

EUROPEAN NEW MOBILITY EXPERT SURVEY 2018 - ENMS '18

OF INNOVATION AND DISRUPTION

March 2018



www.gbd.green

ENMS'18 is an independent, Europe-wide expert survey on the New Mobility market development. ENMS'18 includes the segments: Digital Services, Autonomous Driving and E-Mobility.

Foreword

In our opinion there is currently no industry that is changing as dramatically and disruptively as the mobility sector. Green Business Development has been involved in the development and transformation of the economy towards a sustainable system for 10 years. Technological progress and the legal framework are the parameters that determine this market dynamics.

The mobility market is shifting in many ways, such as from product-based to service-based modes of business. Furthermore, engine types have changed and electrically powered vehicles are increasingly entering the market and drive modes are evolving from manually controlled to autonomous. These dynamic and disruptive developments are summarised under the term “mobility market shift”.

Digital consumption of mobility could be more important in the future than analogue ownership. Thus different consumer attitudes and country-specific mobility cultures, as well as different digital and legal developments in European countries are given much greater importance. This international perspective will not only be crucial for the automotive industry, but also for start-ups, their investors and especially for the public sector including government, municipalities and public transport agencies.

This survey is a trend analysis for the mobility market shift. The aim of this expert survey is to identify trends and problems of this development at an early stage. In particular, the differences in individual European countries. Furthermore, the different assumptions of the protagonists of this market change are analysed: automotive industry, the public sector, start-ups and investors.

We think that our survey will give you some very interesting insights from experts' all over Europe.

We appreciate any feedback. Thank you for your interest.

Kind regards

Egbert Hünnewaldt

Managing Director
Green Business Development

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EUROPEAN NEW MOBILITY EXPERT SURVEY 2018/ ENMS '18

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SURVEY FACTS



18 EUROPEAN COUNTRIES INCLUDING 9 CORE COUNTRIES
 AUT, BEL, DNK, FIN, FRA, DEU, HUN, IRL, ITA, LUX, NDL, NOR, POL, PRT, ESP, SWE, CHE, GBR



330+ MOBILITY EXPERTS IN 9 SECTORS

-  Automotive Industry
-  Governments
-  Consulting
-  Start-ups
-  Municipalities
-  Research
-  Public Transport
-  Investors
-  Universities

2-STEP EXPERT SURVEY

EXPLORATIVE INTERVIEWS

ONLINE SURVEYS

FIELDWORK PHASE: 08/2017 - 01/ 2018

EDITOR

The survey is conducted by **Green Business Development GmbH**, Berlin, Germany - www.gbd.green - info@gbd.green
 Supported by: **IDDRI Institute**, Paris, France; **Business Finland**, Helsinki, Finland

Background & Chronic ENMS

ENMS is an independent, international expert survey on the New Mobility market development. ENMS is repeated in regular intervals and includes the segments: Digital Services, Autonomous Driving and E-Mobility. The survey is a trend analysis for the mobility market, as it is subject to dynamic, disruptive changes. The aim of the expert survey is to identify trends and problems of this development at an early stage. In particular, the differences in

individual European countries are analysed. Furthermore, the different assumptions of the protagonists of this market change are analysed: automotive industry, the public sector, start-ups and investors.

ENMS '16 focused on Digital Services. Nine countries were represented in the 2016 survey and it received approving international response:

Cross-functional exchange within the European start-up scene is very important for the sustainable development of visions and ideas, as is the promotion of creative thinking and the attention paid to these developments. Without start-ups there will be slower development in Europe.

Alexander Schilff, Brand Manager,
Toyota Deutschland GmbH, Cologne, Germany

From a US-based accelerators perspective, we are seeing a strong trend towards open innovation activity in the Silicon Valley, and are working closely with corporate partners. The country origin of the new technologies or services is often irrelevant.

Max Gimpel-Henning, Director Western Regions,
Cleantech Open, San Francisco, USA

We, as VC, believe that new technology will significantly change the mobility sector. Sustainable mobility is a really interesting area to invest in. GBD's survey brought some more transparency to this evolving international market.

Coenraad de Vries, Managing Partner,
StartGreen Capital, Amsterdam, The Netherlands

The GBD European mobility survey makes it abundantly clear that the world of transportation is changing now, not in 2020. The major 'established' companies will need to collaborate with innovative start-ups to maintain their leadership in this rapidly changing industry. Everyone is searching for the next game changer. Who will win?...the nimble and versatile.

Lior Zeno Zamanski, EcoMotion Executive Director,
Israel Innovation Institute, Israel

Methodology

The survey was carried out as a two-step expert survey.

The first stage consisted of expert interviews, where experts from the four participating core target groups in Europe were questioned. These are experts representing the automotive industry, the public sector, investors and start-ups. The results of the qualitative expert survey were the basis for the creation of the questionnaire design in which mainly closed questions were used.

The survey was conducted as an online survey, only accessible by invitation and therefore not open to the public. The study achieved a sample size of 330 mobility experts from 18 European countries (Austria, Belgium, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Luxembourg, The

Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland and Great Britain). The term "European Average" in this study is defined as the average of all participants from the 18 participating countries. Out of these countries, nine core countries were identified, having received the greatest number of votes (> 25) for the statistical analysis (Austria, Finland, France, Germany, The Netherlands, Poland, Spain, Switzerland and Great Britain).

The experts were categorised into nine sectors: automotive industry, start-ups, public-transport, government, municipalities, investors, consulting, research institutes and universities.

ENMS'18 working field phase lasted 08/17-01/18.

Editor

The survey was conducted by Green Business Development GmbH, Berlin. Green Business Development (GBD) is one of the leading consultancies in the area of sustainable business development in Germany. With our expertise, we help corporations, start-ups, investors and public authorities to build up innovation and growth at the intersection of traditional and digital economy.

GBD's topics of expertise include mobility, renewable energy, finance and sustainable consumption.

GBD offers services which comprise strategic and operational business development. The goal is to identify market needs and critical issues at an early stage. Together we find strategical partners and affine start-ups and we develop optimal market strategies, and innovative ways to sell services and products in fast changing and disruptive market environments.

GBD's business development services include research & strategy, start-up monitoring, and market expansion advisory.

- GBD conducts independent research and publish studies. Additionally, GBD offers clients to carry out commissioned studies that address their specific needs.
- GBD's business development consulting approach includes business analysis, development of business unit strategies, and successful market implementation.
- GBD is active in start-up monitoring as well as matching start-ups and incubators, venture capitalists, corporate VCs, and other strategic partners.
- GBD has many years of experience in facilitating market entry of foreign companies into Germany.
- GBD is operating project-oriented in close coordination with an international network of strategic partners, experts and friends.
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Supporter

As part of the most recent survey, the collaborating partners received the opportunity to participate in the creation of the survey questions in a so-called "Omnibus Survey". The survey was carried out in

collaboration with the The Institute for Sustainable Development and International Relations (IDDRI) in Paris and Business Finland, the Finnish Business Development agency, Helsinki.



The Institute for Sustainable Development and International Relations (IDDRI) is an independent research institute dedicated to fostering the transition to sustainable development and prosperity for all. IDDRI identifies the necessary conditions for the integration of sustainable development into public policies and proposes tools for their implementation. It takes action at different levels, from international cooperation to the policies of countries, cities and businesses.

Mobility patterns are moving really fast, bringing new opportunities but also new risks for sustainable development. This survey provides us useful insights into the vision of autonomous mobility of many different experts, which help us to foresight what could be the future system of mobility and identify their.

Laura Brimont/ Research Fellow - IDDRI



Business Finland is the Finnish innovation funding, trade, investment, and travel promotion organization, headquartered in Helsinki. Business Finland is fully owned by the Finnish Government employing some 600 experts in 40 offices globally and in 20 regional offices around Finland. Business Finland is part of the Team Finland network. www.businessfinland.com

Autonomous driving, connected car and new mobility concepts offer great opportunities. The survey helped us to better evaluate chances in different countries for the many innovative Finnish companies in these sectors to further grow their business with leading OEMs and suppliers.

Mikko Koskue/ Program Director Intelligent Vehicle and Mobility Solutions - Business Finland

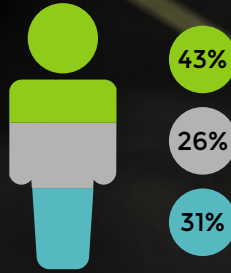


Autonomous Vehicles Usage Options

Disruptive change in usage: only 26% estimate a use as private vehicle



- Robot-taxi (shared or not)
- Private vehicle
- Complementing existing public transport fleet (bus/pod)



3/4 believe in usage as public transport or robot-taxi.

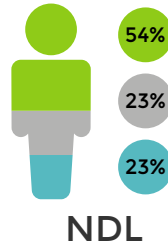
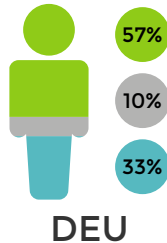
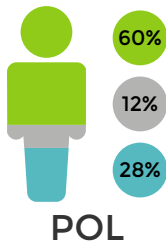
Majority (43%) of experts believe that AV will be used as robot-taxis.

Only 26% estimate usage as private vehicle.

