EcoMotion
Smart Mobility Community

Mobility Challenge Map: A Challenge Based Framework for Technology & Innovation in Mobility

An EcoMotion Community Report

MINISTRY OF TRANSPORT AND ROAD SAFETY
Ministry of Economy and Industry
ISRAEL INNOVATION INSTITUTE

Introduction

At EcoMotion, we work to advance smart mobility by supporting startups to scale and by addressing the challenges of all mobility ecosystem players.

As a non-profit community platform, EcoMotion engages with a wide variety of stakeholders gathering and analyzing insights on the key mobility trends. As the mobility sector evolves and converges with parallel sectors such as energy or industry 4.0, we see new opportunities to expand beyond automotive and engage with more types of technological solutions. Therefore, we consider mobility tech to include any innovation in vehicles, value chain, and technology that advances the movement of people and goods.

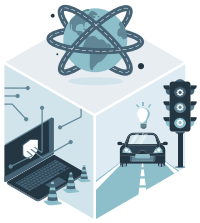
Our aim at EcoMotion, a partnership between Israel's Ministry of Economy & Industry, Ministry of Transport & Road Safety and the Israel Innovation Institute, is to bridge the knowledge gap between entrepreneurs, investor interests and industry needs. We take a challenge-centric approach to innovation by zooming in to the challenges of the industry to better direct entrepreneurs to tailor their solutions to the market need.

Through direct interviews with industry tech scouts and investors and from leading mobility industry reports we've synthesized the core needs of today's mobility market to develop the Mobility Sector Challenge Map.

Our analysis shows that there are 4 "Driving Forces" which are shaping the development of the mobility sector.

The 4 Driving Forces:

Make Mobility **Sustainable and Decarbonized**



Make Mobility **Digitized**

Make Mobility **Efficient and Optimized**

Make Mobility **Safe and Secure**

How to use this map: This challenge map presents a tree framework. Under each "Driving Force" in mobility, there are challenge areas, followed by challenges.

The Mobility Challenge Map is created and curated for founders, investors, business leaders and the wider public to gain a macro perspective on the mobility innovation landscape. For founders, it shows the key areas where innovation is most needed. Entrepreneurs can tag their tech solutions to one or more of the listed challenges. For investors and industry alike, it demonstrates shifting trends in the sector, and the shared, yet mutually competitive, interests of industry players for innovation.

Furthermore, with this framework, more tech companies can identify where they could enter the mobility sector with their solution. The framework also serves as a tool to map existing gaps in solutions and monitor the evolution of new challenges.

The following report presents the centrality of each of the 4 "Driving Forces" in mobility today and explains each of the challenges present. Through this reprot, we aim to demystify the complexities of a vast, evolving and dynamic sector and make the information accessible to all.

I want to extend a special acknowledgement and appreciation to Assaf Oren for his contribution to this research and thank you to Yaroslov Efimov & Adi Greenberger. A big thank you to the dozens of partners of EcoMotion Community, who shared their expertise and insights to develop this tool.

Sincerely,
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* *This report was produced by EcoMotion Community and does not reflect the positioning of the government.*

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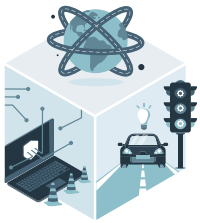
Make mobility **Sustainable & Decarbonized**

Challenge Areas	Challenges		
 **Electrification**	EV Components & batteries	Energy Storage & Management	Charging Infrastructure
 **Sustainable Resources**	Clean Energy Sources	New Materials	Circular Economy / Sustainable Manufacturing



Make Mobility **Digitized**

 **Automation**	Automated Systems		
 **Vehicle Intelligence**	Software Defined Vehicle	Autonomous Systems	
 **Connectivity**	Network Infrastructure	System IoT Intergration	
 **Cyber Security**	Data Privacy & Protection	Network Security	

