



University of Sunderland



Ciemat

Centro de Investigaciones Energéticas, Petrolíferas y Tecnológicas



ABERDEEN CITY COUNCIL



# HYACINTH

FCH JU → SPI-JTI-FCH.2013.5.3

Hydrogen Acceptance in the Transition Phase

Support & Coordinated Action

## *The social acceptance of Hydrogen Fuel Cell applications in Europe: Results from a seven country study*

SENIX Conference

Stockholm, June 13-15, 2016

Uta Schneider, Paul Upham, Christian Oltra, Elisabeth Dütschke, Mònica Lores, Roser Sala

This project has received funding from the Fuel Cells and Hydrogen Joint Undertaking (FCH-JU) under grant agreement N° 621228



# Index

1. Introduction: Hydrogen technologies in Europe
2. Hyacinth project and objectives of the public study
3. Results of the literature review
4. Data and methods
5. Preliminary results
6. Conclusion and outlook

# Hydrogen Technologies in Europe

- The transition phase of hydrogen and fuel cell technologies is expected to happen within the next decades.



- Challenges: higher cost and less comfortable infrastructure or lower reliability. Benefits: energy efficiency and environmental benefits (no local emissions)
- Advanced hydrogen support (Germany, UK), medium support (Spain) and low support.
- Fuel Cell technologies for private end users
  - Fuel cell heating appliances
  - FCEV (fuel cell electric vehicles) and hydrogen refueling station (HRS) network

# HYACINTH project

- HYdrogen ACceptance IN the Transition pHase
- **Objectives:**
  - Gain a deeper understanding of the social acceptance of hydrogen technologies in the general public and at selected stakeholders across Europe
  - Develop a social acceptance management tool toolbox (Social Acceptance Management Toolbox: SAMT) to help promoters and decision makers integrate issues related to social acceptance into their developments.
- **Coordinator:** Centro Nacional del Hidrógeno (CNH2), 11 main partners from 5 different European countries.
- Financed by **Fuel Cell and Hydrogen Joint Undertaking** (FCH-JU). Total cost: 999,383 €; EU contribution: 661,584 €

# Studies in HYACINTH

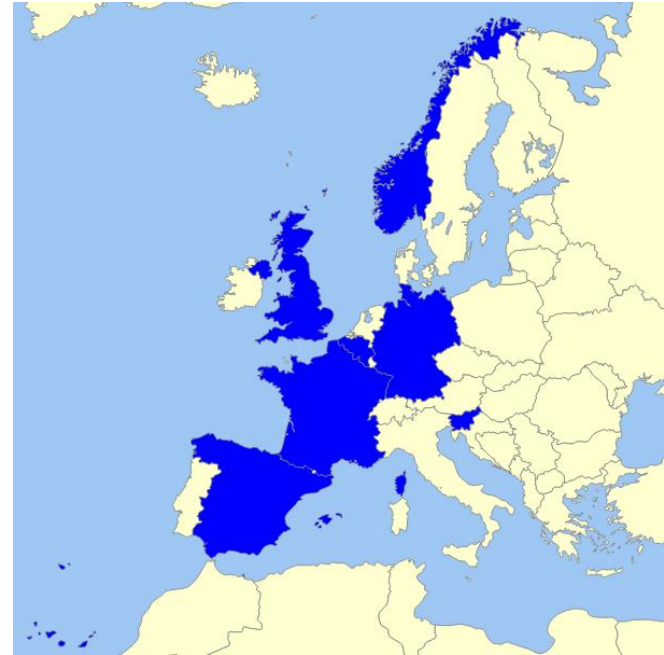
- **Two studies:**
  - Public awareness and acceptance of FCH technologies across Europe
  - Stakeholder acceptance of FCH technologies across Europe
- **Objectives of the public study**
  - To examine public **awareness**, familiarity, perception of benefits and costs, global attitude, **acceptance** of FCH technologies
  - To identify key individual and social **determinants** of public awareness and acceptance of FCH technologies;
  - To report on **cross-country comparisons** in public awareness, attitudes and acceptance towards FCH technologies

