

Moving towards more efficient car use – what can be learnt about consumer acceptance from analysing the cases of LPG and CNG?



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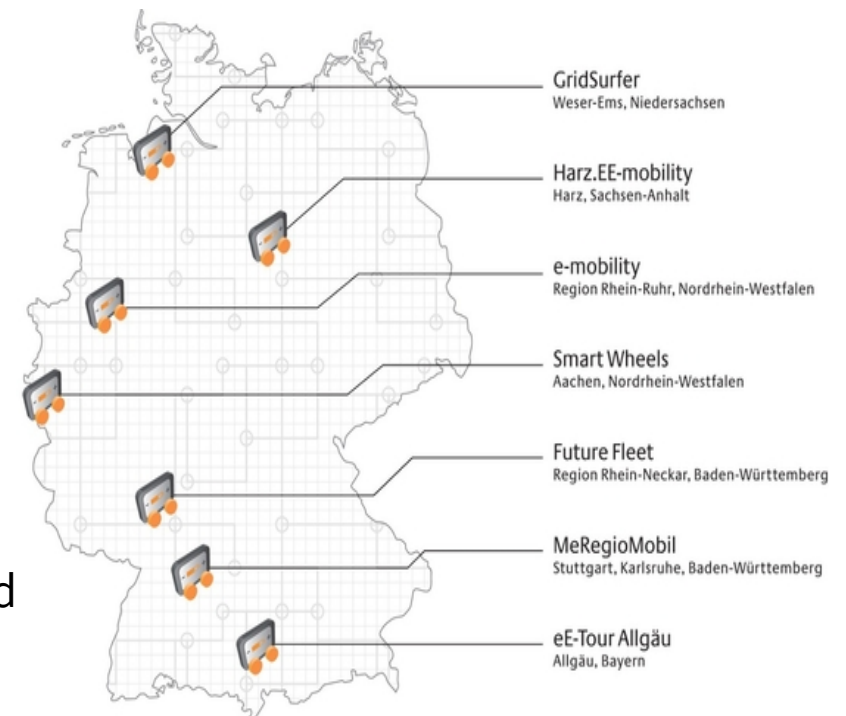


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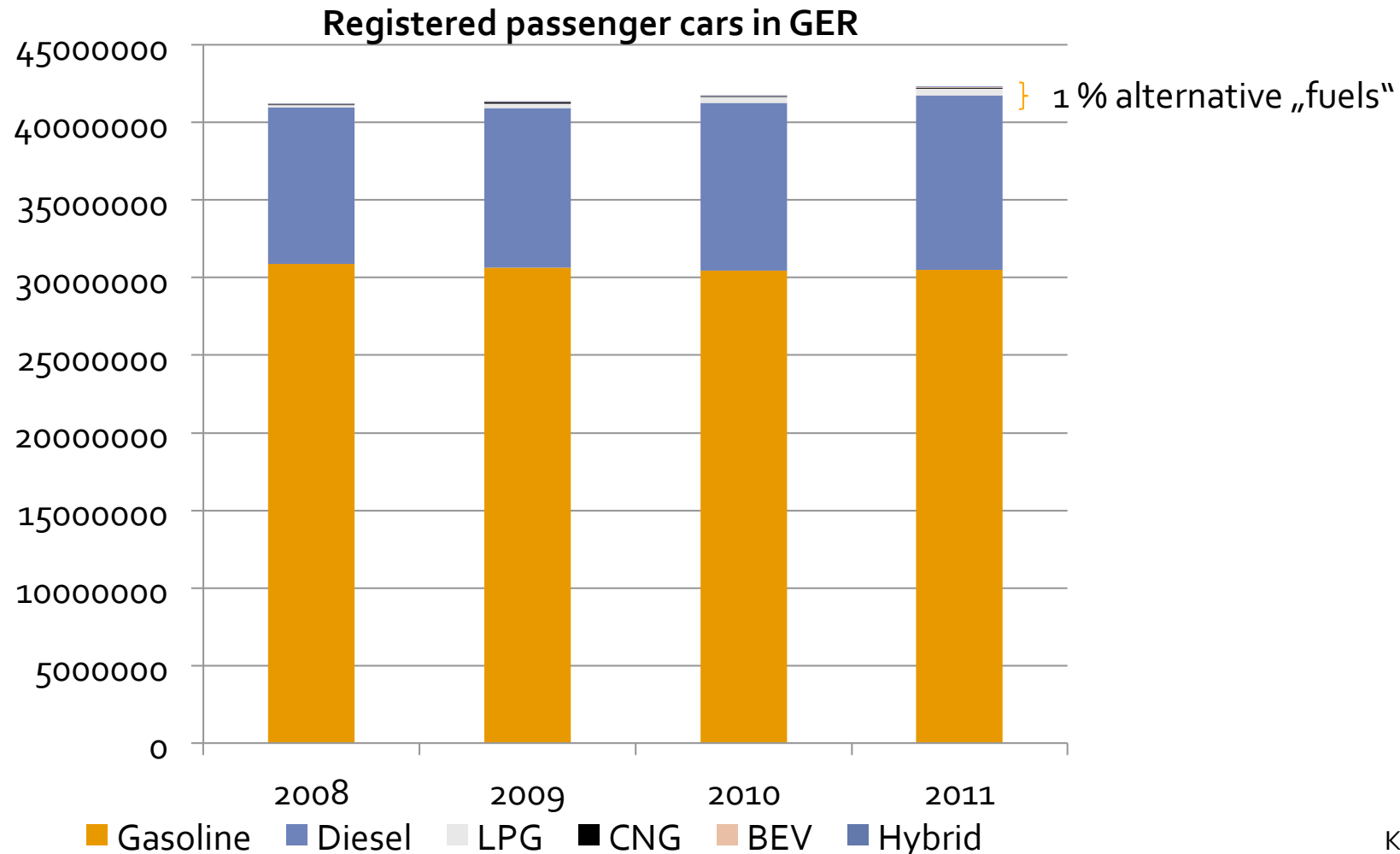


