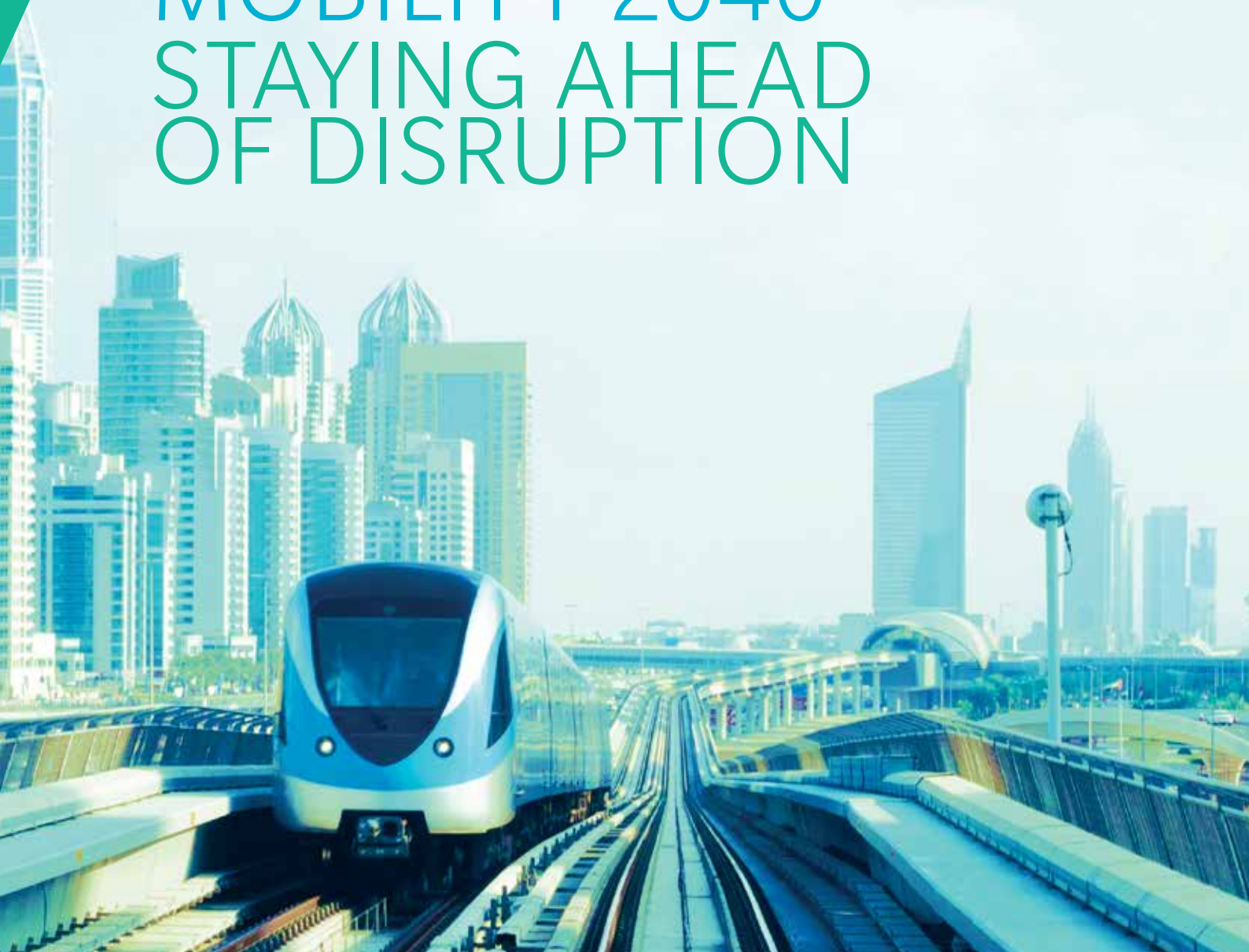


MOBILITY 2040 STAYING AHEAD OF DISRUPTION



WELCOME TO THE FUTURE OF MOBILITY

It's a beguiling vision: You wake up and tell your house management system that you need to be in Munich, or Chicago, or Beijing, by two in the afternoon. The house tells your mobility provider, which computes the journey and sends an itinerary to your smart device. At the appointed time, a driverless car rolls up, perhaps with one or two other people already aboard. The car drops all of you at an integrated mobility hub, where you board a 1,200 kmh hyperloop that whisks you to your target city in mere minutes. An autonomous bus waits at the station to take you to your final destination.

