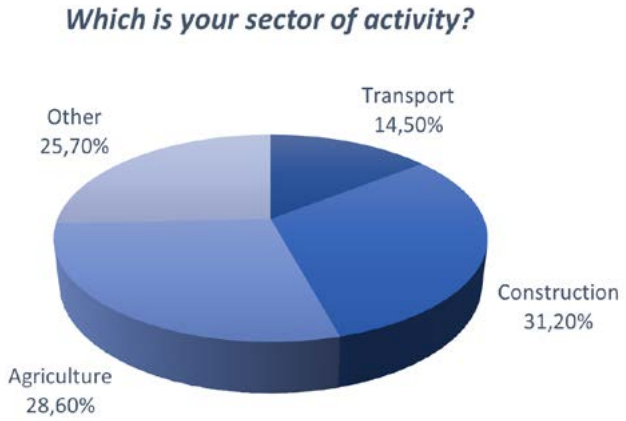
The data was analyzed in the PSPP program, beginning with analyzes of the overall sample (global results), then continuing with similar analyses on the European survey sample. Finally, the comparison according to respondents´ sector of activity was performed. All of these are discussed in the following chapters.

RESULTS: General Global Results

As mentioned above, our analyses began with inspecting the responses received by the total sample - together 18365 respondents. First of all, we focused on who are the people who participated in the survey, on their demographic characteristics. More specifically, we aimed to discover the sector of activity of our respondents, what type of stakeholder they are, their function in the company, and how many vehicles consist of their fleet.

Thus, starting with analyzing the sector of our respondents´ operations, we found out that most of them work in construction (5731 respondents; 31,2%), followed by those working in agriculture (5252; 28,6 %). On the other hand, the least were those who identified themselves as working in transport (2659; 14,5%). Still, there are 4723 (25,7%) respondents left, which we did not mention. These described themselves as others. To our knowledge of LECTURA Specs' audience, these people might be, for example, people focused on lifting, municipal technology, material handling, or just individuals interested in heavy machinery, even though their activity or job is far different from it. However, we will still find out a little bit more about these people later when focusing on the results for specific sectors.

Graph 1 (see the data)



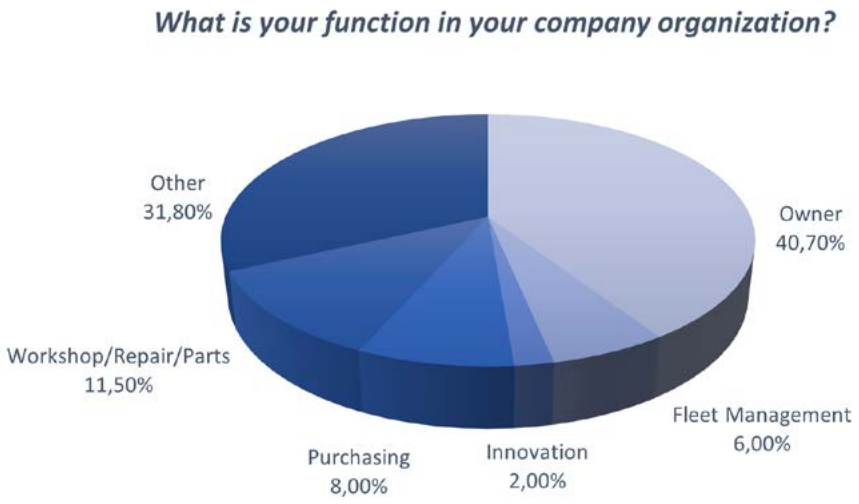
Going further in the global sample analysis, we focused on what type of stakeholder people from our survey sample are. According to a definition, by stakeholder, we mean a person with an interest or concern in something. Keeping this in mind, we indicated a couple of options we consider relevant for the current topic. However, there was still the last option for all those who would describe themselves elsewhere.

Beginning with the predefined options, 10,3% of respondents described themselves as buyers of transport services and 11,2% as members or representatives of logistic companies. Then, 9,1% of the respondents were dealers or resellers. Those who described themselves as municipal operators were 6%, and members or representatives of leasing or rental companies were 3,3%. However, there were 60,2% of respondents who would describe themselves differently.

Graph 2 (see the data)

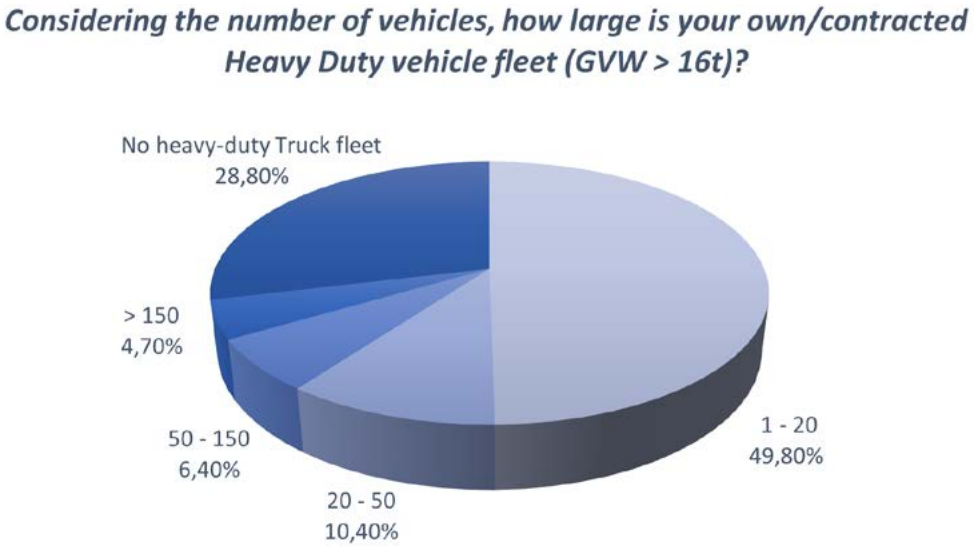
So far, we gained insight into the area and sector of activity. Therefore, in the following question, we asked about their function in their company or organization. The results revealed 40,7% of them were owners of the company. 6% of respondents focused on fleet management and 8% were involved in the purchasing area. Going further, the function of 2% of respondents was in Innovation. 11,5% worked in workshops, repair and parts supply. Still, however, 31,8% of people claimed working in a function different from the ones listed as predefined options.

Graph 3 (see the data)



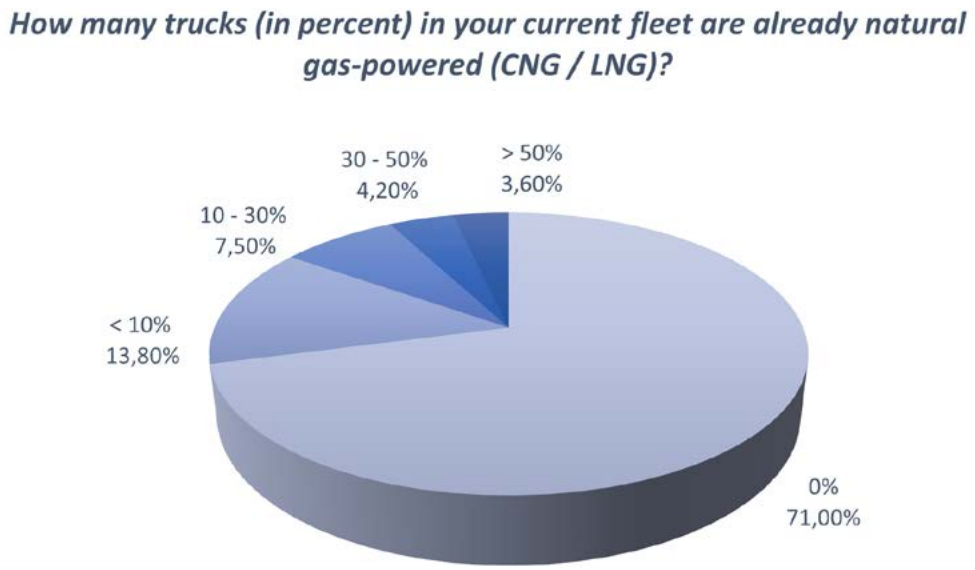
The last of the demographic questions was about the size of respondents´ fleet. We aimed to distinguish either whether people have any heavy-duty fleet or not, either the size of their fleet. Following this approach, we found out 71,2% of respondents (N = 5499) have a heavy-duty vehicle fleet, though 28,8% not (N = 2224). When speaking about the size, 49,8% of the respondents have a small fleet - from 1 to 20 vehicles. Then, 10,4% of respondents have a fleet ranging from 20 to 50 vehicles and another 6,4% of them from 50 to 150 vehicles. The remaining 4.7% of respondents then claimed their fleet consists of more than 150 heavy-duty vehicles.