Electric vehicles are a much discussed issue, but so far hardly EV's are on the roads

- EV's are a much discussed topic in media, politics, industry and research
- The German Governments aims for 1 Mio. BEV / PHEV in 2020 (57 Mio. registered vehicles → ~ 2%)
- When announced in 2008 there were only 1436 EV's registered
- Need for research in order to prepare the market
- Among others: Consumer Research
- ... but hardly any electric vehicles are registered



Gasoline and diesel cars dominate the German passenger car market

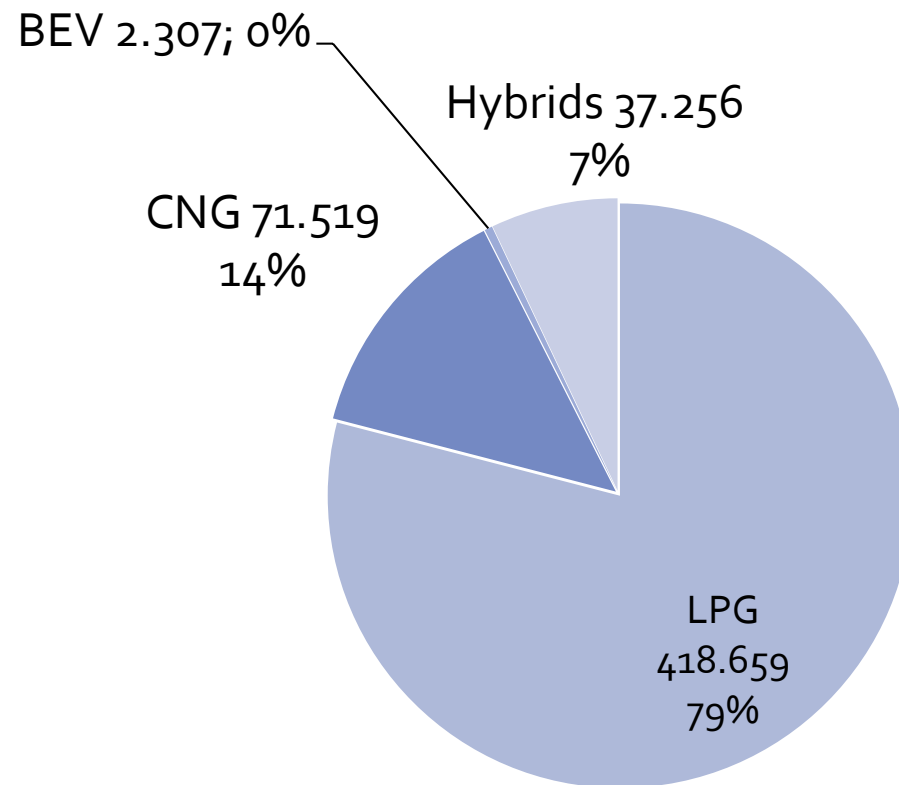


KBA (2011)

LPG = liquefied petroleum gas, CNG = compressed natural gas

The sector of alternative „fuel“ is dominated by LPG-driven vehicles

Alternatively driven passenger cars in GER



➤ The sector of LNG and CNG seems to be a suitable base (~ 0,5 Mio. cars)

From a customer's point of view there are many similarities between CNG/LPG and BEV