This is one vision of mobility in the year 2040. Driven by the fourth industrial revolution, technological convergence, new entrants in the mobility space, and changing travel behaviors, we expect the pace of innovation in passenger transportation to accelerate over the next quarter-century. Disruption to existing business models will be widespread, making some less viable, while others realize new opportunities and gain new strength. Competitive pressures will increase as customer spend and mindshare shift to new mobility providers. Eighty percent of incumbents in passenger transport say they don't feel well prepared for what's coming.

To gauge the potential shape of this emerging landscape, its challenges, and the adaptations it will require, Oliver Wyman conducted in-depth research and surveyed several hundred executives and experts in the transportation industry globally. *Mobility 2040: Staying Ahead of Disruption* provides an aggregated view of those perspectives and of ours. We hope you find it thought-provoking reading and look forward to hearing your comments.

THE OLIVER WYMAN MOBILITY 2040 TEAM

MOBILITY TODAY: THE CHALLENGES OF GROWTH

The world is on the move: Over the past 25 years, passenger flows have grown steadily and across all major modes of travel, a reflection of rising incomes, urbanization, and improvements in public services. Cars are the mainstay of passenger travel (“mobility”), but air travel has grown the fastest.

Supporting this constant increase in travelers has required steadily rising investment in infrastructure and assets. And while unit costs continue to rise (energy, fees, wages), travel prices generally have held stable or grown only moderately.

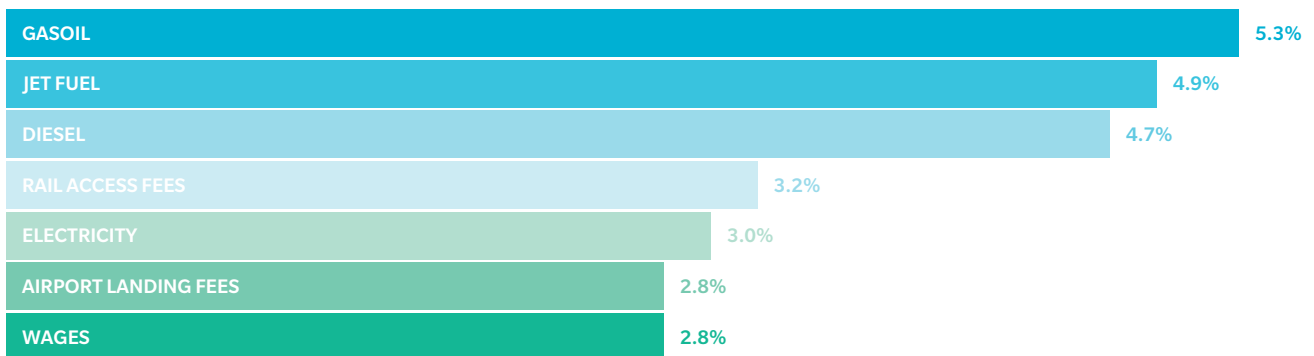
In the public transport arena, higher volumes and frequencies mean higher life cycle costs (more wear and tear on equipment). But the biggest problem is that most passenger demand occurs during relatively narrow “peaks” – such as morning and afternoon rush

hours. Many public transport systems are experiencing exceptional strain during these peaks – while low off-peak demand means that overall seat occupancy has actually been on the decline.