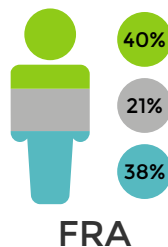
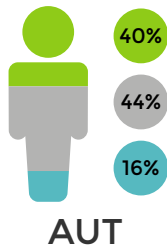
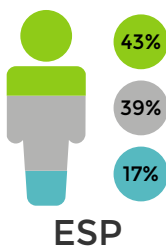
Experts of the automobile industry strongly (41%) believe in usage for public transport, which expresses a stronger believe in this type of usage than the public sector 34% (PTA/ Government).

Q: "What will be the dominant use of the autonomous vehicle?"

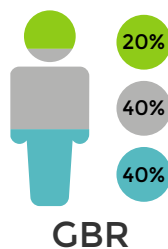
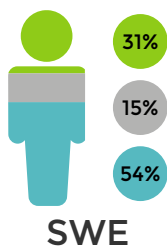
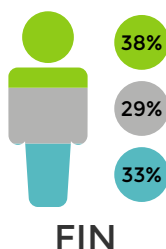
Figures are based on the average of the experts from the 18 participating European countries. n = 330.



Strongest belief in **robot taxis** in **Poland** (60%), **Germany** (57%) and the **Netherlands** (54%). Lowest belief in **GBR** (20%) and **Sweden** (31%).



Strongest belief in **public transport** in **Sweden** (54%), **GBR** (40%). Lowest belief in **Austria** (16%) and **Spain** (17%).

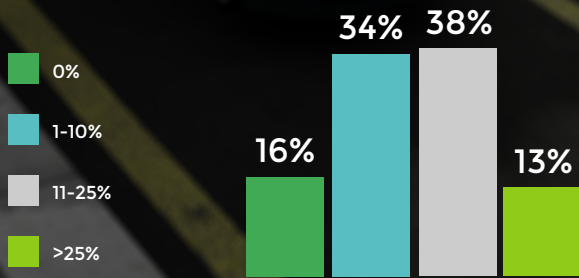


Strongest belief in **private-vehicles** in **Austria** (44%), **GBR** (40%) and **Spain** (39%). Lowest belief in **Germany** (10%), **Poland** (12%) and **Sweden** (15%).



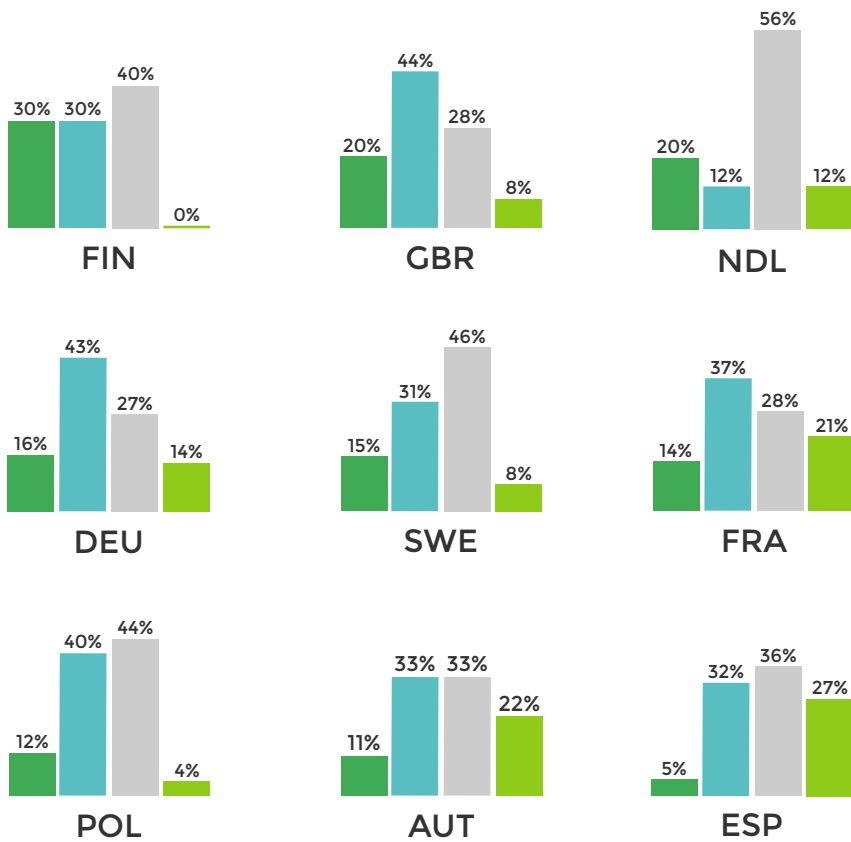
Autonomous Vehicles Price Sensitivity

Split consumer market concerning price sensitivity



Experts estimate a split consumer market. 1/2 believe that consumers will not pay more than 0-10%, 1/2 believes in the willingness to pay 11-25% and more. 75% of the automobile industry experts see the additional cost willingness between 1-25%, of which 47% is between 1-10%.

Q: "What is the additional cost a consumer will be willing to pay to have an autonomous vehicle?"
 Figures are based on the average of the experts from the 18 participating European countries. n = 330.



Price Sensitivity Ranking*

1	FIN	3,50
2	GBR	3,16
3	DEU	2,93
4	SWE	2,85
5	POL	2,84
European Average		2,83
6	NDL	2,80
7	FRA	2,72
8	AUT	2,56
9	ESP	2,23

*Weighted Average



The highest price sensitivity was expected in **Finland, GBR** and **Germany**



Spain, Austria and **France** have the lowest price sensitivity



Autonomous Vehicles Type Of Engine

Strong expert majority (78%) believes AV will be battery powered



- Battery Electric Vehicle
- Fuel Cell Electric Vehicle
- Hybrid Electric Vehicle
- Internal Combustion
- Plug-In Hybrid Electric Vehicle
- Other

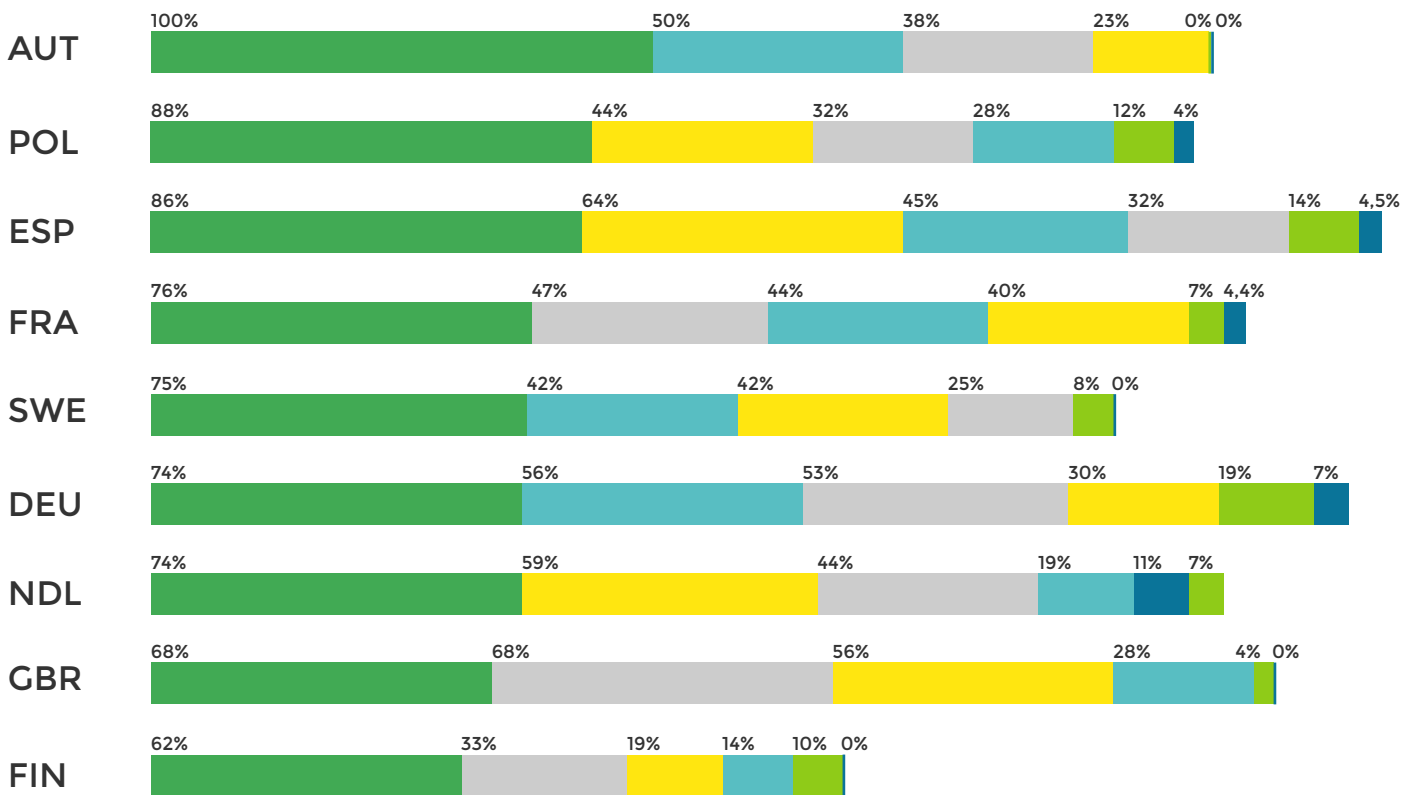


9% of experts believe that the AV will have an internal combustion engine.

