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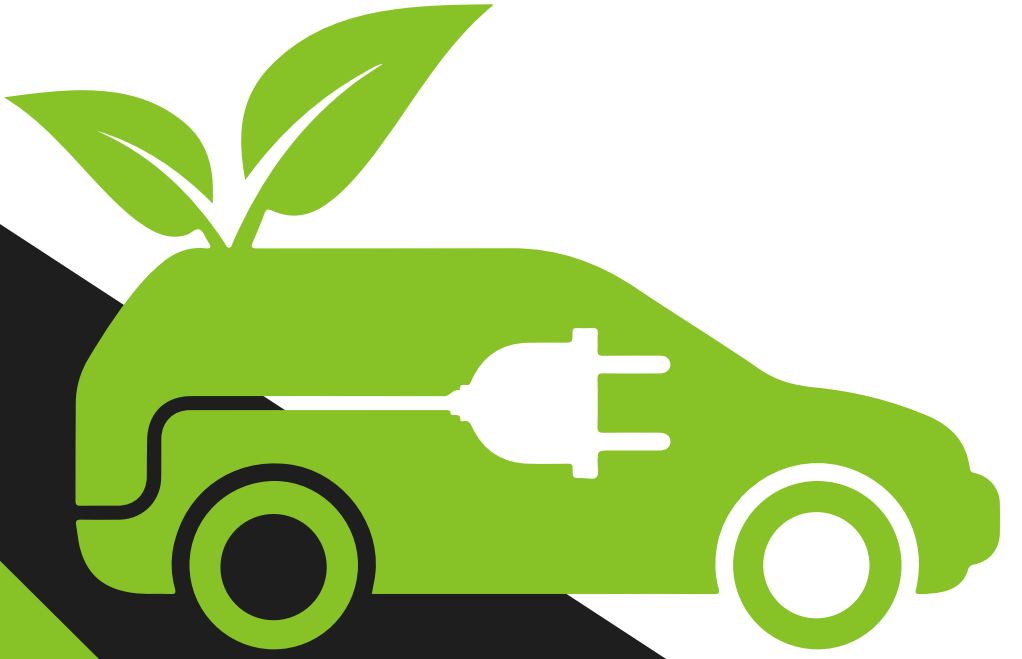
AND PRIVATIZATION
Republic of Belarus

Transport of the future

2025



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Overall, the development of future transport is progressing in the following directions:

1) electric transport, including:

• Electric-powered passenger and cargo vehicles, public transport using electricity as its energy source and traction electric motors for propulsion. This category also includes electric scooters, e-bikes, electric motorcycles, electric aircraft, and electric boats. Currently, nearly all types of transport have electric-powered implementations;

• Autonomous Vehicles – This type of transport includes vehicles controlled by autonomous systems, meaning their operation is fully automated and driverless. Unmanned aerial vehicles (UAVs) and driverless taxis (robotaxis) also fall under this direction;

• Flying Taxis and eVTOLs (Electric Vertical Take-Off and Landing Aircraft) – In the first case (flying taxis), this could be a transformable car that takes off like an airplane or a large multi-rotor drone analog. In the second case (eVTOLs), it's essentially an electric-powered helicopter;

2) Supersonic, Hypersonic, and Space Transport – This includes supersonic aircraft (flying at speeds of Mach 1-5 – from 1225 to 6125 km/h), hypersonic aircraft (speeds of Mach 5 and above), and vehicles performing suborbital flights.

3) Future Transportation and Logistics – This includes vacuum trains (including metro), hybrid (diesel + electric) trains, and hydrogen trains. This type of transport also envisages the implementation of infrastructure projects where cargo movement is handled via autonomous conveyors such as automated highways, monorails, using string transport technology, magnetic levitation (maglev), and robots. A distinct direction could be car-free cities relying solely on underground transport.

4) Personal Transport – This typically includes electric scooters, e-bikes, electric motorcycles, monowheels, and hoverboards. These are categorized as personal mobility devices (PMDs).

1. Electric Transport

Electric transport has firmly entered the sphere of freight and passenger transportation. In 2024, 17 million electric vehicles were sold, and their share of the global market exceeded 20% for the first time. This trend continued into early 2025. In the first quarter, electric vehicle sales grew by 35% compared to the same period last year, with record figures recorded in all major countries.

China remains the undisputed leader in electric car sales. In 2024, nearly half of all cars sold there were electric. This amounts to over 11 million vehicles, exceeding global sales just two years ago. The popularity of electric vehicles is also growing rapidly in the developing markets of Asia and Latin America, where their sales increased by over 60% last year. In the US, electric vehicle sales grew by approximately 10% year-on-year, and they now account for over 10% of the new car market. In Europe, however, the growth of electric car sales has slowed. After reductions in government incentives, their share of the European market remained at 20%.

Sales of electric trucks are also rising. Last year, their volume increased by 80%, and they now make up nearly 2% of the global truck market. Once again, the main growth came from China.
Analysts predict that by 2030, the share of electric vehicles could exceed 40% of the global market. However, sustainable growth requires further development of charging infrastructure, lower battery costs, continued government support programs, and solutions to parts supply and servicing issues.

