



Towards an integrated approach to testing automated driving on public roads

EUCAR Conference 2019, Brussels

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VOLKSWAGEN
AKTIENGESELLSCHAFT



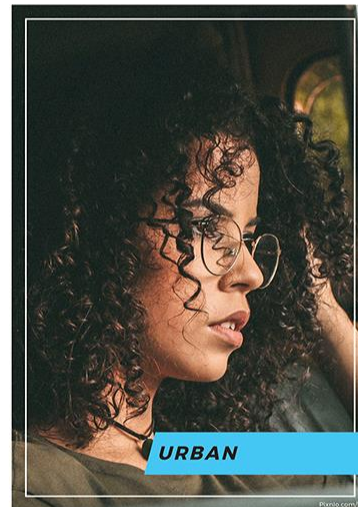
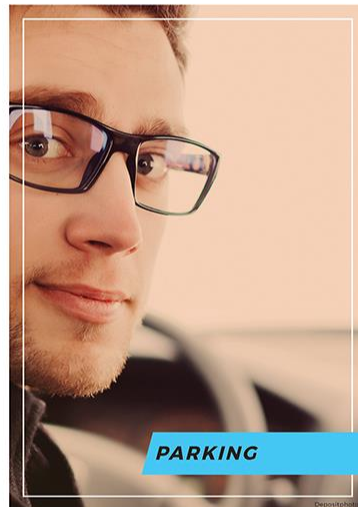
L3 Pilot
Driving Automation

1,000
drivers

100
cars

10
countries

L3 Pilot
Driving Automation
Applications



1,000 drivers

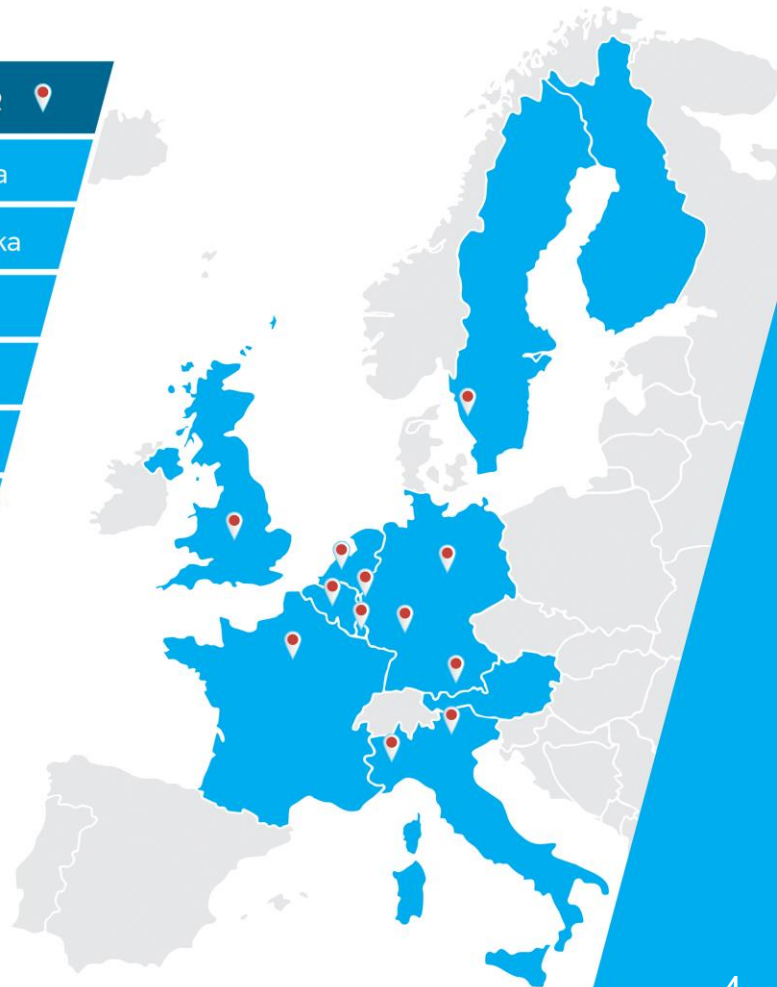
100 cars

10 European countries

Pilot across Europe



COUNTRY/REGION / PARTNER 	
BE / Brussels	Toyota
DE / Aachen	Ford / ika
DE / Munich	BMW
DE / Offenbach	Honda
DE / Wolfsburg	VW
DE / Ingolstadt	Audi
FR / Paris and other regions	REN / PSA
IT / Turin and Trento	CRF
LU / NL	Aptiv
SE / Gothenburg	Volvo
UK / Coventry	JLR
+ Cross-border activities	



Facts



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723051.