# Results of the literature review

- Survey studies with country level samples show that **public awareness about hydrogen is high in Europe**, but also that it varies significantly across European countries.
  - The Eurobarometer on energy technologies (European Commission, 2007) found that five out of ten EU citizens reported having heard about hydrogen energy and cars and four out of ten reported having heard about fuel cells.
  - Awareness was significantly higher in countries such as Denmark or the Netherlands and lower in Eastern European countries. (European Commission, 2007).
  - But: Very few cross-country studies systematically comparing public attitudes to HFC applications. Majority of studies focused on specific countries or regions.
- Levels of awareness do not correspond, necessarily, with high levels of **public knowledge** about hydrogen technologies: In general, studies tend to show that **low levels of knowledge** of - and interest in - hydrogen among the public nonetheless coexist with relatively **high levels of acceptance** (public tends to report positive attitudes towards hydrogen in general).
- Majority of studies focused on transport applications. Very few studies have focused on the public reactions to **HFC stationary residential applications**. No systematic comparisons have been found regarding the acceptance of specific applications, but it is acknowledged that **public attitudes towards HFC technologies** might vary depending on the **type of application** considered

# Data and methods public study

- **Method:** Survey data collected in 7 European countries.
- **Participants:** around 1000 members of the general population aged 16 and over. Nationally-representative samples.
- **Data collection:** April and May 2016.

