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ORIGINAL SCIENTIFIC PAPER

# The Concept of Mobility and Global Challenges in Road Transport by 2050

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**Abstract:** After collecting and processing of the facts, it is evident that today, 2.6 million posts of drivers remain unfilled in the countries covered by the survey with a tendency that this estimated number shall increase to 3 million. In data processing, the official data of the International Road Transportation Union IRU have been used which are explicitly showing that a trend of «vacant» jobs and mobility challenges have been observed in all regions, except Eurasia. The least affected countries are Mexico and Argentina with 8.6% of truck driver vacancies, the exception being China, where the system is stable. In the paper, we deal with the issue of mobility in countries outside the EU, especially the countries of the Western Balkans where we have determined that the trend of drivers leaving for the EU is on the rise and will be especially instigated by continuous economic recovery of global GDP growth, persistent tensions in the supply and demand of road freight and decrease in available workforce of drivers as well as training and qualification challenges. To obtain the results of the work, we set the first hypothesis «lack of professional drivers is a global problem that directly affects the GDP», as well as the second hypothesis «EU directives and the lack of standards harmonisation in the countries outside the EU cause job positions of motor vehicle drivers being uncovered» In order to understand the set hypotheses, our work included extensive research and experience, whereas the methods used include: inductive and deductive methods, methods of analysis and synthesis, methods of abstraction and concretization, methods of generalization and specialization, method of classification, method of description, method of compilation and comparative method. With the protocols, road transport operators have committed to become carbon neutral by 2050 through the IRU Green Compact, the summary provides an overview of this research, focusing on the scenarios assessed and the recommended way forward. In short, which optimization model is the best for road transport operators to make Europe carbon neutral by 2050 on one hand and on the other, to meet the standards of the EU Directives on the mobility of workers, professional competences, skills and abilities, so to make the profession of a professional driver attractive for young people, and also to facilitate and remove the existing barriers that are visible. In conclusion, we confirmed and proved the set hypotheses with proposal for the measures at different levels and recommendations to eliminate or stop negative trends through comprehensive coordination.

**Key words:** drivers mobility, EU Directives, IRU, road operators, CPC,

**JEL classification:** F02, L91, R4, R5

## STARTING BASIS FOR CONSIDERATION OF GLOBAL CHALLENGES IN ROAD TRANSPORT

### ANALYSIS OF MOBILITY AND FILLING OF POSTS OF MOTOR VEHICLE DRIVERS

The IRU survey on drivers shortage was distributed by IRU<sup>1</sup> members to their road transport companies. The results for 2021 were collected between October 2021 and January 2022 and 1,524 companies from 25 countries responded (including passenger and freight companies).

For each topic (shortage of drivers, percentage of female drivers, percentage of young and old drivers, average age) the results show the average, weighted by the number of drivers of each company and the weight of the country in terms of employees in road transport<sup>2</sup> / transportation and storage employees compared to the regional average.

The share of unfilled driver positions is based on the answers to the questions "How many drivers do you currently employ?" and "How many unfilled driver positions do you currently have?". The forecast for 2022 is based on the respondents' own forecasts (answers to the questions "Indicate the expected number of drivers you will need next year (assuming business as usual)" and "How many of these driver positions will you be unable to fill (due to lack of drivers)?" "). The number of unfilled driver positions is based on the total number of drivers working for logistics companies and dispatchers, provided by national road transport associations (IRU members), and the percentage of unfilled driver positions (the number of drivers is considered to correspond to the number of driver positions that have been filled). The share of unfilled positions is calculated based on the companies that responded to the survey.

In the case of freight, these are mainly road freight companies (for hire and reward), as there were very few dispatchers/companies that responded to the survey. Considering that for this type of company the percentage of unfilled positions could be lower than for operators of road freight transport for hire and reward (i.e. transport on short distances), the total number of indicated unfilled positions could be slightly higher than the actual figure.

Over 2.6 million jobs for professional motor vehicle drivers were unfilled in 2021<sup>3</sup> in the countries covered by the survey and the shortfall is expected to increase in 2022. Truck driver shortages increased in 2021 in all regions surveyed except Eurasia. It was strongest in Eurasia and Turkey, where 18% and 15% of driver jobs were unfilled in 2021, respectively.

<sup>1</sup> IRU | World Road Transport Organisation - IRU is a world organization for road transport, 3,5 million operators and logistics around the world.