€68 million BUDGET





































48 months DURATION, starting in September 2017

€36 million FUNDING

34 PARTNERS, among them OEMs, suppliers, research, SMEs, insurers, authorities and user groups

12 COUNTRIES involved: Austria, Belgium, France, Finland, Germany, Greece, Italy, Netherlands, Norway, Sweden, Switzerland, UK

Partners

OEMs	      	       	
Suppliers	  	   	
SMEs	 	       	
Insurers	 		

1,000 drivers 100 cars 10 European countries Piloting Automated Driving on European Roads.

Methodology



Data



Fleet



Piloting



Evaluation



Code of Practice



PREPARE

DRIVE

EVALUATE

DEPLOY - Europe-wide Piloting Environment - User Studies - Business Studies



TRAFFIC JAM CHAUFFEUR



MOTORWAY CHAUFFEUR



PARKING CHAUFFEUR



URBAN CHAUFFEUR

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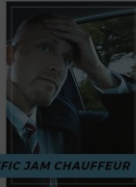
Code of Practice

PREPARE

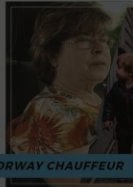
DRIVE

EVALUATE

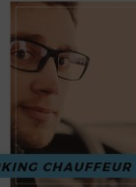
DEPLOY - Europe-wide Piloting Environment - User Studies - Business Studies