Similar characteristics from a customer's point of view

- Seen as alternative fuels/drives (even though natural gas is not renewable; LPG is a by-product of oil production and usually burned off)
 - Environmentally friendly with an energy-efficient powertrain (less CO₂, CO, HC, NO_x, basically no particular emissions)
 - High level of awareness (75% indicate to know these cars)
 - Higher investment, less operational costs
 - Limited infrastructure (stated as main concern in other research)
 - But technically mature and available on the market for several years
- Let's take a closer look at CNG/LPG cars

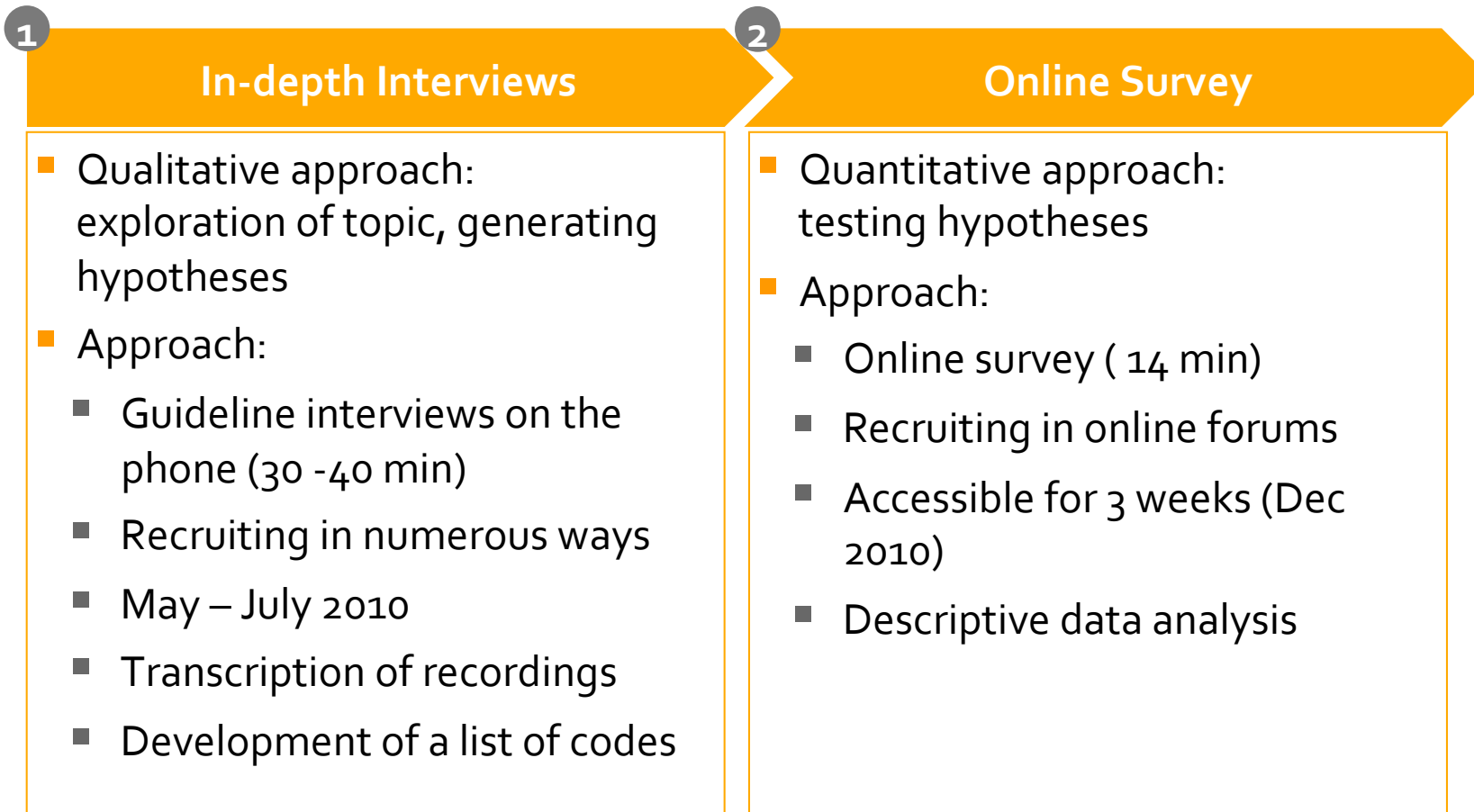
A short introduction to LPG and CNG

	LPG	CNG
Filling stations	5800 (2010)	852 (2010)
Range (in gas operation mode)	250 – 500 km	200 – 550 km
Additional / conversion costs	2000 – 2500 € (conversion)	1500 - 4000€
Break-even distance (replacing a petrol-driven vehicle)	~ 70.000 km	~ 50.000 km
Energy content	6,6 kWh/kg	14 kWh/l
Fuel price (gasoline 1,60 €/l; diesel 1,46 €/l)	0,771 €/l	0,984 €/kg
Subsidies by german government	Reduced tax on fuel	Reduced tax on fuel, reduced motor vehicle tax
CO ₂ -Emissions (well-to-wheel). Petrol: 190; diesel: 155 g/km	145 g/km	120 g/km