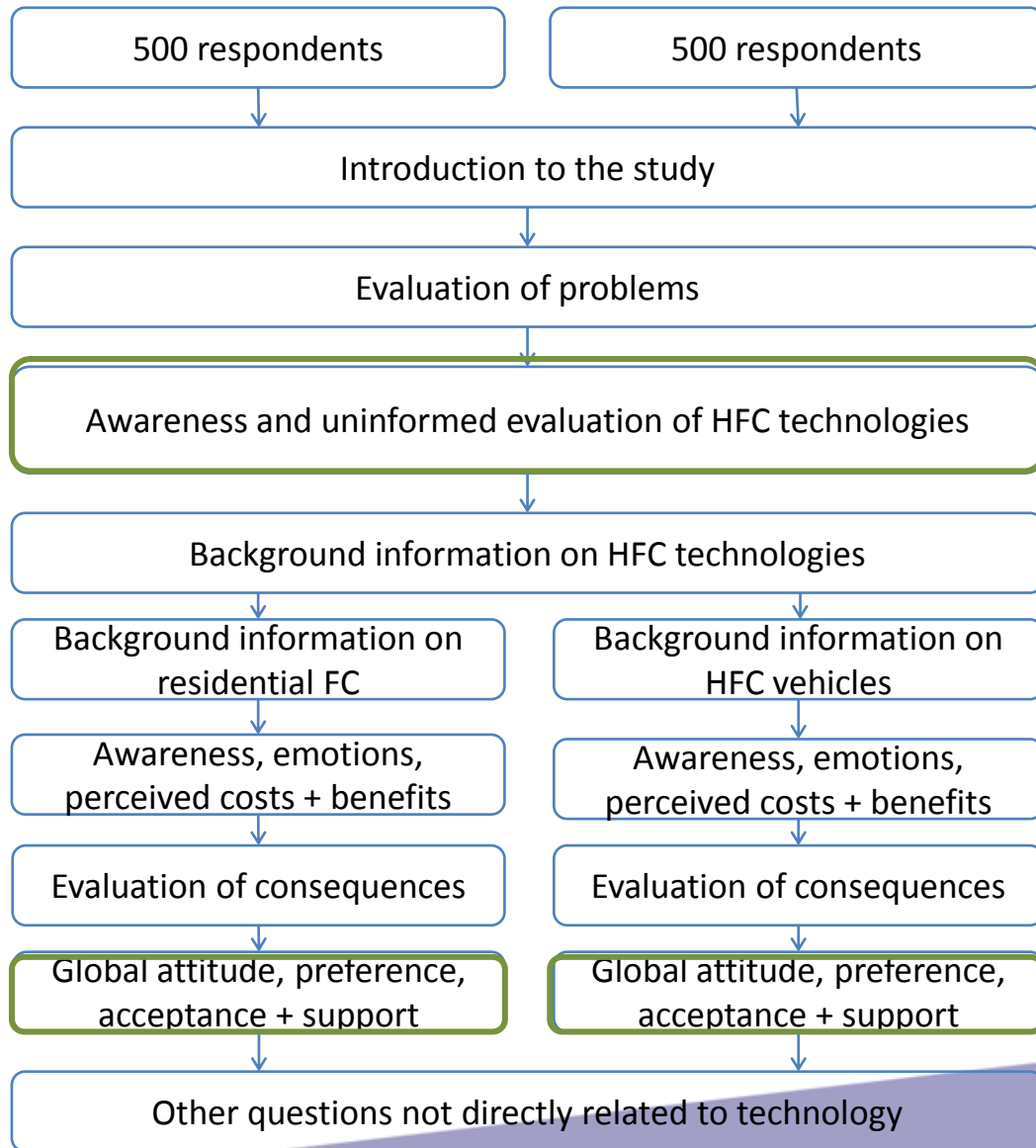


- **Studied applications:**

1. Hydrogen fuel cell stationary residential applications
2. Hydrogen fuel cell transport applications and related infrastructures



# Data and methods public study



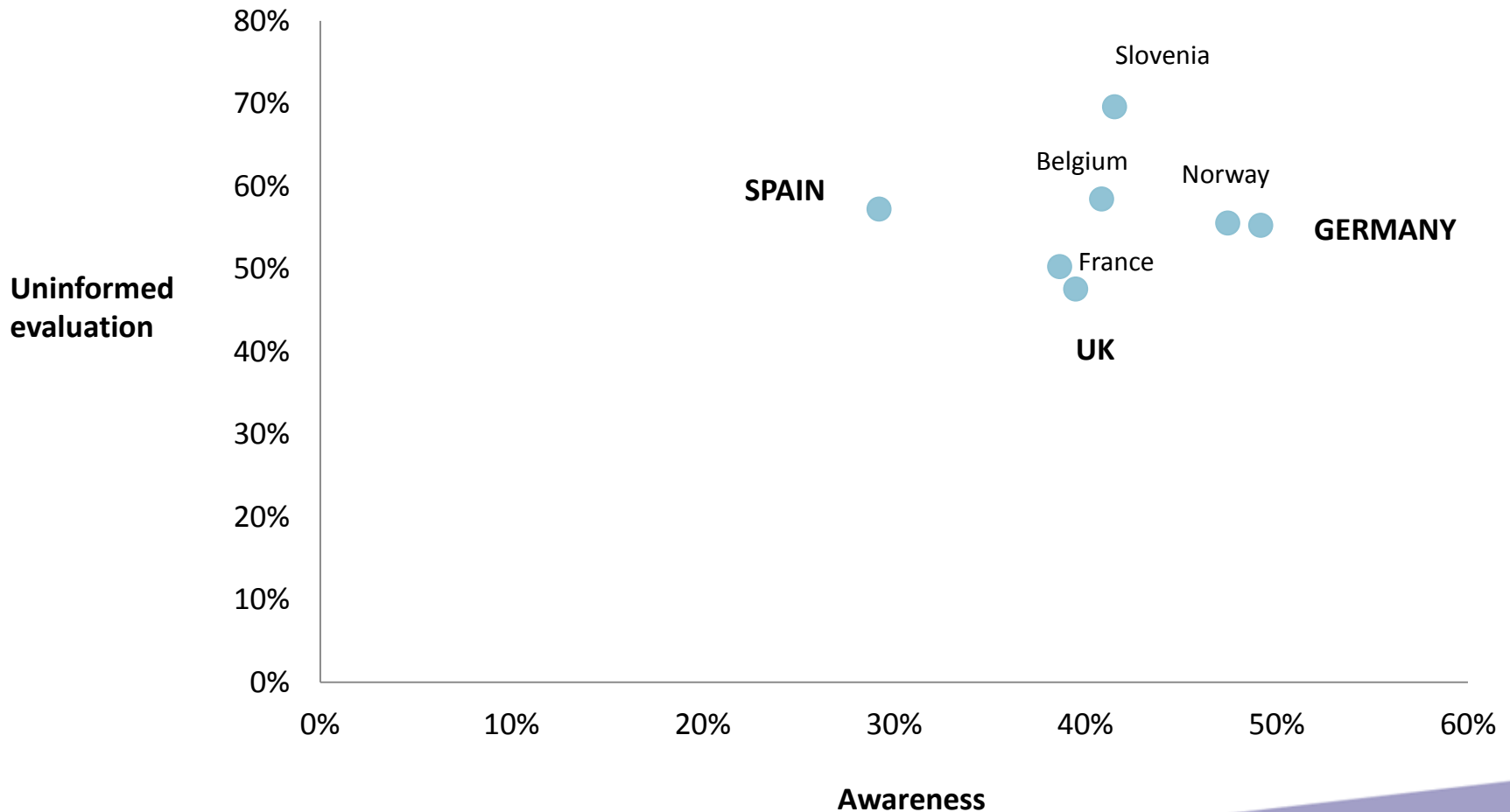
*Awareness, familiarity, affects and beliefs :*

