

WCTRS – SIGf2: Real-world insights into user acceptance of renewable fuels in passenger vehicles

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BEniVer

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Wissen für Morgen



Agenda

- Research goal and questions
- Survey methodology
- Survey results
- Summary and recommendations



Goal: Analyzing vehicle usage and refueling behavior of German car owners

- In context of the **BEniVer** project, the DLR Institute of Transport Research investigates **user acceptance and the potential use of renewable fuels** in road transport with the following questions:
 - What are the drivers and barriers for the use of renewable fuels?
 - Which user groups have high potentials for the use of renewable fuels?
 - How are fuel properties evaluated from the user's perspective?
- ➡ **Commercial Transport:** Group discussion with commercial transport stakeholders on refueling behavior and acceptance of renewable fuels.
- ➡ **Passenger Transport:** Quantitative survey of renewable fuel acceptance (incl. stated choice experiment)
- ➡ **Passenger Transport:** Recording of car usage patterns and refueling behavior

To be considered:

- Surveys are conducted on hypothetical situations and future issues
- Attitudinal acceptance ("I think using renewable fuels is a good idea") does not equate to future use of these fuels



Survey methodology and participants of the survey



Panel from DLR plant **MovingLab**
sample: **3,500 German private car owners**
after data preprocessing: **545 complete answers**



Online survey (**18 general questions + 6 stated choice questions**)



September und October 2020



- Vehicle usage and refueling behavior
- Willingness to use and acceptance with regard to renewable fuels
- Hypothetical decision situations (Stated Choice)



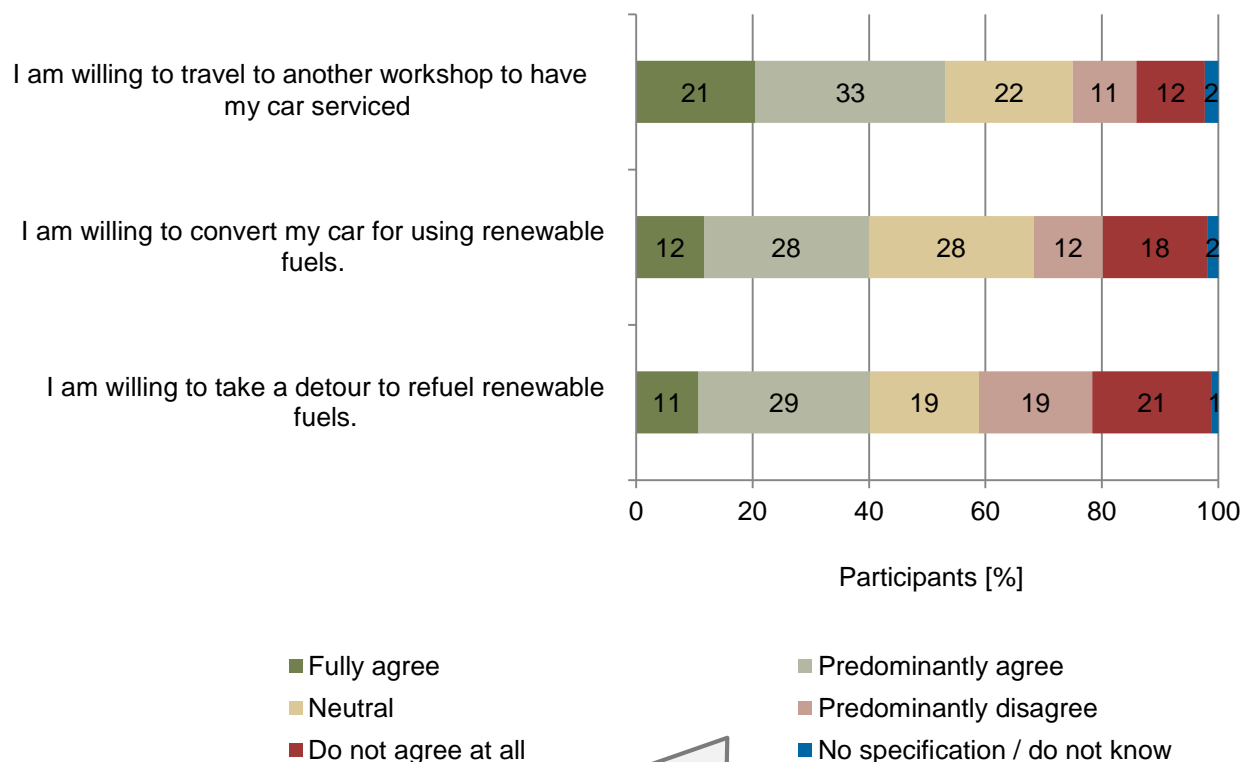
- Sample weighting according to MID2017 categories:
 - Household size
 - Number of vehicles in the household
 - RegioStaR2 typology of residence (urban region, rural region)
- Sample differentiation by :
 - **Driving frequency**(daily, often, rarely)*
 - **Environmental behavior** (high, average, low)
 - **Innovativeness** (high, average, low)
 - **Experience in the use of specific fuels / drivetrains** (self used, used in the environment, heard of, never heard of)