Research Questions

- How was the decision making-process?
 - How did actual users learn about the technology? Sources of information?
 - What were the main motives for buying a CNG/LPG car?
 - What were the main barriers before purchase and what happened to them during usage?
- What can be learnt for the introduction of EV's?

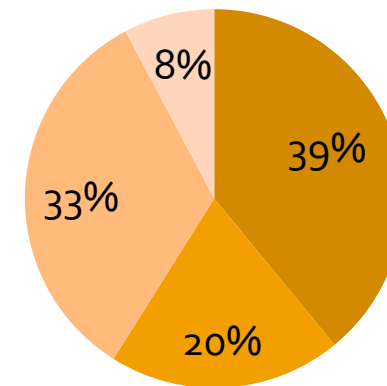
To answer these questions we used a two-step approach



Both studies had mainly male participants, living outside the city

	Interviews	Online Survey
N	12	142
Vehicles	6 CNG, 6 LPG	60% CNG, 40% LPG
Age	20-62 years	21-73 years mean: 44 years
Sex	2 female 10 male	94% males
Education	8 university degree	42% university degree
Household situation	$\frac{3}{4}$ are married, 6 have one or two kids	82% are married, half of them live with one or more kids

Living situation



■ rural region

■ suburb

■ in a center, but not city-center

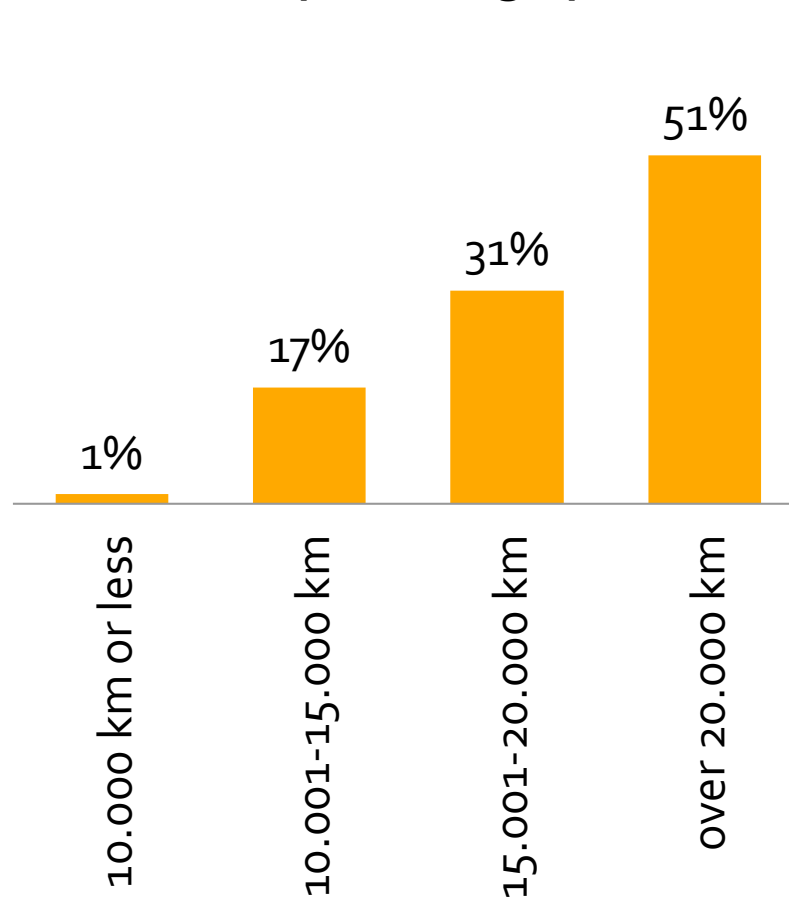
■ in a city-center

The majority lives in privately owned houses (61%)

n=142

Most participants are high mileage drivers and use minivans

What's your milage/year?



What kind of car do you drive?