Graph 4 (see the data)



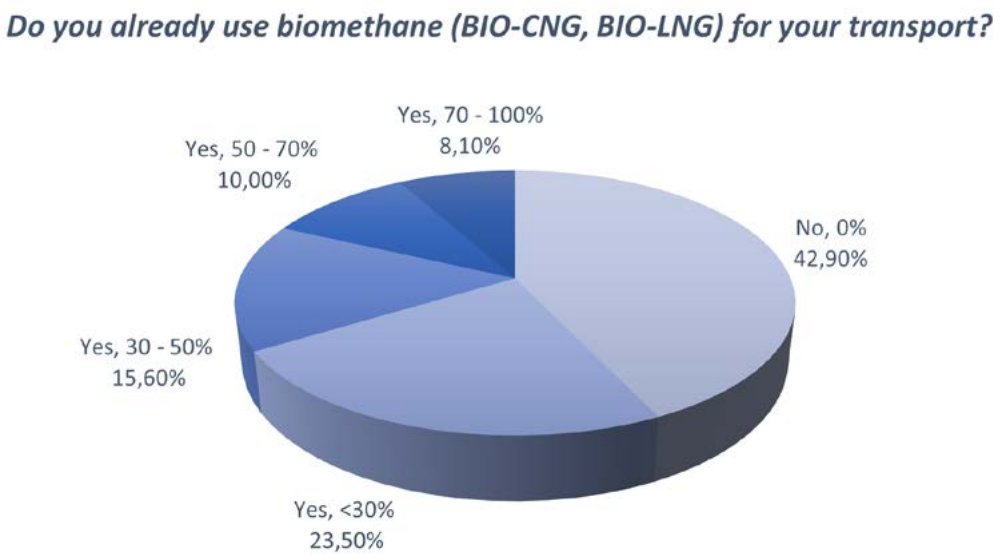
Leaving the demographic question issue behind, we more in-depth focused on those who reported they have their own or contracted heavy-duty vehicles fleet with the purpose to discover whether even a part of their fleet is already natural gas-powered. Again, we aimed to distinguish between those whose fleet is even partially natural-gas-powered and those who rely on traditional fuels. Beginning with the former, those who already use alternative fuels were 29%, the latter was 71%, indicating most people still rely on traditional fuels. When focusing on the extend of natural-gas usage, 13,8% of our respondents indicated, their fleet is up to 10% gas-powered, 7,5% claimed they have between 10 and 30% of vehicle naturally gas-powered, and 4,2% of respondents have between 30 - 50% of their fleet consisting of natural gas-powered trucks. The remaining 3,6% admit they have more than 50% of their fleet powered by alternative fuels.

Graph 5 (see the data)



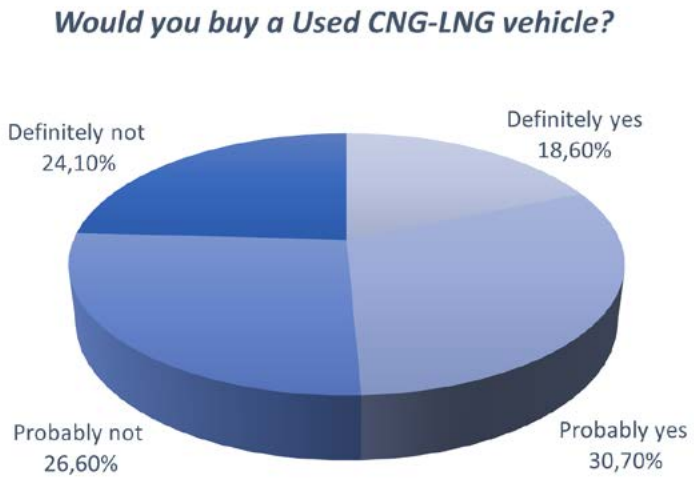
Going further in the analysis of alternative fuels, we also asked our respondents whether they already chose bio-methane. Therefore, the following question was presented only to those respondents who indicated their fleet is somewhat natural gas-powered. The results revealed, although, that 42,9% of respondents do not use bio-methane fuels. Going further, when speaking about the remaining 57,1%, we found out 23,5% of respondents use less than 30% biomethane for transport, 15,6% between 30 and 50%, and 10% between 50 - 70%. Finally, only 8,1% of people use biomethane for more than 70% of the missions.

Graph 6 (see the data)



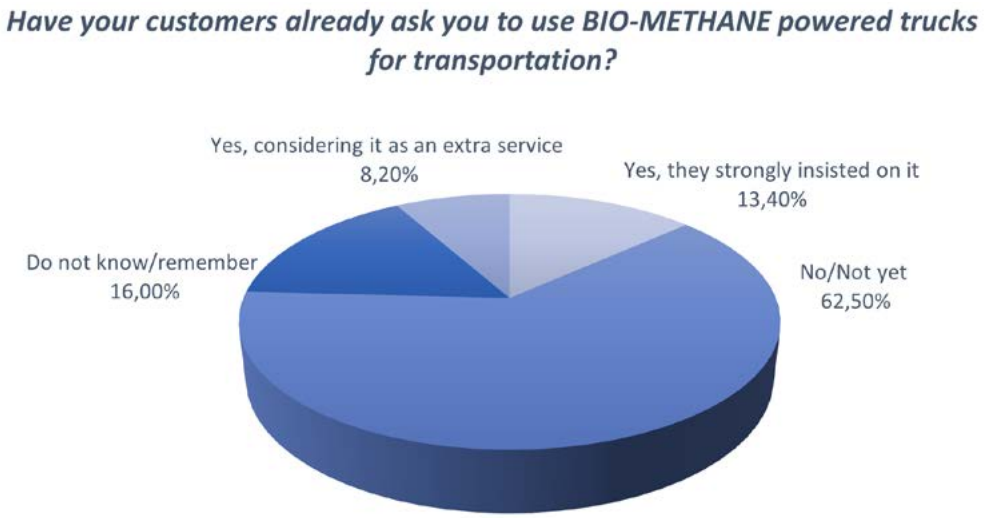
Moreover, regardless of whether respondents from our survey use or do not use biomethane, we asked all who claimed they have a fleet on their attitude towards buying used CNG-LNG vehicles. Respectively we asked them whether they would buy a used CNG-LNG vehicle. In total, 18,6% of respondents would definitely do so, and a further 30,7% (most common answer) would probably buy it. When speaking about those who are not into a used CNG-LNG vehicle purchase, 24,1% of respondents are strongly against such purchase, whereas 26,6% are not a hundred percent sure, but would not probably buy it, too.

Graph 7 (see the data)



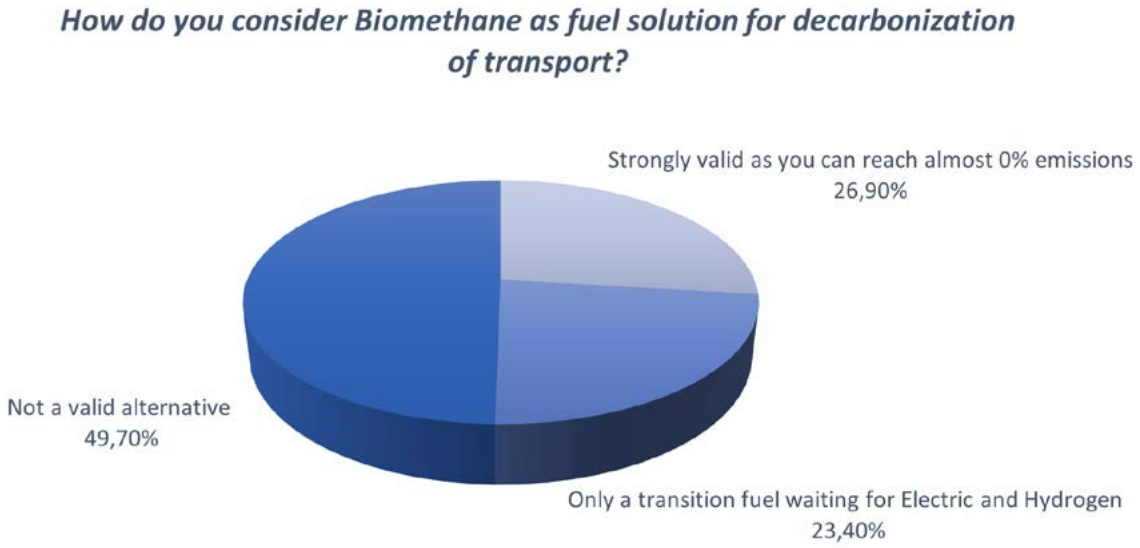
The last question prominently for fleet owners and managers focused on their experience with customers´ demands on transport services - whether they asked them for bio-methane powered trucks for transportation. Speaking about numbers, 62,5% of respondents claimed their customers never asked them about using bio-methane powered trucks for transportation, other 16% of them do not know or do not remember. Among respondents who claimed to have already faced demand by customers to run transport service using bio-methane as fuel, 8,2% said the customers considered it an extra service. Those who met customers strongly insisting on bio-methane usage for transportation were, on the other hand, 13,4%.

Graph 8 (see the data)



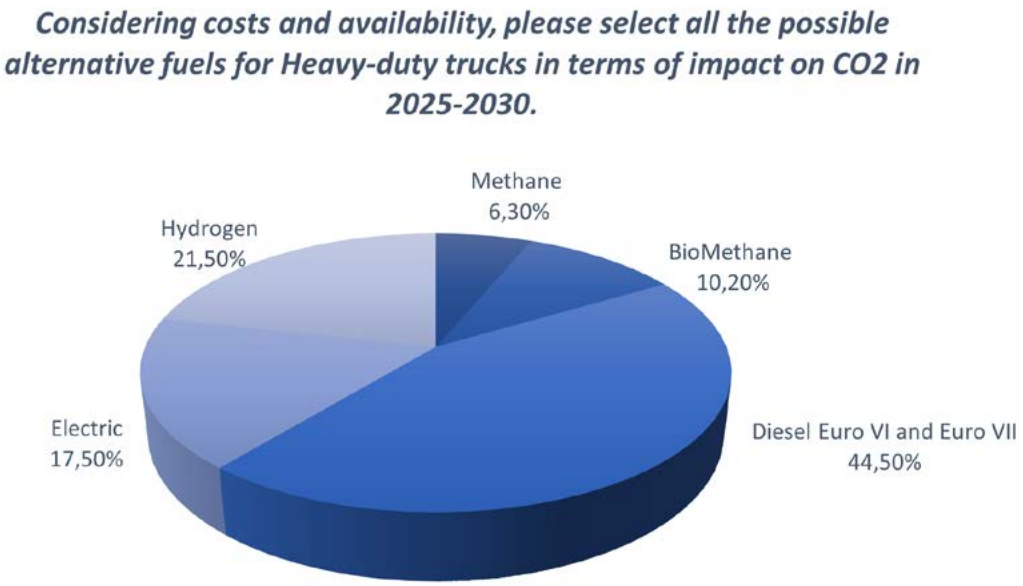
Having discussed all questions presented prominently to fleet owners, we continue now analyzing the questions for all respondents regardless of their characteristics. Thus, the next question focused on people's perception or attitude towards bio-methane; whether people consider it as a fuel solution for decarbonization of transport. The results revealed that 49,7% of respondents do not consider it as a valid alternative. The remaining 50,3%, on the other hand, has more open attitudes. 23,4% of respondents claimed they consider bio-methane as a transitional fuel waiting for Electric and Hydrogen, and the remaining 26,9% even think bio-methane is strongly valid as it allows to reach almost 0% emissions.