Participants received neutral information regarding: a) hydrogen and fuel cells in general; b) fuel cells for residential use or hydrogen fuel cell vehicles.

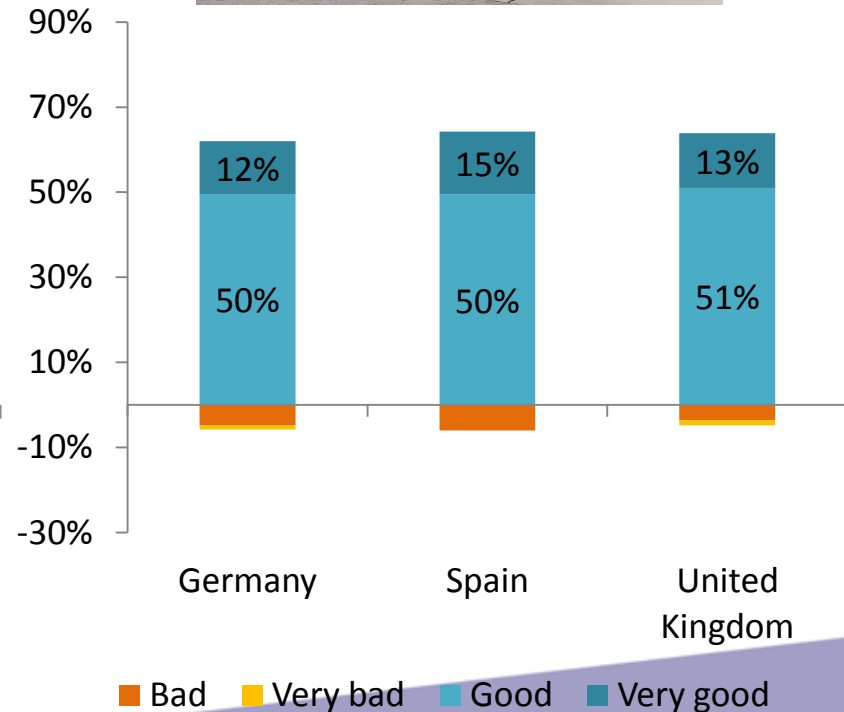
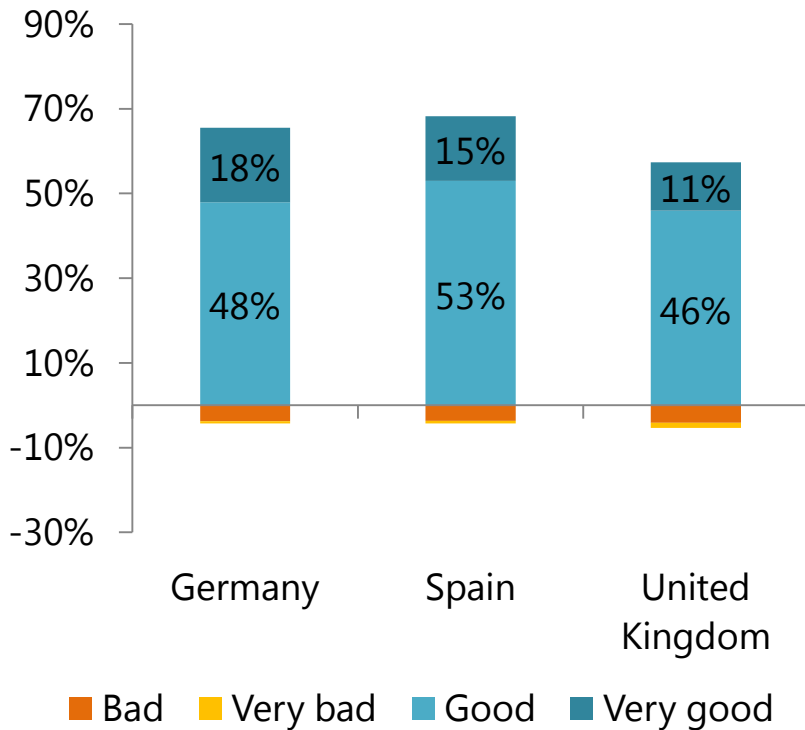
*Evaluation of consequences:*  
Participants were then provided with information regarding some of the potential consequences (one potential benefit/cost) of the implementation of the specific HFC application.