* often – 1 to 3 a week
rarely - less than once a week



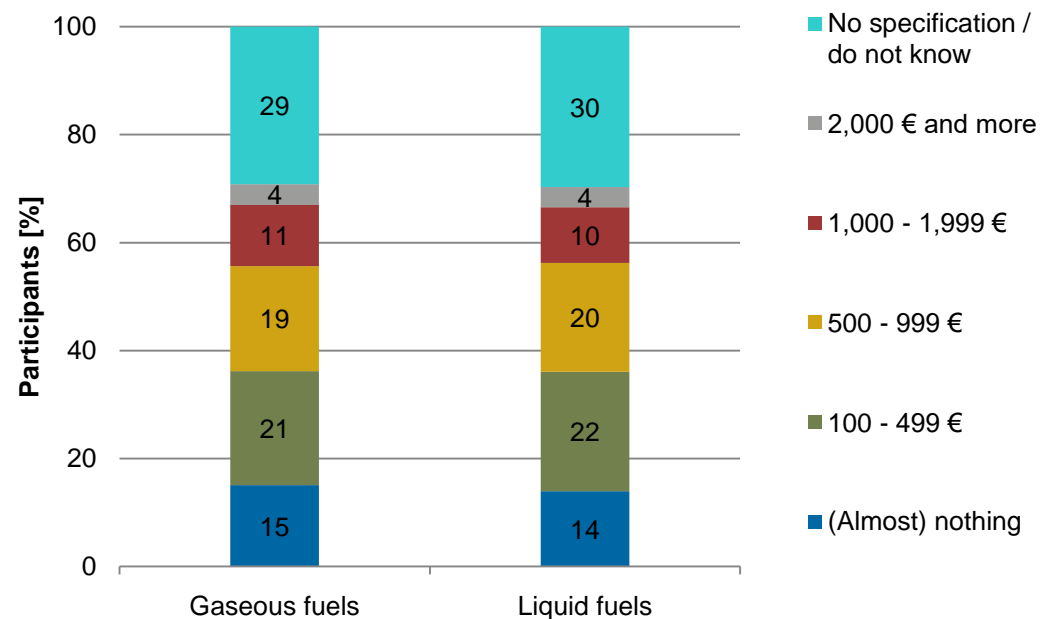
Four out of ten car users are willing to convert their car to use renewable fuels. Around 34% of car users would pay more than €500 for this.

Questions on willingness in vehicle conversion to renewable fuels



Car owners with **highly pronounced environmental behavior** or **experience with alternative fuels/drives** are **more likely to convert** their cars.