Graph 9 (see the data)



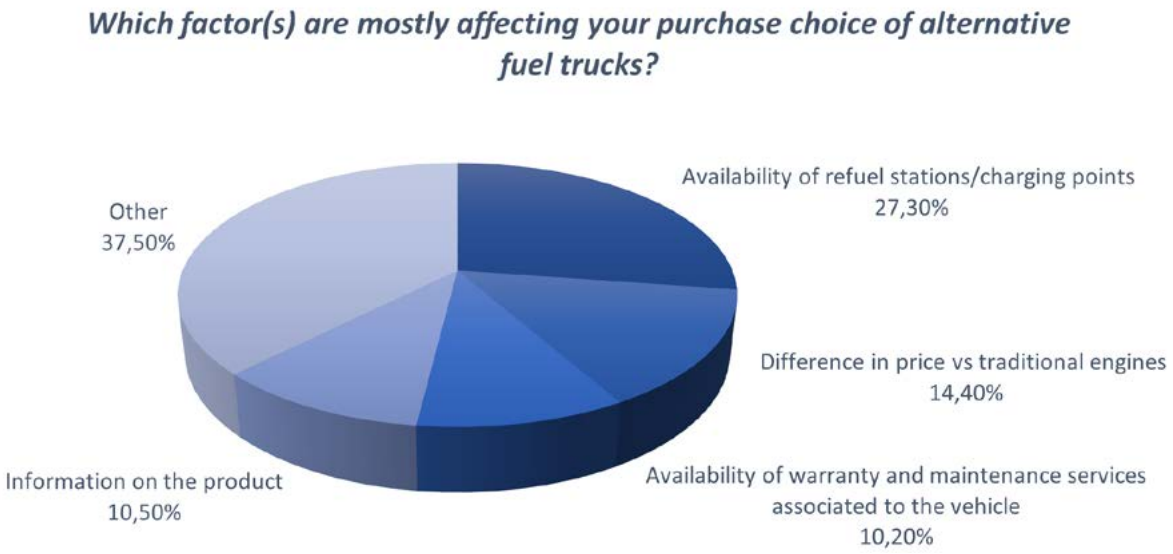
However, beyond bio-methane, the current survey also focused on other alternative fuels. We asked our respondents about their opinion on the fuel's impact on CO2 in 2025 - 2030 when considering costs and availability. When answering this question, the respondents could choose more than one option. Thus, speaking about the overall number of responses, most of them (44,49%) were for Diesel Euro VI and Euro VII. Also, Electric (17,53%) and Hydrogen (21,48%) seem to be considered available alternatives in terms of impact on CO2 in 2025 - 2030. Speaking about the rest, 10,18% of answers were for Biomethane, and 6,31 for Methane.

Graph 10 (see the data)



The last question was about the factors affecting the purchase choice of alternative fuels. Again, in this question, respondents could choose more than one reply. The results revealed that 27,33% of responses consider availability of refuel stations or charging points as key factor on purchase decision, 14,42% reported the differences in price vs. traditional fuels, about 10% listed the availability of warranty and maintenance services associated with the vehicle (10,15%) and information on the product (10,55%). Still, however, 37,54% of responses claimed other factors are affecting the purchase choice of alternative fuel trucks, as well.

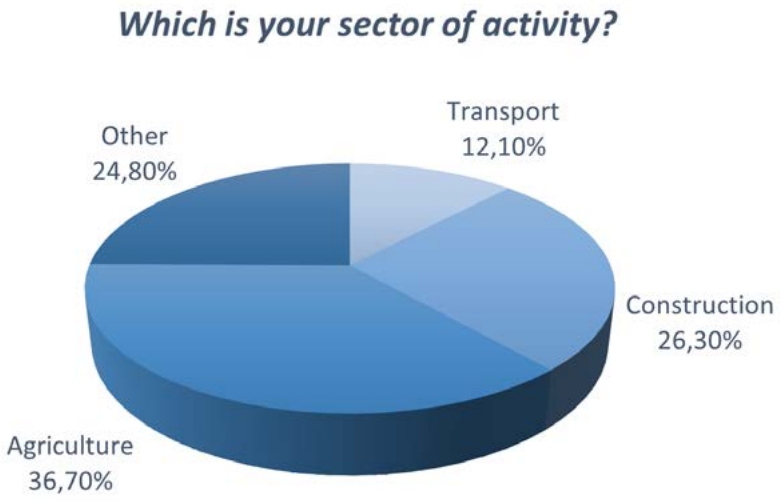
Graph 11 (see the data)



RESULTS: European Sample

Despite the fact, we have been discussing the general global results, the key analyses were performed on the European sample[1] - in total, 10738 respondents. Thinking about the sector of activity, 12,1% of respondents (N = 1301) characterised themselves as working in transportation, 26,3% (N = 2826) in construction and 36,7% (N = 3943) in agriculture. The remaining 24,8% (N = 2668), however, did not fall into any category.

Graph 1 (see the data)



1 Albania (N = 29), Andorra (N = 3), Austria (N = 489), Belarus (N = 5), Belgium (233), Bosnia and Herzegovina (18), Bulgaria (N = 45), Croatia (N = 83), Cyprus (N = 20), Czechia (N = 67), Denmark (N = 129), Estonia (N = 24), Faroe Islands (Denmark) (N = 3), Finland (N = 75), France (N = 1347), Germany (N = 2133), Gibraltar (United Kingdom) (N = 1), Greece (N = 106), Guernsey (United Kingdom) (N = 3), Hungary (N = 82), Iceland (N = 22), Ireland (N = 200), Isle of Man (United Kingdom) (N = 2), Italy (N = 1317), Jersey (United Kingdom) (N = 3), Kosovo (N = 1), Latvia (N = 50), Lithuania (N = 57), Luxembourg (N = 31), Macedonia (N = 17), Malta (N = 9), Moldova (N = 8), Monaco (N = 1), Montenegro (N = 4), Netherlands (N = 165), Norway (N = 222), Poland (N = 607), Portugal (N = 161), Romania (N = 170), Serbia (N = 70), Slovakia (N = 36), Slovenia (N = 101), Spain (N = 872), Sweden (N = 206), Switzerland (N = 301), Ukraine (N = 19), United Kingdom (N = 1191)

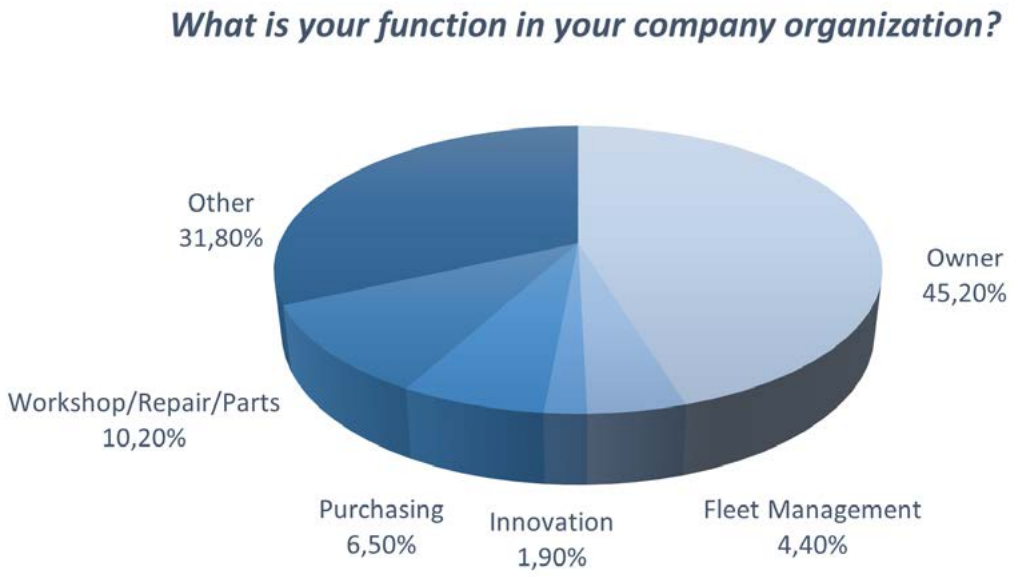
Going ahead in results for the European sample, first of all, we focused on a more in-depth insight into who the respondents of our survey are. On top of the sector of activity, we also aimed to explore what type of stakeholder the respondents are. Together with what is their function in the company and the size of their vehicle fleet.

Beginning with the exploration of what type of stakeholders our respondents are, we were mainly curious about how many of them are buyers of transport services, municipal operators, dealers or resellers, members of logistic companies or leasing/rental companies. The analyses revealed 34,4% of the respondents fell into one of these categories though 65,6% would describe themselves differently. However, going back to those who described themselves as any of these categories, 9,8% were buyers of transport services, 8,2% members of logistic companies, 5,6% municipal operators, 8,5% dealers/resellers, and 2,3% members of leasing or rental companies.