World's Leading Electric Vehicle Manufacturers::
• BYD (China) – Produces models like the Song, Yuan Plus, Dolphin, and Seagull.
• Tesla (USA) – Key models: Model Y (the world's best-selling electric vehicle), Model 3, Cybertruck.
• GAC Aion (China) – Popular models: Aion Y and Aion S.
• Volkswagen (Germany) – Key EVs: ID.4, ID.3, ID.Buzz.
• SAIC-GM-Wuling (China) – Known for affordable models like the HongGuang Mini EV.
• BMW (Germany) – Lineup includes the i4, i7, iX.
• Hyundai (South Korea) – Models: IONIQ 5, Kona Electric.
• Mercedes-Benz (Germany) – Focuses on the premium segment: EQS, EQE.
• MG (China/UK) – Owned by SAIC, popular in Europe.
• Kia (South Korea) – Models: EV6, EV9.

In Belarus, the adoption of electric transport (excluding metro, trams, and trolleybuses powered by overhead lines) began in 2016 with the first trial run of an electric bus (e-bus). Regular e-bus service on specific routes commenced in 2017. The rolling stock for Minsk e-buses consists of domestically produced vehicles, manufactured by the companies Belkommunmash and Minsk Automobile Plant. In 2017, the state enterprise «Minsktranz» received its first 20 extra-long articulated high-capacity e-buses – the E433 Vitovt Max Electro produced by Belkommunmash. During 2018-2019, Belkommunmash supplied an additional 28 upgraded e-buses of the E433 Vitovt II Max Electro model and 32 e-buses of the E321 Siabar model.

In 2018-2019, the e-bus fleet was expanded with 9 E321 Olgert model e-buses produced by Belkommunmash and 4 MAZ 303E10 model e-buses produced by MAZ (Minsk Automobile Plant). As of now, Minsk operates 93 e-buses and 281 trolleybuses with extended off-wire range (battery-powered). The share of electric transport in Minsk's total passenger traffic increased to 56.6% in 2024. A recent trend is the shift from express-charging e-buses towards overnight (longer duration) charging e-buses, involving changes in energy storage sources.

In the near term, BCM Holding is working on developing public transport with elements of unmanned driving. The first level of automation is planned for implementation in trams being assembled for Minsk. Subsequently, the technology will be introduced on wheeled vehicles, where implementation is slightly more complex than on rail-based transport.

Regarding passenger cars, their production started in 2025 at the BelGee plant (although the first car was developed back in 2017, based on the Geely SC7 platform, at the United Mechanical Engineering Institute). The first electric car model produced at BelGee is the Geely EX5 crossover. As of the presentation date (May 23, 2025), 169 of these vehicles had been delivered to the country's dealerships.

Geely EX5 is a fully electric crossover with a range of 430 km, a 60.2 kW h battery and a power of 218 horsepower. It is equipped with modern driver assistance systems, Russified navigation and other technological solutions. Mogilevliftmash, Novopolotsk Izmeritel, the First Battery Company (they make the battery), the United Institute of Mechanical Engineering of the National Academy of Sciences and BELGEE (final assembly) participated in the creation of the domestic electric car. The entire design is Belarusian, the microelectronics are purchased, the battery cells are Chinese, the metal is Russian. The battery, engine, inverter, switching module, electronics are domestic. In principle, we can say that the electric car is Belarusian in terms of added value. This year, BELGEE will begin assembling serial hybrids. This car is currently undergoing testing, and they plan to bring it to the market by the end of the year.

The situation with electric trucks is developing more dynamically. Already 4 manufacturers of automobile equipment have presented their electric trucks.

MAZ-MAN presented the electric truck MAZ-MAN 3301E1. The truck has a 120 kW traction electric motor, and 100 A/h batteries are located in the base under the frame. The range is up to 300 km.

BKM Holding (Belkommunmash) presented the Vitovt Truck Electro Prime electric truck back in February 2022. The van body volume is 44 cubic meters, the carrying capacity is 7800 kg, and the maximum speed is 90 km/h. The truck is equipped with an asynchronous traction with a maximum power of 180 kW. The capacity of the lithium-iron-polymer battery is 273 kW h. The range on a single charge reaches 200 km.

MAZ presented the MAZ-4381EE model, created for urban cargo transportation. The range is 100-130 km, the engine power is 105 kW, the battery capacity is 126 kW/h.

BelAZ has launched the 7558E model. The payload capacity of this new vehicle is 90 tons. Under the hood sits over 8 tons of lithium-ion batteries. The dump truck is equipped with two power units delivering a combined peak power of 675 kW and a battery capacity of 675 kWh. This setup enables it to reach speeds of up to 65 km/h – even higher than its diesel counterparts. Operating time on a single charge ranges from 2 to 8 hours (depending on conditions), while a full charge takes just 20 minutes.

However, none of the presented electric trucks have yet transitioned to serial production due to charging infrastructure limitations. The charging infrastructure specifically for trucks is not ready for the rapid charging of high-capacity batteries. To achieve the necessary efficiency and operational parity with diesel counterparts, electric trucks require the deployment of appropriate charging infrastructure – specifically, the construction of ultra-high-power charging stations starting from 500 kW. This is especially relevant since such developments already exist globally. Currently, European countries have charging stations with power outputs of up to 1.2 megawatts (MW), enabling the charging of a large truck battery in mere minutes. In the future, the power of such stations is expected to reach 3.75 MW.