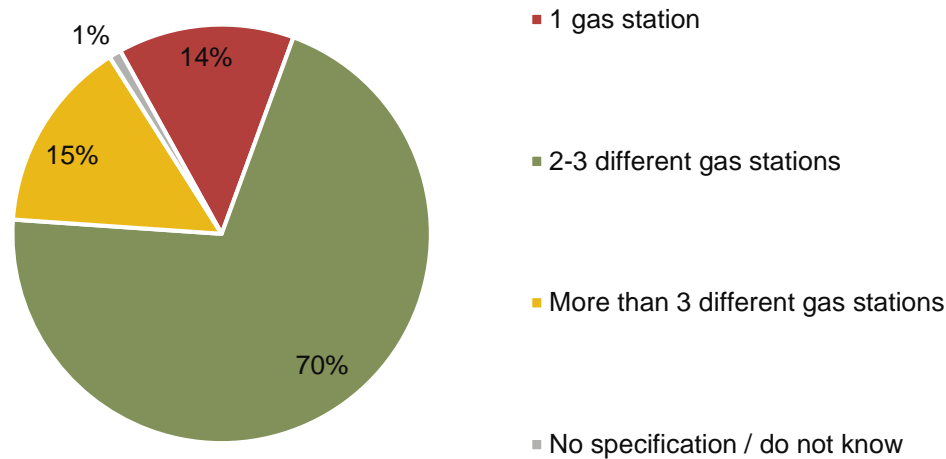
How much would you be willing to pay to convert your car to use renewable fuels?



Very innovative car owners as well as those **experienced with alternative fuels/drive technologies** are **more likely to pay more** for the vehicle conversion.

More than two-thirds of all participants refuels at two to three different gas stations in daily live. Renewable fuels would only be considered to use if they are at least available at every second gas station.

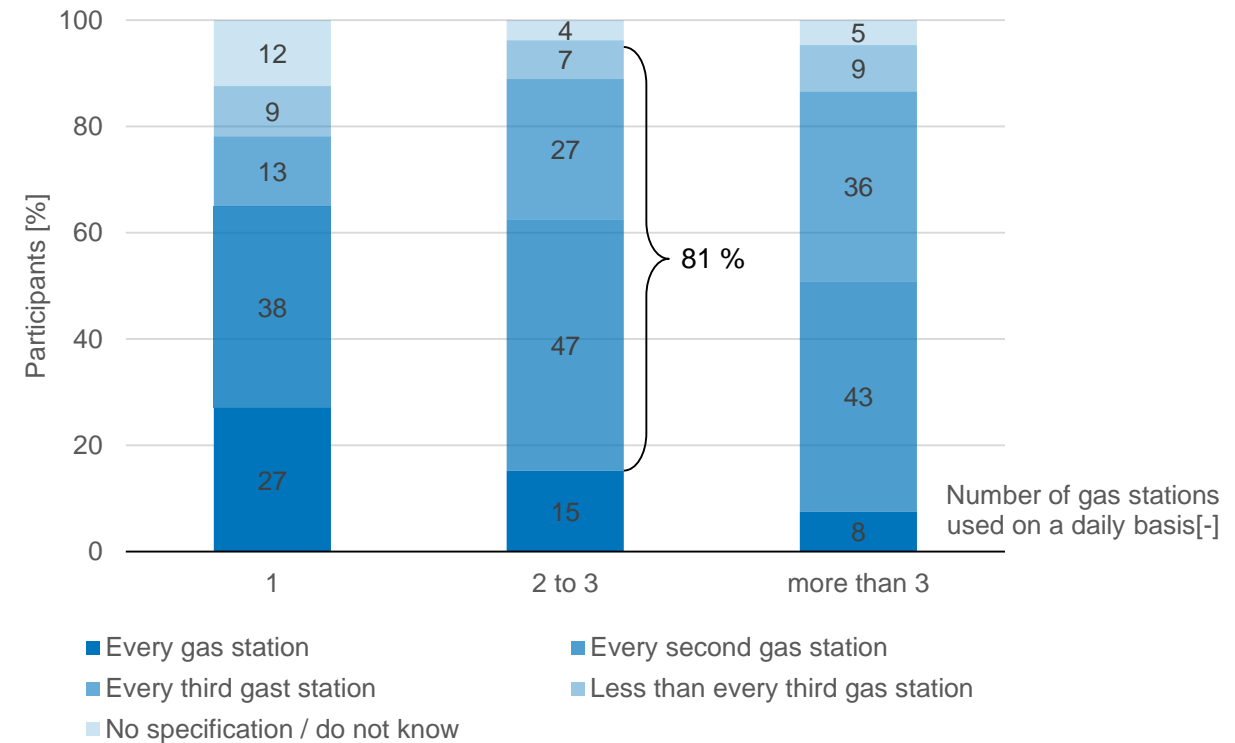
How many different gas stations do you usually use for refueling on a daily basis?