Graph 2 (see the data)

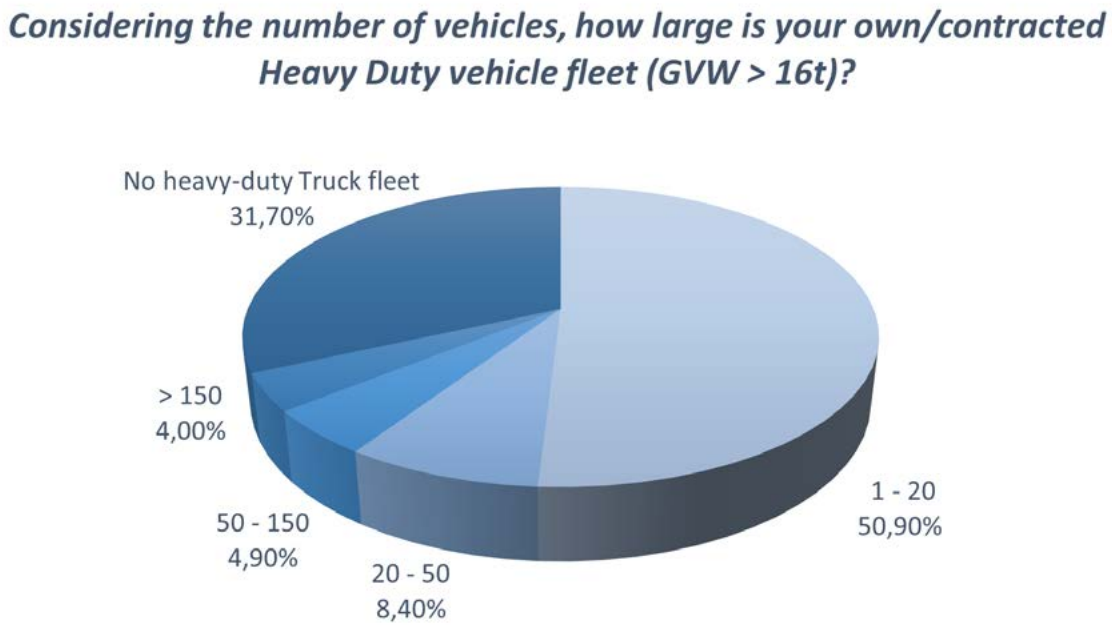
Then we focused on respondents´ function within the company or organization. The respondents were again provided with a multiple-choice question and were instructed to pick one of the predefined options or indicate whether they would describe themselves differently. From those who had answered the question, 68,2% chose one of the predefined options, whereas 31,8% claimed they have a different job function. In total, we discovered our sample consists of 45,2% owners, 4,4% respondents dealing with fleet management, 6,5% of people working on purchasing, 1,9% of people working in the innovation department, and 10,2% of respondents described themselves working in workshops by taking care of repair or spare parts supply.

Graph 3 (see the data)



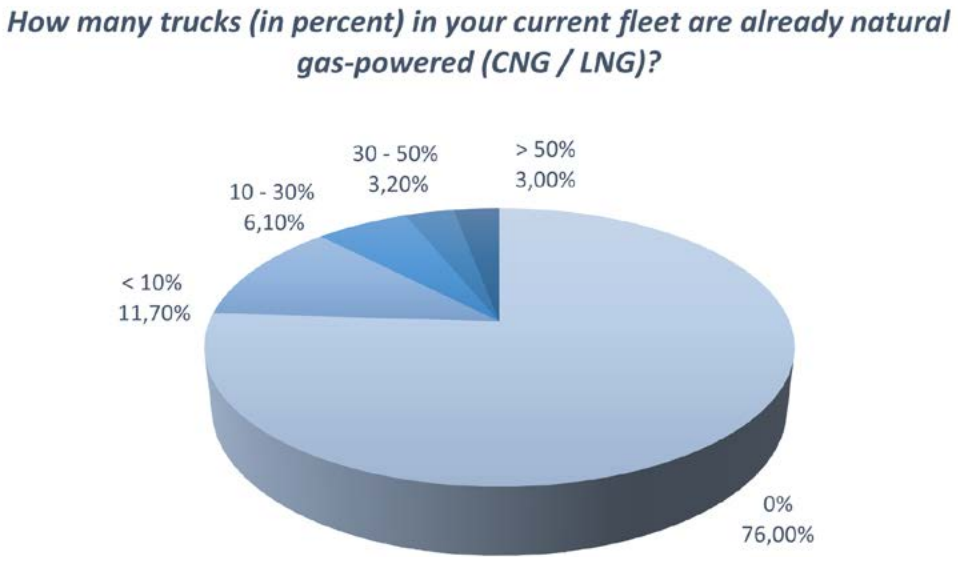
The last demographic question was about the fleet size. The respondents were asked to choose the interval that fits the size of their fleet. In total, 50,9% of the respondents claimed they have a relatively small fleet from 1 - 20 Heavy Duty vehicles, 8,4% claimed their fleet consists of 20 - 50 Heavy Duty vehicles. 4,9% of respondents choose the interval ranging from 50 to 150 Heavy Duty vehicles. Finally, 4% of people in our survey say their fleet consists of more than 150 vehicles. So far, however, we were speaking only about those who are the owners of (or who work in a company owning) Heavy Duty trucks fleet. Still, there are 31,7% of respondents declaring not to have any Heavy Duty truck.

Graph 4 (see the data)



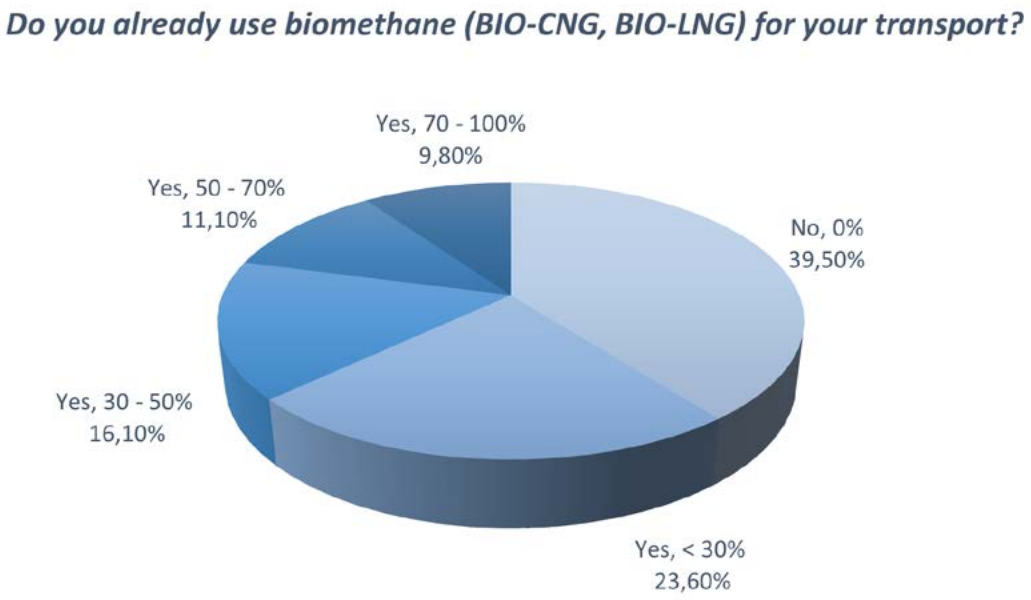
After the demographics exploration, we aimed to map the visions and attitudes about natural gas-powered trucks and alternative fuels. First of all, we were curious about the current situation when speaking about our respondents´ fleet - how many of their trucks are already natural gas-powered, respectively. The results revealed that 24% of our respondents have to some degree, a naturally gas-powered fleet. The remaining 76%, however, did not claim so. Anyway, going more deeply into the analyses of how many respondents indicated their fleet is somewhat gas-powered, we found out that 11,7% of respondents declared to have up to 10% of trucks naturally gas-powered. Then, 6,1% reported between 10 and 30% of their fleet being naturally gas-powered. 3,2% are counting on a fleet between 30 and 50% gas-powered and finally, 3% of people indicated their fleet is more than 50% gas-powered.

Graph 5 (see the data)



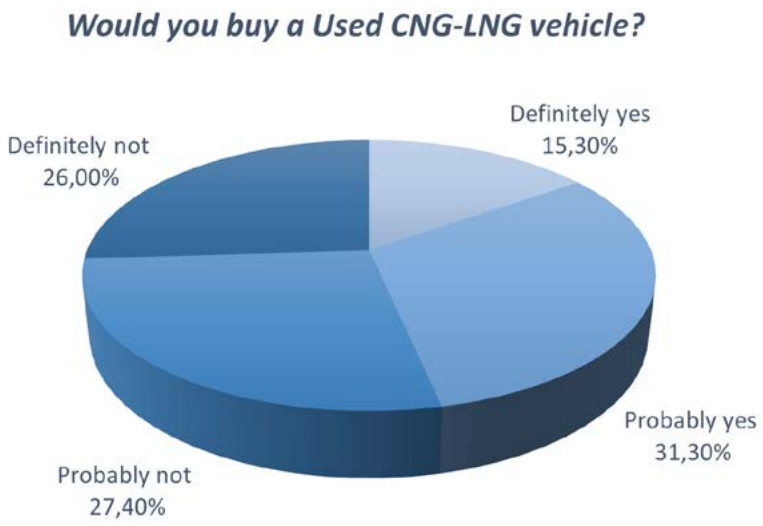
Moreover, since we found out that 24% of respondents claimed they have a natural gas-powered fleet, we asked this 572 (smaller number due to the attrition) people to tell us whether this alternative fuel for transport is biomethane (BIO-CNG; BIO-LNG). The results were as follows: 39,5% of respondents do not use bio-methane ever, and 23,6% of respondents use less than 30%. Then, another 16,1% of respondents use biomethane for between 30 and 50% of transportations. Another 11,1% of respondents claimed they use biomethane in 50 - 70% of cases of transports. The remaining 9,8% of people then claimed they use it in more than 70% of cases.