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Challenge Areas	Challenges			
Make mobility Efficient & Optimized				
Journey Management	Traffic Optimization	Route Optimization	First & Last Mile Delivery	Parking
Performance & Operations	Predictive Maintenance	Vehicle & Infrastructure Monitoring	Smart Manufacturing	Fleet Management
Passenger Experience	UI/UX Optimization	Personalization, Lifestyle & Wellnes	Accessibility	
Make mobility Safe & Secure				
Vehicle Safety	Passenger Oriented	Vehicle oriented		
Public Safety	Urban Spaces	Disaster & Incident Response Systems		

Driving Force 1: **Make Mobility Sustainable & Decarbonized**

The mobility sector is undergoing a radical transformation towards sustainability and decarbonization in order to reduce its environmental footprint and align with global climate goals. The transportation sector currently accounts for around 24% of direct CO_2 emissions from fuel combustion globally, with road vehicles contributing over 75% of that total[1]. Pollution from vehicle emissions significantly degrades air quality and public health. As urbanization intensifies, the demand for sustainable transportation solutions grows. Beyond direct emissions from fuel combustion, the lifecycle of a vehicle and its parts also contributes to GHG emissions. Decarbonization in mobility can be carried out in a variety of ways: through electrification, through material sourcing, energy sourcing, circular economy practices, and even more sustainable practices across the value chain processes.

The urgency of this challenge is reflected in rapid advancements in electric vehicle (EV) development, adoption and related technologies. According to the International Energy Agency (IEA), the market for electric vehicles is projected to expand rapidly, with estimates indicating that the number of EVs on the road will reach approximately 230 million by 2030, under current policies[2]. The surge of batteries from EVs will also create a "recycling crisis" at the battery end of life with over 100 million vehicle batteries expected to be retired in the next decade[3]. Moreso, governments are reinforcing this shift through regulatory actions, such as the European Union's effective ban on new fossil-fuel car sales by 2035[4], alongside global agreements like COP26, which emphasizes reducing emissions to combat climate risks. These developments underscore a global commitment to a cleaner, more sustainable transportation future.

Who seeks solutions? This transition matters for diverse stakeholders, starting with urban planners & municipalities focused on sustainable city design. OEMs and suppliers are developing solutions for the lifecycle of electrification, low-emission vehicles and circular solutions, such as battery recycling, to minimize lifecycle impacts. Energy and infrastructure companies are focused on energy sourcing, optimizing the grid and providing the infrastructure needed for electrification. Investors today are enthusiastic about climate related solutions for mobility as electrification is the only area of mobility where investments have steadily increased since 2020.[5]

Challenge Areas & Challenges

Electrification – Addresses the transition from fossil-fuel-powered transportation to electric power, aiming to reduce emissions and dependence on non-renewable energy sources. This applies to cars, trucks, busses, rail, aviation vehicles and micro-mobility vehicles.

Challenges:

EV Components & Batteries – Focuses on the development and optimization of EV parts, such as electric motors, power electronics, thermal management systems, or advanced batteries with longer lifespans and faster charging and safety mechanism to enhance vehicle performance, increase driving range, and reduce costs

Energy Storage & Management – Focuses on improving the range, performance and longevity of EVs through usage of energy with technologies such as energy recovery systems, energy harvesting or predictive analytics of battery performance

Charging Infrastructure – Focuses on improving accessibility, speed, efficiency and integration with renewable energy sources such as fast, wireless or robotic charging options, smart charging systems, bi-directional charging, charging network connectivity and grid-integrated charging.

Sustainable Resources – Aims to significantly lower the ecological footprint and improve energy efficiency throughout the entire lifecycle of mobility solutions and vehicles.

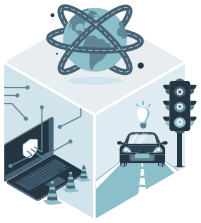
Challenges:

Clean Energy Sources – Focuses on transitioning to renewable, and low-emission energy options or alternative fuels to power transportation systems, such as hydrogen fuel cells and solar arrays.

New Materials – Emphasizes the development and use of environmentally friendly materials in the production of vehicles and infrastructure, such as biodegradable composites, aiming to reduce the ecological impact and enhance recyclability.

Circular Economy – Promotes the principles close loop recycling to minimize waste and maximize resource efficiency throughout the lifecycle of vehicles, infrastructure and related services such as tires, vehicle body, batteries.