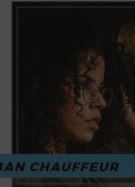
TRAFFIC JAM CHAUFFEUR



MOTORWAY CHAUFFEUR

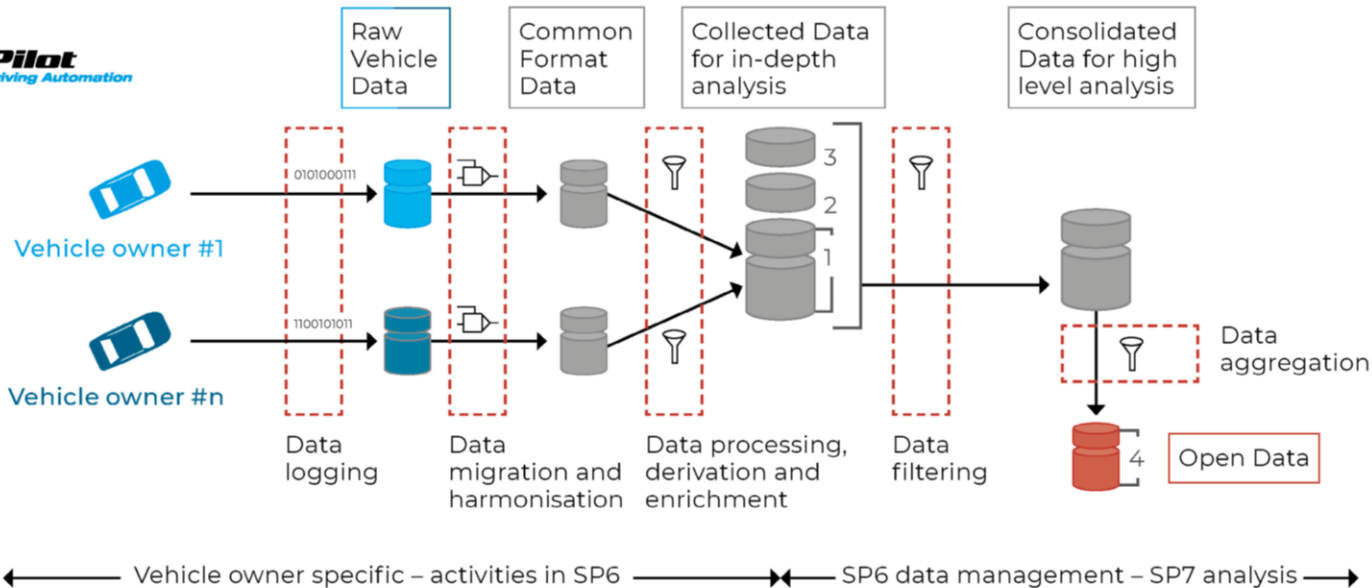


PARKING CHAUFFEUR



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L3Pilot Data Flow



Categories of data:

- 1 Derived Vehicle Data (CAN, GPS, PIs, video, and/or video annotations)
- 2 Subjective Data (interviews, questionnaires, simulator studies)
- 3 External Data (weather, map, infrastructure, other traffic participants, ...)
- 4 Open Data (aggregated data)

 Tools provided by SP5

© L3Pilot



Pseudonymization Process

Personal information

First name	Last name	Driver ID	SHA256(Driver ID + salt)	Age	Gender	Nationality	...
David	Davidson	001	1a064a72...1afe5341	26	Male	Earth	...
Stan	Stanson	002	b2452fbb...02753647	38	Male	Mars	...
Nelly	Nelson	003	339b0d9a...212960be	29	Female	Venus	...

Master table of participants which only OEM has access to

SHA256 driverID is only link between these

H5 file	Start timestamp	End timestamp	Driver ID	Trip ID (SHA256 of start timestamp + salt)	var
2019-04-23.h5	1530364592574	1530364652474	1a064a72	691ea24d...b79b5524	...
2019-04-24.h5	1530364651438	1530364677843	b2452fbb	4a8c43dd...1d228db6	...
2019-04-25.h5	1530364651778	1530364651234	339b0d9a	dc0d005d...4e26967a	...

H5 data for selected partner

Consolidated database (Consortium has access)

Trip ID	Start timestamp	End timestamp	Max/min/avg var
691ea24d	1530364592574	1530364652474	...
4a8c43dd	1530364651438	1530364677843	...
dc0d005d	1530364651778	1530364651234	...

Confidentiality

Data Detail

L3Pilot Common Data Format (L3Pilot CDF)

- In order to facilitate the analysis of data in L3Pilot, a common data format was developed based on experience from previous projects (AdaptIVe, euroFOT, UDrive, etc.)
- The CDF is **made available to the public** via Github:
<https://github.com/l3pilot/l3pilot-cdf>
 - Everyone is invited to use the format and contribute to it
 - Use open source tools and formats to facilitate use in other projects
- Detailed information on the format can be found on
<http://indexsmart.mirasmart.com/26esv/PDFfiles/26ESV-000043.pdf> (public access)

1,000 drivers 100 cars 10 European countries Piloting Automated Driving on European Roads.

Methodology



Data



Evaluation



Fleet

Piloting

Code of Practice

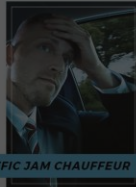
PREPARE

DRIVE

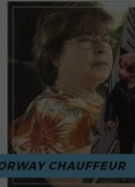
EVALUATE

DEPLOY

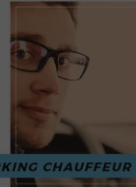
Europe-wide Piloting Environment - User Studies - Business Studies



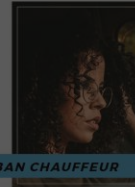
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MOTORWAY CHAUFFEUR

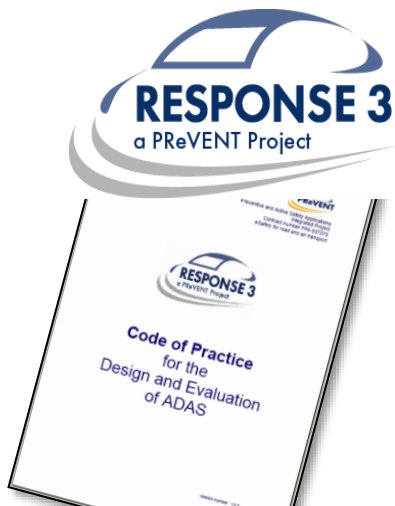


PARKING CHAUFFEUR



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History of the Code of Practice (CoP)