45% of automobile industry experts believe FCEV is an engine option for AV, the lowest rate of 31% comes from government and PTA.

Q: "Which type of engine will the autonomous vehicles have?" (Option to select three answers)

Figures are based on the average of the experts from the 18 participating European countries. n = 330.



Experts from **Finland** (62%) and the **GBR** (68%) share the lowest belief in BEV.



Strongest belief for BV comes from **Austrian experts** with 100%.



German experts make up the highest percentage (19%) of selecting IC as an option of AV, whereas 0% of **Austrian experts** selected this option.

Chapter Summary: Autonomous Driving

Non-private Passenger transportation will dominate the use of AV

Autonomous driving is expected to drastically change the common use of vehicles, especially for non-private use. The majority of experts predicted AV's to be used as robot-taxis and/or for public transport, which would lead to considerable changes in the competitive market of the public transport sector. Planning for these changes and integrating new technologies into the public transport sector should, therefore, be considered a vital strategy for adaptation.

With the minority of experts predicting consumer willingness to pay an additional 25% to purchase an AV, it is currently expected that the majority of AV's will not become privately used vehicles. Interestingly, a considerably large proportion of experts predicted AV's for private use in Great Britain, while simultaneously foreseeing an over-proportionally high price sensitivity. It will, therefore, be interesting to see which solutions are found to close the gap between the price sensitivity of consumers and their interest in privately owning an AV.

Polarising Opinions of Price Sensitivity

Generally, the experts' opinion on price sensitivity is polarising, as 50% expect consumers to accept the additional costs of 11-25%, whereas 50% expect consumers to accept no additional costs or additional costs only up to 10%. With the expectation that AV's will cost more than regular vehicles, high price sensitivity is anticipated.

Disruptive Change in Type of Engine for AV

The vast majority of experts predicts BEV engines to be the most suitable type of engine for AV, and the vast minority predicts the use of internal combustion engines.

Interestingly experts' opinions from the 'car production countries' Germany and France on internal combustion engines are very different. While 19% of German experts (clearly above the European average) believe internal combustion engines to be used for AVs, only 7% of French experts predict this, putting them below the 9% European average.

A respectable 36% Prediction for FCEV as Engine Type for AV

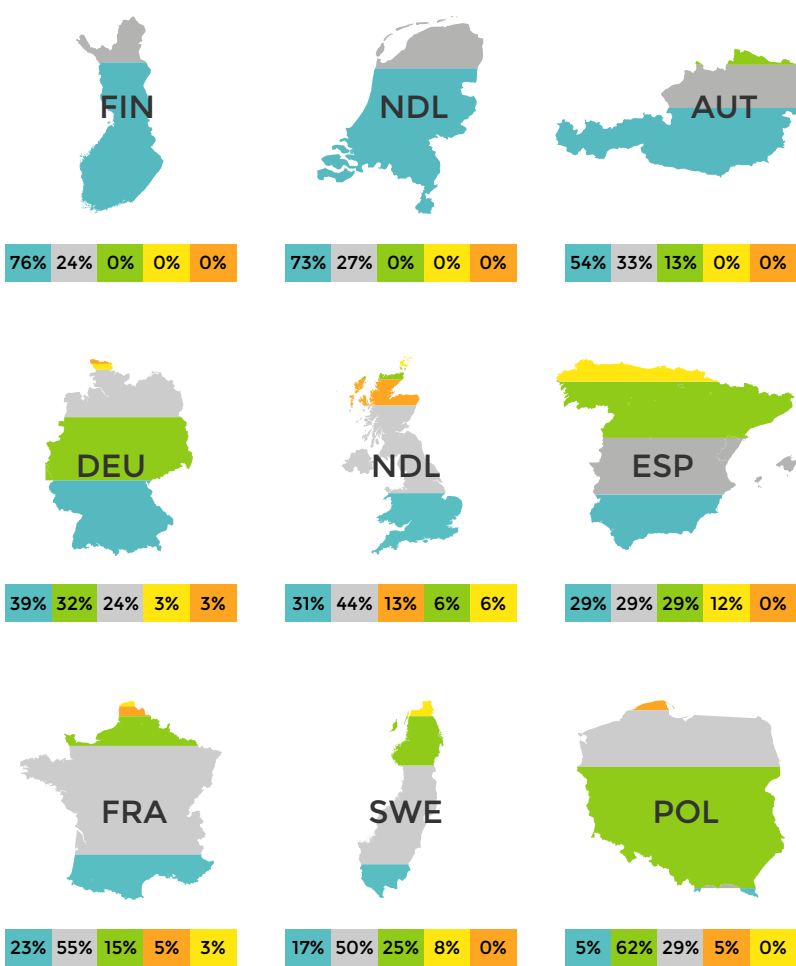
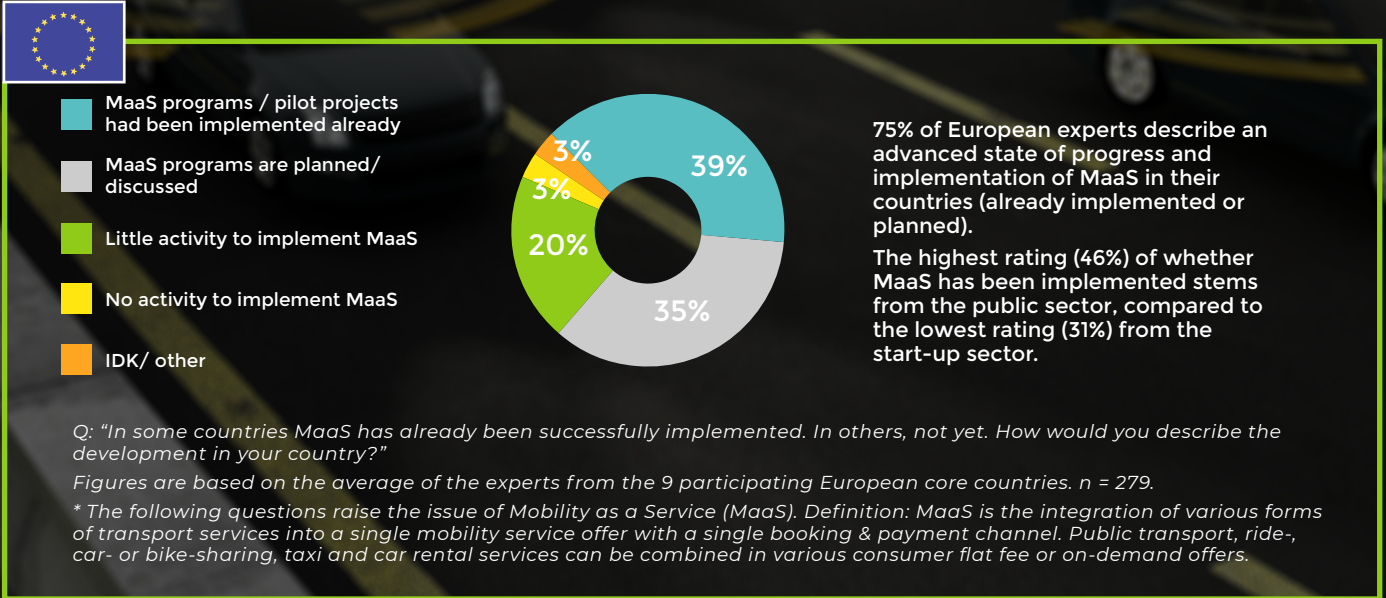
Strikingly, fuel cell receives a relatively large approval of 36%, as it is not yet a commonly known or widespread type of engine. While PHEV and HEV are an integral part of the engine mix, the FVEV are still in the early stages of admission and charging station infrastructure. The outcome of 36% can, therefore, be considered surprisingly high and speaks for a relative acceptance of FCEV among experts.

Conclusively, one can state that experts assume that AV in Europe will cause a disruptive change in the mobility market. This concerns both the departure from the use of vehicles for private use, as well as the shift from CI to electrically powered engines.



Mobility As A Service (MaaS)* State Of Progress

Advanced state of progress regarding MaaS in Europe

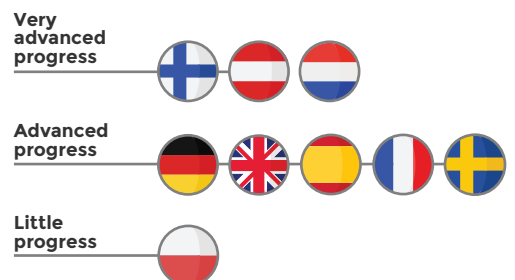


MaaS-Progress Ranking**

1	FIN	5,52	5	FRA	3,90
2	NDL	5,45	6	GBD	3,88
3	AUT	4,83	7	ESP	3,65
EUROPEAN AVERAGE		4,16	8	SWE	3,58
4	DEU	3,97	9	POL	2,67

**Weighted average

Regarding the state of progress, the countries can be divided into 3 groups: in the first group (FIN, AUT, NDL) MaaS is already implemented or in process with more than 80% approval. In the second group (DEU, GBR, ESP, FRA, SWE) there are at least 60% of experts thinking that MaaS is implemented or in process. Only in Poland 62% of the experts think, that there was so far little activity to implement MaaS.