Daily driving car owners tend to use **the same gas station more often** than car users with lower driving frequency.

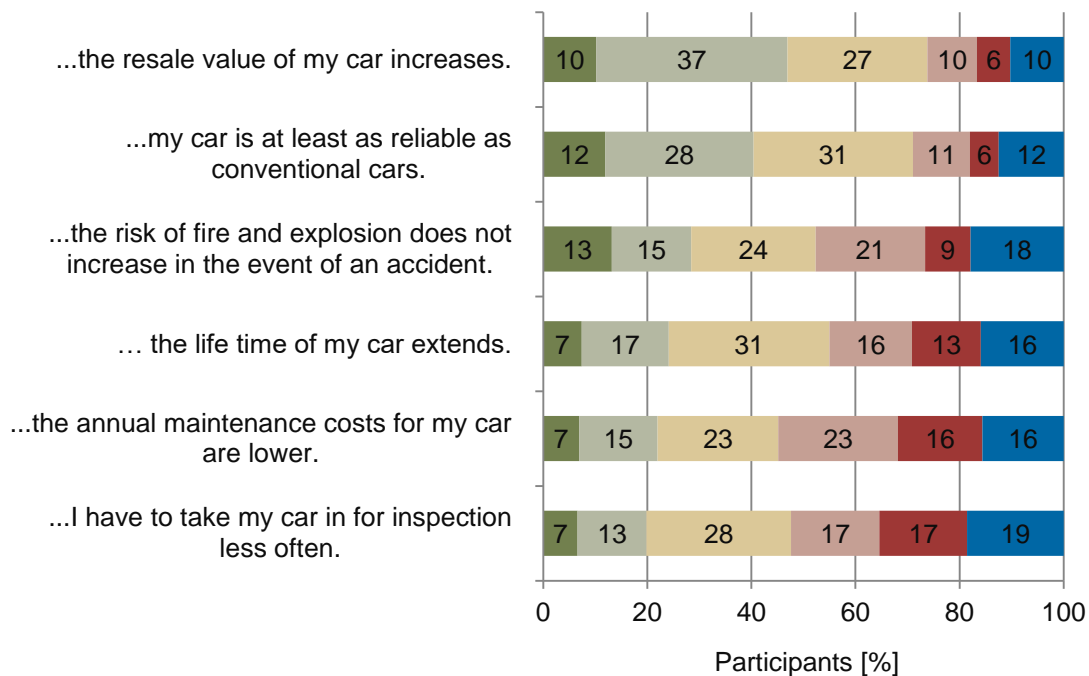


What is the minimum number of gas stations in your area that would need to offer renewable fuels for you to consider using them?