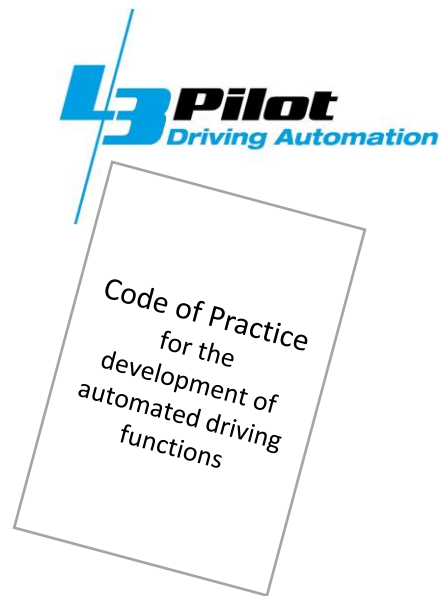
PREVENT:
RESPONSE 3 „CoP ADAS“

2008 2014



Adapt:Ve:
Response 4 „Legal aspects AD“

2017 2017








L3Pilot:
„Code of Practice AD“

2021

Categories of the CoP

- Categories of the CoP according to D2.1 „Code of Practice Framework“¹:

<p>Operational Design Domain Vehicle Level</p>  <p>Function description, system limits, test-/scenario catalogue</p>	<p>Operational Design Domain Traffic System Level</p>  <p>Remote assistance, V2X, MRM etc.</p>	<p>Safe Guarding Automation</p>  <p>Functional safety, cyber security, SOTIF, updates (e.g. over the air) etc.</p>	<p>Human-Machine Interaction</p>  <p>Provide guidelines for HMI, mode awareness/confusion, controllability etc.</p>	<p>Behavioral Design</p>  <p>Traffic safety (mixed traffic), references to Ethics</p>
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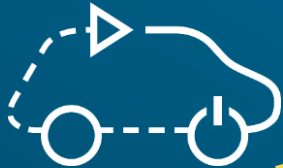
1: S. Wolter, A. Knapp, V. Jütten, M. Chen, F. Bonarens, U. Eberle, O. Schädler, Code of Practice Framework, L3Pilot Deliverable D2.1, 2018



L3 User Acceptance Survey

2	1	2	3	4
3	878	1547	1965	226
4				
5				
6	1	2	3	4
7	1587	1434	2358	135
8				
9				
10				
11	1	2	3	
12	928	873	2601	202
13				
14	1	2	3	4
15	968	1135	1958	223
16				
17	1	2	3	4
18	695	627	1582	298
19				
20				
21	1	2	3	
22	6210	460	659	
23				
24	1	2	3	
25	3671	2269	1389	
26				


Facts and figures



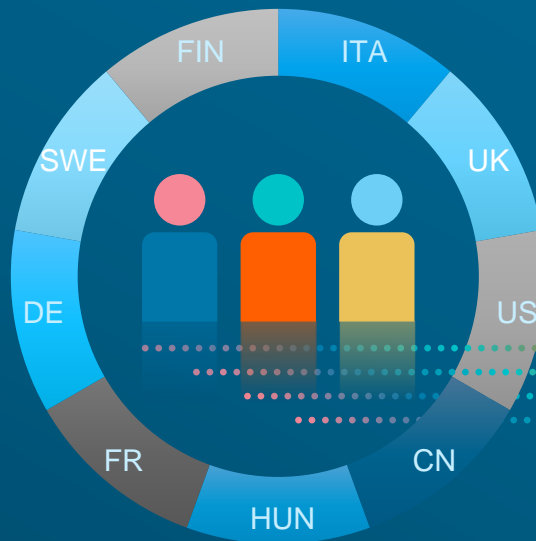
On **Conditionally Automated Cars** **L3 Car**