Graph 6 (see the data)



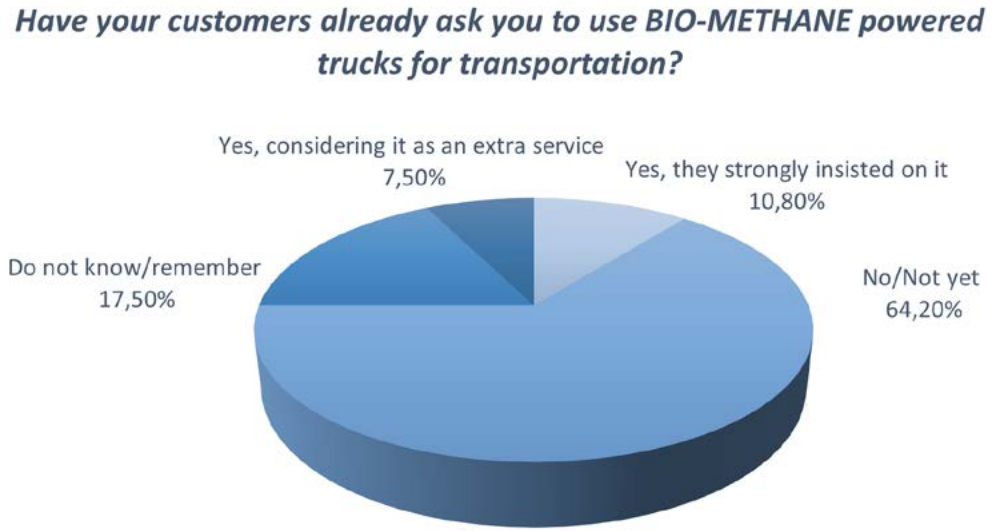
Going back to the total sample of fleet owners/users, we were also curious to explore the willingness to buy a used CNG-LNG vehicle. The distribution of responses was, however, pretty similar. More concretely, 15,3% of responses would definitely buy it, whereas almost double (31,3%) say they would probably buy it. When speaking about those who do not intend to buy it, 27,4% of people claimed they would not probably buy it, and the remaining 26% claimed they would definitely not purchase it.

Graph 7 (see the data)



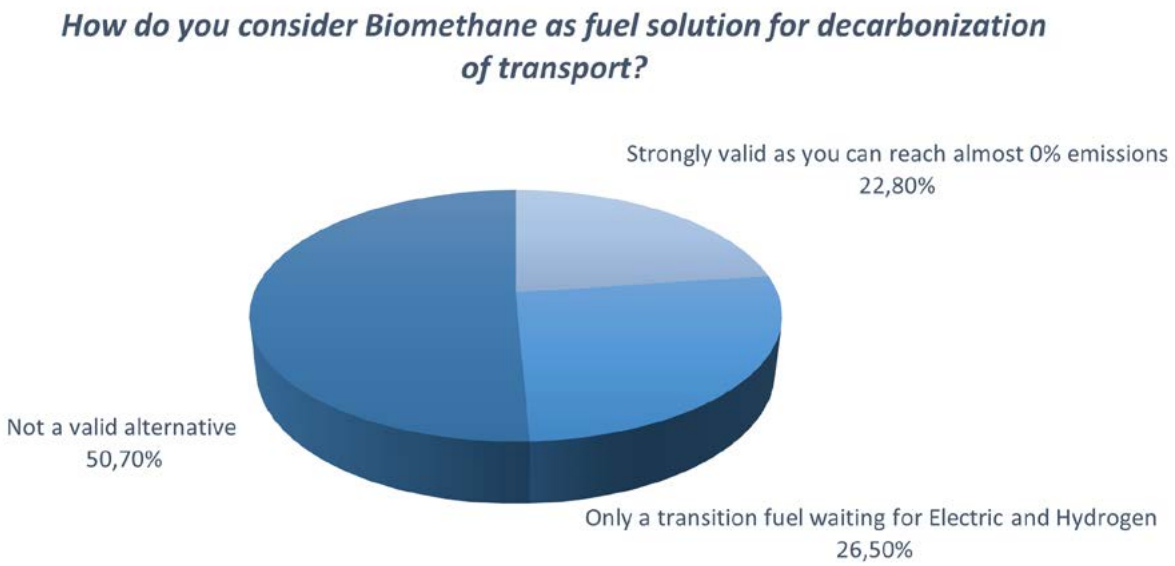
Beyond the attitudes towards a natural gas-powered purchase, the experiences with customers´ demands were explored. The results revealed that about 18% of respondents met customers who at least considered this option. Respectively, 10,8% claimed that their customers strongly insisted on bio-methane powered trucks transportation, and 7,5% of respondents met customers who had demanded bio-methane powered trucks for transport, considering it as an additional feature of the transport service offer. However, 64,2% of respondents did not meet such demand in their customers, and 17,5% of respondents do not know or remember whether their customers ever asked them so.

Graph 8 (see the data)



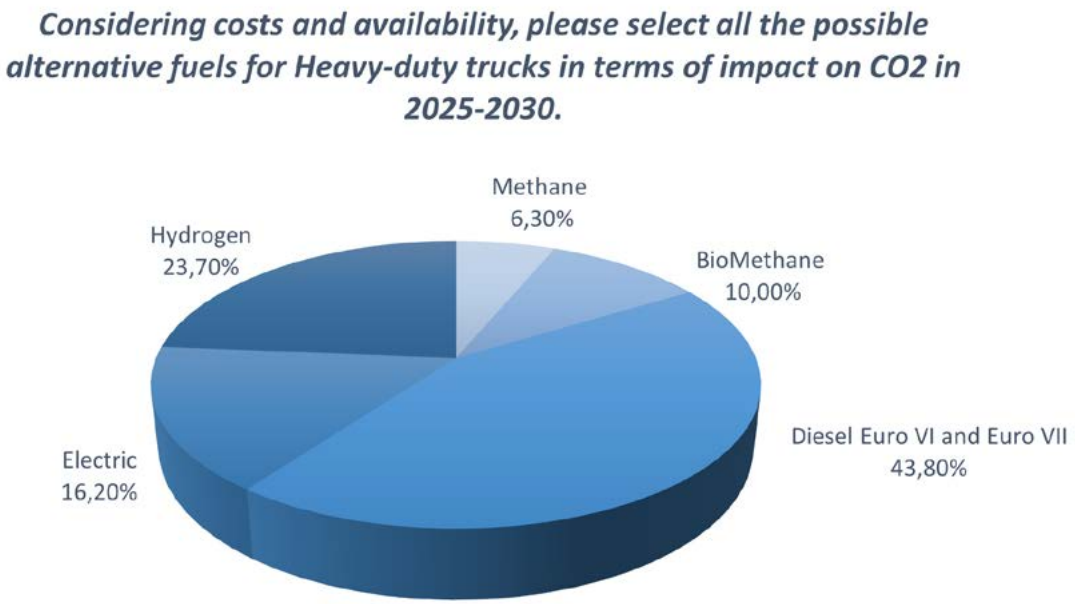
The last three questions were again presented to all respondents regardless of whether they have a heavy-duty truck fleet. The first question referred to biomethane as a potential solution for decarbonization of transport. In total, 50,7% of respondents do not think so. On the other hand, 22,8% of respondents believe that biomethane is a strongly valid alternative having the potential to reach almost 0% emissions. The remaining 26,5% think biomethane is only a transitional fuel waiting for Electric and Hydrogen.

Graph 9 (see the data)



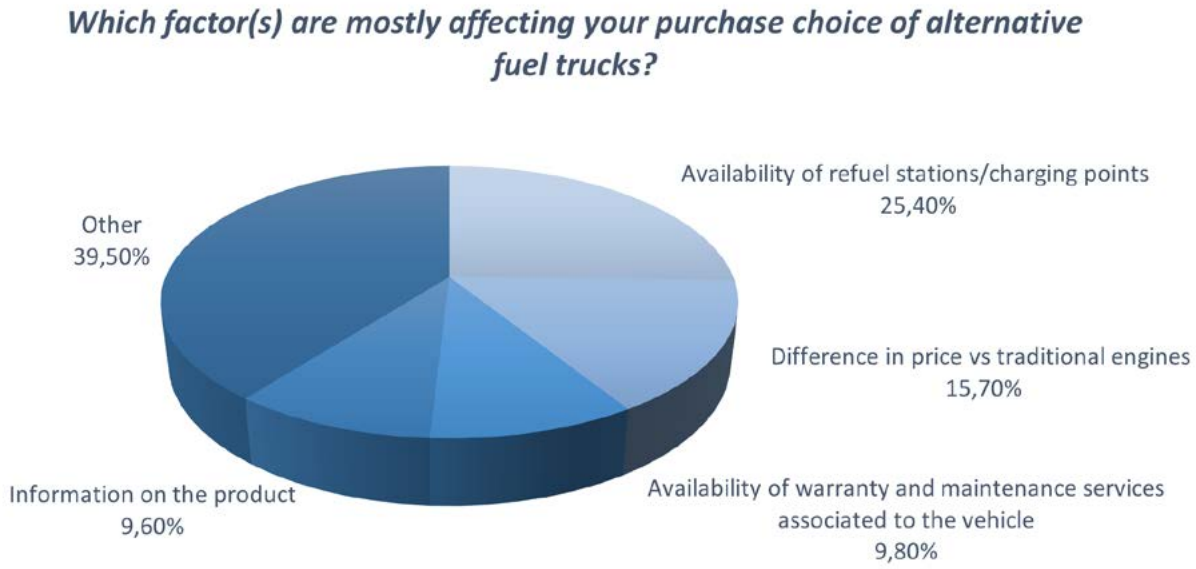
Except for biomethane, we focused on other alternative fuels perception. At this point, respondents have the chance to choose more than one option to simply indicate which alternative fuels for heavy-duty trucks will have an impact on CO2 in 2025 - 2030 when considering the costs and availability. Most of the answers - 43,77% were for Diesel Euro VI and Euro VII, and thus 52% of respondents think these are the most prospective alternative fuels (when considering the above factors). The second place goes for Hydrogen - 28,21% respondents/ 23,74% of answers. 16,2% of responses in total goes for Electric, and together, about 16% of responses for Methane and BioMethane.