<sup>2</sup> Full link to 2023 Driver Shortage Survey: <https://www.research.net/r/drivershortage2023>

<sup>3</sup> In the scope of countries surveyed: United States, Mexico, Argentina, Europe (Spain, Italy, France, UK, Ireland, Germany, Poland, Romania, Belgium, Netherlands), Eurasia (Russia, Uzbekistan, Ukraine), Turkey, Iran, China

Mexico and Argentina are the least affected, with 8.6% of truck driver vacancies. Transport companies predict that the shortage of truck drivers will continue to grow in 2022. The only exceptions will be China and Argentina, where they will remain practically stable. This will be fueled by continued economic recovery (global GDP growth forecast at 4.2% for 2022, even if economic growth will slow compared to 2021), persistent tensions in road freight supply and demand and a reduction in available driver workforce (due to demographic factors, as well as difficult working conditions and training and qualification challenges).

Eurasian companies expect 26% of truck driver jobs to remain unfilled in 2022. This exceeds the 2019 level (24%), while the shortfall is expected to reach 14% in Europe, 11% in Mexico and 18% in Turkey. Globally, the shortage of truck drivers remains a structural problem and is expected to be a factor limiting the growth of the road freight industry in 2022<sup>4</sup>.

In all regions, less than 3% of truck drivers are women, except in China (5%) and the USA (8%). The share of female drivers remains very low in all regions, especially compared to the overall benchmark of the transport industry: over 8% of transport workers are women in general, and even over 20% in some regions (Eurasia, Europe and America).

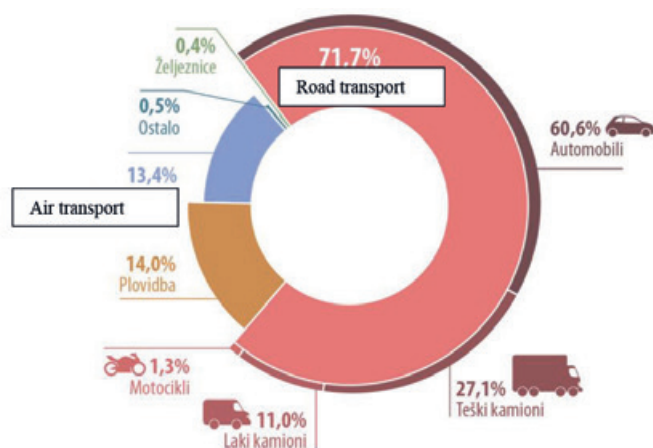
In the bus transport segment, even if the share of female drivers was slightly higher in Europe compared to freight transport, the representation of women fell from 16% in 2020 to 12% in 2021. The entire transport industry is struggling to attract young people. There were encouraging signs in Mexico and China, where 19% and 17% of truck drivers were under the age of 25. In the rest of the countries, the share of young drivers was below 7%. The situation is particularly difficult in the passenger segment, where the share was below 3% in both Europe and China. The main reasons for such low numbers are the aging population, the minimum legal age for entering the profession, which in some countries goes up to 21 and even 26, along with the attractiveness of the profession. The pandemic has also negatively affected the number of new young drivers entering the profession in many countries. Given the large percentage of older drivers approaching retirement, the driver shortage will continue to grow dangerously, if no action is taken.

### OBLIGATIONS TO REDUCE HARMFUL GAS EMISSIONS AND THE ROADMAP UNTIL 2050

Starting from the fact that supply chains, and thus GDP, are dependent on professional relation, filling of job vacancies, we are facing, on the other side, with signed international agreements and clear roadmaps towards "decarbonization". The EU's targets for reducing emissions from road traffic introduce new target values

<sup>4</sup> Full link to 2023 Driver Shortage Survey: <https://www.research.net/r/drivershortage2023>

for CO<sub>2</sub> emissions, in order to reduce harmful emissions from new passenger cars and light commercial vehicles (vans). The new legislation paves the way for zero CO<sub>2</sub> emissions for new cars and light commercial vehicles from 2035. The transitional emission reduction targets for 2030 are 55 percent for cars and 50 percent for vans - light trucks. Parliament and EU member states have reached an agreement on the final form of the rules. Other measures and targets the EU intends to complement the CO<sub>2</sub> targets for cars and vans - light trucks with: a new emissions trading system (ETS) for road traffic and buildings, increasing the share of renewable transport fuels, abolishing tax credits for fossil fuels and revising the law on infrastructure for alternative fuels for the purpose of expanding capacity.