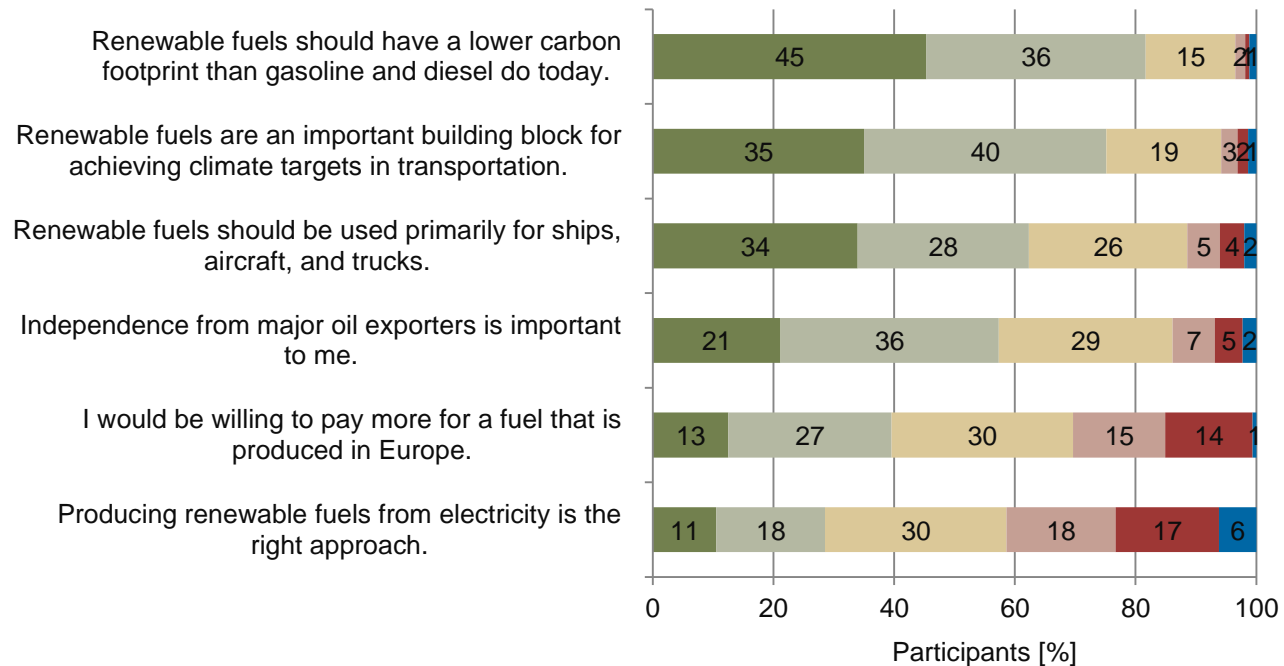


The benefits in using renewable fuels are evaluated differently. The same can be seen in the relevance of the framework conditions.

By the use of renewable fuels,...



What is your opinion of the following statements about renewable fuels?

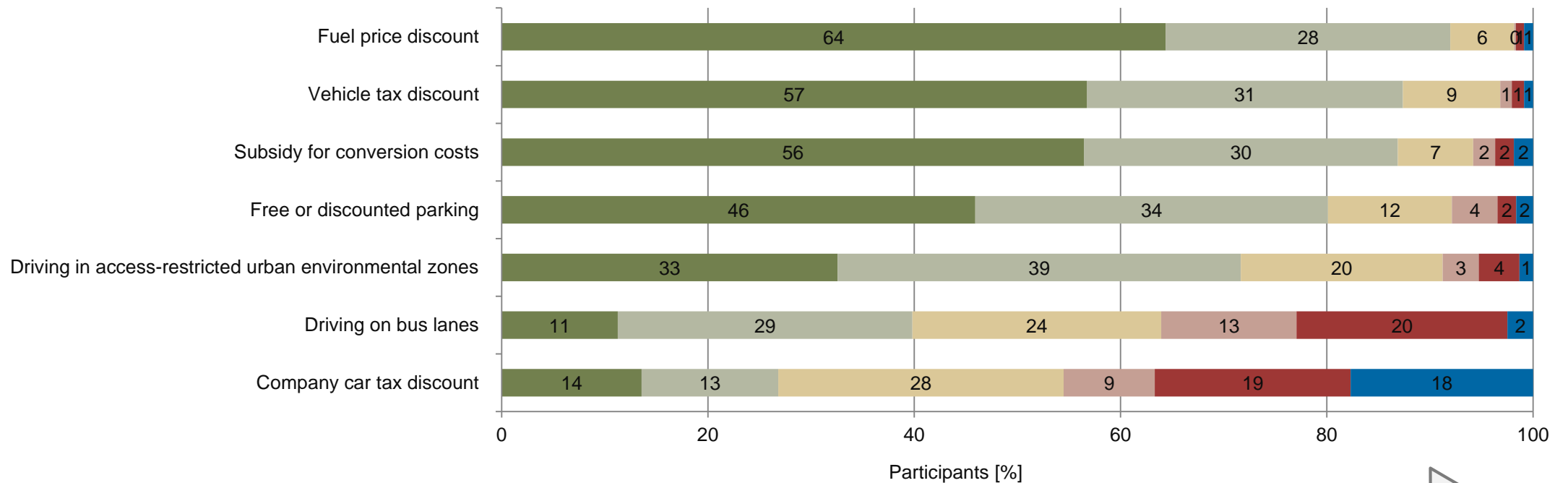


■ Fully agree
 ■ Predominantly agree
 ■ Neutral
■ Predominantly disagree
 ■ Do not agree at all
 ■ No specification / do not know



Financial benefits show the greatest influence in acceptance. Especially fuel prices play the biggest role in the choice decision to refuel.