The presence of high-power complexes (with charging stations from 1 MW) along roads connecting the capital, satellite towns, and regional centers would undoubtedly boost business interest in using electric transport within logistics schemes. This would significantly impact the development of the electric freight transport sector. However, there is a lack of electrical grids capable of handling megawatt-level loads.

To facilitate comfortable charging for passenger EVs, the Republic is developing its charging station (EZS) network, which currently numbers around 1,400 stations. More than half of these charging stations belong to the state operator Belorusneft (Белоруснефть). The number and capacity of installed EZS in Belarus will continue to grow. Specifically, plans include installing 814 EZS with capacities of 120-350 kW and 35 ultra-fast charging complexes. This will increase

the total capacity of the state charging network fivefold – from 40 MW to 200 MW. While the government's focus in previous years leaned towards developing fast-charging stations, today there is a clear demand from the public and small businesses for slow chargers installed in residential areas, parking lots, and leisure venues. This is precisely why a dedicated portal for installing charging stations has been created.

The portal offers businesses three key directions: Installation for Owners (Cafes, Hotels, Offices, etc.): In just three clicks, businesses can select a location, choose equipment configuration, and receive a turnkey solution. The portal handles all technical and administrative issues – from coordinating power requirements with energy suppliers to equipment installation.

Opportunities for Investors & Large Networks: The portal provides an automated contractor selection mechanism, access to partner financing programs, and detailed project cost calculations.

Integration with the «Malanka» system guarantees instant grid connection and a customer flow from day one (every station connected via the portal becomes part of the centralized «Malanka» network).

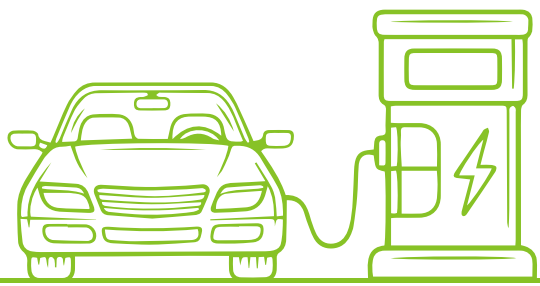
Support for Developers & Contractors: The portal offers standardized documents, roadmaps, and technical specifications for design. This speeds up the construction process and minimizes risks, the company assures.

This impetus for electric transport development was made possible by the adoption of the State Program for Electric Transport Development for 2021-2025. Within this program, the «Electric Transport» Innovation and Industrial Cluster was established. Participating companies include: MAZ, BELAZ, MTZ, Belkommunmash, Mogilevliftmash, Izmeritel, the United Institute of Mechanical Engineering of the NAS of Belarus, BNTU, ETON-ELTRANS, and others.

Beyond passenger and freight EVs, the program envisages the production of specialized electric vehicles. Moreover, a strong emphasis is placed on component localization. This is facilitated by the established scientific and engineering school and the mastery of methods for designing electric vehicle powertrains and their core components, considering the technological capabilities of domestic enterprises.The following components of electric powertrains have already been developed and manufactured:

1. Traction Electric Drive Systems: Comprising a traction electric motor, control inverter, and matching gearbox, with power outputs of 80 kW for passenger and light commercial EVs, and 130 kW for medium-duty commercial transport.

2. Traction Battery Packs: Based on domestically developed electronic Battery Management Systems (BMS) and diagnostic modules, utilizing battery cells from Chinese and Korean manufacturers.



3. High-Level Control Systems: Providing the «driver-powertrain» interface and coordinating the operation of the EV's key electrical systems.

4. Auxiliary Subsystems Complex: Comprising power electronics subsystems that ensure the operation of climate control systems, traction battery charging, and the conversion of high-voltage power to low-voltage for the vehicle's auxiliary systems.

2. Autonomous Transport

The most popular types of autonomous transport are unmanned aerial vehicles (UAVs) and driverless taxis (robotaxis).

Unmanned Aerial Vehicles (UAVs)

The UAV market was valued at USD 35.28 billion in 2024 and is expected to reach USD 67.64 billion by 2029, with an average annual growth rate of 13.9%. Initially, UAVs were developed for military purposes and to access or cross hard-to-reach areas, which limited their widespread use. However, recent technological advances have enabled manufacturers to produce a wide variety of models in different sizes, weights, and shapes, capable of carrying various sensor payloads—making them suitable for a broad range of applications.

UAVs are actively used in agriculture, construction, energy, logistics, journalism, healthcare, environmental protection, and other fields. As they become more autonomous, they are able to perform complex tasks without direct human intervention, using artificial intelligence (AI) and machine learning.

The modern UAV market includes many players, but the main leaders are based in the United States, China, Europe, and Russia, with a focus on different applications—from consumer drones to military systems. Key companies include Northrop Grumman Corporation, Skydio, THALES, Parrot SA, DJI, EHang, Yuneec International, Draganfly, General Atomics, AeroVironment Inc, BAYKAR TECH, TAI, Elbit, ZALA, Autel Robotics, and others.