44% compact van



13% middle-sized class



12% compact car



11% lower middle-sized class



11% upper middle sized class

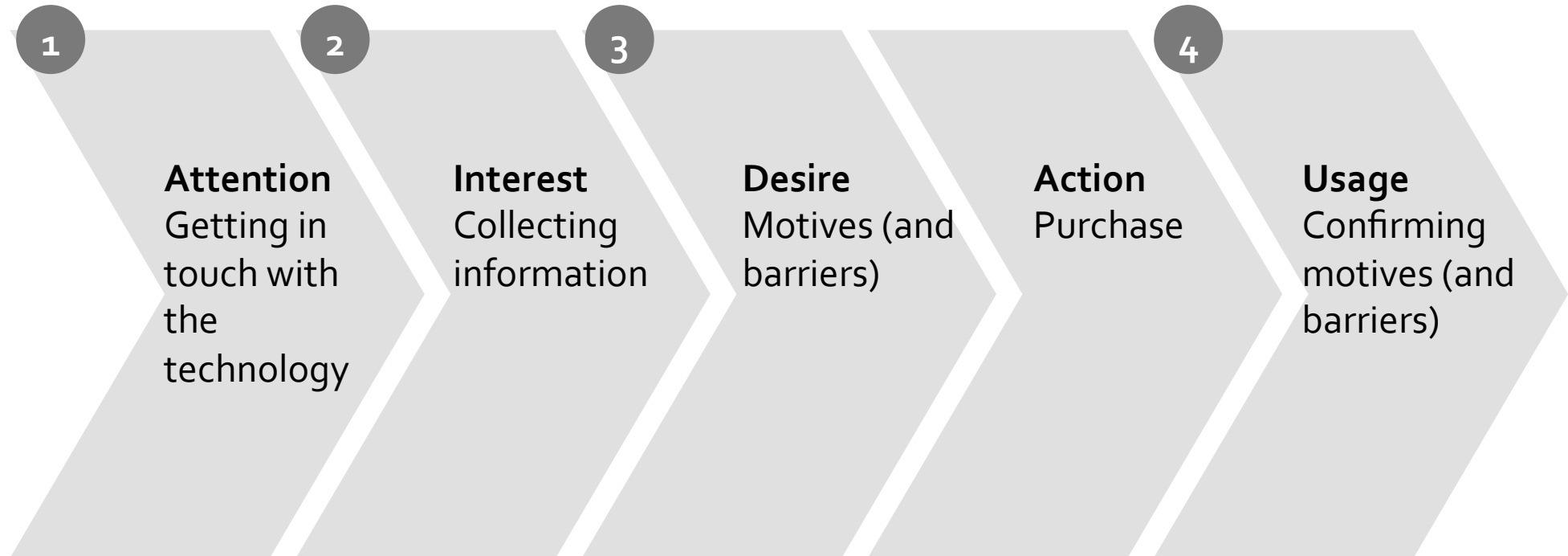
9% other

n=142

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Presentation of results along AIDA(U)



The participants first have heard of CNG/LPG by accident

1

Getting in touch with CNG/LPG

- accidentally (via friends, colleagues)

„well, by accident... an acquaintance with a gas-driven car visited us and then I thought, why not searching the internet for further information" (P4, LPG vehicle)

- local campaigns (utilities), automobile fair

„there was a campaign by the utilities in my hometown: everyone who purchased such a vehicle got a subsidy of approx. 1500 €; so I thought, this is profitable for me and I bought the car" (P6, CNG vehicle)

- in the course of a new car purchase

„I've heard about it before, but actually, it never touched me, because normally we keep our cars very long and as long as you don't buy a vehicle yourself, you don't really care about it; but when we needed a new car, we started dealing with it" (P12, LPG vehicle)

Main source of information were „experts“ that had experience with CNG/LPG

2



54% Special interest magazines / internet



50% other users of CNG/LPG



21% car dealer



21% garages



18% friends

"I had to persuade my car dealer to sell me a CNG vehicle. [...] He would have preferred to give me a diesel vehicle." (P6, CNG vehicle)