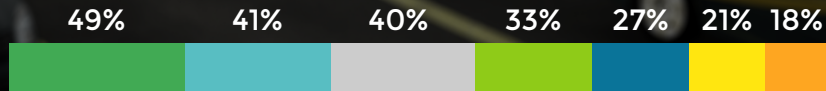


Mobility As A Service (MaaS) Implementation Hurdles

General, legal, and technical difficulties to integrate different players are the main hurdles



- Too difficult to integrate different players
- Technical hurdles (data security, bundling different operators)
- Legal issues
- MaaS is not yet sufficiently known
- Different approach on integrated mobility
- Financial reasons
- Public transport sector does not want to implement MaaS



49% of experts believe that difficulties of integrating different players, 41% that technical hurdles and 40% believe that legal issues are the biggest issues for MaaS implementation.

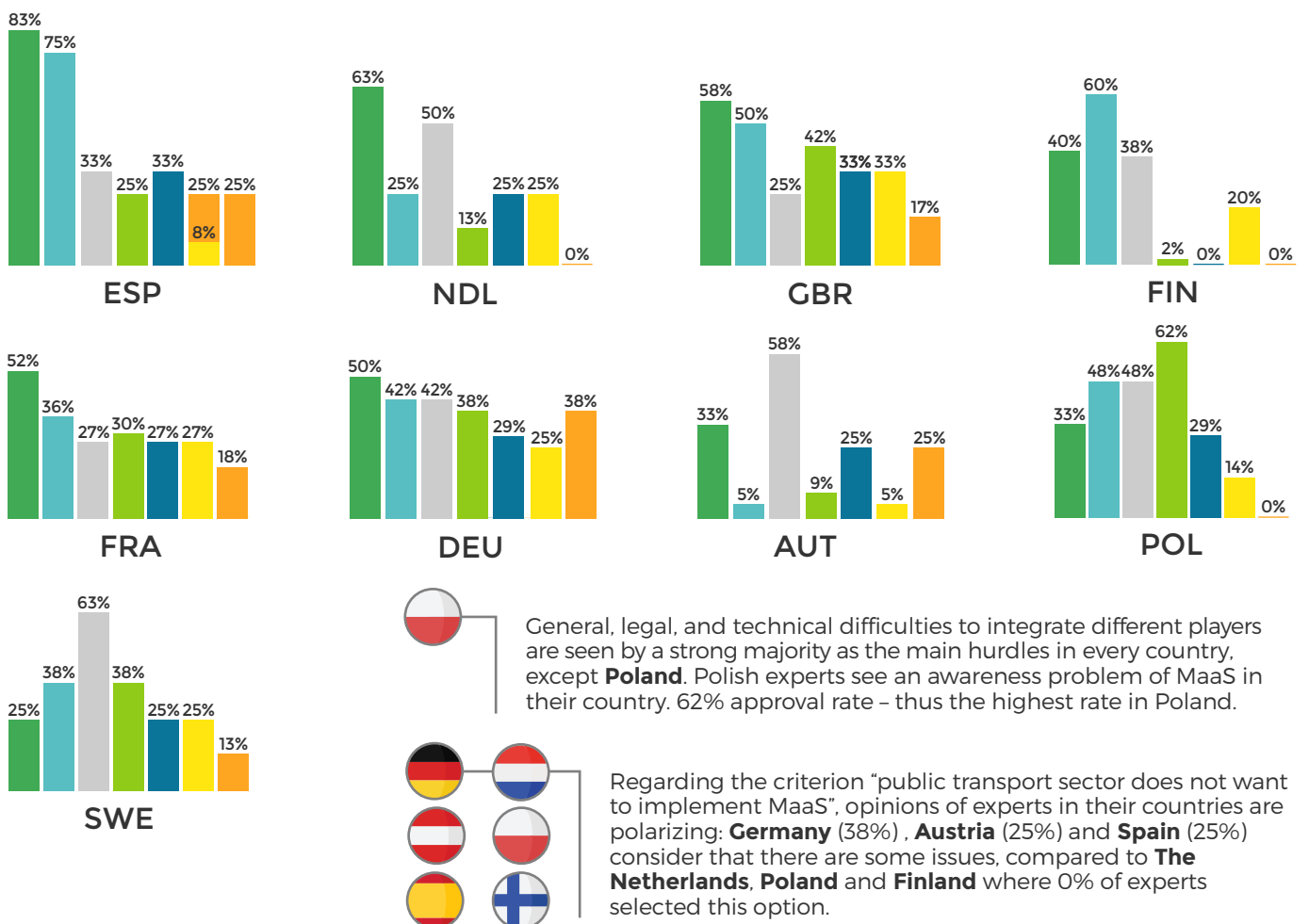
The hurdle “public transport sector does not want to implement MaaS” gets the lowest approval with 18%. But this criteria is weighted in the opposite way by Start-ups and Public sector. While start-ups attribute the highest, - and a disproportionately significant -, importance to this criterion with 33%, this criterion receives significantly less importance from the public sector and the least significance compared to the other sectors with just 5%.

Start-up experts believe, more than any other expert group, that MaaS is not sufficiently known (44%) and that it is not supported by public transport (33%).

Public sector experts believe that difficulty of integrating different players (76%), technical hurdles (43%) and legal issues (43%) are the main reasons for the lack of implementation.

Q: “In some countries MaaS has already been successfully implemented. In others, not yet. How would you describe the development in your country?”

Figures are based on the average of the experts from the 9 participating European core countries, which have not voted that MaaS has already been implemented. n = 167.



Chapter Summary: Mobility As A Service (MaaS)

MaaS One Term, Multiple Definitions and Some Awareness Problems

The main challenge within the survey on the question of new mobility as a service lies in the definition of the term. The term can be interpreted in many different ways, which became apparent during the interview phase of the data collection. In some cases, MaaS was used synonymously with intermodal mobility services. However, the decisive criterion which differentiates MaaS from Intermodal Mobility Services is that MaaS includes a payment function. A single App would be used to select, book and pay for mobility services, even if this includes different types of services and different providers. In this respect, the following definition is provided:

“MaaS is the integration of various forms of transport services into a single mobility service offer with a single booking & payment channel. Public transport, ride-, car- or bike-sharing, taxi and car rental services can be combined in various consumer flat fee or on-demand offers.”

Only 1% of experts stated to be unfamiliar with the term MaaS. Surprisingly, 27% agreed that one of the main hurdles for the implementation of MaaS is that it is not yet sufficiently recognised. It seems as if some countries have a considerable awareness problem for MaaS, an opinion held especially by experts from the Start-up sector. These experts believe, more than any other expert group, that MaaS is not sufficiently known (44%).

The Advanced State of Progress Regarding MaaS in Europe

75% of European experts describe an advanced state of progress and implementation of MaaS in their countries, meaning MaaS has already been implemented or is being planned for.

Regarding the state of progress, the countries can be divided into 3 groups:

- In the first group (FIN, AUT, NDL) MaaS is already implemented or in process.
- In the second group (DEU, GBR, ESP, FRA, SWE) at least 60% of experts think that MaaS is implemented or in already process.
- Only in Poland, 62% of the experts believe so far there had been little activity implementing MaaS.

Main Hurdles: General, Legal and Technical Difficulties Integrating Different Players

General, legal, and technical difficulties to integrate different players are viewed by a strong majority as the main hurdle in every country, except for in Poland. Polish experts view the lack of awareness of MaaS in their country as the main problem.

49% of experts believe that difficulties integrating different players, 41% that technical hurdles and 43% believe that legal issues are the biggest issues for MaaS implementation.