Increasing cost with little or no parallel increase in revenues has resulted in some sectors of the passenger transport industry being unable to build business models that are economically viable for the long term. These business models, and indeed, all incumbent stakeholders in mobility – from automotive manufacturers and airlines to rail and bus operators and travel agencies – will be challenged by coming disruptions in the mobility space. What travelers desire now – and will demand tomorrow – is evolving. Punctuality, convenience, simplicity, and comfort will take on new dimensions as the pace of innovation in mobility quickens and becomes far more disruptive.

UNIT COSTS FOR TRANSPORT HAVE RISEN STEADILY

COMPOUND ANNUAL GROWTH RATES, 2000-2015

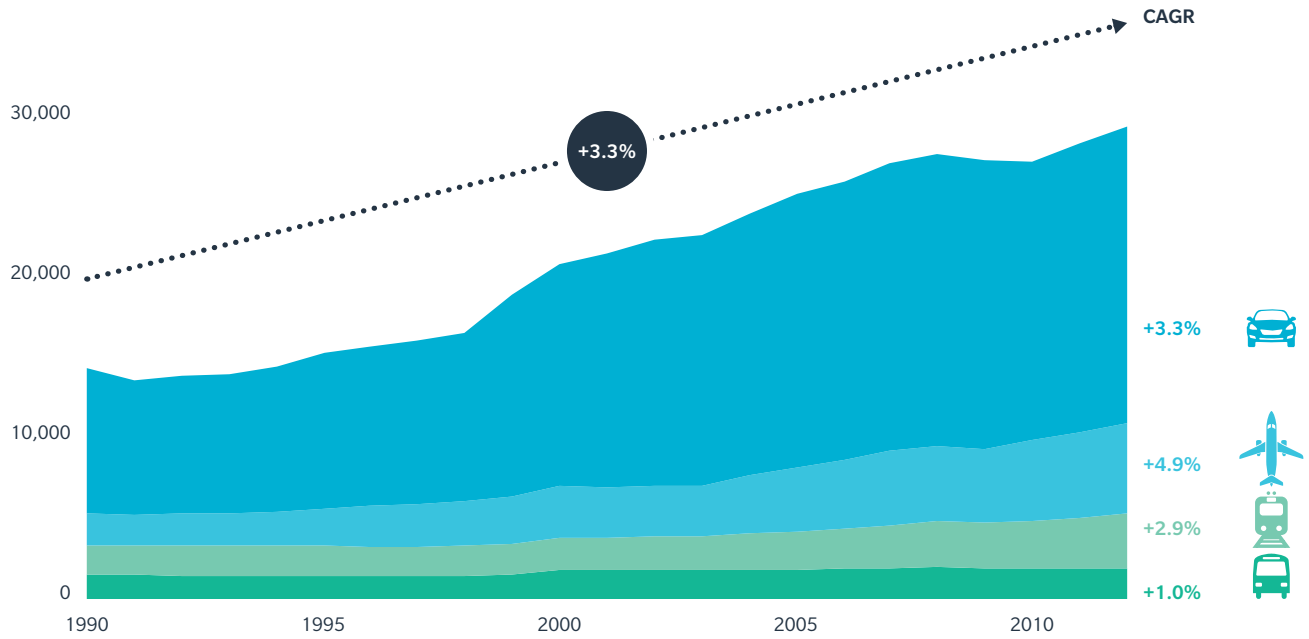


Note: Energy price excludes taxes. Airport landing fee increase based on 10 largest US airports. Rail access fee increase based on passenger rail transport in Germany (2002-2015). Wage increase based on US transport wages (2000-2009) and ILOSTAT wages from available countries globally (2009-2015).

Source: US Department of Commerce, ILOSTAT, IEA, Bloomberg, Oliver Wyman analysis.