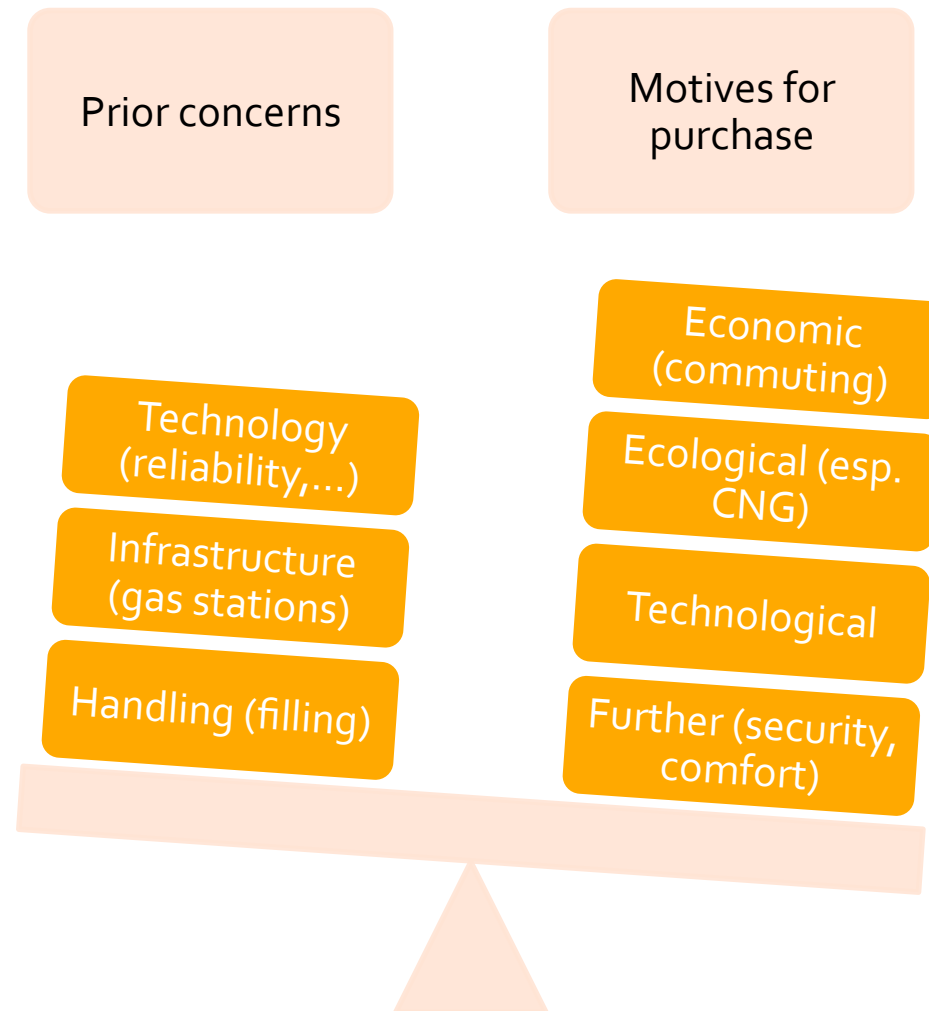
"Because we had someone around who knew a lot about it, we had all the information needed, we knew about the advantages of the technology. And that made it easy for us. That's great if you have such an expert around." (P10, CNG vehicle)

n=142

3

Prior concerns were mostly outweighed by economical and ecological advantages

"I heard that the infrastructure is bad. Thus, I was concerned about this."
(P5, CNG vehicle)

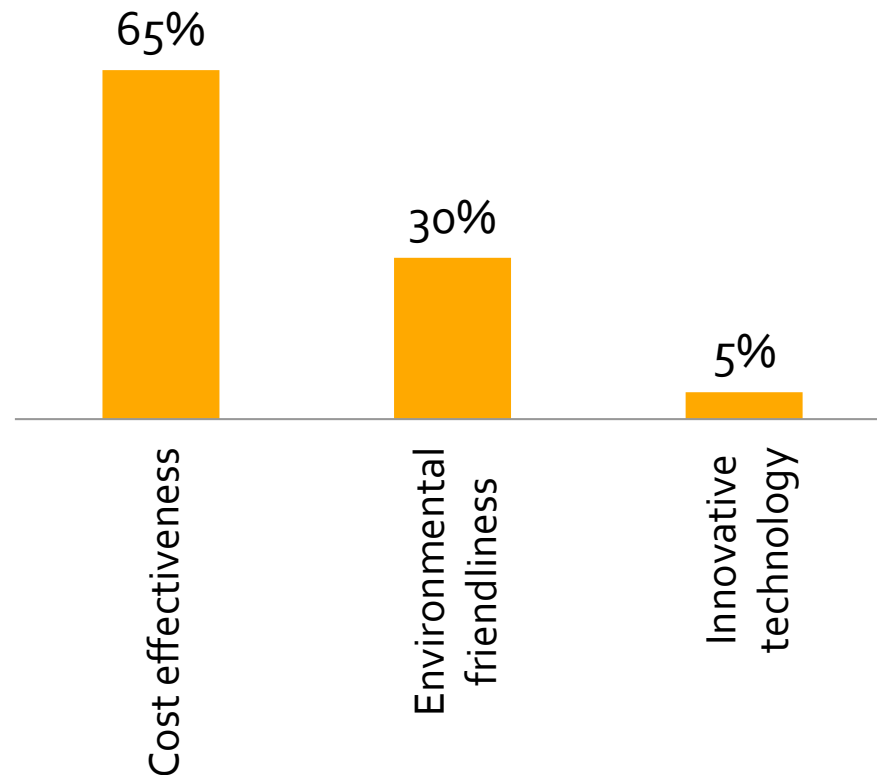


"Natural gas is environmentally-friendly, I always liked it, we also use it for heating our home; I always thought that this would be the best alternative if it was possible."
(P10, CNG vehicle)