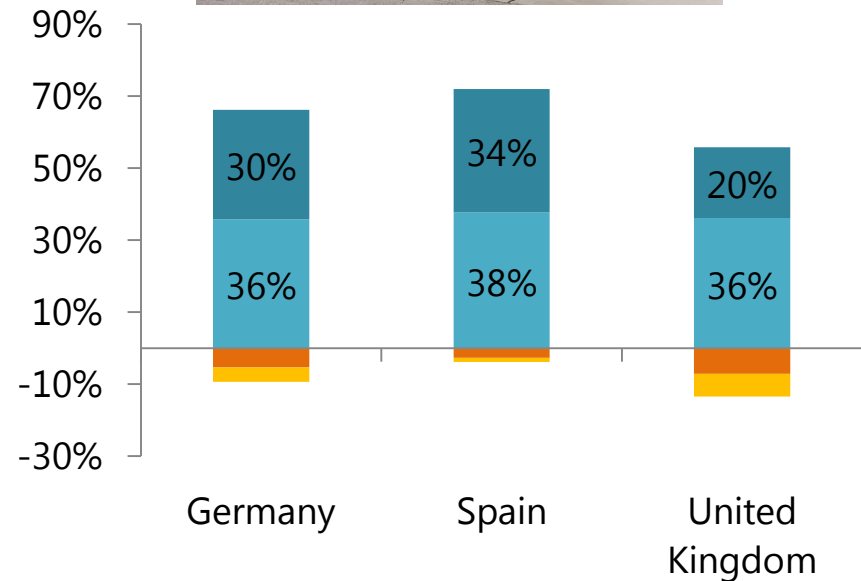
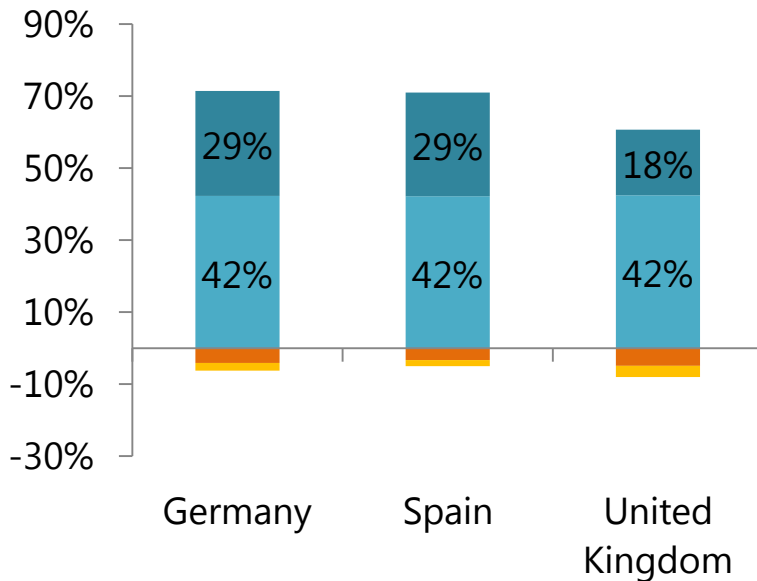
# Preliminary results: Public awareness and evaluation of HFC technologies