Sustainable Manufacturing – Concentrates on adopting production practices that minimize environmental harm, reduce resource consumption, and promote sustainability throughout the production lifecycle of vehicles, components, and infrastructure such as low carbon manufacturing solutions or sustainable battery production through green mining and material sourcing.



Driving Force 2: **Make Mobility Digitalized**

Digital transformation is revolutionizing mobility by integrating advanced technologies, applying AI and Big Data into transportation systems to create interconnected, adaptive networks that respond to real-time data and user needs. This transformation addresses core challenge areas: automation, which leverages advanced technologies; vehicle intelligence, which improves decision-making capabilities in vehicles; connectivity, which enables seamless data flow across the ecosystem; and cyber security, which ensures the safety and reliability of these interconnected networks. Together, these digital advancements address the complexity of modern transportation demands, including rising expectations for responsive, tech-integrated experiences. Digitalized mobility solutions are a foundational enabler that unlocks intelligence at scale for integration across the entire mobility sector, addressing various types of challenges.

The increasing reliance on data-driven, connected solutions is reshaping how vehicles interact with infrastructure and users. For example, global market for Internet of Things (IoT) technologies and solutions, specifically within the automotive sector, is projected to reach approximately $280 billion by 2030, underscoring the significant investments being made to connect vehicles and infrastructure[6]. Moreso, the global Intelligent Transportation System market size was valued at USD 51.16 billion in 2023 and is expected to grow at a significant CAGR of 8.5% from 2023 to 2030. In addition, the adoption of 5G connectivity will be pivotal for connected and autonomous vehicles, as it enables low-latency communication essential for real-time responsiveness. Estimates suggest that 5G-enabled transportation systems could generate economic benefits exceeding $200 billion annually by 2035[7].

Who seeks solutions? Digitalized mobility solutions hold appeal for a range of stakeholders. Automotive OEMs and suppliers, for instance, are investing heavily in digital platforms and AI-driven analytics or GenAI to develop smarter, more connected vehicles that improve user experience and safety. Urban planners and municipalities, are increasingly interested in digitalized transportation networks for improving public transport, smart traffic management and Mobility-as-as-a Service. Infrastructure and roadway companies are increasingly integrating connectivity technologies as part of a transition towards intelligent transport systems (ITS). Automation is now revolutionizing the transportation of goods, from autonomous trucks to robotic warehouse systems to last mile delivery. Insurance companies also stand to benefit, as digitalization enables more accurate risk assessments and usage-based insurance models, while investors and venture capitalists are drawn to the high-growth potential of startups focused on AI and data-based solutions for mobility applications.

Challenge Areas

Automation – Automation in mobility refers to the integration of advanced technologies to perform transportation-related tasks with minimal or no human intervention. Automation solutions serve to meet the goals of other 'Driving Forces' of safety, efficiency and sustainability.

Challenges:

Automated Systems – Using advanced technologies such as data & AI for automated scheduling, on-demand services such as ridesharing, system integration, or to optimize logistics or supply chain management through automated warehouses.

Vehicle Intelligence – Enhances the cognitive capabilities of vehicles enabling smarter and more autonomous decision-making and operations.

Challenges:

Software Defined Vehicle – Utilizes software to offer real-time, over-the-air updates and new features for vehicles

Autonomous Systems – Focuses on systems that enable vehicles to independently navigate and make decisions in real-time, without human intervention, including technologies for sensors for perception, mapping, navigating, edge computing, operating systems, or simulation and testing tools.

Connectivity – Enhances the ability of various transportation components to communicate and interact seamlessly, ensuring real-time data exchange, updates and integration across the mobility ecosystem.

Challenges:

Network Infrastructure – Involves the development and deployment of robust communication networks that support the reliable exchange of data within transportation systems such as wireless communication, 5G networks, vehicle-to-everything (V2X) communication, and software-defined networking.

System IoT Integration – Involves connecting various smart devices, sensors, infrastructure and data platforms so they can work together and share data. This ensures that different parts of the transportation network can communicate and coordinate, enhancing overall system functionality such as IoT integration platforms for smart traffic management or road hazard alerts.

Cyber Security – Concentrates on protecting transportation systems from digital threats, ensuring the integrity, confidentiality, and availability of data and systems.