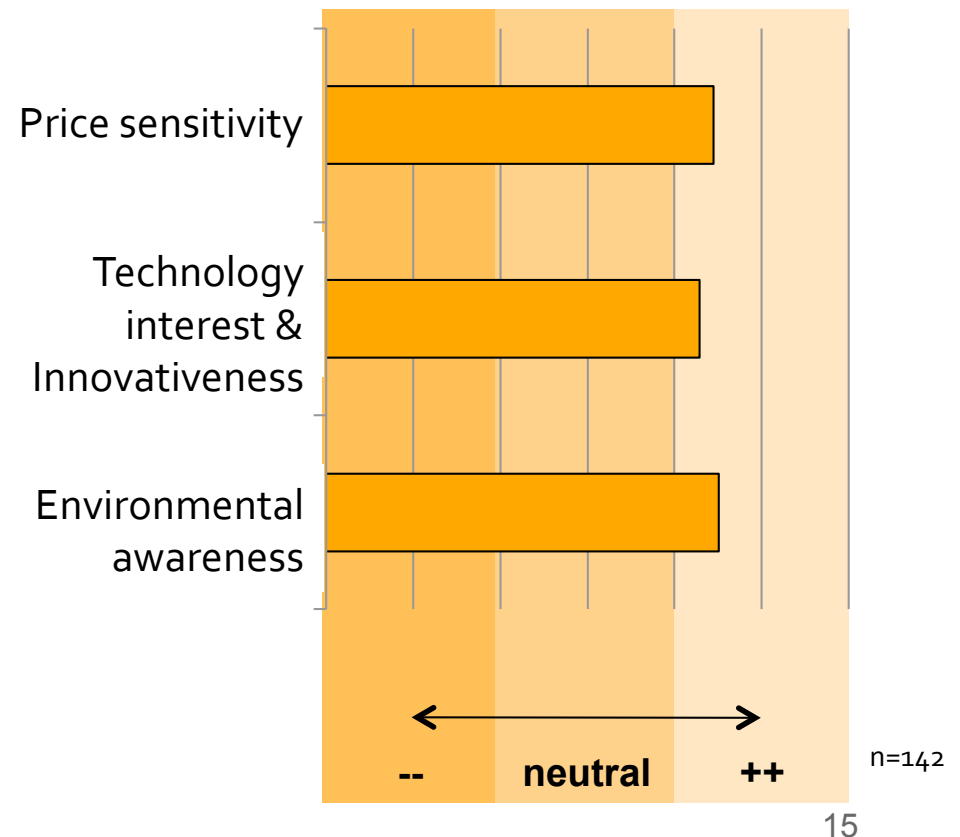
The online survey supports these results and indicates the relevance of cost effectiveness

3

What was the main reason for buying your CNG/LPG car?



... attitudes towards all three aspects



4

While motives for purchase proved true during usage, prior concerns did not

Motives	Concerns
<ul style="list-style-type: none">■ High satisfaction, esp. with operational costs <i>"Then, it's this smile at the refilling station: When the others pay 1.55, and we pay 0.60. [...] That's more than happiness, that's... Well, I'm always pleased." (P4, LPG vehicle)</i>■ 50% of the participants believe that driving a CNG/LPG car leads to a more sustainable car usage	<ul style="list-style-type: none">■ 96% are satisfied with the level of security of the car■ The range meets the expectations of 64%■ Mostly no need to change mobility behaviour (66%); only 8% say that they have to renounce some rides■ Dealing with infrastructural gaps:<ul style="list-style-type: none">■ Flexibility: choice of holiday destination according to refilling facilities, detours■ Technical support: internet, navigation system

n=142

4

CNG/LPG cars have low visibility and the reactions by others are mixed

Strangers

- Seldomly addressed by strangers
- Usually addressed while refuelling
- Interest varies according to price level of conventional fuels