**Picture 1.** Analysis of the harmful gas emissions by types of transport<sup>5</sup>

Based on the data of the European Agency for Ecology, we have determined that road traffic is marked as the carrier with 71.7% of negative data on the emission of harmful gases, out of which 27% comes during the transport of goods and bus transportation of passengers, while 73% is the result of individual use of cars and vans.

The European Union has adopted strategic documents that, in the roadmap until 2050, refer to the spheres of reforms in individual and public transport, to reforms and transformations in the domain of logistics, macro-micro distribution, as well as costs for introduction of a new approach.

The roadmap until 2050 requires major transformations in the domain of “green logistics” and “green distribution” and includes a series of changes that will take place in order to improve these sectors. In addition to the key principles of the concept that we discussed in the next chapter, we will mention sustainability, as rail transport of passengers and goods, we expect the goal of reducing CO<sub>2</sub> emissions by more strongly directing flows towards rail transport. The concept of mobility,

derived from the European mobility strategy, foresees an increase in the volume of railway traffic by 200% by 2050 and strengthening of the role of railways in the total volume of transport.

## THE CONCEPT OF „EU MOBILITY PACKAGE“ IN FUNCTION OF FILLING THE POSTS OF DRIVERS IN ROAD TRANSPORT SYSTEMS

To obtain the results of the work, we set the first hypothesis “lack of professional drivers is a global problem that directly affects the business of transport operators and the GDP itself”, as well as the second hypothesis “EU directives and the lack of harmonization of standards with countries outside the EU cause the non-coverage of positions of motor vehicle drivers”.

In order to understand the set hypotheses, our work included extensive research and experience, we used inductive and deductive methods, methods of analysis and synthesis, methods of abstraction and concretization, methods of generalization and specialization, method of classification, method of description, method of compilation, as well as comparative methods. With the protocols, road transport operators have committed to become carbon neutral by 2050 through the IRU Green Compact<sup>6</sup>, the summary provides an overview of this research, focusing on the scenarios assessed and the recommended way forward.

In short, what is the best optimization model for road transport operators, on one hand, to make it carbon neutral in Europe by 2050, and on the other, by meeting the standards of the EU directives on the mobility of workers, professional competences, skills and abilities, make the occupation of a professional drivers attractive to young people, that is, to facilitate and remove the existing barriers that are visible.

Shortage of truck drivers since over 2.6 million truck driver jobs were unfilled in 2021 in the countries covered by the survey<sup>7</sup>.

With the package on drivers mobility, the European Union has largely defined restrictive measures and limitations in terms of working hours, breaks, tachographs, advanced second generation tachographs, secondment of workers, cabotage and the justification period.

The implementation of new frameworks is being prepared in the field of extending the probation period from current 28 to 56 days, as well as restrictions on the operation of the towing and towed vehicle for up to 8 weeks.

<sup>6</sup> IRU Green Compact | IRU | World Road Transport Organisation

<sup>7</sup> The scope of the countries include: United States (various methodologies), Mexico, Argentina, Europe (Spain, Italy, France, UK, Germany, Poland, Romania, Lithuania, Belgium, Netherlands), Russia, Turkey, Iran, China. Unfilled truck driver jobs calculated based on the total number of truck drivers in each country, and the share of unfilled positions reported in responses from road transport companies (more details in the methodology).

<sup>5</sup> Source: Evropska agencija za ekologiju, 2022. (European Environment Agency's home page (europa.eu))



The aforementioned changes and modifications have already entered into force and with clear application deadlines as a contribution to the concept of driver mobility, we are also introducing “more flexible activities in supply chains”, so that loading and unloading time is significantly shortened to 30 minutes, that is, to 5 minutes for automated processes.

The majority of countries decide to change the dimensions of freight vehicles, so in Denmark, Norway, Germany, Spain, measures of up to 60 tons of total vehicle weight are introduced, and the length is extended to 26 meters, etc. At the proposal of the associations, new categories are introduced in driver’s licenses, for example 4.25 tons, and the age limit for drivers is lowered to 17 years of age.

The aim of the measures within the mobility concept is to facilitate, improve, optimize, eliminate congestion, relieve supply chains and other by 2050.

The position of a professional driver is irreplaceable until 2050, with corrections and application of new technological solutions, the share and percentage will be reduced but unchanged in absolute value. They want to make the workplace more attractive and acceptable, so the strategic documents of the EU emphasize the need for disincentive measures, as in the example of Spain, which banned the work of drivers during loading and unloading, and also by affirmation in the strategic documents fines for empty driving are introduced.