China became the first country to authorize the use of flying taxis. The Civil Aviation Administration of China issued certificates to two local companies—EHang Holdings and Hefei Hey Airlines—allowing them to operate autonomous aerial vehicles for commercial transportation. These companies can now offer a variety of «air logistics» services, including urban sightseeing tours. The market leader in this segment is the EHang EH216-S drone, which can automatically plan routes, take off, and land. However, its capabilities are limited: it can stay airborne for no more than 25 minutes and accommodates a maximum of two passengers. The cruise speed of this two-seater vehicle is 100 km/h, with a maximum speed of 130 km/h. The cost of this «taxi» is 1.99 million yuan (USD 277,000).

Chinese authorities are actively developing this sector of the economy, including cargo drones and air mobility vehicles, and consider it a priority area alongside biotechnology and artificial intelligence. The concept of flying taxis has a long history, and today around 300 companies worldwide are working on it, including major countries such as Germany, Japan, and Singapore.

The history of Belarusian-made unmanned aerial vehicles began in 1996 with the founding of the private design bureau «Indela» (now known as «Unmanned Helicopters»). The company started by creating onboard equipment and a ground control station for drones to meet the needs of the Belarusian army and, by 2002, had already introduced the «Indela Vintokryl» UAV.

By 2007, the design bureau had developed four more UAV models. Around that time, government agencies and enterprises also began participating in UAV development. Significant progress in UAV creation was made by the Military Academy of the Republic of Belarus, in cooperation with partners such as the Scientific and Technical Center «LEMT» (focused on payload systems) and the company «NTLab-IS» (navigation systems). The main assembly site for many drones became the 558th Aircraft Repair Plant in Baranovichi.

Since 1996, more than 30 UAV models (including airplanes and helicopters) have been produced and tested, including the Indela, Strizh, Berkut, Shershen, Kondor, Quadro, Formula, Yastreb, Bekard, Hunter, Chekan, and Lovchiy types.

The Republican Unitary Enterprise «Scientific and Production Center for Multifunctional Unmanned Systems» of the National Academy of Sciences of Belarus is the leading institution in the country for the development and production of unmanned aerial systems (UAS). These systems are designed for:

- Performing surveillance, reconnaissance, and data collection (including high-resolution video, also in the infrared range);
- Conducting aerial photography;
- Relaying radio communication signals;
- Use in scientific research;
- Transporting cargo.

There are 6 models of UAVs in serial production (all multifunctional, depending on the payload, which is attached to the nose of the UAV; replaceable payload, sold and manufactured separately, each payload has its own purpose). The unmanned aerial complex «BUSEL M» is used by the Ministry of Internal Affairs to suppress drug trafficking, helps with the detection of illegal plants, the unnoticed pursuit of transport carrying

prohibited goods, the search for missing persons; it is used in environmental and agricultural activities for the early detection of forest diseases, soil analysis for the purpose of applying precise doses of fertilizers, and also for irrigation.

Long-range unmanned aerial systems (UAS) such as the BUREVESTNIK and the environmental monitoring UAS (EM-UAS) based on an airship are also used for monitoring purposes. In the future, the development of a hybrid UAV called Orel is planned. Work is also underway on aerostats designed to operate under conditions of electronic warfare interference.

The company Aviation Technologies and Complexes, a resident of the Great Stone Industrial Park, is also engaged in UAV production. Currently, the enterprise specializes in the manufacture of multirotor and fixed-wing unmanned aerial systems, as well as multipurpose hybrid-type UAS. Depending on the assigned tasks, the produced UAVs are equipped with interchangeable payloads: high-resolution video cameras, infrared cameras, laser rangefinders, GNSS equipment (Global Navigation Satellite System), or a combination of these payloads.

In 2020, ATK JSC began producing unique rotary-wing aircraft that combine the capabilities of both airplanes and helicopters in a single flying machine—gyrocopters. The company currently manufactures 2-, 3-, and 6-seat ultralight manned aircraft of its own design: the autogyros Yastreb and Tercel.

These are used for monitoring (including automotive and railway infrastructure), reconnaissance, rescue and search operations, in business aviation, and for transporting passengers and cargo. A key feature of these domestic gyrocopters is the ability to use 95-octane gasoline.

In 2025, a presentation of a new Belarusian-developed UAV — the cargo helicopter drone SKY-TRUCK — took place in Minsk. The SKY-TRUCK is being developed by UAVHELI, a Belarusian company specializing in unmanned helicopter systems. The main task of the SKY-TRUCK is transporting cargo up to 200 kg over long distances — up to 350 km on a single charge. The system can operate in two modes: fully autonomous (along a pre-programmed route) or under remote operator control. Its maximum takeoff weight is 500 kg, and it can reach an altitude of up to 3000 meters. It flies at speeds up to 150 km/h and can stay airborne for up to six hours without recharging.

Onboard systems include satellite navigation, inertial sensors, and an onboard computer capable of analyzing the route, weather, and battery level in real time. A key structural element is the modular AIR BOX cargo container, which can be quickly swapped or adapted for different types of cargo — from medical supplies to tools or food. This makes the drone especially useful for search and rescue operations, supplying remote areas, or in military logistics where rapid delivery to hard-to-reach areas is critical.

A Russian company "Transport of the Future" has presented a project for a turnkey factory capable of producing 100,000 drones, which will soon be implemented in Belarus. The factory project includes production lines for localizing components and manufacturing drones for agriculture (a key sector of the Belarusian economy), monitoring, and logistics.