PASSENGER FLOWS HAVE GROWN FOR ALL MODES OVER THE PAST 25 YEARS

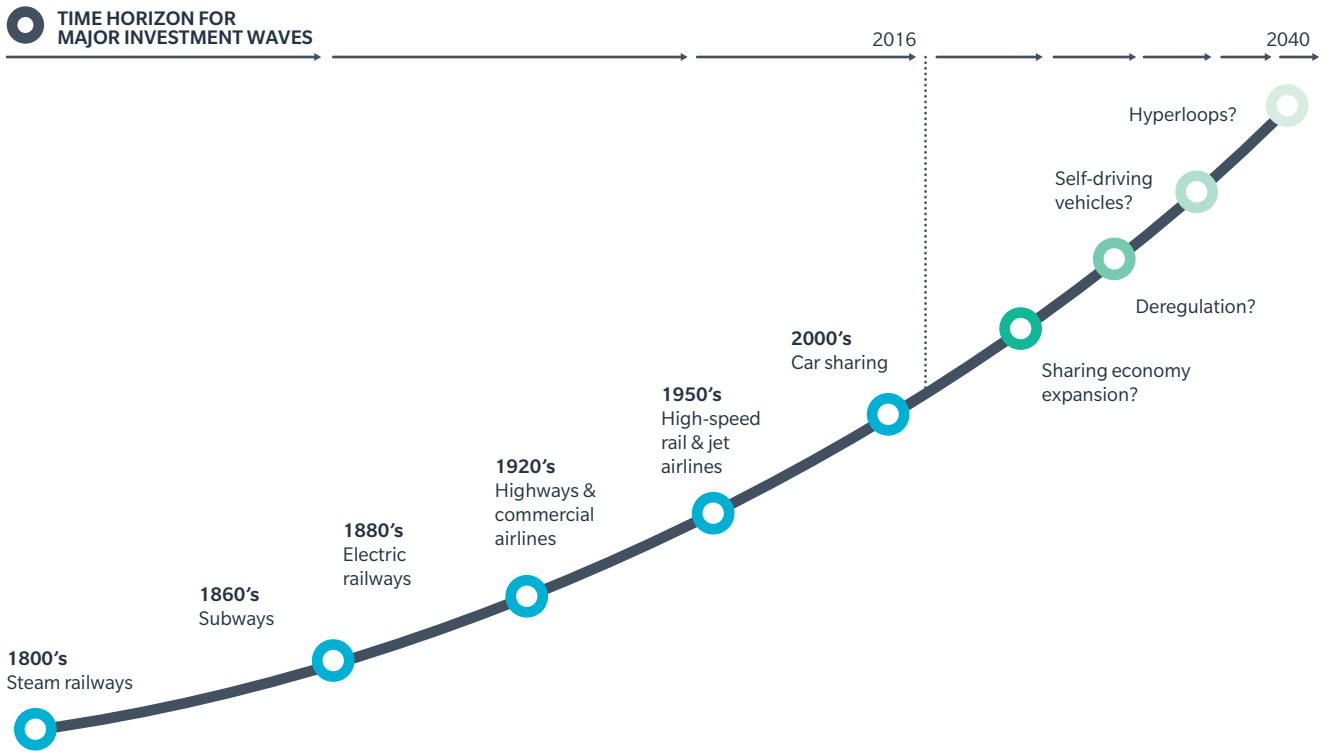
BILLIONS OF PASSENGER-KILOMETERS



Note: Based on data for 54 countries, covering all global regions. CAGR = compound annual growth rate.

Source: OECD, Oxford Economics, IATA WATS, Oliver Wyman analysis.

THE CHANGING PACE OF INNOVATION



Source: Oliver Wyman analysis.

THE SHAPE OF MOBILITY TOMORROW

Oliver Wyman’s survey of transportation executives and experts identified a number of trends that are likely to shape passenger transport over the next 25 years, including the rise of integrated mobility providers, the decline of private cars, the mainstreaming of shared mobility, and increased innovation and competition in passenger transport.