Graph 10 (see the data)



Finally, the last question was concerned with factors affecting respondents´ purchase choice of alternative fuel trucks. Again, respondents have the chance to choose more than one answer. In total, 25,36% of the answers went for the availability of refuel stations/charging points, 15,71% of responses for the price difference when considering the gap between traditional and alternative fuels. Then, about 10% of answers went for the availability of warranty and maintenance services, the same number for information on the product. The remaining 39,49% of responses were for other options.

Graph 11 (see the data)



Comparison of Results According to the Sector of Industry

A subsequent analysis was conducted to describe more in-depth the results when considering the potential differences among industry sectors in the attitudes, experience, and opinion on alternative fuels. Again, we began with the exploration of demographic characteristics as summarised in the table below.

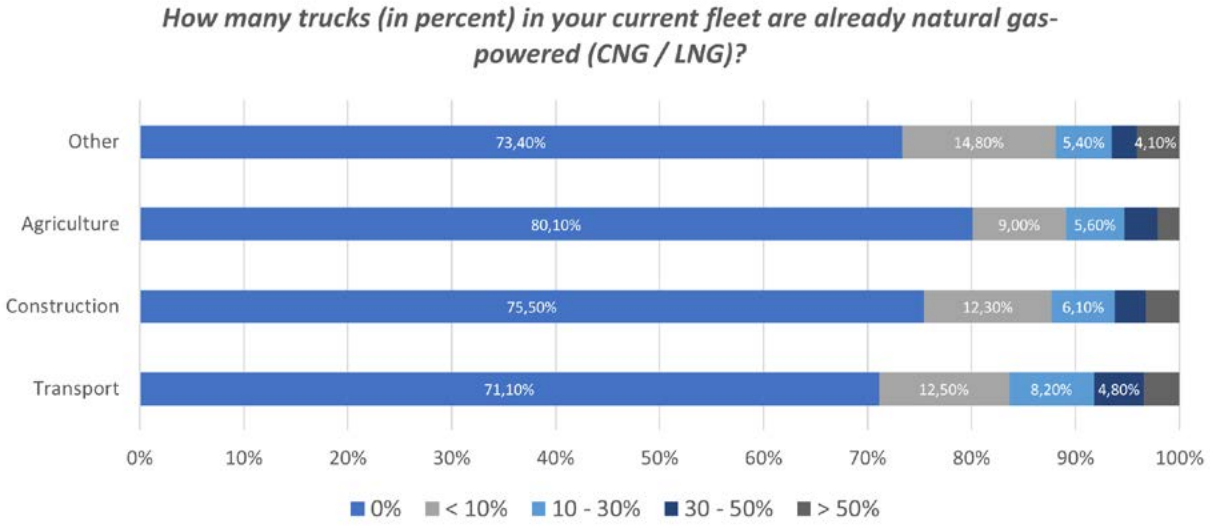
	Transport	Construction	Agriculture	Other
Type of stakeholder				
Buyer of transport services (shippers/ End customer)	20,2%	12,3%	10,0%	2,6%
Logistics company	39,3%	6,0%	2,6%	4,0%
Municipal operator	4,7%	8,0%	4,7%	4,8%
Dealer/reseller	6,8%	10,6%	7,4%	8,7%
Leasing/Rental company	2,7%	3,9%	0,9%	2,3%
Other	26,3%	59,1%	74,4%	77,6%

	Transport	Construction	Agriculture	Other
Function in company				
Owner	44,4%	47,1%	62,8%	23,0%
Fleet Management	13,5%	5,5%	1,8%	2,8%
Purchasing	6,3%	9,8%	4,9%	5,2%
Innovation	3,9%	2,1%	1,5%	1,5%
Workshop/Repair and Maintenance/Parts	8,4%	10,4%	8,1%	13,2%
Other	23,5%	24,9%	20,9%	54,3%
Fleet size in N of vehicles				
1 - 20	53,2%	57,1%	57,7%	36,4%
20 - 50	17,4%	12,1%	5,3%	4,9%
50 - 150	7,6%	6,4%	4,0%	3,4%
> 150	7,2%	3,7%	3,0%	4,0%
No heavy-duty truck	14,6%	20,7%	30,0%	51,4%

After that, the comparison analyses were conducted. We aimed to observe whether attitudes and behavior vary across the sectors or whether they are similar. First, it is clear from the table with respondents´ demographics that not all of them are truck owners or users who work with a fleet of heavy duty trucks. Thus, "only" 85,4% of respondents from the transport sector, 79,3% from the construction sector, 70% from the agriculture sector, and 48,6% of respondents whose occupation belongs to another industry sector were provided with questions about their situation and experience with alternative fuels. The results are presented below in charts with a short description about its meaning.

Beginning with an exploration of how many trucks within the respondents' fleets are already natural gas-powered, it is clear, at first sight, no drastic differences exist when comparing various sectors of activity. However, , most of the respondents, regardless of the sector, indicated 0% of their fleet is naturally gas-powered. From these, the transportation sector appears to be the one in which currently the adoption of alternative propulsion solutions is higher - at least 28,9% of respondents claimed their fleet is even in part naturally gas-powered. On the other hand, the agriculture sector shows the least open attitude towards alternative fuels resulting in the highest rate (80,1%) of respondents who admitted their fleet is not naturally gas-powered at all. Quite interesting, but not surprising, is the fact that in each sector no more than 5% of respondents said their fleet consists of more than 50% gas-powered trucks - though the highest rate was obtained from respondents in unspecified sectors. This could serve as a basis for further research.

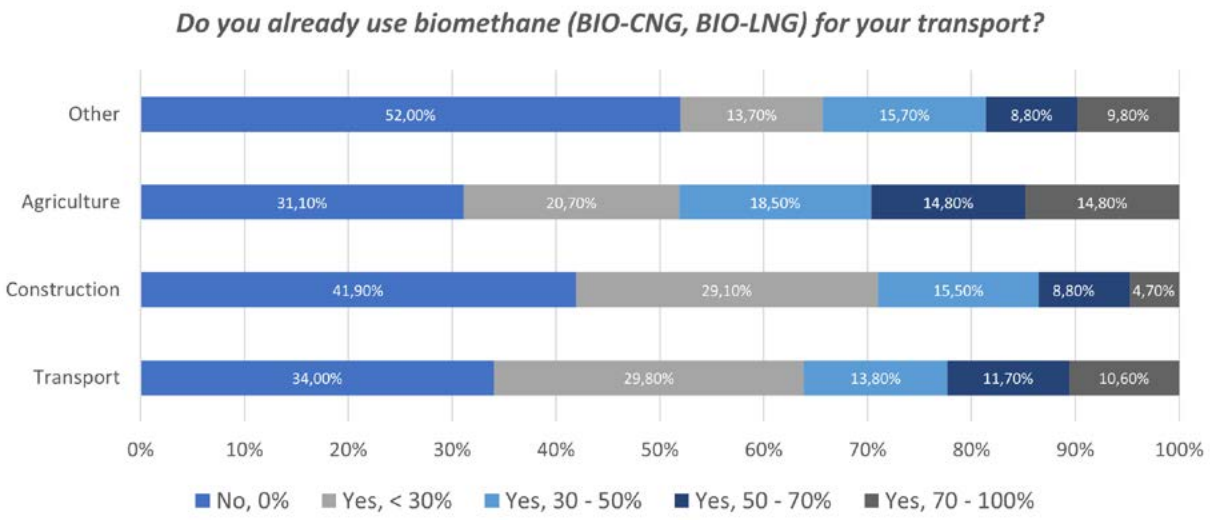
Graph 1 (see the data)



Since the numbers in the previous question indicate that most most people do not run gas-powered trucks, the next question on biomethane usage was presented to 28,9% of respondents from the transport sector, 24,6% from the construction sector, 19,9% from the agriculture sector, and 26,7% of those who indicated they work elsewhere, a total of 572 respondents. The question should reflect the fact there are several alternative fuels (whose preferences we analyze later).

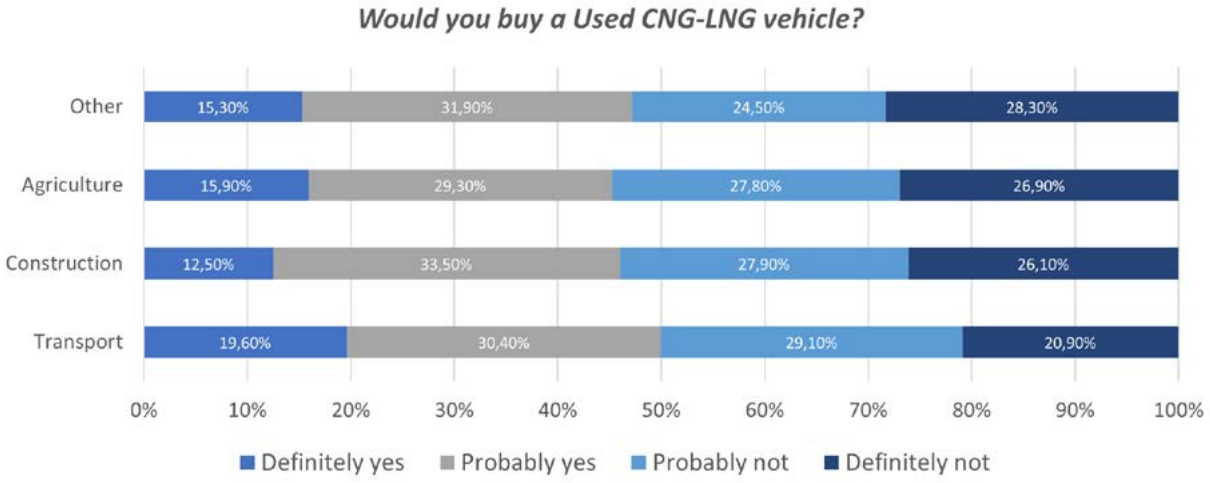
The highest numbers speaking for biomethane usage were received from respondents in the agricultural sector (68,8%), followed by responses provided by those working in the transport sector (65,9%). The same pattern was then observed when speaking about the ratio of responses indicating the level of biomethane usage. Even when considering this, the agriculture sector conquers the rank leading to almost 15% of respondents using biomethane in more than 70% of missions, compared to 10,6% for transport; 4,7% for construction, and 9,8% for other sectors.