Notably, the UAV sector in Belarus is regulated by Decree No. 297 dated September 25, 2023, titled "On state registration and operation of civilian unmanned aerial vehicles." It states that the import, storage, circulation, operation, and manufacturing of civilian UAVs is permitted only for legal entities and individual entrepreneurs, and only for professional or business purposes in compliance with the decree.

To import civilian UAVs into Belarus, companies and entrepreneurs must obtain special permission from the Aviation Department of the Ministry of Transport and Communications, which will also manage the UAV registration system.

The decree also mandates the creation of an automated state registration system for civilian UAVs owned by legal entities or entrepreneurs. There is a ban for individuals on importing, storing, selling, operating, or manufacturing civilian UAVs.

Autonomous Taxis

Analysts forecast that by 2030, the annual revenue of the autonomous taxi market could reach $47 billion. The sector is actively developing in the USA and China.

Major US companies working on autonomous taxis include:

- Waymo (Google) – a leader in autonomous taxis (launched Waymo One in June 2024; over 4 million commercial trips in the USA).
- Tesla – planning to launch its Robotaxi service using 10–20 Model Y vehicles in June 2025. Later, it will transition to the Cybercab – a two-seat driverless car without steering wheels or pedals, with production starting in 2026.
- Cruise (General Motors) – autonomous taxis in San Francisco and autonomous shuttles.
- Zoox (Amazon) – robotaxi mobility-as-a-service.
- Argo AI (Ford & VW) – formerly developed autonomous systems (project closed, but tech reused).
- Mobileye (Intel) – autonomous driving systems for automakers.
- Aurora – self-driving trucks and passenger vehicles.
- Motional (Hyundai & Aptiv) – autonomous taxi service.

In China, the key companies providing driverless taxi services are Apollo Go, Pony.ai, WeRide, AutoX and SAIC Motor. WeRide is known for its driverless taxis, trucks, buses and special equipment. Currently, manufacturers of driverless cars are entering foreign markets: Turkey, Switzerland, Luxembourg, Saudi Arabia, South Korea, Japan, Singapore, the USA and others.

Baidu launched its Apollo Go robotaxi service commercially in several Chinese cities in 2022. These vehicles are classified as 4 level autonomy — meaning they drive without a driver, but only within designated areas. In Wuhan, for example, Apollo Go has access to over 3,000 km of public roads.Pony.ai, with a fleet of 300 robotaxis, aims to integrate its services with Dubai's metro and tram systems in the long term.

On May 17, 2019, the first fully driverless bus was launched on a short ring route in the special «Smart Island» district of Zhenzhou. Later, a «smart public transport» project was launched, which is already being actively implemented in cities such as Chengdu, Shenzhen and Hangzhou. The point is that buses in China are beginning to be connected with AI, which analyzes the occupancy of the cabin. Analyzing the passenger flow, AI generates recommendations for dispatchers: this is a dynamic redirection of buses (loaded buses let empty ones through), flexible routes (buses can avoid sparsely populated areas, shortening the route, or, conversely, arrange express routes without stops), adaptation to events (for example, during various events, buses can change routes and go through large crowds of people, or bypass traffic jams). There are examples of integrating buses with city systems (traffic lights, police, subway and other public transport). This year, such smart transport systems will appear in 50 Chinese cities. Efficiency and savings: a 30% reduction in rush hour congestion (according to Shenzhen's experience), fuel savings due to the reduction of «empty» trips.

Another promising field is electric vertical take-off and landing vehicles (eVTOLs), both manned and unmanned. Well-known manufacturers include:

- Joby Aviation – electric air taxis with vertical takeoff.
- Lilium – eVTOLs with jet propulsion.
- Volocopter – multicopter-type air taxis.
- Archer Aviation – urban air mobility.
- EHang – Chinese autonomous drone taxis.
- Beta Technologies – eVTOLs for cargo and passenger transport.

As a rule, such machines look like multi-rotor drones and helicopters. The main purpose is to transport people.

Belarus ranks 7th in the rating of readiness for the introduction of autonomous transport among the CIS countries, BRICS, Turkey and Saudi Arabia. In Belarus, the introduction of unmanned transport (passenger, commercial and passenger) is predicted for the 2030s. However, specific steps are already being taken. In Minsk, the Yandex company plans to launch its service with unmanned taxis, the possibility of launching unmanned transport between Minsk and satellite cities is being analyzed, as well as providing a car rental service equipped with a device for maximum driver condition monitoring for those who want to earn extra money in taxis.

Testing of Yandex's driverless cars began in Tatarstan back in 2018. In October 2023, robotaxi was launched on the Black Sea coast of Sochi, and the service has been operating in Moscow since the same year. At first, AI cars accompanied other cars with an operator who could make an emergency stop remotely. Initially, vehicles were accompanied by safety cars. Today, the Moscow service operates from 7 a.m. to 1 p.m.

In addition to UAVs and unmanned taxis, the greatest interest in Belarus is generated by developments in two areas:
1) freight transport: autonomous trucks, drones, trains (in 2015, a license was issued in the USA for the operation of an experimental unmanned Freightliner Inspiration Truck on one of the highways).
2) passenger transport: buses, trolleybuses, trams, metro (in 2017, regular operation of unmanned buses began in Shenzhen).