Employers are requested to organize the work of drivers with mandatory vacations at the latest after three weeks in the place of residence, to reduce the percentage of night driving hours through the strategy of night jumps, and to facilitate the return to the operational headquarters.

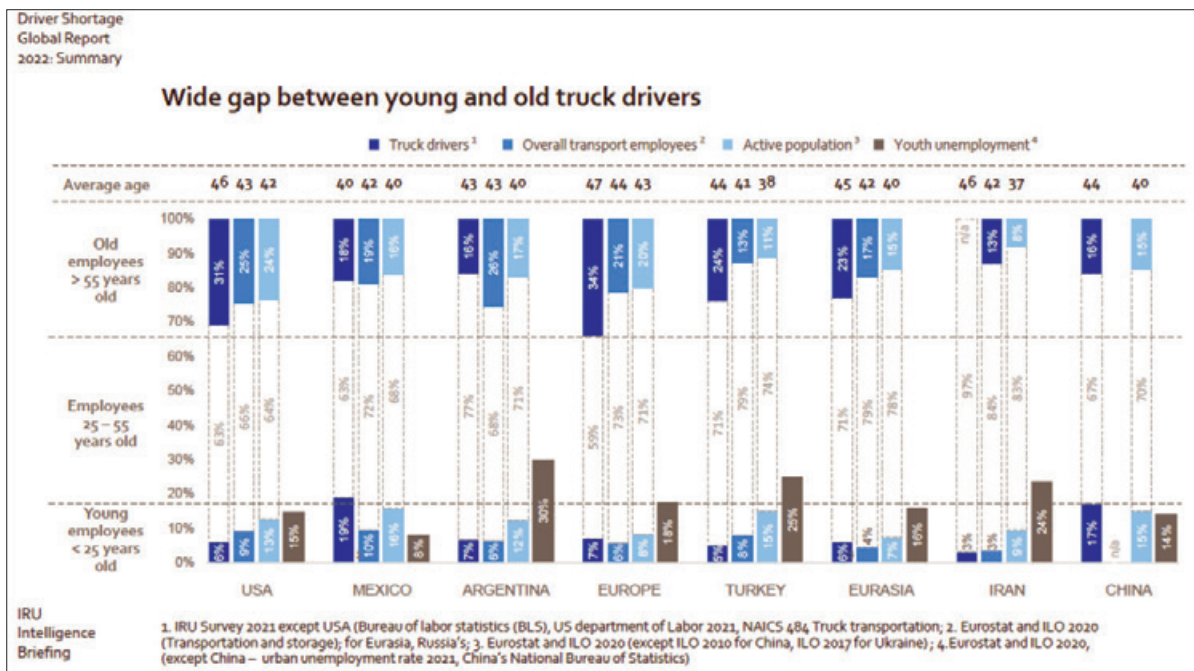
The strategic document “mobility package”, in the first phase, includes the reform of the rules for professional drivers. However, we are also aware of the fact that the concept of mobility and global challenges in road traffic by 2050 currently records a shortage of about 230,000 jobs in the position of motor vehicle driver.

Based on the research, it was determined that the difference between old and young drivers is one of the causes of vacant seats, where it can be seen that Europe and America face a high percentage of 34% of drivers over 55 years old.