Graph 2 (see the data)



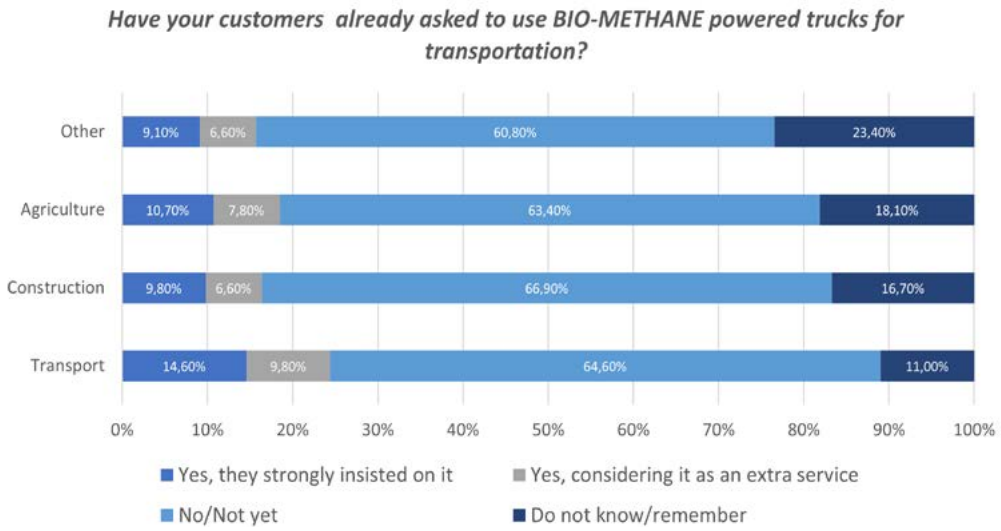
Coming back to the total sample of respondents, who were asked how many trucks in their fleet are currently gas-powered, we were also curious to explore whether these people will buy or run a used CNG-LNG vehicle. While comparing the data from respondents according to their sector of activity, it is important to note that the opinions are somewhat consistent. 50% of the responses from those working in the transport sector show a positive attitude towards such a solution (these respondents also most often - 19,6% - claimed they would definitely buy a used CNG-LNG vehicle), with the remaining 50% declaring they would not buy a used truck . Answers collected from the remaining sectors and overall numbers indicate people who would not purchase the used CNG-LNG vehicle outweigh those willing to buy it.

Graph 3 (see the data)



So far, it seems like people from the transport sector are the most enlightened with new trends in fuels, also considering the ecological aspect of the industry. The next question, asking people whether their customers demand using bio-methane powered trucks revealed people in the transport sector, compared to those from other sectors, are more frequently receiving demand from their customers to use trucks with alternative fuels - more precisely, 14,6% of respondents from the transport sector experienced customers urgent need to use this truck, 9,8% then said the customers demanded for it as an extra service. On the other hand, the current question reflects the respondents´ experience, which can be distorted by knowledge of the business or lack of memory. For example, on average, about 17% of respondents do not remember (or do not know) whether they have ever been asked about bio-methane-powered trucks for transportation. This is more important if we consider that these answers were more frequent among respondents from other sectors than transport. The final numbers may be quite different. However, at least, we know people from the transport sector are more focused on this issue and probably think more in-depth about the possibility their customers may require alternative fuels in the trucks.

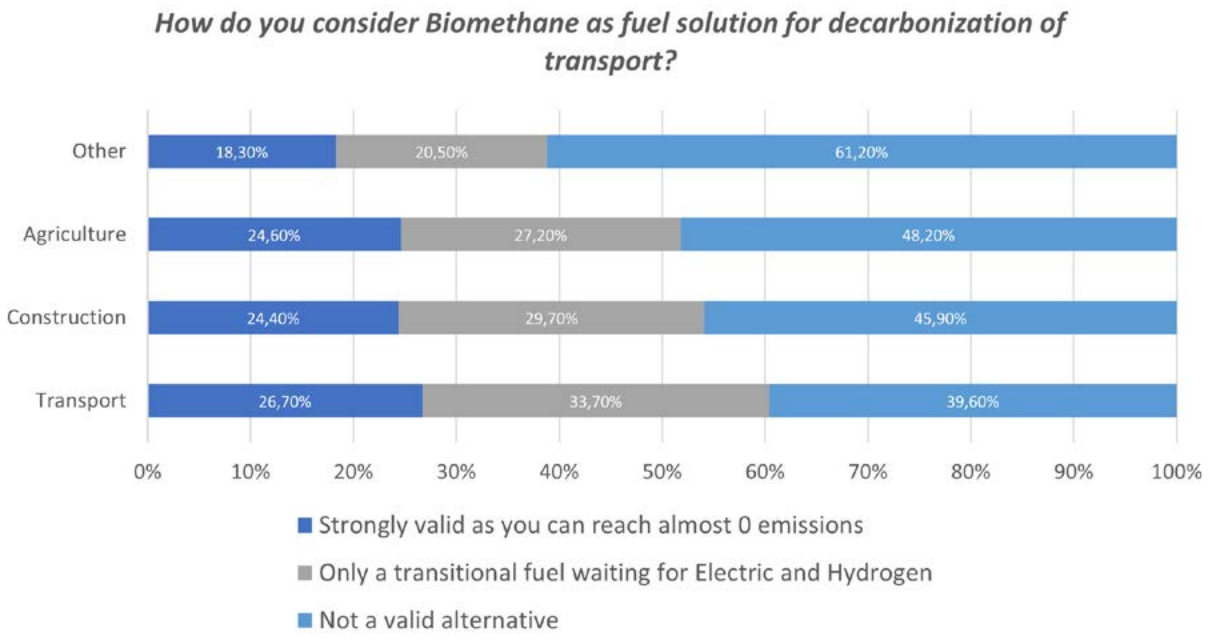
Graph 4 (see the data)



The previous results were obtained only from people declaring to work with heavy duty trucks. However, even those who do not have any vehicle may have some attitudes and opinions on alternative fuels. That's why the remaining questions we will describe were made to all the participants.

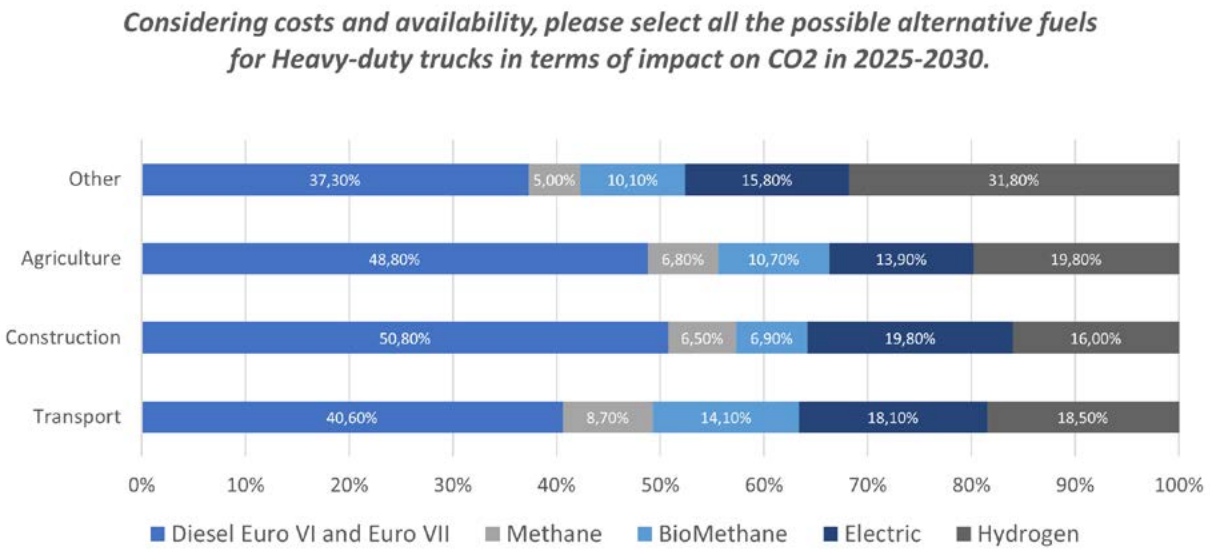
The next question was simple. We just asked the respondents of our survey how they consider biomethane as a fuel solution for decarbonization of transport. Again, the most positive responses (considering biomethane as a strongly valid reaching almost 0 emission) came from people working in the transport sector(26,7%). But even in construction (24,4%) and agriculture (24,6%) about ¼ of people consider biomethane as worthy. Whereas it is probably less known in other sectors.

Graph 5 (see the data)



Since the so-far analyses focused mainly on biomethane, we then asked respondents to evaluate other alternative fuels. Electric and hydrogen powered engines are reported together as the future of the industry by almost 40% of the participants regardless of the sector of activity. Many people still rely on diesel - at this point, however, under the strict limits set by Euro VI and Euro VII norms. Even though we observe, except for the construction sector, that more than half of our respondents think non-diesel alternative fuels may have the highest impact on CO2 emissions, almost half still depend on diesel as a medium-term solution for transport decarbonization. Though, probably costs and availability steps into this, together with limited knowledge of the current alternatives and opportunities.