How attractive do you consider the following support measures related to the use of renewable fuels?



Car owners with **highly pronounced environmental behavior** tend to **agree more often**.



Structure of the Stated Choice Survey



Imagine that you have to fill up your car during the course of the day. **Which fuel would you choose?**

Please do not assume your current car, but imagine a situation in which you can fill up your car with all alternatives.

| | A | C | D | B |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| <u>Aggregatzustand</u> | gasförmig | flüssig | flüssig | flüssig |
| <u>Stickoxidemissionen</u> | mittel | sehr gering | hoch | gering |
| <u>CO2-Emissionen</u> | sehr gering | mittel | gering | mittel |
| <u>Kraftstoffkosten pro 100 km</u> | 17 € | 13 € | 29 € | 17 € |
| <u>Reichweite pro Tank</u> | 390 km | 285 km | 585 km | 420 km |
| <u>Ressourcenverbrauch*</u> | sehr gering | gering | sehr hoch | mittel |
| Welchen Kraftstoff würden Sie tanken? | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Variation of the characteristics in the different decision-making situations



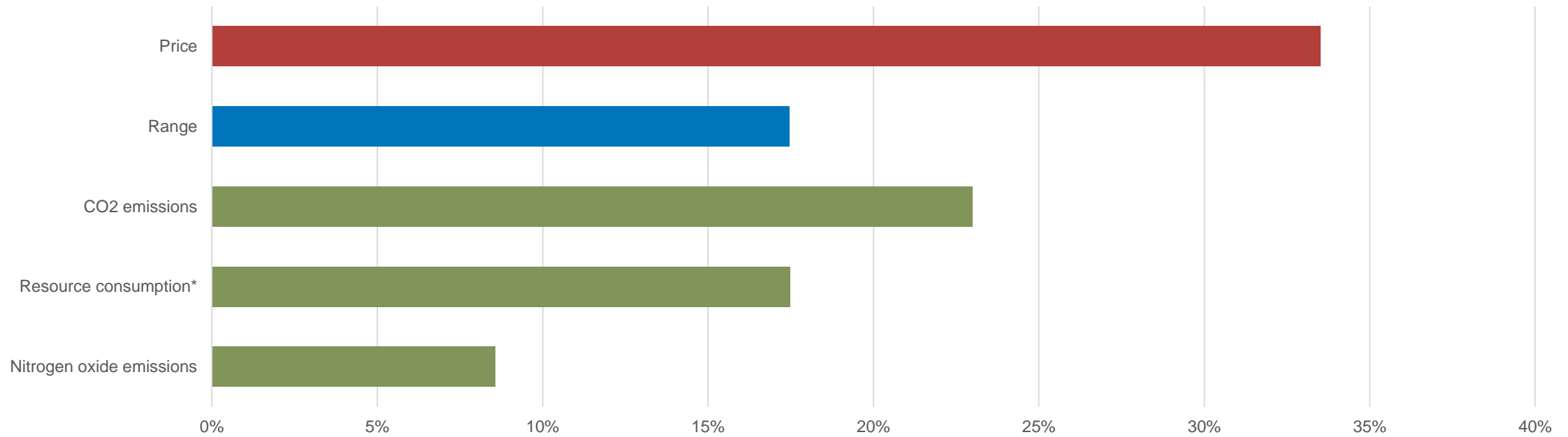
6 decision-making situations per participant

*i.e. energy and water consumption in fuel production



Price is the most important factor in the choice for a fuel, but there are clear differences in willingness to pay.