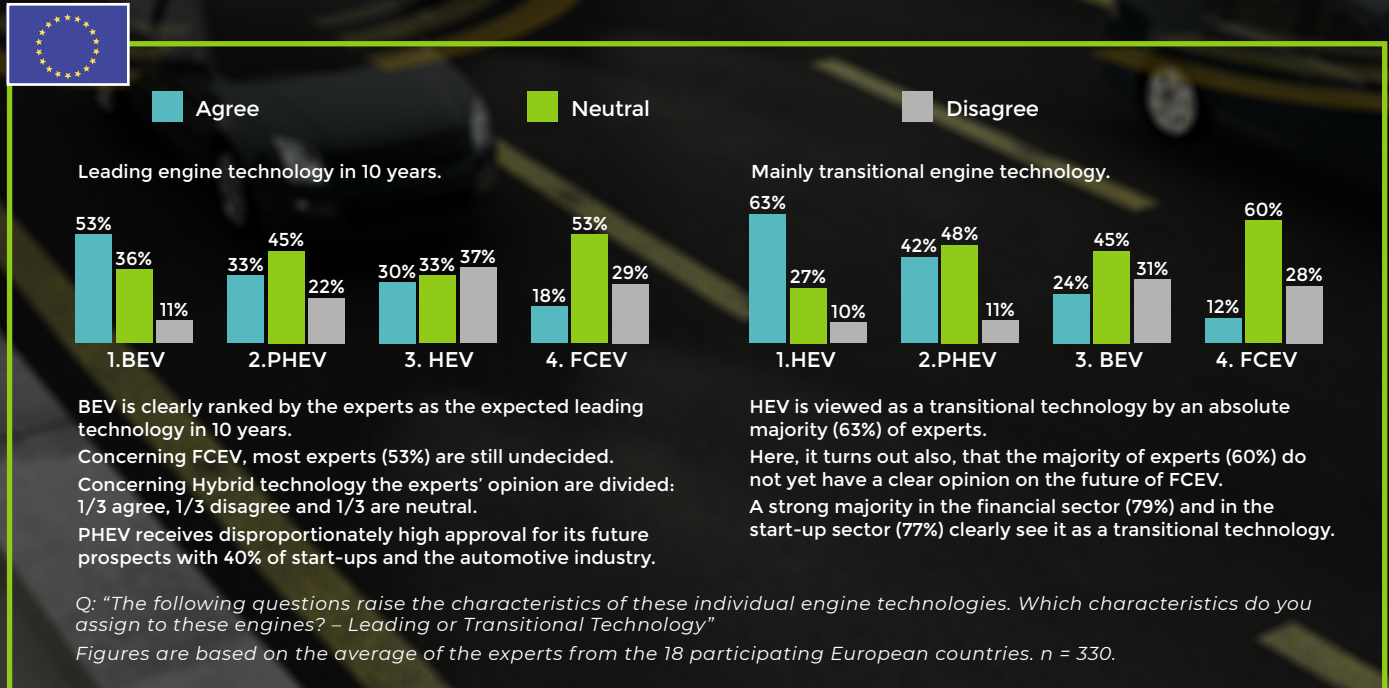
Importance of the Public Sector for Successful Implementation of MaaS

The highest rate of whether MaaS has been implemented stems from the public sector, compared to the lowest rating from the start-up sector. These figures correspond with the results of the question concerning the hurdles of MaaS implementation. For this criterion Start-up and Public sector seem to be of highly opposing opinions. Furthermore, some experts from Germany, Austria and Spain are of the opinion that one of the issues of implementation is that the public transport sector does not want to implement MaaS, whereas experts from The Netherlands, Poland and Finland gave this criterion 0%.




E-mobility Engines BEV - FCEV -PHEV- HEV Leading Or Transitional Technology

BEV will be the leading technology in 10 years
HEV is expected to be a transitional technology




Leading engine technology in 10 years


BEV/ leading engine technology in 10 years

	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
POL	86%	14%	0%	1
ESP	71%	12%	18%	1
SWE	64%	36%	0%	1
	53%	36%	11%	1
AUT	50%	33%	17%	1
NDL	47%	47%	5%	1
FRA	44%	47%	9%	1
DEU	43%	37%	20%	1
GBD	40%	40%	20%	2
FIN	29%	57%	14%	3


PHEV/ leading engine technology in 10 years

	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
POL	52%	33%	14%	2
ESP	50%	50%	0%	3
GBD	43%	36%	21%	1
FRA	37%	43%	20%	3
	33%	45%	22%	2
AUT	33%	50%	17%	2
FIN	29%	62%	10%	2
DEU	25%	38%	38%	3
SWE	20%	40%	40%	2
NDL	5%	53%	42%	4

FCEV/ leading engine technology in 10 years


	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
GBD	36%	50%	14%	4
NDL	33%	44%	22%	2
POL	19%	67%	14%	3
ESP	19%	31%	50%	4
	18%	53%	29%	4
FRA	18%	48%	33%	4
FIN	14%	71%	14%	4
DEU	14%	43%	43%	4
SWE	9%	73%	18%	3
AUT	4%	47%	49%	3

HEV/ leading engine technology in 10 years


	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
ESP	53%	18%	29%	2
FIN	52%	29%	19%	1
FRA	42%	32%	26%	2
GBD	39%	38%	23%	3
DEU	38%	35%	26%	2
	30%	33%	37%	3
NDL	26%	26%	47%	3
POL	14%	57%	29%	4
SWE	8%	26%	66%	4
AUT	4%	31%	65%	4

Mainly transitional technology


HEV/ Mainly transitional technology

	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
GBD	71%	27%	2%	1
SWE	70%	28%	2%	1
FRA	68%	19%	13%	1
FIN	67%	33%	0%	1
NDL	67%	28%	6%	1
DEU	67%	24%	9%	1
ESP	65%	18%	18%	1
	63%	27%	10%	1
AUT	50%	17%	33%	1
POL	43%	43%	14%	2


PHEV/ Mainly transitional technology

	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
DEU	61%	29%	10%	2
NDL	58%	26%	16%	2
SWE	50%	50%	0%	2
POL	43%	57%	0%	1
	42%	48%	11%	2
GBD	36%	43%	21%	2
AUT	33%	50%	17%	2
FRA	33%	40%	27%	2
ESP	31%	63%	6%	2
FIN	30%	68%	2%	2

BEV/ mainly transitional engine technology

	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
POL	40%	30%	30%	3
GBD	33%	27%	40%	3
DEU	32%	38%	29%	3
	24%	45%	11%	3
FRA	24%	41%	35%	3
NDL	21%	53%	26%	3
FIN	19%	43%	38%	3
SWE	18%	45%	36%	3
AUT	17%	67%	17%	3
ESP	12%	59%	29%	4

FCEV/ Mainly transitional technology

	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
ESP	19%	31%	50%	3
POL	19%	71%	10%	4
AUT	17%	67%	17%	4
NDL	17%	50%	33%	4
FRA	15%	39%	45%	4
GBD	14%	64%	21%	4
	12%	60%	28%	4
DEU	6%	50%	44%	4
SWE	6%	74%	20%	4
FIN	2%	69%	29%	4



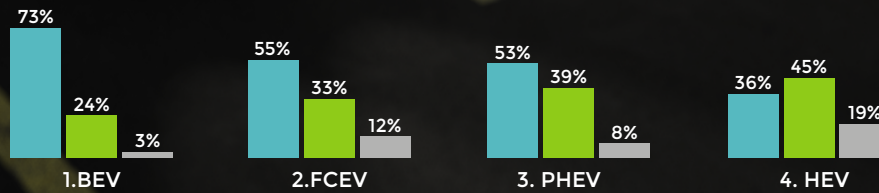
E-mobility Engines BEV - FCEV -PHEV- HEV Environmental Impact

**BEV is ranked number 1 by 3/4 of the experts
FCEV gets the 2nd place, closely followed by PHEV**



Technology with positive environmental impact.

Agree Neutral Disagree



Q: "The following questions raise the characteristics of these individual engine technologies. Which characteristics do you assign to these engines? - Technology with positive environmental impact." Multiple answers can be selected. Figures are based on the average of the experts from the 18 participating European countries. n = 330.

Technology with positive environmental impact - ranked by country

In all countries the BEV stands in first place.
Only German experts see FCEV in first place and in Finland PHEV comes first.

BEV /technology with positive environmental impact

	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
ESP	100%	0%	0%	1
GBD	87%	13%	0%	1
POL	86%	14%	0%	1
NDL	74%	26%	0%	1
EU	73%	24%	3%	1
AUT	67%	33%	0%	1
FIN	67%	33%	0%	2
SWE	64%	36%	0%	1
DEU	60%	29%	11%	2
FRA	56%	32%	12%	1

FCEV/ technology with positive environmental impact

	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
DEU	79%	12%	9%	1
SWE	64%	34%	2%	2
POL	57%	33%	10%	2
EU	55%	33%	12%	2
AUT	54%	46%	0%	2
FRA	50%	34%	16%	3
GBD	50%	43%	7%	3
ESP	50%	31%	19%	4
FIN	48%	29%	24%	3
NDL	44%	33%	22%	2

PHEV/ Technology with positive environmental impact

	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
FIN	81%	19%	0%	1
ESP	69%	19%	13%	3
POL	57%	30%	7%	3
FRA	55%	38%	7%	2
EU	53%	39%	8%	3
AUT	50%	50%	0%	3
GBD	46%	54%	0%	4
NDL	42%	47%	11%	3
SWE	40%	50%	10%	3
DEU	38%	38%	25%	4

HEV/ technology with positive environmental impact

	AGREE	NEUTRAL	DISAGREE	RANKING WITHIN A COUNTRY
ESP	71%	18%	12%	2
GBD	57%	21%	21%	2
FRA	45%	32%	23%	4
FIN	43%	43%	14%	4
EU	36%	45%	19%	4
AUT	33%	67%	0%	4
POL	29%	52%	19%	4
NDL	26%	32%	42%	4
DEU	21%	59%	21%	3
SWE	0%	78%	22%	4

Technology with positive environmental impact - ranked by sector

All four sectors see BEV ranked in first place.
FCEV is ranked 2nd by the Automotive Industry and the Finance sector and 3rd by Public sector and Start-up sector, which see PHEV on 2nd position.

	PUBLIC SECTOR (GOV/PTA)	RANKING INSIDE SECTOR	AUTOMOTIVE INDUSTRY	RANKING INSIDE SECTOR	FINANCE SECTOR	RANKING INSIDE SECTOR	START-UP SECTOR	RANKING INSIDE SECTOR
BEV	74%	1	63%	1	77%	1	72%	1
FCEV	60%	3	48%	2	70%	2	52%	3
PHEV	68%	2	42%	3	59%	3	60%	2
HEV	56%	4	28%	4	27%	4	36%	4

Figures are based on the results of the experts' opinion in these four sectors. n=165.