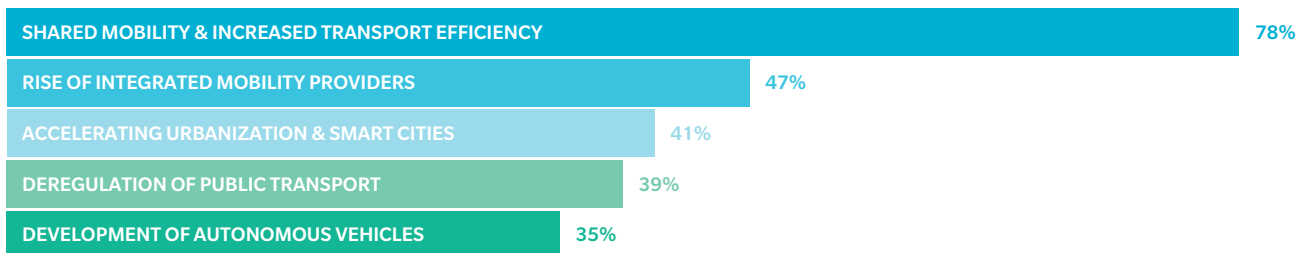
Most critically, the next 25 years will see greater demand for sustainable solutions and more efficient use of transportation assets. Private cars are likely to face increasing restrictions and rising costs, and 80 percent of survey participants believe that there will be fewer private cars in the future. Instead, 70 percent of those surveyed see a significant increase in car sharing. Of course, a number of car- and ride-sharing options already exist, but in the future these will become both fully mainstream and better integrated with other transport options.

These trends will be accelerated by the development of fully autonomous vehicles. It is not too farfetched to imagine roaming fleets of driverless cars that are shared across a neighborhood or a city on a fee-per-use or subscription basis. Survey participants do not expect major infrastructure investments will be required to support implementation of full autonomy, thus as the technology improves – bringing with it the promise of improved safety, highway capacity, and power train efficiency – the spread of driverless cars could occur relatively rapidly. And the technology isn’t necessarily limited to automobiles. Linked to users by mobility technology, autonomous bus and rail could offer more efficient and even on-demand services in the future.

Sharing and end-to-end mode integration will be enabled by a key future business design: the integrated personal mobility provider. These up-and-coming businesses will focus on creating seamless journeys and

SURVEY SAYS: MOST RELEVANT MOBILITY TRENDS

PERCENTAGE OF RESPONDENTS WHO CITED AS A “TOP THREE” TREND

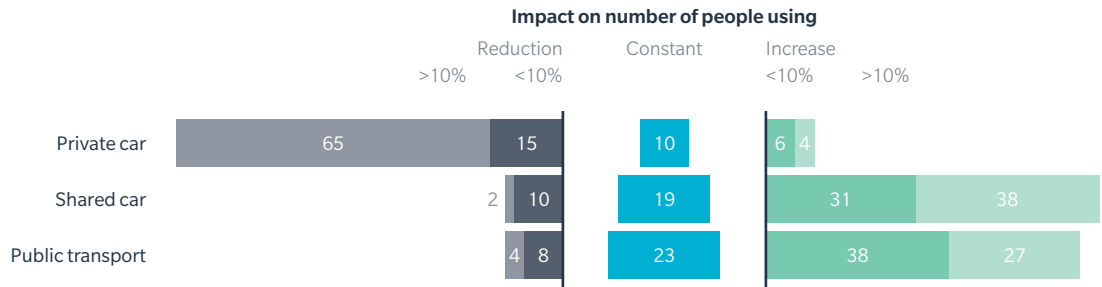


Note: Multiple answers possible.

Source: Oliver Wyman Mobility 2040 survey analysis.