Peers

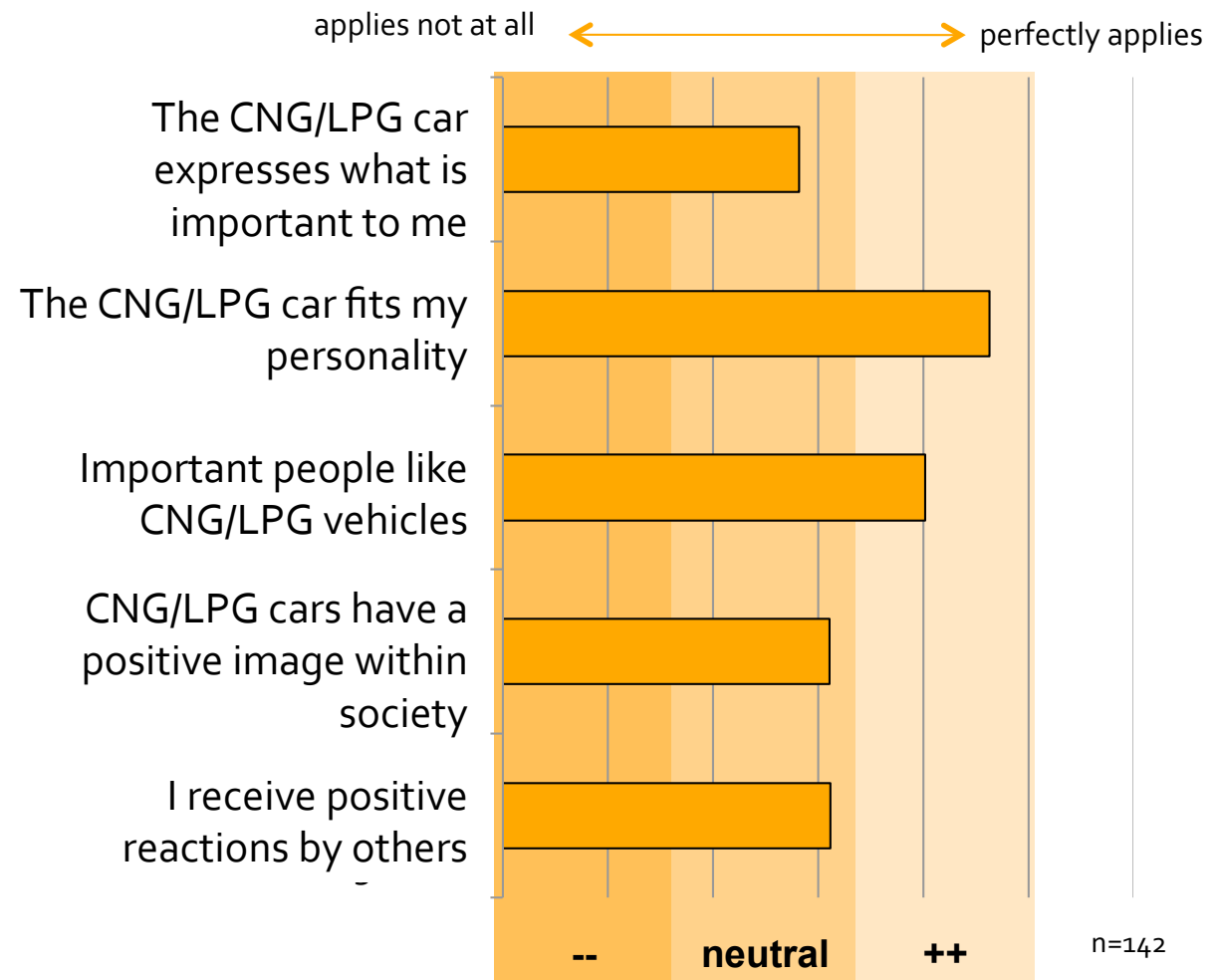
- Interest of peers varies according to degree of interest in technology, pre-knowledge, (in) direct experiences
- Positive reactions: 4 interviewees could persuade others
- Sceptical reactions: mostly related to investment, technics and infrastructure
- Negative reactions: derision, lack of understanding

„Those of my colleagues who are interested in cars are asking. The others do not.“
(P7, CNG vehicle)

Nevertheless the participants feel that the car fits their personality

4

- Participants feel that their CNG/LPG car fits their personality
- About 40% perceive a positive image of the car within the circle of family & friends,...
- ... but only every 7th participant believes this is also true for the society



What can we learn for electric vehicles?

- High relevance of cost effectiveness is a challenge
- Environmental friendliness seems to be a „must-be“ driver
- Interest in innovative technology is important especially during the process of **Attention and Interest**
- Visibility
 - ... of electric vehicles currently can be an opportunity
 - ... (psychological) relevance of infrastructure to reduce prior concerns
- Personal contact during information process (social networks)
- Prior experience by creating „points of touch“
 - ... by providing information / demonstration / campaigns
 - ... opportunities to test EV's in daily life
- Integration of cooperation partners (especially garages and car-dealers)

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Thank you for listening!



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Thanks for your kind attention!



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