Challenges:

Data Privacy & Protection – Ensures that personal and sensitive data within transportation systems are safeguarded from unauthorized access and breaches, maintaining user trust and compliance with regulations.

Network Security – Protects the data & communication infrastructure of transportation systems and connected or autonomous vehicles from cyber threats and attacks, ensuring the reliability and safety of data transmission and system operations.

Driving Force 3: **Make Mobility Efficient & Optimized**

Making mobility more efficient is about improving operational processes of vehicles or the physical mobility infrastructure such as roadways or railways and optimizing the customer experience that supports the movement of people or goods from A to B while ultimately reducing operational costs.

Cities around the world face growing congestion issues, with an estimated cost to the global economy of around $300 billion annually due to lost productivity from traffic alone[8]. To mitigate these pressures, efficient journey management solutions can streamline resource use, reduce emissions, and enhance reliability and productivity. It is estimated that integrating AI-based route optimization solutions in logistics and fleet operations could reduce fuel consumption by up to 10-15%, significantly cutting both costs and meeting sustainability goals[9].

Optimizing the performance & operations of mobility value chains, vehicles and infrastructure is crucial in maintaining efficient transport systems and reducing operating costs. Regular maintenance prevents failures which could compromise safety. Digital technologies such as IoT, automation, and advanced analytics are complimentary solutions to enhance optimization.

As technologies advance, there is more potential for mobility solutions to meet individual needs and preferences. By making transportation more accessible, real-time responsive, and personalized, user-centric services enhance the overall travel experience while aligning with the larger goal of optimized operations. For example, the market for Mobility as a Service (MaaS) is evolving to provide holistic transport services that meet user needs. With the Software-Defined-Vehicle (SDV), features such as integrated apps are enhancing the passenger experience and personalization of the car itself.

Who seeks solutions? This pillar is the most over-arching with varied use cases in transportation systems, from cities, transportation operators, fleets, OEMs, and more. This combination of operational efficiency and user-oriented improvements sets the foundation for a more efficient, adaptive, and resilient mobility system.

Challenge Areas

Journey Management – Focuses on improving the overall travel experience by coordinating smooth, timely, and efficient transportation. This area aims to streamline all components of travel, from planning to execution, enhancing the effectiveness of the transportation network.

Challenges:

Traffic Optimization – Implements technologies to improve the flow of traffic, reducing congestion and delays, and ensuring more efficient transportation.

Route Optimization – Utilizes data and algorithms to determine the most efficient routes for travel, minimizing travel time, emissions and fuel consumption while improving overall journey efficiency.

First & Last Mile Delivery – Focuses on improving the initial and final segments of a delivery process for efficiency, cost reduction and customer satisfaction. These stages are crucial parts of the logistics and supply chain requiring seamless integration with the transportation system.

Parking - Focuses on optimizing parking spaces, reduce congestion, making it easier for users to find available parking spots and saving time spent searching for parking.

Performance & Operations – This area aims to enhance the efficiency and reliability of mobility systems and processes to ensure that all aspects of transportation are optimized to meet rising demand, reduce downtime and costs, save time as well as improve safety.

Challenges:

Predictive Maintenance – Focuses on using data analytics, sensors, and advanced algorithms to predict when a vehicle or infrastructure component is likely to fail, enabling maintenance activities to be scheduled before failures occur. This improves reliability, safety, reduces costs and extends the vehicle's lifespan.

Vehicle & Infrastructure Monitoring – Continuous monitoring of the health condition of vehicles and underlying infrastructure to detect potential issues early, performing timely interventions better ensures safety and functionality.

Fleet Management – Involves overseeing and coordinating the operations of a fleet of vehicles to maximize efficiency, reduce costs, enhance safety and ensure optimal performance.

Smart Manufacturing – Refers to the use of advanced technologies, data, and interconnected systems to enhance the design, production, and assembly of vehicles and their components through technologies such as additive manufacturing, digital twins, IoT and more.

Passenger Experience – Focuses on enhancing the overall journey experience by tailoring services to meet individual needs and preferences. This area focuses on ensuring that mobility solutions are designed to be intuitive, personalized, and accessible for all users.