In 2022, the Russian company Sberavtotech (now Navio) and the Belarusian MAZ signed an agreement to develop an unmanned tractor and launch its serial production. The first model will be a two-axle MAZ-54402L truck tractor. Now, to create an unmanned vehicle, developers install sensors and computers on a regular serial vehicle with minimal integration into the production of the vehicle itself. MAZ began actively engaged in unmanned developments only in 2021. The plant has already digitalized the control systems of various models of trucks and passenger vehicles and released components that will ensure the connection of vehicles to autonomous control systems. At the moment, MAZ has released a hybrid truck MAZ-X.

It is driven by two electric motors, which are powered by a diesel engine - it works as a generator. Total power - 660 hp. Total range - 3000 km. The share of Belarusian components is more than half, the projected price for serial production is about 120 thousand dollars. This is comparable to Chinese trucks, European models are almost twice as expensive.

Unmanned trucks will soon be the most popular transport on the market.

It should be noted that a concept car of an unmanned tractor (Navio L5) has already been developed, where there is no driver's workplace. These cars are robot cars, where everything is controlled by artificial intelligence.

At present, BELAZ is successfully testing dump trucks without human participation (BELAZ-7513R). The use of unmanned dump trucks has already been implemented in China. The Chinese company Huawei, together with the heavy equipment manufacturer XCMG and scientists from the Beijing University of Science and Technology, launched 100 autonomous trucks of the Huaneng Ruichi model at a coal deposit in the Inner Mongolia region. The project is being implemented by order of the mining company Huaneng Mengdong and has become the largest such initiative in the global coal industry. By 2028, it is planned to increase the number of autonomous trucks at this deposit to 300 units, and throughout the coal industry of China - to 10 thousand vehicles.

MTZ presented the first unmanned tractor (BELARUS 3523i) in 2024. Similar projects are also known and implemented outside Belarus. Cognitive Pilot, a leading Russian developer of AI systems for unmanned agricultural machinery, presented a fully autonomous robotic tractor in 2024.

It should be noted that an alternative to driverless trucks is driverless conveyors. In Japan, there are plans to implement a 500 km long Autoflow-Road conveyor system, which will replace 25,000 trucks per day, connecting Tokyo and Osaka. The goal of the project is to solve the problem of a shortage of truck drivers and improve the efficiency of cargo transportation. The Autoflow-Road system will use pallet systems capable of transporting up to one ton of cargo on each pallet. They will be placed under highways, on ground tracks in the middle of roads and along the shoulders of highways. Conveyor belts will operate around the clock, which will potentially replace 25,000 drivers per day.

Another alternative to cargo transport are unmanned transporters. Similar ones have been implemented in the port of Wuhan. They resemble giant electric skateboards, are equipped with LiDAR systems and cameras with computer vision, which allows you to build a 3D map of the space in real time. Each transporter is capable of carrying up to 50 tons of cargo with an autonomy of 12 hours thanks to modular lithium-titanate batteries. The implementation of the system has led to a reduction in cargo handling time by 37% compared to traditional diesel forklifts. Algorithms optimize routes so that transporters move in «flocks» without collisions, synchronizing via a secure 6G communication channel. This is especially important for multimodal transportation: AI automatically adjusts the docking schedule with river barges and trains. According to the port operator, downtime due to the human factor was completely eliminated during the first two weeks of operation.

String Rail Transport

EcoTechnoPark of UST Inc. (Unitsky String Technologies Inc.) has developed an unmanned vehicle (unimobile U4-220) for 48 passengers. The key element of the technology is the string-rail overpass (and the string rail itself). The car looks like a capsule made of transparent, darkened monolithic polycarbonate 4 mm thick and suspended on a string rail. U4-220 is as large as a bus in terms of capacity, it moves along an overpass several meters above the ground. In addition to the automated control system, the movement is controlled by a dispatcher. One of the main qualities of the U4-220 is its efficiency. The unibus can transport passengers at a speed of up to 150 km/h. At the same time, the energy consumption is about 32.5 kW·h/100 km, while electric vehicles consume about 23–25 kW·h per 100 km.

3. Supersonic, Hypersonic, and Space Transport (Suborbital Flights)

The idea of supersonic transport is not new. The most famous supersonic aircraft were the Soviet Tu-144 and the Anglo-French Concorde. However, these projects were closed down in their time due to their high cost. At supersonic speeds, aircraft fuel consumption was many times higher than that of conventional jet aircraft. Currently, 100% of the world's civil aviation fleet consists of subsonic aircraft. Nevertheless, supersonic technologies, considering new advancements such as the use of electric or hybrid engines, are considered quite promising.

Companies working on supersonic aviation projects include:

• Boom: Creating the world's fastest airliner (Overture project); its XB-1 demonstration aircraft first broke the sound barrier during a test flight in Mojave, California in 2025. The XB-1's supersonic flight was the first instance of an independently developed aircraft breaking the sound barrier.

• Aerion: Developing the Aerion AS3 business jet for long-distance flights.

• Lockheed Martin: Developing the Lockheed Martin X-59 QueSST – an airliner with quiet supersonic technology; this company developed the US Air Force's supersonic reconnaissance aircraft SR-71 (Blackbird).

• Virgin Galactic: Developing the Twinjet aircraft with a delta wing (similar to the Tu-144 and Concorde).