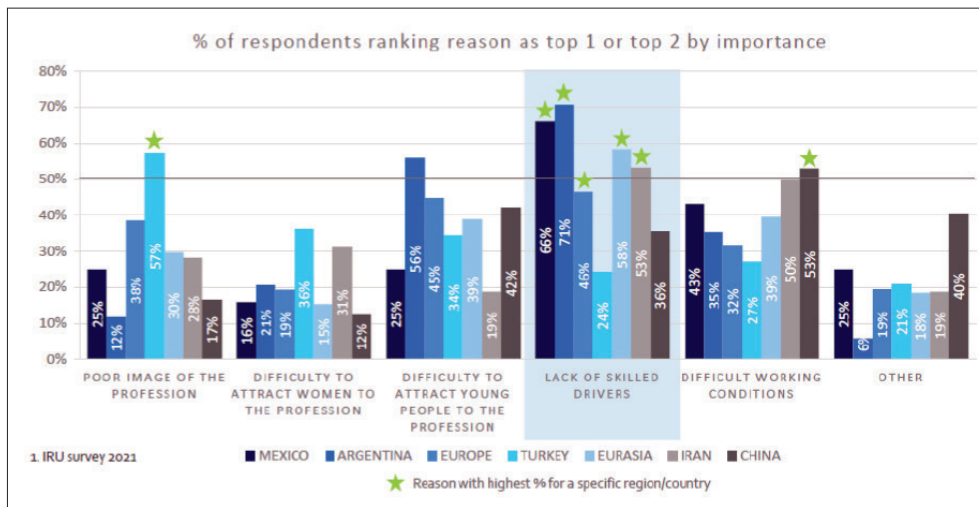
It is clear that the over-55 age limit dominates the markets with the largest driver shortage, and is too large compared to the share of young truck drivers, meaning the shortage will increase in the near future as there will not be enough young drivers to cover the aging drivers who are leaving for retirement. The most difficult cases are Europe and Iran. Europe has the highest average driver age (47), and more than one third of the driving population is over 55. Moreover, the proportion of young drivers is very low (only 7% of drivers are under 25). Iran also has a high average age (46), and the lowest proportion of young drivers among the regions surveyed (3%). On the other hand, Mexico and Argentina have a low level of share of old drivers over 55 (18% and 16%, respectively), which is aligned with the total active population and, in the case of Mexico, accompanied by a high share of young truck drivers (19%).

As was the case in 2020, operators from all regions/countries surveyed (except Turkey and China) continue to see a lack of qualified drivers as the most important reason explaining the driver shortage affecting them.

On the other hand, when asked about the most necessary measures to solve the shortage and attract more



Picture 2. Analysis of drivers age breakdown / <https://www.research.net/r/drivershortage2023>



Picture 3. Main reasons for truck drivers shortage (according to the surveyed operators) / <https://www.research.net/r/drivershortage2023>

people to the profession, operators agree that priority should be given to measures to improve the working conditions of drivers:

- Fairer remuneration of employees
- Greater investments in safe parking spaces and supporting infrastructure,
- More decent and higher quality treatment of drivers at departure/arrival points,
- Shortening and eliminating waiting - more flexible delivery time,
- Elimination of the driver’s physical effort (manual loading, etc.)

Transport companies are concerned about the complex approach to training, so they are in favor of a simpler approach. In other words, there is a high demand to facilitate access to the profession through incentive subsidies or payment of training costs and training. Another parameter that has been highlighted is the return of the image to the profession.

In Europe, the shortage of bus drivers is steadily increasing, but is still expected to remain far from pre-pandemic levels in 2022. It has risen from 5% to 7% in 2021, and is expected to increase further to 8% in

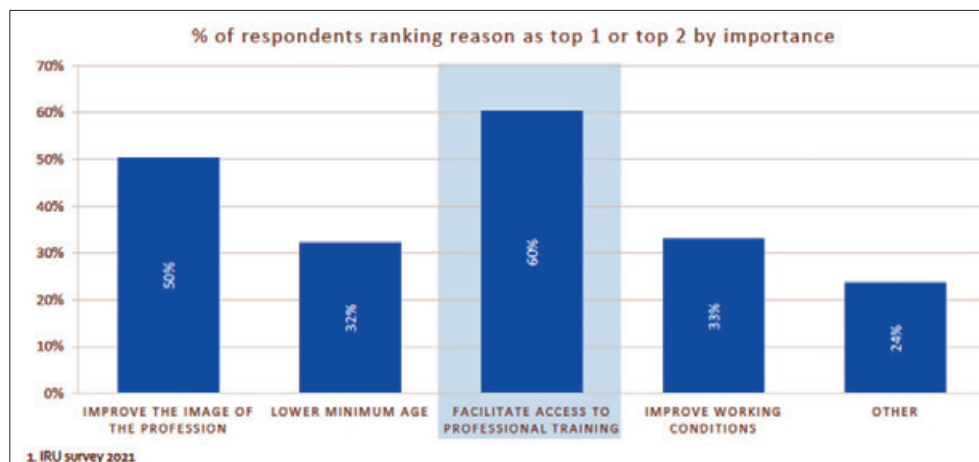
2022. This is the result of the increased demand which is expected in 2022 because the restrictions of mobility are mitigated and reduction of existing drivers due to:

Bus drivers change their profession because the activity lost in the pandemic shall not resume, fewer young drivers are trained and enter the profession, due to low activity, restrictions limit the training capacity and the attractiveness of the profession.