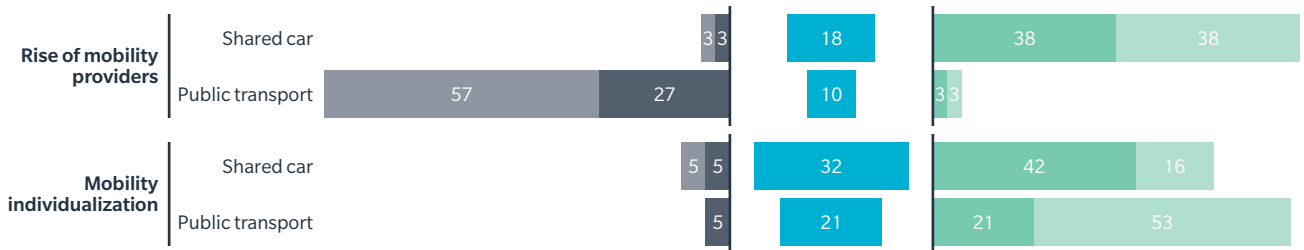
IMPACT OF SHARED MOBILITY ON MODAL SPLIT BY 2040

PERCENTAGE OF RESPONDENTS



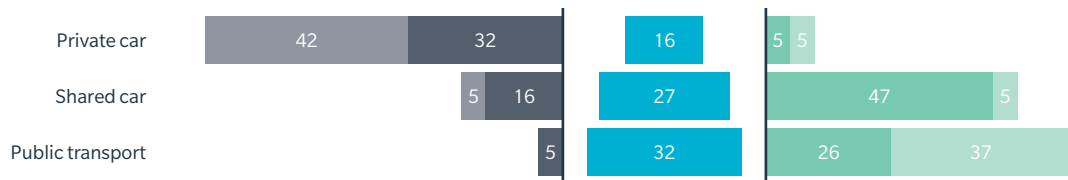
IMPACT OF INTEGRATED MOBILITY SOLUTIONS ON SHARED CAR AND PUBLIC TRANSPORT

PERCENTAGE OF RESPONDENTS



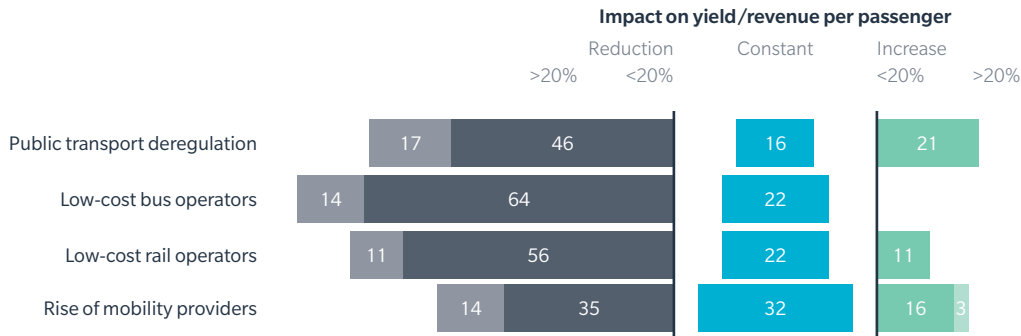
IMPACT OF SMART CITIES ON MODAL SPLIT

PERCENTAGE OF RESPONDENTS



POTENTIAL MOBILITY TREND IMPACTS ON YIELD/REVENUE PER PASSENGER

PERCENTAGE OF RESPONDENTS



Source: Oliver Wyman Mobility 2040 survey analysis.

“mobility on demand,” thereby integrating all modes of transport. For the traveler, transport mode selection and timetables will cease to be an issue – only when to start a journey so as to reach a destination by a given time. Smart devices will become the organizational center for individualized trip planning.

About three-quarters of survey participants expect that integrated mobility solutions will increase passenger volumes and shared car usage. Survey respondents also believe mobility personalization and on-demand services could benefit public transport as well, but incumbents are likely to see the passenger interface shift to new mobility providers.

Another issue that will critically impact mobility is the continued growth of urban and conurbation populations, which will increase demand for commuting options. The “smart city” of the future will be one that invests in technology and transport so as to best manage passenger flows. Coordination with mobility providers, real-time data monitoring, and responsive smart grid systems will be needed to ensure the best use of public transport and to minimize congestion. To get beyond the overwhelming peak capacity demand that is already putting so many public transport systems and highway systems under strain, businesses in the future are likely to be encouraged through tax breaks and other incentives to utilize alternative models, such as staggered work hours and more decentralized locations. And as shared autonomous cars replace private cars, valuable real estate now used for parking can be reclaimed for other uses.