• Spike Aerospace: Developing the Spike S-512 supersonic business jet.

Hypersonic aircraft refer to aircraft with speeds exceeding Mach 5 (6125 km/h). Currently, a very limited number of countries (Russia, China and the United States) possess technologies capable of providing full-fledged controlled hypersonic flight. Hypersonic technologies are currently in demand mainly in the defense industry. The main factor restraining market growth is the shortcomings of existing technologies. Effective implementation of hypersonic flight requires breakthrough achievements in a number of industries such as propulsion, materials science, and mathematical modeling. Current hypersonic technologies can be categorized into three main groups:

Hypersonic gliders: objects that do not have their own engine, but are capable of efficient control at hypersonic speeds. They are used exclusively in the defense industry, and in the future may become the basis for the creation of descent vehicles for manned spacecraft of a new generation. The leaders in this segment are Russia and China;

Hypersonic rocket aircraft: carry both fuel and oxidizer on board, so they are significantly limited in range. Such vehicles have been actively used as technology demonstrators since the 1950s. Their operation allowed to define the requirements to the new generation of structural materials necessary for further development of the technology. Such materials should effectively combine lightness, strength and thermal stability. Hypersonic aircrafts with air-jet engine. They use atmospheric oxygen as an oxidizer. The creation of such vehicles will allow to fully disclose the potential of hypersonic technology.

But, at present, there are no air-jet engines perfect enough for mass production and operation, capable of operating at speeds five or more times the speed of sound. The development of such an engine could be an important technological breakthrough, changing the established market in space and aviation. So far there are experimental and demonstration models of hypersonic airplanes, for example, hypersonic airliner Boeing, project ZEHST of the European Aerospace Agency, project SpaceLiner of the German Aerospace Center, project QuarterHorse of Hermeus, project Talon A2 of Stratolaunch, rocketplane North American X-15 (on it the first suborbital flights of a man were made).

Space transportation and suborbital flights are also a promising area. This can include not only intercontinental transportation, but also space tourism. Well-known companies are SpaceX (Starship), Blue Origin (New Shepard), Virgin Galactic (SpaceShipOne, SpaceShipTwo), Boeing (CST-100 Starliner).

4. Vacuum transport, hybrid and hydrogen trains

Vacuum transport (hyperloop / Hyperloop) has a long history (since 1905), but its commercial version has not yet been realized. The essence of such transportation is the movement of a capsule or train (a chain of capsules) inside a tube with rarefied air / vacuum. The capsule itself moves due to linear magnetic acceleration, i.e. with the help of magnetic levitation (maglev). Advantages of vacuum transportation - high speed (presumably up to 1200 km/h).

The idea became popular again after its publication by Elon Musk in 2013. As a consequence, there were such companies as Virgin Hyperloop, Hyperloop One, Hyperloop Hardt, Hyperloop Transportation Technologies, Nevomo, TransPod, Swisspod Technologies, Zeleros and others engaged in the development and promotion of this idea. At the moment, small experimental sections of such vacuum tubes have been built.

Similar projects in this area are supersonic trains on a magnetic cushion. The fastest operating train on a magnetic cushion works in China - it is the Shanghai Maglev.

The essence of the technology lies in the mutual action of magnets whose poles repel each other. In this way, the main problem of rail trains - friction against the surface - is overcome. The new technology required not only new trains without wheelsets, but also new infrastructure: a special T-shaped rail bed is laid on a concrete pad. Visually, the train covers the rail from all sides, rising only 1-2 centimeters above the track in motion. The Shanghai maglev covers a route of 30 km in 7 minutes and 20 seconds. The maximum speed reaches 430 km/h.

A successful example is JR-Maglev, a Japanese system of high-speed maglev trains developed by the Japan Research Institute of Railway Technology in cooperation with the operator Japan Rail-ways since the 1970s. Currently, a test section has been built in Yamanashi Prefecture, where on April 21, 2015, a test train of the Shinkansen L0 modification set an absolute speed record for rail transport - 603 km/h. The train is scheduled to enter commercial operation in 2027.

Japan's maglev high-speed train system operates on electrodynamic suspension, which is fundamentally more stable than the electromagnetic suspension that is being built in other countries. Due to the high speed (up to 500 km/h-plus), the cost of keeping the maglev in the air will be only a small fraction of the total energy cost of propulsion.

Unlike electromagnetic suspension (EMS), trains based on electrodynamic superconducting magnet suspension (EDS) technology require additional wheels when traveling at low speeds (up to 150 km/h). When a certain speed is reached, the wheels separate from the ground and the train "flies" at a distance of a few centimeters from the surface. In the event of an accident, the wheels also allow the train to stop more gently.

In total, there are 11 magnetic levitation projects in operation worldwide in such countries as Japan, Germany, China, South Korea and Brazil. The experience of using such trains shows that they are 20% cheaper than traditional railway transportation. In the Republic of Belarus, in particular in Minsk, there are no plans to build and use maglev trains as it is realized in other countries. In Russia, a Consortium of developers, manufacturers and operators of the magnetic levitation system "Russian Maglev" was established in 2023.

While most countries are beginning to implement high-speed electric trains, scientists are discussing the development of magnetic levitation: if a train on a magnetic cushion runs in a vacuum tunnel, air resistance can be avoided. Theoretically, the speed of such trains will reach 6000-8000 km/h.