1 online survey



Data collection:
May and June 2019



9 countries

7 European and
2 non-European

EU - European Union
CN - China
US - United States

**9,000
car drivers**

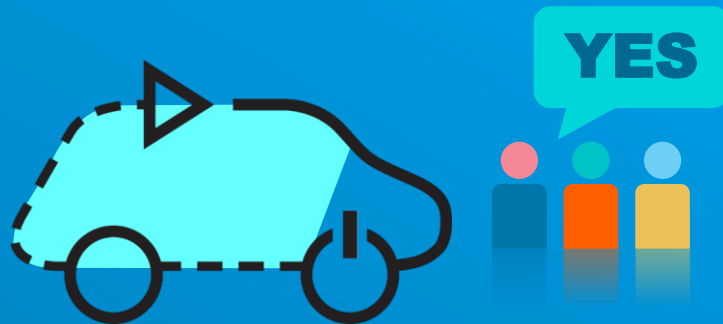
Long-term // Representative // International



What do people know about automated driving?

Awareness

> 75 % have heard about automated driving before



Role of driver in L3 car

> 70 % know that they have to take over control

Knowledge about L3 functions

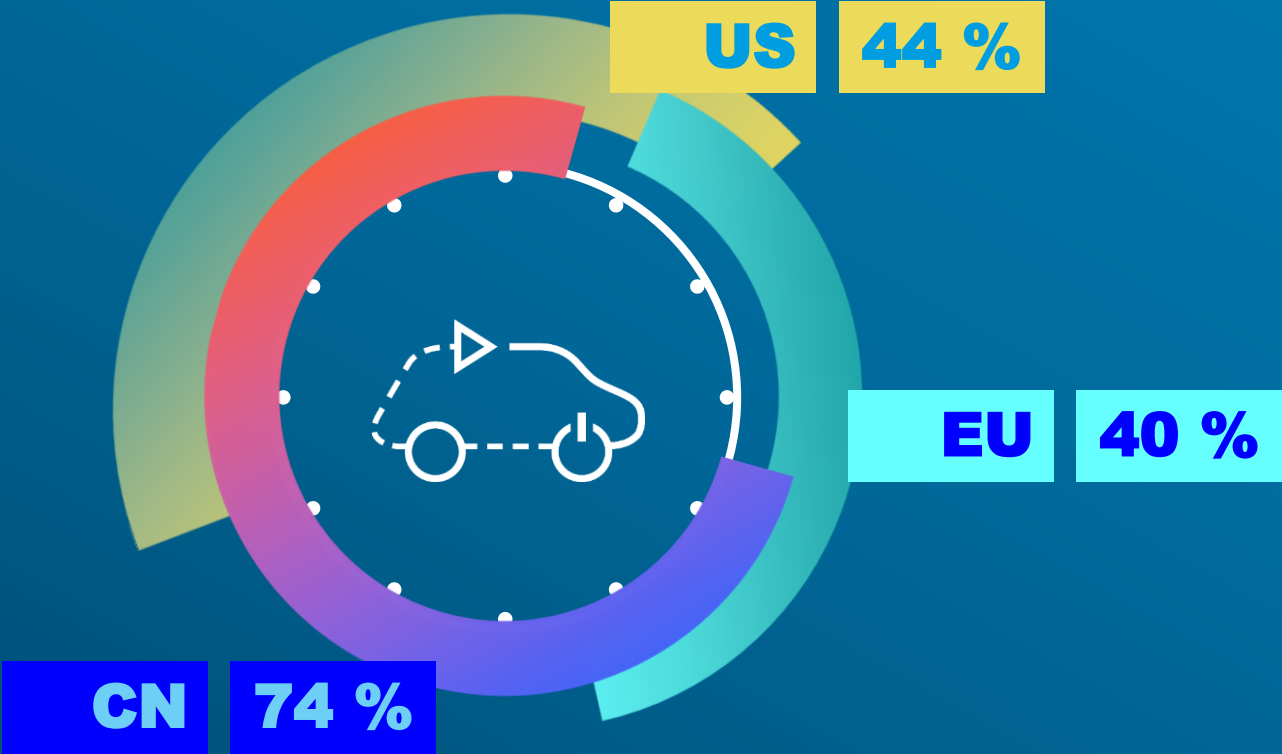
L3 car stays in lane **85 %**

overtakes alone **55 %**

does NOT operate everywhere **57 %**

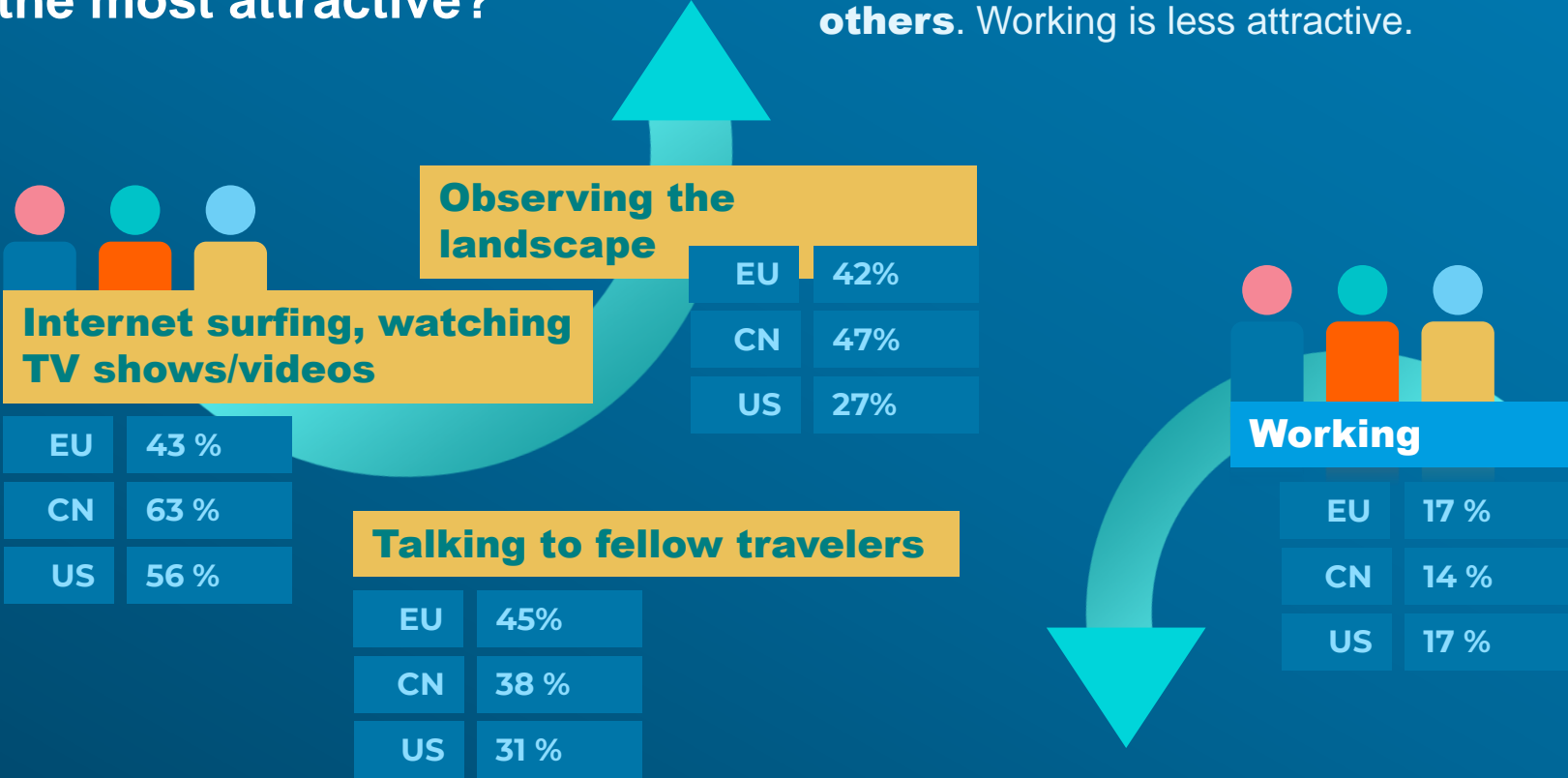
Would people use their time in the car for other activities?