E-mobility Engines BEV – FCEV –PHEV- HEV Suitability Distances and Carsharing

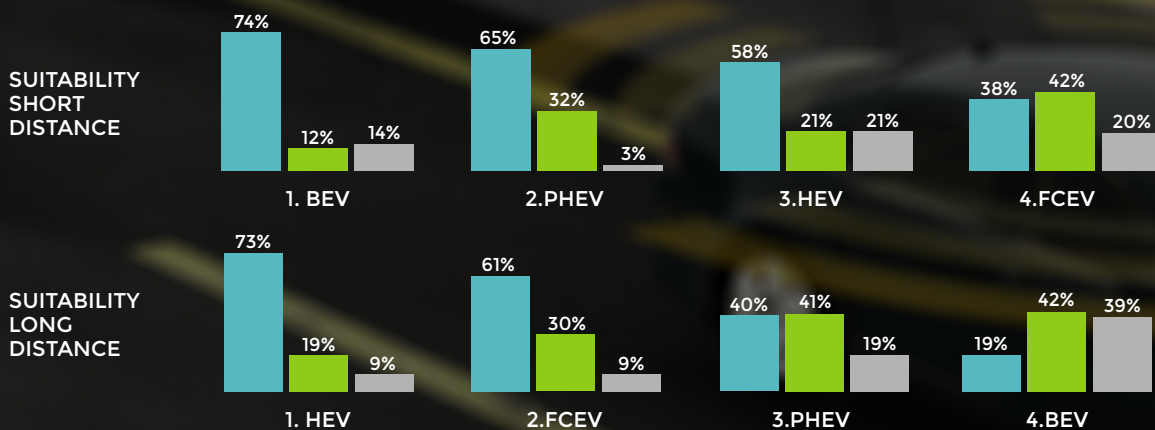
FCEV and HEV are particularly suitable for long distances
All technologies are suitable for both carsharing models



■ Agree
 ■ Neutral
 ■ Disagree

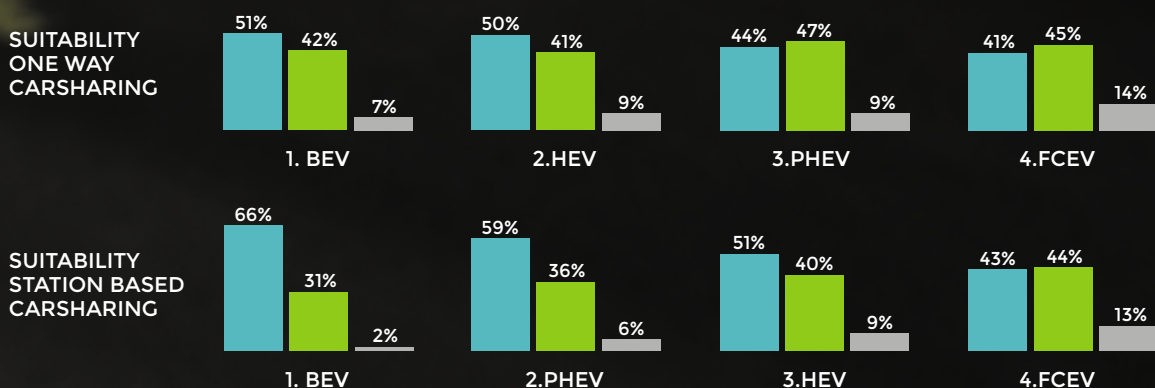
SUITABILITY SHORT / LONG DISTANCE

Battery vehicles such as BEV and PHEV are considered by a strong majority (65%+) to be predestined for short distances. HEV and FCEV are considered by a strong majority (60%+) as predestined for long distances.



SUITABILITY ONE WAY /STATION BASED CARSHARING

Little differentiation regarding the suitability for the two carsharing models. All four technologies are considered by experts to be suitable for both models. Approximately 40% are neutral on this issue regarding all technologies, but only about 2-14% consider a technology as unsuitable.



Q: "The following questions raise the characteristics of these individual engine technologies. Which characteristics do you assign to these engines? – suitability short/ long distance – suitability one-way/station based carsharing." Multiple answers can be selected.

Figures are based on the average of the experts from the 18 participating European countries. n = 330.

Chapter Summary: E-MOBILITY Engines BEV – FCEV – PHEV- HEV

Leading Engine Technology in 10 Years

Although the majority of experts predicts for BEV engines to become the leading technology in 10 years, the results illustrate uncertainties whether PHEV and HEV engines could also become leading technologies, whereas only the minority expect FCEV engines to take on a leading role. One must consider though, that experts' are yet relatively uncertain what role FCEV could take in the engine market, as this was the only engine type to receive a disproportional amount of 'neutral' answers. The engine predicted to be mostly used as transitional technology is HEV.

Engine Type with Most Positive Environmental Impact

BEV engines received the largest percentage of approval in regards to its positive environmental impact, although FCEV and PHEV engines also received high ratings. Here it is apparent, that experts from all participating countries (except Germany and Finland) are of the same opinion, choosing BEV as the most environmentally friendly engine. Interestingly, German experts voted FCEV engines as having the most positive environmental impact.

HEV technology, being the one viewed primarily as a transitional technology, received the least expert votes within this category.

Suitability for Long Distances

The two technologies regarded as most suitable for long distances are HEV and FCEV, whereas BEV is more suitable for short distances according to experts.

Suitability for Carsharing

The aim of the question was to find out whether experts predict an engine preference within the two carsharing models (station-based and one-way carsharing). The study revealed that all four engine technologies are predicted to suit both models, although FCEV received the lowest scores.

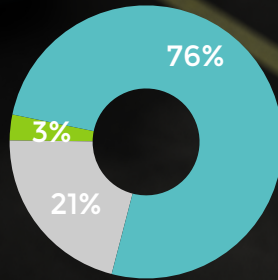


Challenges Of The Mobility Market Shift Advantages/ Disadvantages

76% believe that the benefits will outweigh the disadvantages



- Advantages will outweigh disadvantages
- Neutral
- Disadvantages will outweigh benefits



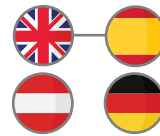
76% believe that the benefits outweigh the disadvantage, just 3% have a negative opinion.

The public sector (Public Transport, Government) believes with a majority of 60% in the advantages, which is the lowest rate compared to other sectors.

The finance sector has the highest belief rate (87%) in the advantages of this market shift.

Q: "There will be challenges and disadvantages of the market shift to New Mobility. In your opinion, the advantages or disadvantages are outweighed?"

Figures are based on the average of the experts from the 18 participating European countries. n = 330.



British, Austrian, Spanish and German experts see market changes positive with a strong majority of over 80%.



Each country has at least a majority of 62% (**FIN**) for the benefits.



Disadvantages are only seen in four countries (**FIN, NDL, AUT, FRA**). Here, however, the proportion is only 3-10% of the experts.



Challenges Of The Mobility Market Shift

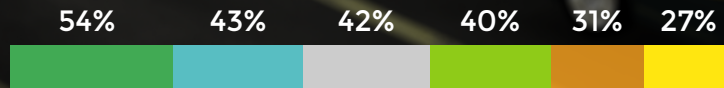
Can increased energy demand be covered by renewables?

Concerns that energy demand is increasing and cannot be covered by renewable energies - Less concerns about the labour market



- Demand for electricity will increase. This demand can hardly be covered by renewable energies.
- If AV and shared mobility are not based on renewable energies pollution could increase due to increased traffic.
- High competition for public transport could further worsen its profitability.
- AV and shared mobility could increase vehicle usage. This could increase congestion.
- A rapid market penetration of AV's could lead to many job losses in the taxi and bus industry.
- A shift of the car industry to EV's could lead to many job losses in the car mechanics industry.

Q: "In your opinion, what are the biggest challenges concerning the market shift to New Mobility?" (Several answers can be selected)



The biggest concern is that a growing e-mobility market cannot be covered by renewable energies. Regarding this concern the highest approval value across all criteria and industries comes from the automotive industry with 63%.

A serious consequence of this may be increased pollution caused by increasing traffic which is not generated by renewable energies (43%).

A worsening competitive situation for the public transport (42%) is in third place on the list of disadvantages.

Job losses are only selected by 1/4 (concerning mechanics industry) to 1/3 (concerning bus/ taxi market) as a negative consequence of the market shift. Start-ups (59%) and the public sector (52%) believe disproportionately that the situation for public transport is worsening due to increasing competition. For the start-ups see this as a desirable development, whereas the Public Transport as a disadvantage.

Figures are based on the average of the experts from the 18 participating European countries. n = 330.

Demand for electricity will increase. This demand could hardly be covered by renewable energies.

ESP	71%	GBD	57%
FRA	65%	EUROPEAN AVERAGE	54%
SWE	64%	NDL	42%
POL	62%	DEU	36%
FIN	57%	AUT	29%

If AV and shared mobility are not based on renewable energies pollution could increase due to increased traffic.