Hybrid trains (with different types of traction, e.g., diesel with electric batteries) and hydrogen trains (also equipped with additional traction sources) are also being developed. The world's first hydrogen fuel cell-powered train – the Coradia iLint – was launched by the French engineering company Alstom in northwestern Germany in September 2018. It is capable of reaching speeds of up to 140 km/h and can travel almost silently for about 1,000 km on a single tank. In 2022, a commercial line consisting solely of this train model was launched in Germany.

In Russia, hydrogen-fueled trains are actively being developed and are planned to be launched primarily on Sakhalin. The project is being implemented by Transmashholding in cooperation with the government of the Sakhalin region. The first two trains are scheduled for launch in 2027. Transmashholding plans to test the first Russian hydrogen train in 2025 on Sakhalin. The Eastern Hydrogen Cluster has been created there, with one of its main facilities being a hydrogen plant. The facility is expected to produce low-carbon hydrogen from natural gas and liquefy it.

Experiments with hydrogen-powered transport are being conducted in many countries around the world (USA, China, South Korea, Japan, Canada), but the economic prospects remain unclear.

5. Personal Transport and Micromobility

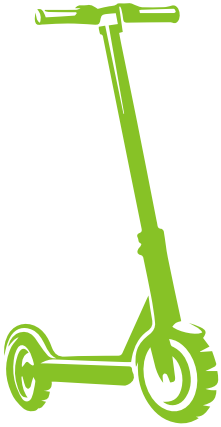
Personal transport and micromobility are two interrelated concepts concerning human movement in urban environments. The development of personal transport and micromobility in cities leads to more diverse and efficient mobility systems that take into account the needs and preferences of residents. Micromobility is often used as a complement to public transport, facilitating access to final destinations.

The global electric scooter market, which was valued at USD 17.73 billion in 2023, is expected to grow to USD 50.15 billion by 2032, with an average annual growth rate of 12.6%. The Asia-Pacific region dominates the market, accounting for 83.08% of it. Kicksharing (e-scooter rental) is a key market segment, attracting consumers with its affordability and convenience.

The most popular personal mobility devices are electric scooters. Less demand exists for hoverboards, electric bicycles, electric motorcycles, monoboards (unicycles), and even more exotic means of transport, such as the Jetson One personal drones or BlackFly flying cars, which are rarely used due to their high cost. Popular modes of transport are either privately owned or offered by short-term rental services.

The e-scooter market is experiencing intense competition among various companies, contributing to an increase in the number of scooters and the expansion of coverage areas. Each service offers its own rental method and pricing model, typically per-minute payment or subscription.

Main players in the Belarusian market:
- Eleven: A Belarusian kicksharing service actively expanding in Minsk and other cities.
- BusyFly: A service operating in several Belarusian cities in addition to Minsk.
- JET: A Kazakh service actively expanding in the Belarusian kicksharing market.
- Whoosh: A Russian sharing service that entered the Belarusian market in 2022.
- Kolobike: A Belarusian service offering electric scooter rentals in several cities.



6. Promising Transport Technologies and Projects in Belarus

Several promising areas of transport development can be identified in Belarus:

a) Electric transport (electric buses, electric cars, electric trucks, charging infrastructure):
- development of electric buses (Minsk already purchases electric buses, but their use can be expanded to other regions) and modernization of public transport;
- promotion of electromobility (incentives, reduction of duties, development of charging stations, including those for trucks and infrastructure for personal transport);
- localization of production (e.g., joint projects for assembling electric vehicles, manufacturing components, batteries, etc.);

b) Smart public transport and digitalization:
- implementation of intelligent transport management systems (adaptive traffic lights, congestion monitoring);
- contactless payment and unified transport cards (integration with mobile apps, currently unified passes and the «Oplati» service are separate);
- development of Mobility as a Service (MaaS) – unified platforms for trip planning (public transport, carsharing, taxi, kicksharing);

c) Cycling and micromobility:
- expansion of bike lanes (especially in densely populated cities);
- development of e-scooter and bicycle rental services (as in Minsk, but with improved infrastructure);

d) Railway innovations:
- modernization of railways (e.g., increasing the speed of intercity connections) and development of suburban and interregional services;
- hybrid and hydrogen trains (Belarus could already start pilot projects for hybrid trains operating on non-electrified railway sections).

7. Investor Roadmap

Investment projects and PPP
>1000

Investment ideas
>700

Concessions
9

Manufacturing sites and real estate
>900

Land plots
>1000

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More investment projects and ideas, as well as land plots and real estate objects for the implementation of investment projects can be found on the interactive portal «Investor's Roadmap»

National Agency of Investment and Privatization

The Agency is a state institution that provides assistance at no cost or foreign investors interested in launching a business in Belarus:

- provision of information about investment opportunities, preferential regimes and benefits granted, economic sectors and legislation
- provision of up-to-date information about investment projects
- assistance in selection of sites and premises
- search for prospective partners for investment projects, arranging meetings and negotiations for establishing cooperation
- providing a platform for negotiations and support during negotiations
- organization of visits to the Republic of Belarus (schedule development, visa support)
- representation of investor's interests during negotiations with governmental representatives concerning implementation of investment projects, as well as improvement of investment climate in the Republic of Belarus
- aftercare

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