Relevance of the different fuel characteristics



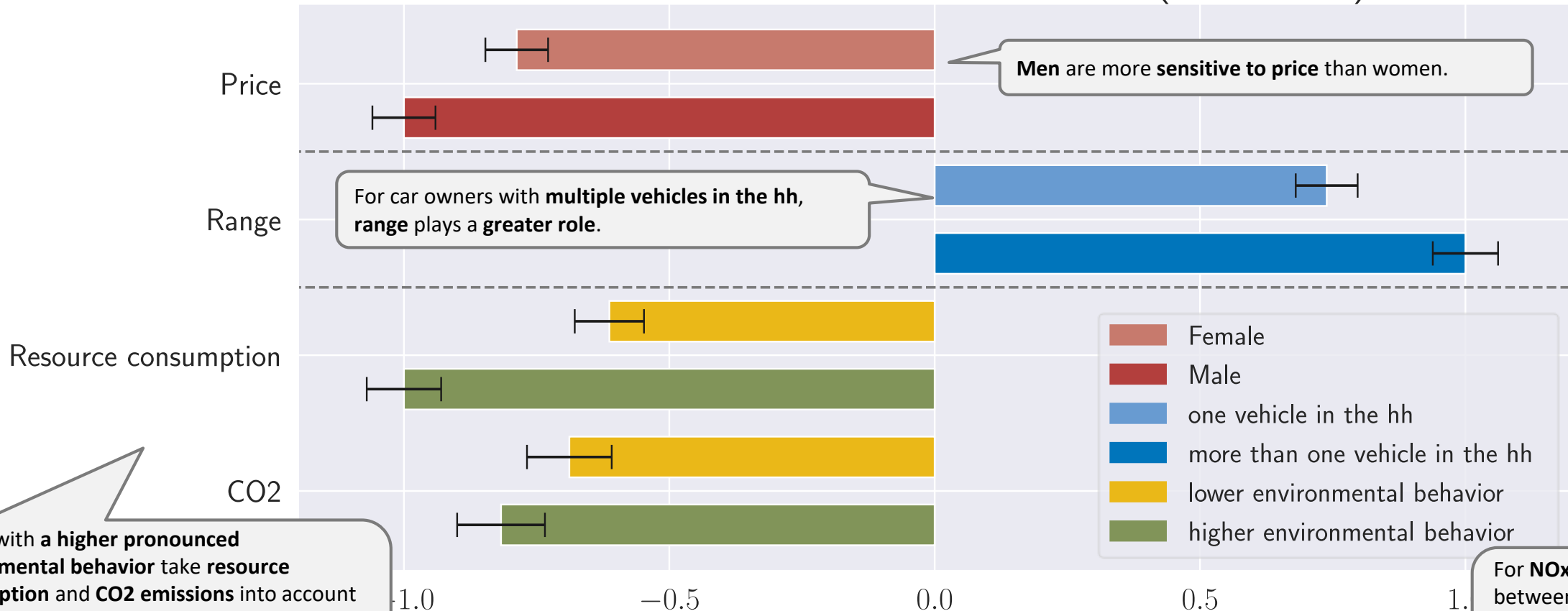
* Taking into account energy and water consumption

Price has the **greatest influence** on the choice of a fuel. Among **the environmental factors**, **CO2 emissions** play the biggest role.



Range is especially important for people with multiple vehicles in hh and the importance of environmental features increases with environmental behavior.

Influence of sex, available vehicles in the household (hh), and environmental behavior on fuel choice (normalized)



Men are more sensitive to price than women.

For car owners with multiple vehicles in the hh, range plays a greater role.

People with a higher pronounced environmental behavior take resource consumption and CO2 emissions into account to a greater extent. In the case of resource consumption, there is also a greater difference between the groups.

For NOx, no correlation between relevance and environmental behavior could be found.



Summary and recommendations

- Participants are **generally willing to convert their car** for the usage of renewable fuels. For such a conversion, they are **willing to pay at 500€ or more**.
- Participants desire an **availability** of renewable fuels **at every second filling station**. Therefore, **funding** for a user-oriented (refueling) **infrastructure expansion** is advised.
- **Drop-in fuels** can significantly **increase the acceptance and penetration** of renewable fuels.
- **Opinions** on the usage benefits of renewable fuels **vary widely** within the sample. **Extensive knowledge sharing** and **education** on that matter are therefore **crucial** for the acceptance of renewable fuels.
- **Financial benefits**, especially in fuel prices, are rated as the **most attractive incentive measure**.
- The **refueling decision** is **highly dependent** on the **user group**. However, the **price** of fuel remains the **most important driver**.



Thank you for our attention!
Questions? Remarks?

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