AUT	79%	GBD	45%
ESP	53%	EUROPEAN AVERAGE	43%
DEU	53%	FRA	26%
NDL	53%	POL	24%
FIN	52%	SWE	9%

High competition for public transport could further worsen its profitability.

FIN	67%	FRA	39%
POL	62%	AUT	38%
GBD	43%	ESP	35%
NDL	42%	DEU	31%
EUROPEAN AVERAGE	42%	SWE	18%

AV and shared mobility could increase vehicle usage. This could increase congestion.

FIN	67%	FRA	39%
GBD	50%	SWE	36%
NDL	42%	DEU	36%
ESP	41%	AUT	29%
EUROPEAN AVERAGE	40%	POL	24%

A rapid market penetration of AV's could lead to many job losses in the taxi and bus industry.

FIN	62%	POL	29%
GBD	43%	DEU	25%
AUT	38%	NDL	21%
EUROPEAN AVERAGE	31%	SWE	18%
FRA	29%	ESP	12%

A shift of the car industry to EV's could lead to many job losses in the car mechanics industry.

AUT	46%	SWE	27%
DEU	39%	EUROPEAN AVERAGE	27%
FIN	33%	POL	24%
FRA	29%	ESP	18%
FRA	29%	NDL	16%

Chapter Summary: Challenges of the Mobility Market Shift

Market Shift Seen as Predominantly Positive

The New Mobility market shift will lead to dynamic changes in the automotive industry, which is therefore confronted with a number of challenges. One of the most striking results of this study is, that only 3% of experts believe the disadvantages of the New Mobility market shift will outweigh the advantages. Although the outlook on the future of New Mobility is predominantly positive, it is important to consider some of the possible disadvantages.

Concern of Rising Energy Demand: Can Renewables Cover it?

When asked about which challenge is the most concerning in regards to the New Mobility market shift, the majority of experts selected 'rising demand for energy that cannot be covered by renewable energy sources' out of six different options. A significant majority of experts from Spain, France and Sweden selected rising demand for energy as the most concerning options, whereas comparatively experts from The Netherlands, Germany and Austria seem to be less worried about the challenge to cover the energy demand with renewables. Furthermore, the exponential increase of electricity necessary in the prospect of autonomous vehicles being primarily battery powered requires changes in the entire electricity grid.

The possibility of increased pollution is linked to the concern of how vehicles will be powered in the future and to what extent renewables can supply sufficient energy for the New Mobility market shift. In addition, the increased use of shared mobility and autonomous vehicles is expected to render mobility more affordable to the individual. This may, in fact, lead to increase traffic and congestion and create negative environmental impacts if these vehicles are not powered by renewable energy sources.

Economic future of Public Transport Influenced by Increasing Competition

Improved shared mobility and autonomous vehicles are expected to have an economic impact on the public transport sector. This prediction is linked to the expectation that autonomous vehicles will primarily be used for shuttles and robot-taxis, which will put increasing pressure on the public transport sector. In fact, experts from the public transport sector and start-up sector both believe, more than experts from any other sector, that conditions for public transport are worsening due to increased competition. One can, therefore, argue, that these predicted changes may open doors for the start-up sector to win market share in the mobility sector and are a concern for the public transport sector.

Fewer Concerns About Negative Consequences for the Labour Market

The New Mobility market shift will undoubtedly lead to job losses, specifically in the automotive mechanic's industry and in the public transport sector, where bus and taxi drivers will partially be replaced by robots. Only 1/4 of experts selected job losses in the automotive mechanic's industry as a concern, and 1/3 considered it a concern in the autobus and taxi industry. It can be argued, therefore, that although automated autobuses and taxis may put the public transport sector at a disadvantage, it may open doors to development and innovation. Concerning the automotive mechanic's industry, it is no surprise that experts from countries where the automotive industry employs a large number of citizens, such as Germany, France and Austria, are more concerned about potential job losses than experts from other countries.



Hotspots & Lead Countries New Mobility Hotspots Europe

**Paris stands in first place before London
Helsinki rises to the top three - equal to Berlin**



Q: "In your opinion which city (ies) can currently be referred to as THE New Mobility hotspot in Europe (you can name two)?"

Figures are based on results of the experts from the 9 participating European core countries. The votes of the 8 countries were adjusted, so that each country has the same proportion. Open question/2 responses allowed/ 43 cities were named/ n = 279.



Top 10 New Mobility Hotspots 2018			Ranking 2016
1	PARIS	12,7%	(4)
2	LONDON	12,0%	(1)
3	HELSINKI	11,6%	(5)
3	BERLIN	11,6%	(2)
5	AMSTERDAM	10,4%	(3)
6	COPENHAGEN	6,5%	N/A
7	MUNICH	3,4%	N/A
8	BARCELONA	3,0%	N/A
9	MADRID	2,7%	N/A
9	WARSAW	2,7%	N/A



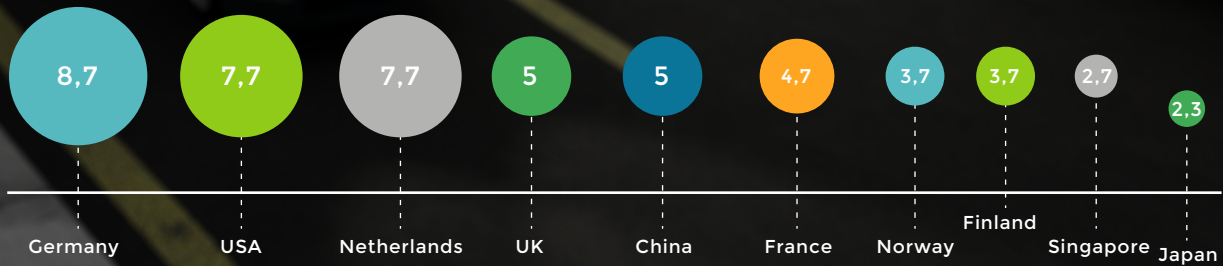
Hotspots & Lead Countries

The New Mobility Lead Countries Worldwide

Germany, USA and Netherlands seen as the leading New Mobility countries. Norway and China are leading the E-Mobility segment. Finland gets 2nd place in Digital Services



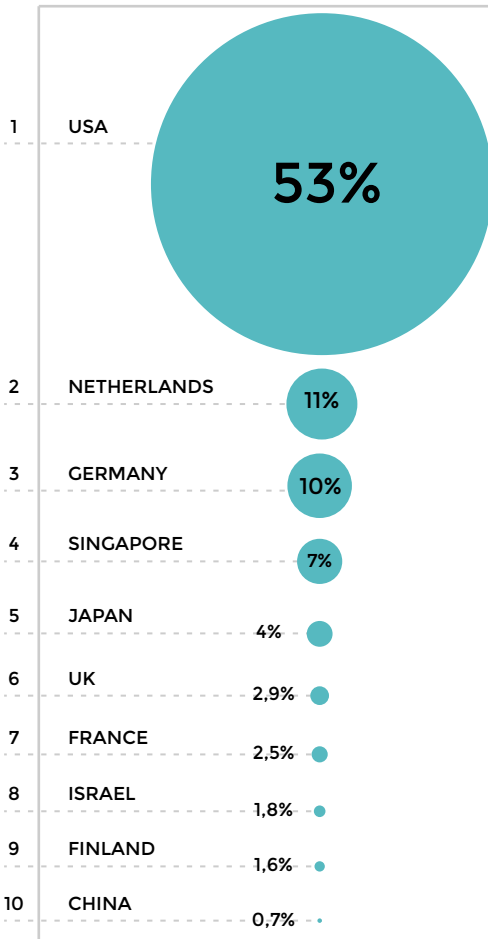
New Mobility Combination of 3 (weighted average of the 3 single valuations)



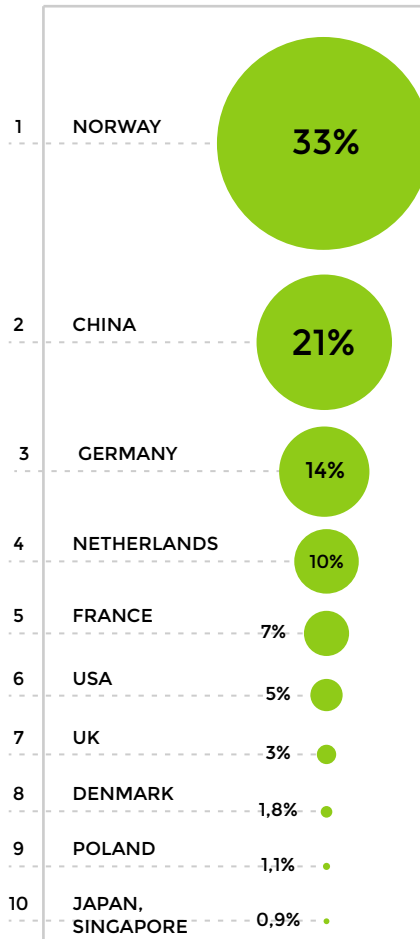
Q: "We define New Mobility as the umbrella term for the three segments New Mobility Services, E-Mobility, Connected and Autonomous Driving. In which country (worldwide) do you consider the development to be the most progressive?" (Please answer segment by segment)

Figures are based on results of the experts from the 9 participating European core countries. The votes of the 9 countries were adjusted, so that each country has had the same proportion. Open question/ n = 279.