YES



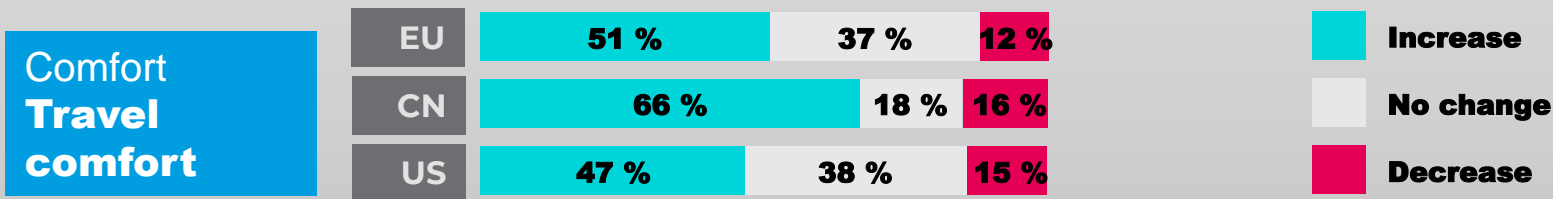
Which activities would be the most attractive?

Respondents prefer to **be entertained, relax and communicate with others**. Working is less attractive.



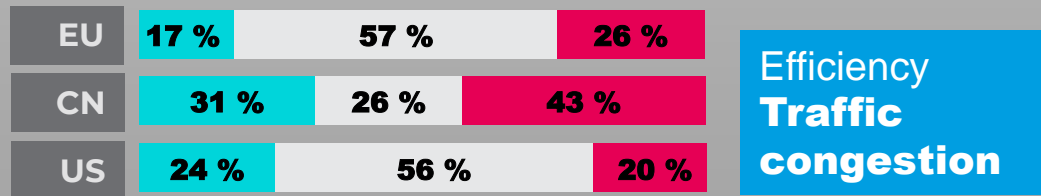
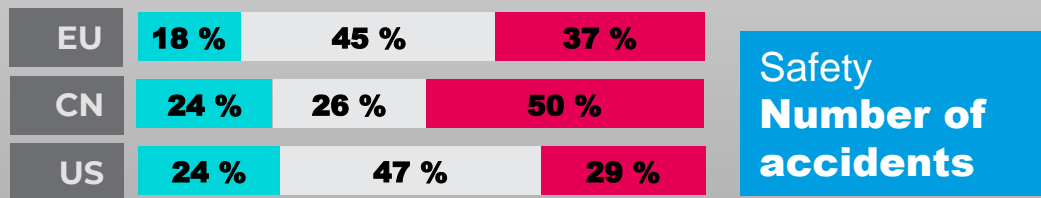
Note: Max. selection of 3 activities/respondent

Which benefits do the people expect for their own mobility?