## THE MOBILITY CONCEPT AND GLOBAL CHALLENGES IN ROAD TRANSPORT BY 2050

### SHORT TERM CONCEPTS OF MOBILITY

When we talk about different concepts of mobility development in road transport, we point out that short-term and long-term goals are set, road transport faces minor and major challenges. We are currently witnessing demands in road transport aimed at sustainable solutions, starting from closer plans, so this year activities are directed towards shaping sustainable mobility solutions such as:



Picture 4. Main reasons for shortage of bus drivers

**1. INTRODUCCION OF ELECTRIC VEHICLES (EVs)<sup>8</sup>:** During the year 2024, the direction towards stimulating the procurement of electric vehicles, certainly the rise of sales will also contribute to the new technologies in the field of batteries, the increased radius of autonomy and the development of infrastructure.

**2. SUPPORT INFRASTRUCTURE FOR ELECTRIC VEHICLES:** Relevant ministries in decision-making bodies are considering different models for development of support infrastructure, primarily filling stations for electric vehicles, but also other forms of environmentally friendly fuel.

By defining the directions of development, locations, level and quality of infrastructure is in direct proportion to "introduction of electric vehicles". Some of the recognized and well-known models are state, public-private and private investment in infrastructure.

Strategic TENT "network of European corridors", capitals, urban environments and other strategic zones, and intersections are in the highest rank.

**3. MOBILITY DIVISION (MaaS)<sup>9</sup>:** In the last decade, there has been an expansion, sharing of mobility with an emphasis on "cars". Some states and cities have regulated and defined a legal framework in which disincentive measures are aimed at lower capacity utilization coefficients of private driving units. The goal of these tasks is to reduce congestion, more rational and optimal use of the capacity of personal driving units. And the money from the disincentive measures, which is collected, is directed towards the improvement of the infrastructure from the construction of bicycle paths, the definition of "zero tolerance CO<sub>2</sub>" zones and the like.

Mobility sharing is in direct correlation with digitization, defining user platforms that enable the realization of the road plan, the number of users, optimization of consumption and with emphasis on stimulating electric vehicles as a mobility sharing concept. On the other hand, modifications and technologies in the domain of "two-wheelers" have given birth to new forms and more technologically advanced light, collapsible and mobile vehicles. The challenges that are current today are the definition of legal frameworks for sharing mobility. The currently available data indicate that the average occupancy rate per car is around 1.6, which must certainly change.

**4. SUSTAINABLE CITY PLANNING MANAGEMENT:** Places with highest concentration of inhabitants, the process of creating a megapolis began in the last decades of the last century, and today the reality is that majority of inhabitants are located in cities, and closer goals certainly mean moving toward planning of sustainable city urbanism. We are facing correction of ur-

ban errors, lack of management space, i.e. priorities are defining sustainable zones, paths for cyclists, directing macro and micro-distributive flows, improvement of city traffic towards an efficient system, with large capacities in a short period of time, switching to environmentally friendly systems powered by electricity. In the individual system, the focus is on planning of sustainable pedestrian zones and in administrative and cultural centers, on public transport system that connects city areas, such as residential with business zones.

**5. VEHICLES WITH NO DRIVERS - AUTONOMOUS VEHICLES:** The development of the concept of vehicles with no drivers is not new, but in short term it represents a binding potential that is primarily used to connect airport terminals with the city center and experiences from large cities such as Paris and others, give us the right to consider this concept as binding.

The development and testing of the potential of autonomous vehicles is proven in the delivery of goods, which will be discussed later, the so-called "last mile".

The concept aims to optimize the connection of airport facilities with the city center, significantly improve traffic flow, reduce congestion and optimize transport systems.

Testing of the use of autonomous cars and flying vehicles continues with testing and technical-technological safety and security data.

## EUROPEAN CONCEPT OF MOBILITY AND CHALLENGES IN ROAD TRANSPORT

The European Union, as well as all other countries in Europe, have more or less agreed on strategic documents based on sustainable mobility guidelines and have adopted strategic policies within which the foundations of the "green agenda" are defined, with a clear framework for their implementation until 2050.

The concept of mobility and global challenges in road transport by 2050 covers a wide range of topics, from economic recession, high business costs, market instability to problems in finding transporters, challenges are especially pronounced in the time of global supply chain disruptions.