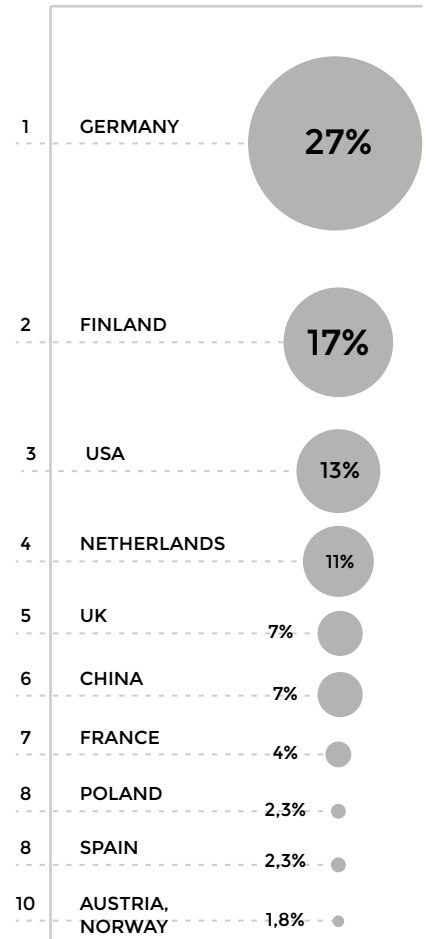
Connected & Autonomous Driving



E-Mobility



New Mobility Digital Services





Hotspots & Lead Countries E-Mobility Market-Share Trends

Majority estimates market share-gains for European, Chinese and Japanese car brands in Europe

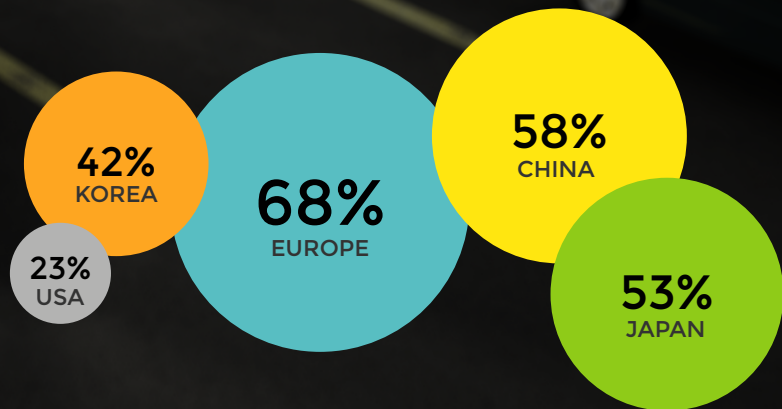
Only 23% of experts see US-car brands gaining market share in Europe



New Mobility Combination of 3
(weighted average of the 3 single valuations)

- European car brands
- Chinese car brands
- Japanese car brands
- Korean car brands
- Us-American car brands

Q: "The dynamic development of the e-mobility market is accelerating. Which brands will gain market share in the next 5-10 years in this market in Europe?"
(Several answers can be selected).



Figures are based on the average of the experts from the 18 participating European countries. n = 330.

Chapter Summary: New Mobility Hotspots & Lead Countries

European New Mobility Hotspots

The city anticipated to become the New Mobility Hotspot is Paris, followed by London and Berlin and Helsinki in third place. Although the top five cities selected as hotspots in ENMS'16 and ENMS'18 have remained the same, their order has changed.

Most Progressive New Mobility Lead Countries

When evaluating the results from this question, it should be taken into consideration that this was an open question, divided into three separate sections: E-Mobility, Connected & Autonomous Driving and Digital Services.

Connected & Autonomous Driving

Considering that the question was only answered by experts from European countries, it is interesting to see that many non-European countries were in fact chosen to be progressive in the industry.

The great majority of experts predicted the US to become the most progressive country in regards to Connected & Autonomous Driving, followed by The Netherlands and Germany, representing the leading countries within Europe. Singapore and Japan ranked fourth and fifth, and are therefore expected to be the most progressive countries in the Asian market.

E-Mobility

One-third of experts predicts Norway to be the most progressive country for E-Mobility, followed by China and Germany. Surprisingly the US only received 5% of the votes for this question.

New Mobility Digital Services

For the New Mobility Digital Services, experts anticipate Germany to become the leading country in the field, with Finland and the US following close by.

New Mobility Total Evaluation (weighted average of 3)

In the total evaluation of the three segments, Germany came in first place, closely followed by the USA and the Netherlands, which share the second place and China representing the Asian market by coming in fourth place.

Future Positive Market-share Trends of Car-Manufacturing Countries

The aim of the question was to identify a general trend, not the specific market share gain for car manufacturing countries: which countries will gain market share with their car brands in the European E-Mobility market.

The vast majority of European experts expect European brands to gain on market share, followed closely by Chinese brands, Japanese brands and Korean brands. It is astonishing, that the US brands receive very little recognition within this topic in this pan-European survey.

Executive Summary

The European New Mobility Expert Survey 2018 is a trend analysis in the area of New Mobility. Five main topics were tackled by the survey: Autonomous Vehicles, Mobility as a Service, E-mobility Engines, Challenges of the Mobility shift and Lead-Countries & Hotspots. The aim of this expert survey was to identify trends and problems of the mobility market shift at an early stage. The mobility market is on the rise. Innovation and disruptions change usage behaviour and also the market conditions for the providers in this market. However, the pan-European survey shows that this upheaval has different stages of development in the individual European countries. It also shows that the opinions of experts in the automotive industry, the public sector, start-ups and investors differ from each other.

Autonomous Driving

The main results of the survey concerning the future of autonomous vehicles are that AVs will mainly be used for general passenger transport (robot-taxis and public transport). For private use, a high price sensitivity is predicted of which a consequence will be a disruptive change in the usage type of vehicles from private to public. A strong majority of experts is of the opinion that the most popular engine for AV will be battery powered and in fact, only a very small minority of experts' expect internal combustion engines for autonomous vehicles.

Mobility as a Service (MaaS)

MaaS is a term used to describe the integration of various forms of transport services into a single mobility service offer with a single booking & payment channel. The state of progress is generally considered to be quite advanced in Europe. However, there are three stages of development: the very advanced countries - such as The Netherlands and Finland - and countries where MaaS has not successfully been implemented yet, such as f. ex. Poland. The difficulty in implementing MaaS is mainly seen when trying to bring together different players and especially different companies in one App. These difficulties are highlighted by economic, legal and technical hurdles. The most evident difference in opinion here was between experts from the public transport and start-up sector. Many start-up experts believe that one hurdle is, that MaaS is not sufficiently supported by public transport.

E-Mobility Engines

Concerning the topic of E-mobility engines, the study aimed to gather experts' opinions on engine technology regarding different characteristics. According to experts' BEV will most likely be the leading engine in 10 years. HEV engines were mainly expected to be more of a transitional technology.

Interestingly, experts' opinions were still very uncertain about how FCEV engines could fit into the market of the future. Regarding environmental impacts of engines, BEV are the ones considered the engines likely to have the most positive impact on the environment, followed by FCEV. German experts even voted FCEV to be the most environmentally friendly engine. Interestingly, where experts were uncertain about the future of FCEV, they agreed that this type of engine is certainly environmentally friendly.

Challenges

Overall, the impact that changes in the mobility market will bring were regarded as predominantly positive, with the overall expectation that advantages will clearly outweigh the disadvantages. Nonetheless, possible concerns must be considered: The primary concern and biggest challenge of the new mobility market shift is whether the rising energy demand can be covered by renewables. With experts' predictions stating that the leading engine technologies will be battery powered, they are concerned how a rapid change in mobility can be made sustainable. Furthermore, the public transport sector faces challenges in how to adapt to the new mobility market shift, possibly leaving gaps that may be filled by start-ups. The impact of changes in the mobility market on the labour market, especially bus, taxi and automobile industry, was viewed as less critical. In the car producing country, Germany experts were the most concerned - compared to other countries - about the impact disruption will bring to the labour market.

Lead-Countries & Hotspots

Experts predict Paris to become the new New Mobility hotspot, followed closely by London, and then Helsinki and Berlin sharing third place. Paris, therefore, moved from 4th place in 2016 to the first rank in 2018. Experts largely agreed that the USA will be the lead country for autonomous driving, followed by The Netherlands, Germany and Singapore. In the E-Mobility sector, Norway is expected to be the leading country, followed by China and Germany. Lead Countries in Digital Services are expected to be Germany, Finland and the USA. Thus, Germany, the USA and The Netherlands are the most progressive countries in terms of the three segments of New Mobility.

The European outlook of the study has shown that it is important to differentiate development and expert opinions by country. Usage behaviour is changing, legislations transforming as well as cultural understanding of innovation and disruption shifting.

However, as mobility knows no boundaries per se, it is important to keep an eye out on these innovative market changes with an international focus.

Disclaimer

Despite the greatest possible care, Green Business Development assumes no liability for the accuracy and completeness of these survey results. The survey is a trend analysis and does not claim to be representative. The reader remains responsible for management and/or investment decisions.

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