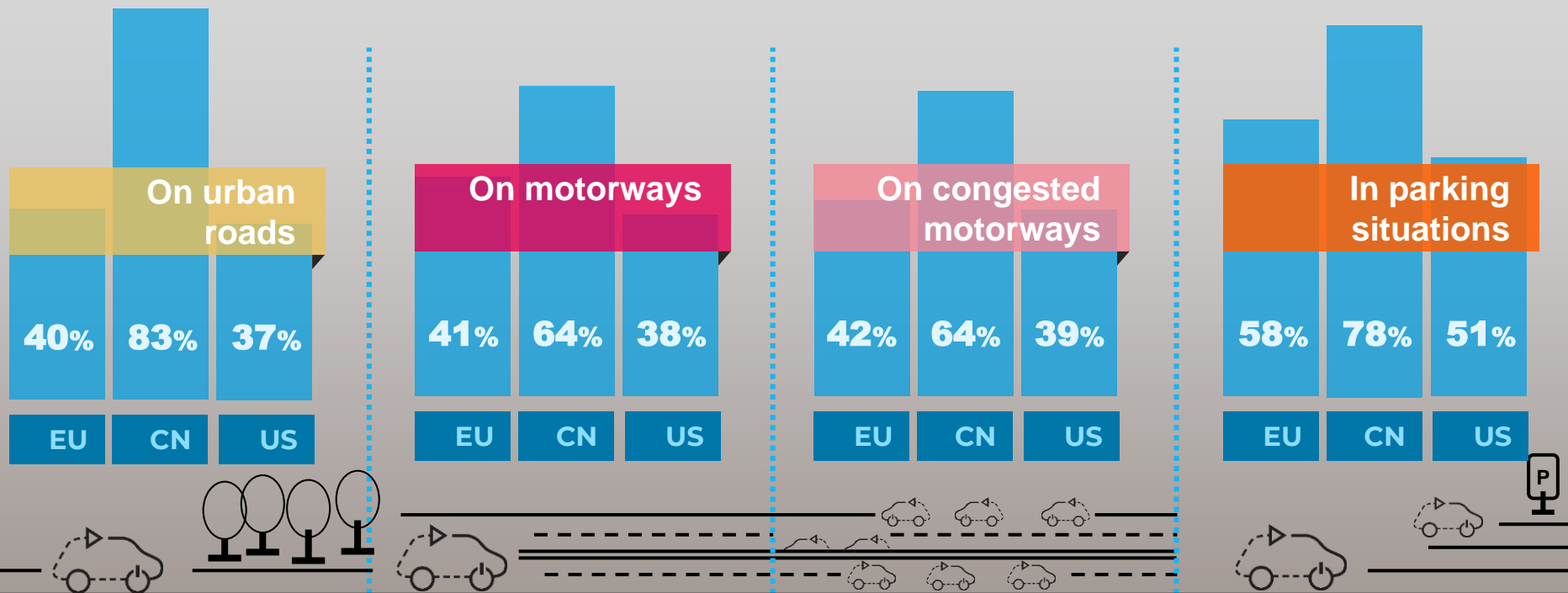


Clear benefit is seen in terms of increased **comfort** among all respondents.

Respondents are more **sceptical** with regards to **safety and efficiency gains** except for the more positive expectations of the Chinese respondents.

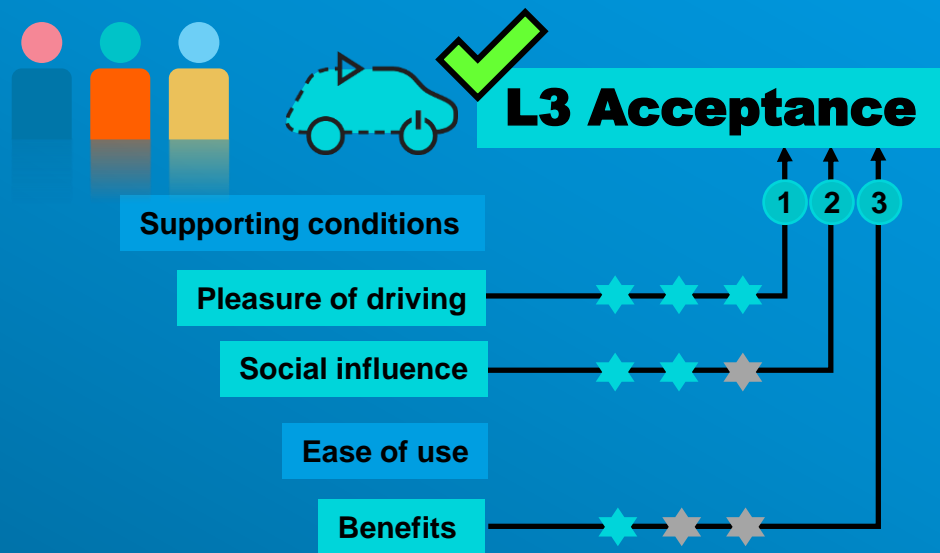


Where are L3 functions of most interest?



Highest interest to use L3 car in parking situations and lowest interest to use it on urban roads among the EU and US respondents. Highest interest of Chinese to use L3 car on urban roads. Interest of Chinese respondents outstandingly positive.

What are the influencing factors for the user acceptance of L3 cars?



To increase the user acceptance of L3 technology, **the pleasure of driving and the perceived benefits must be more clearly demonstrated** and promoted in people's everyday lives and social networks.



Thank you for your kind attention.

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