The starting point is decarbonization of transport, the increase in the number of environmentally friendly hybrid to electric vehicles globally could increase five-fold by 2025, electromobility aims to achieve net-zero emissions in road transport.

Governments around the world are adopting programs and plans with the aim of improving overall road safety, with the EU's long-term goal of achieving a zero fatality rate by 2050.

1. Efficiency: Optimizing delivery routes and times can significantly reduce costs and increase customer satisfaction.

2. Technology: The use of advanced technologies like GPS tracking and route management software can

<sup>8</sup> <https://odrzime.rs/digitalna-infrastruktura-i-povezanost/trendovi-odrzivamobilnost-u-2024/>.

<sup>9</sup> <https://odrzime.rs/digitalna-infrastruktura-i-povezanost/trendovi-odrzivamobilnost-u-2024/>.



improve the accuracy and speed of delivery.

3. Sustainability: Electric vehicles and bicycles are becoming increasingly popular for “last mile” delivery in urban areas, reducing emissions.

4. Adaptability: Flexibility in delivery times and the ability to choose a pick-up location are important to provide better customer service.

The outstanding problem is the development of infrastructure for a sustainable concept of the “green agenda” until 2050, which is multidimensional and complex, with unknown variables, and a specific time frame, the problem of financing is a challenge that must be addressed much deeper than a roadmap. Cooperation and coordination require all holders of executive functions of governments in Europe to support investment in research and development of new technologies with common strategies.

#### DIGITIZATION AND AUTONOMOUS VEHICLES

The basis of the European concept of mobility is digitization of processes and documentation in logistics processes, with the aim of reducing costs, automating activities and actions, improving efficiency. A digitized approach will facilitate distribution of goods by the year 2050 in collection and door-to-door delivery with autonomous vehicles.

We expect that digitalization and application of advanced technologies would completely transform transport activities especially in initial and final logistics operations, increasing the efficiency of transport systems, eliminating unnecessary waiting costs, delays, empty rides, reducing the total costs of logistics systems and improving overall road safety.

The concept of mobility leads to major changes in distribution of goods, autonomous vehicles will form the backbone of the distribution of goods, we can also include “drones” in this grouping, that could significantly contribute to reducing the number of traffic accidents.

By 2050, the reforms will include regulatory measures, primarily legal regulations, which must be adapted to enable the use and wider application of autonomous vehicles. Reforms include technical and technological standards, and also adaptation of other traffic regulations.

## CONCLUSION

The concept of mobility challenges in road transport is going in two directions, in one direction the strategic commitment of the EU is to make it carbon neutral by the year 2050, and the other direction is to fulfill the standards of the EU directive on the mobility of workers, professional competences, skills and abilities to make the profession of a professional driver attractive to young people, that is, to facilitate and remove the existing barriers that are visible.

The position of a professional driver is irreplaceable until 2050, with corrections and application of new technological solutions, currently in order to solve the shortage and attract more people to the profession of motor vehicle drivers, operators agree that priority should be given to measures to improve the working conditions of drivers:

- fairer remuneration of employees,
- greater investments in safe parking spaces and supporting infrastructure,
- more decent and better treatment of drivers at departure/arrival points,
- shortening and eliminating waiting - more flexible delivery time,
- elimination of physical effort of the driver (manual loading, etc.).

Transport companies are concerned about the complex approach to training, so they are in favor of a simpler approach.

The European Union has adopted strategic documents that, in the roadmap until 2050, refer to the spheres of reforms in individual and public transport, to reforms and transformations in the domain of logistics, macro-micro distribution, as well as costs for introduction of a new approach.

The Roadmap until 2050 requires major transformations in the domain of “green logistics” and “green distribution” and includes a series of changes that will take place in order to improve these sectors. In addition to the key principles of the concept that we discussed in the previous chapter, we will mention sustainability, as rail transport of passengers and goods, we expect the goal of reducing CO<sub>2</sub> emissions by directing flows more strongly toward rail transport. The concept of mobility, derived from the European mobility strategy, foresees an increase in the volume of railway traffic by 200% by 2050, and the strengthening of the role of railways in the total volume of transport.

The outstanding and stated problem is the development of infrastructure for a sustainable concept of the “green agenda” until 2050, at the very least it is multidimensional and complex, with unknown variables, and a specific time frame, the problem of financing is a challenge that must be addressed much deeper than a hodo-gram. Cooperation and coordination require all holders of executive functions of government in Europe to support investment in research and development of new technologies with common strategies.

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