Some cities are already moving forward in the search for smarter solutions. For example, Bellevue, Washington uses a traffic signal system that adjusts in real time, reducing travel time by 40 percent during peak travel hours and saving drivers \$9 million to \$12 million per year. Similarly, San Francisco, California has adopted a smart parking solution that shows space availability in real-time via a mobile app. The system features dynamic pricing for popular blocks and remote payment options. The results: parking wait time has been reduced by 43 percent and vehicle distance traveled by 30 percent (no more block circling).

Finally, survey respondents expect that transport deregulation will continue to spread, contributing to increased travel demand. Liberalization of railways, bus services, taxis, and ride-sharing will enable new companies to enter the market, giving travelers more choice and driving further innovation. More options

for bus and rail could even somewhat reduce demand for shared cars.

A number of the trends described above – the rise of integrated mobility providers, more deregulation, and increased low-cost bus and rail services – could have the compounding effect of forcing revenues and yield per passenger downward. Without significant changes to their business designs, current incumbent transport providers are likely to be the ones with the most to lose. Collaboration with or integration of mobility providers, technology and data investments, and an open ecosystem for sharing real-time journey data may be crucial to staving off commoditization.



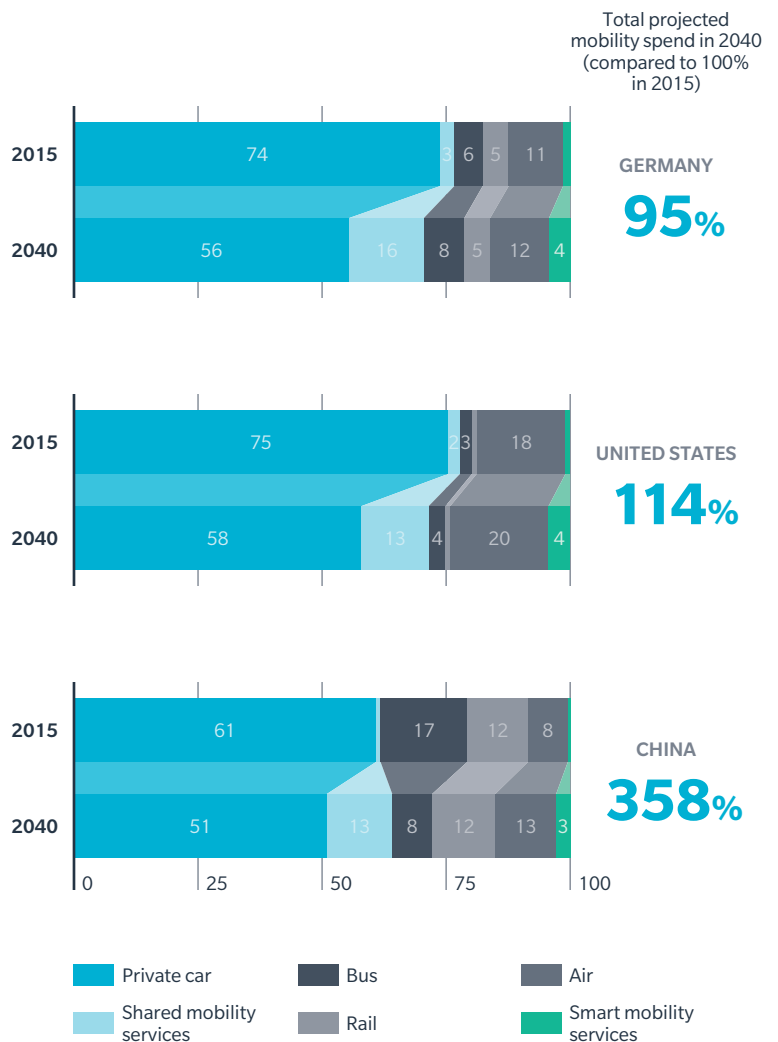
THE COMING MOBILITY LANDSCAPE

Taken all together, what do these trends imply for the future of mobility? Clearly, better services and faster connections – driven primarily by technology and data innovations – will contribute to more people traveling overall. But private cars will lose their starring role as shared mobility – using autonomous vehicles – increases dramatically. Public transport demand will increase moderately as well, with more focus on the role it can play as a component in seamless passenger journeys.

The number of companies operating in the mobility space undoubtedly will grow and become more diverse. But different modes and players might need to embrace more of a “co-opetition” model that offers opportunities to both compete and collaborate (such as by offering competitive services while sharing integrated mobility hubs). Passenger rail services are likely to become more concentrated on main commuter lines and intercity pairs where they can maximize volume, while other, more flexible modes, such as autonomous bus and shared cars, take over more fragmented service demands.