Challenges:

UI/UX Optimization – Enhanced user services in mobility increases usability, comfort, adoption rate of new technologies, and convenience, ensuring they are intuitive and easy to use for increased customer satisfaction.

Personalization, Lifestyle & Wellness – Customizes services and interactions based on individual user preferences and needs, improving overall satisfaction and engagement.

Accessibility – Ensures that transportation services and solutions are designed to be inclusive and usable by people with various abilities, promoting equal access for all users.

Driving Force 4: **Make Mobility Safe & Secure**

Making mobility safer and more secure is about protecting the physical safety, well-being of passengers, road users, pedestrians both in vehicles and in public spaces. According to the US Department of Transportation, in 2023, 40,990 lives were lost on U.S. roads either in motor vehicle crashes or while walking[10]. Even more were injured. Globally, road traffic accidents account for approximately 1.3 million deaths annually, a number that is largely preventable with the contribution of technologies and improved vehicle design[11].

Vehicle safety technologies such as improvements to quality of vehicle components, Advanced Driver Assistance Systems (ADAS) or impairment detection in new vehicles have shown to significantly reduce accident risks, improving overall road safety and saving lives[12]. Preventive and responsive technologies integrated into the roadways or smart city infrastructure, leveraging the benefits of connectivity can further reduce fatality and injury rates.

Who seeks solutions? Governments and regulators play a pivotal role by implementing stringent safety standards and encouraging innovations that reduce road-related risks. The main stakeholders seeking to implement safer mobility solutions include fleet operators, OEMs, suppliers, municipalities, roadway operators, emergency services. Furthermore, insurance companies prioritize safety technologies to reduce accident rates and claims.

Challenge Areas

Vehicle Safety – Focuses on improving the safety level of vehicles and their occupants by integrating technologies and systems designed to prevent accidents, reduce the impact of collisions, and enhance overall vehicle safety performance.

Challenges:

Passenger Safety – Aims to protect and enhance the safety of the driver and vehicle occupants, including reducing human error, providing better protection during accidents, and improving overall driving experience safety.

Vehicle-Oriented – Addresses the components of the vehicle itself to improve safety and reduce accidents. This involves integrating safety technologies into vehicle design and systems to prevent accidents and reduce injury risks.

Public Safety – Aims to protect the safety and well-being of all road users through technologies designed to enhance emergency response, manage risks, and safeguard individuals in various scenarios.

Challenges:

Urban Space Safety – Focuses on safety in urban spaces prioritizes safeguarding all users within urban environments by addressing accident prevention and risks associated with dense, mixed-use spaces that include vehicles, pedestrians, cyclists, and public transit.

Disaster & Incident Response Systems – Focuses on improving the ability to rapidly respond to and manage emergencies, disasters, and incidents to ensure public safety during critical events.

Using this Map

Innovation is about solving problems, pain points or addressing challenges. This report has presented the 4 “Driving Forces” for innovation in mobility: sustainability, digitalization, efficiency and safety followed by a categorization of the various challenges. Adopting a challenge-centric approach to the mobility sector can lead to better, more precise solutions and collaboration opportunities within the mobility ecosystem.

The categorization of this mapping of challenges areas and challenges is not mutually exclusive. Many of the challenges serve to address the goals and needs of a different Issue area. For example, autonomous systems are part of digitalization while also serving to improve safety. And traffic management optimizes user experience while also serving to lower emissions.

While many startups have developed solutions that address multiple challenges simultaneously, there remain significant gaps in existing solutions where further research and solution development are necessary.

This mapping of challenges serves as a valuable resource for entrepreneurs, public and private sector partners, enabling them to identify areas for potential collaboration, investment, and innovation. By leveraging this framework, stakeholders can better align their efforts to tackle pressing mobility issues and contribute to a more productive future of mobility.

The map is a live, dynamic map with the option to add more challenges as needs develop. We encourage industry partners, including corporations, government entities, and public sector municipalities to engage with us by sharing their specific challenge areas with EcoMotion Community. Together, we can foster a collaborative environment that drives meaningful advancements in mobility solutions and enhances the movement of people and goods.

Resources

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