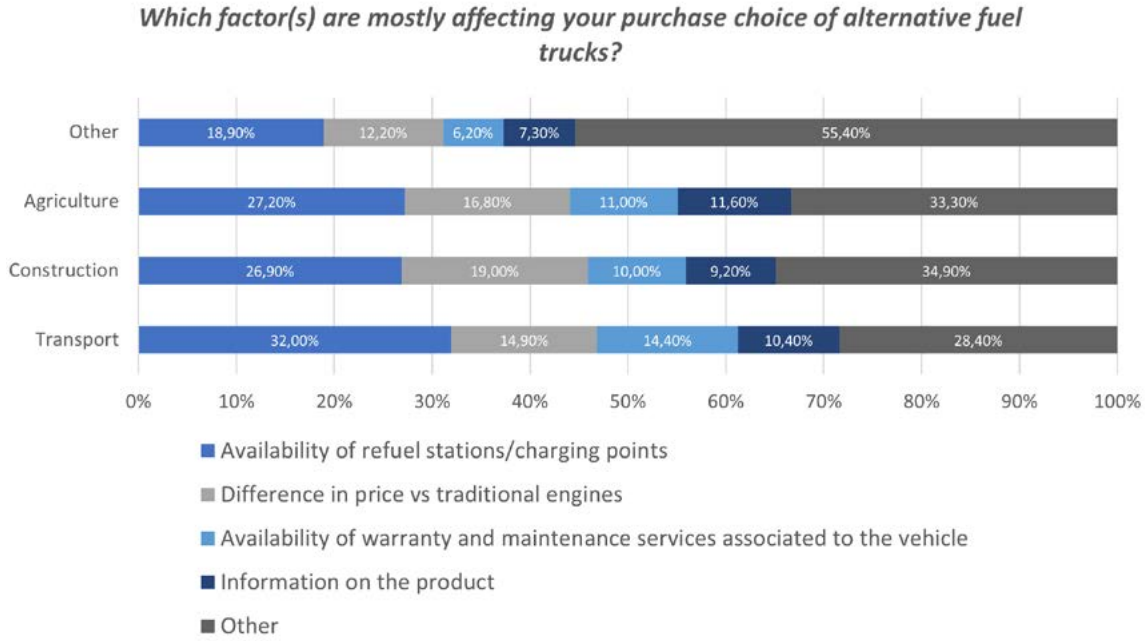
Graph 6 (see the data)



Actually, the availability and expansion of alternative fuels are more in detail discussed in the last question. Even if it is possible to buy a truck with alternative fuels, it may lose its effectiveness (either become more expensive or completely disable) if no services and infrastructures are around. Also, awareness and expectations of alternative fuels in a given locality/region may be an obstacle to alternative fuel usage.

Speaking about factors affecting people's purchase choice in Europe, most people consider the availability of refuel stations/charging points (especially those from the transport sector - 32%). On the other hand, when speaking about differences in prices, we received the highest numbers (19%) from those in construction. About 10% of responses refer to the availability of warranty and maintenance. However, there are still many other factors (about 40%) which according to our survey respondents might affect the decision to purchase a truck powered with alternative propulsions.

Graph 7 (see the data)



We can conclude this chapter by claiming that the sector of activity has something to do with attitudes towards alternative fuels. Therefore, finally, we decided to go a little bit beyond a simple description of the results and focused on whether there is any evidence (and if so, what and how strong) the differences between sectors exist in real-life situations. To explore whether the above-presented numbers can be generalized beyond our survey sample (and thus describe the potential influence of the industry sector on the nature of people's behavior, attitudes, and beliefs about alternative fuels), we conducted contingency tables analysis together with chi-square tests of independence.

Even results of these analyses mostly reveal a weak impact of the sector of activity on the other variables. We found out that the industry sector somewhat influences (or determines) what attitudes and opinions people have towards alternative fuels, respectively. As an index indicating the effect size (how strongly two questions, or better said, variables, are associated), we used the Cramer´s V index - in this case, at best not more than 0,2, thus small. Still, the results are mostly statistically significant (except the question about intentions to buy a used CNG-LNG vehicle, for which the p values[2] were smaller than 0,05). Therefore, we also consider the results presented above relatively relevant and worthy of consideration in a real-life situation. However, to avoid their unconditional and uncritical acceptance, it is worthy to note the results are generalizable only for a population of Europeans, and for internet users (since the analyses were conducted on the European sample, and the data were collected via an online survey), at the same time. Participation in the survey was also voluntary. Therefore, speaking about voluntary surveys, generalisability of their results, and added value, there is always a probability we miss some unique information from those who are skeptical about the participation. On the other hand, we believe (and hope so) that with a large enough survey sample (which this is), the potential threats of the relevance of the results can be relatively eliminated.

2 We were curious about the potential association of sectors and questions (variables) about alternative fuels. Thus our initial assumption was about the existence of the relationship. However, since it is not worthy to accept the existence of such association just by one piece of evidence, we approached to refuse the opposite - no association. Therefore the smaller the p-value (the probability of no existence), the lower the evidence for the assumption of no association (and reversely, an indicator of some probability the association exists).

Conclusion

To conclude, we believe the survey and its results may contribute to a more in-depth exploration of the field of alternative fuels among various stakeholders regardless of their sector of activity. The high number or responses collected shows a great interest in the topics related to a green economy and to the transition towards more sustainable business models.

Climate change is likely the biggest challenge of our generation and the covid emergency has further accelerated the transition towards technologies which allow reduction of greenhouse gases emissions. It is a huge challenge in face of all the sectors of the economy and will likely drive innovation in future years. Effective implementation of any solution will require close collaboration between business players, the scientific and the academic world, with the involvement of national governments and sovereign institutions and the society at large.

Our decision to run a survey on the decarbonization alternatives for the heavy duty truck industry relies on the awareness of the crucial role that long haul road transport and logistics play in ensuring goods distribution and on the severe impact it has on the environment. In the next years we will all witness a transition which will require major investments in infrastructures, park renewal, new product development, the rise of new service offers. A lot of changes are in front of us, likely with different speeds and different evolutions according to customers demand, project scalability, value of the investments required, readiness for the market and availability of financial and political support. The results of our survey also confirm the assumption of differences among stakeholders from various sectors of activity. Not only, let's say,

the starting point or the baseline of the current situation, but also attitudes and needs are different, and thus, require an individual approach.

Yet, it seems many factors step into the decision processes when speaking about the transition to a more ecological-driven approach. Society cannot call for the urgency towards the development of sustainable models if resources and services are not in place. These, together with information, have to be visible and perceived as achievable and available for the users. Our perception is that the awareness has still to be increased and supported by information specific for this sector. Today mass communication is mainly oriented towards the automotive industry and the development of alternative powertrain solutions for the city transport, as the large focus on electric applications is showing. On the other end, knowledge about the status of the art and the short-medium term perspectives for the heavy commercial vehicles market look still rather limited.

It is important to overcome the enthusiastic and emotional approach, driven by research and expectations of the most futuristics and advanced solutions which will still require years to become viable, and take a more pragmatic look at the major enhancements already made in terms of development of more ecological solutions. It must be clear that it is necessary to take immediate actions to meet the challenging decarbonization objectives. Focus should put together both on research for new solutions and on increased penetration and scalability of the technologies which can provide an immediate contribution. Road transport must decarbonise quickly to make a real shift!

Prototypes of battery electric vehicles are starting to reach the truck heavy-duty market as zero-emission technology. However, electric trucks have high power and energy demands and require a dedicated network of suitable high-speed chargers to keep the transport of goods flowing. Their charging infrastructure differs significantly from those of passenger cars; it must be completely created to allow the successful

mass market deployment of zero-emission trucks and will be immediately followed by hydrogen-powered trucks. It will require investments in grid capacity, creation of dedicated charging points in all Countries along the main communication axis, making it hard, if not impossible at least in the short term, the rump up in their usage.

That's why together with the investment in new product development and in the creation of infrastructures dedicated for electric charge the valorisation of existing solutions is a key factor of success in the decarbonisation process of the heavy sector. And for the same reason it can be argued that all the players should improve communication and diffusion knowledge about vehicles which are already running on European streets and driving towards the objective of greenhouse gas reduction.

Natural power engines have performances equivalent to the internal combustion engines powered with fossil fuels. With the adoption of the biomethane they can cut dramatically emissions, coming down to almost 0 CO2 emissions well-to-wheel. The infrastructure network is already in place and is growing year over year, with a multiplication of the distribution points and the set-up of pipelines suitable for the distribution of gas and in the future of hydrogen. However, less than ¼ of our European respondents run naturally gas-powered trucks. About ½ considers naturally gas-powered truck purchases, and few of them also meet customers willing to use trucks powered with biomethane for transportation. People are only now starting to perceive gas (methane/biomethane) as a solution for the decarbonization of the heavy machinery industry, especially transport and are also awaiting other alternatives to traditional fuels. Also current Euro6 engines have emission levels considerably lower than the oldest ones. Renewal of the aged units which are in the European running park can provide substantial enhancement versus current baseline. Used E6 diesel vehicles can be bought by lowering the initial investment, and similarly used NP vehicles start being available.

Clearly it is essential to invest in research and in the development to build up the future and a new ecosystem for the transport, but this must start on the consolidation of all the enhancements which have already been made. It is necessary to promote and allow the diffusion of all the alternatives, which in the future will coexist in the heavy transport industry and drive towards the creation of a new environment, where different products and technologies will coexist and will be chosen according to the customer missions, which will be more and more specialised. Likely this will result also in new business models, from the one-time purchase of a product to the offer of transport solutions on demand, but this may be the subject of a future and dedicated survey.

Efficient zero-emission vehicles are already beginning to come to market, the number needs to rapidly increase over the next few years!

APPENDIX

Find the elaborated data analyses and results **here**.

Interested in your individual survey?

Whenever you want to improve and grow your business conducting a survey may help you. Despite the fact that there are plenty of research methods or strategies to understand your customers' behaviour, the easiest way to get information about people is to simply ask them. Understanding your customers' perspective and needs provides you with the most important information about the future development of your business and therefore determining priorities of its direction. Moreover, ongoing communication with your customers and demonstration of the interest in their needs helps maintain their loyalty.

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questions are presented to respondents right immediately on the LECTURA Specs website.

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Darja Kočárová
Market Research Analyst at LECTURA
survey@lectura.de