The biggest story of course over the next 25 years will be the rise of digitally based mobility services and information. Out of the many different providers now attempting to establish themselves in this space, we expect only a few will rise to the top, gaining enough share and reach to build an ecosystem that can provide integrated mobility coordination from one end of a journey to the other. Regardless of geography, the case for smart and shared mobility to take an increasing share of spend is compelling.

SHARE OF SPENDING FOR PASSENGER TRANSPORT: 2015 VERSUS 2040
PERCENTAGE SHARE OF EACH MODE



Note: Inflation adjusted, private car includes spending for parking, financing, and aftersales.
Source: Oliver Wyman analysis.

MOBILITY 2040 AND TRANSPORT INCUMBENTS

Our survey asked respondents if they are ready for the changes that they see coming in the passenger transport landscape. Only nine percent said they were truly prepared; 47 percent have identified trends and are working on planning, while 43 percent have as yet developed no action plans.

In terms of the actions incumbents could take, more than half cited a need to change business models, develop new products or services, and increase customer service levels. Few see a possibility at this stage of increasing barriers to entry or reducing investments.

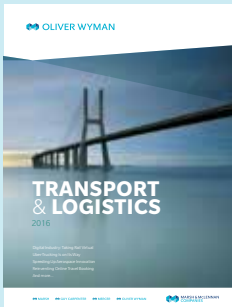
In our view, planning for mobility 2040 means that incumbents must start working on answering the following questions:

- How will they direct their investments, particularly in infrastructure and equipment? Transportation assets have long lives, and clearly between now and 2040 those assets will have to function within a rapidly changing mobility environment.
- How will incumbents position themselves along the mobility value chain to ensure access to data and defend customer relationships? As integrated mobility providers emerge, incumbents will be challenged for control of the customer.
- How can they best manage peak capacity demand – through optimizing asset utilization, capacity management, new tools and services? Peak capacity demand will only become more of an issue as passenger volumes continue to grow.
- How will incumbents accelerate the pace of innovation within their own companies? Incumbents will need to consider whether they will be transport mode providers or mobility providers. Can innovation be pursued organically or is it best acquired?
- What service innovations and partnerships would be worth pursuing – particularly with companies in the smart mobility and sharing spaces? With competitors?

A number of mobility innovations are already in play and have had a dramatic impact in their nascent environments. Tomorrow those innovations (and more to come) will be mainstream. Mobility is about to undergo the same rapid evolution as has occurred in industries such as media and retail – and similarly, in a single generation. To some, 2040 may seem to be a long way off. But in terms of investment horizons for transportation assets, it's the very next investment cycle. Planning for tomorrow can't wait.

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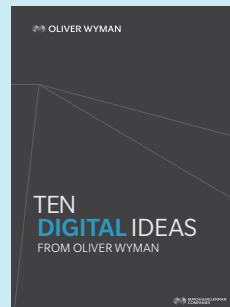
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