# Preliminary results: Informed evaluation of home fuel cells and HFCEVs



# Preliminary results: Acceptance (willingness to install/purchase) of home fuel cells and HFCEVs



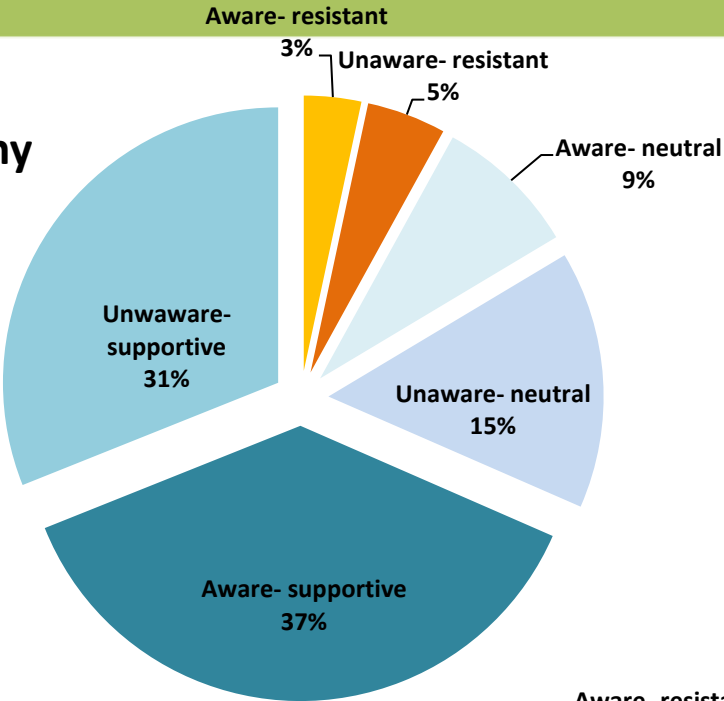
■ Disagree      ■ Strongly disagree  
■ Agree      ■ Strongly agree

■ Diasgree      ■ Strongly disagree  
■ Agree      ■ Strongly agree

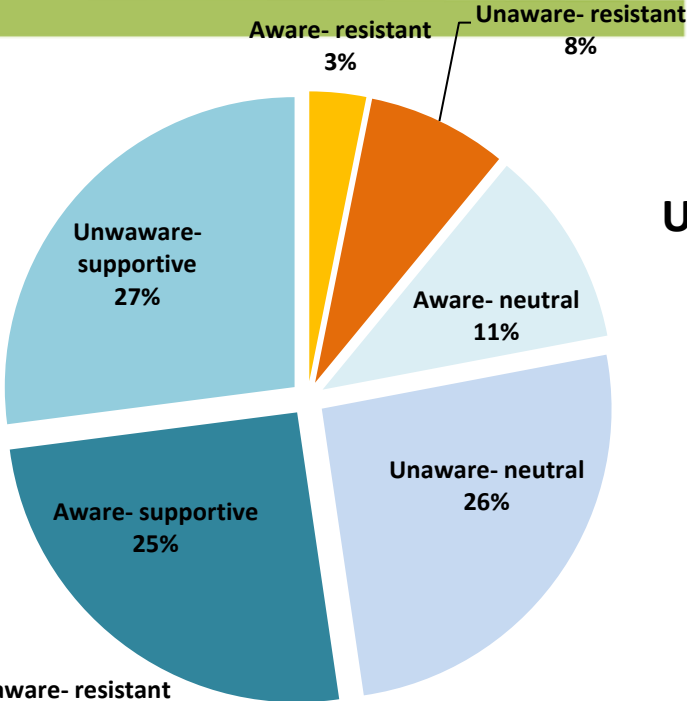
# Distribution of the country samples in support-awareness.



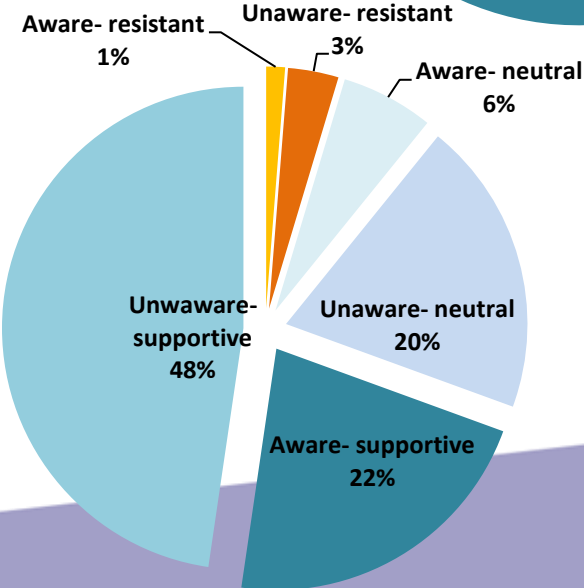
Germany



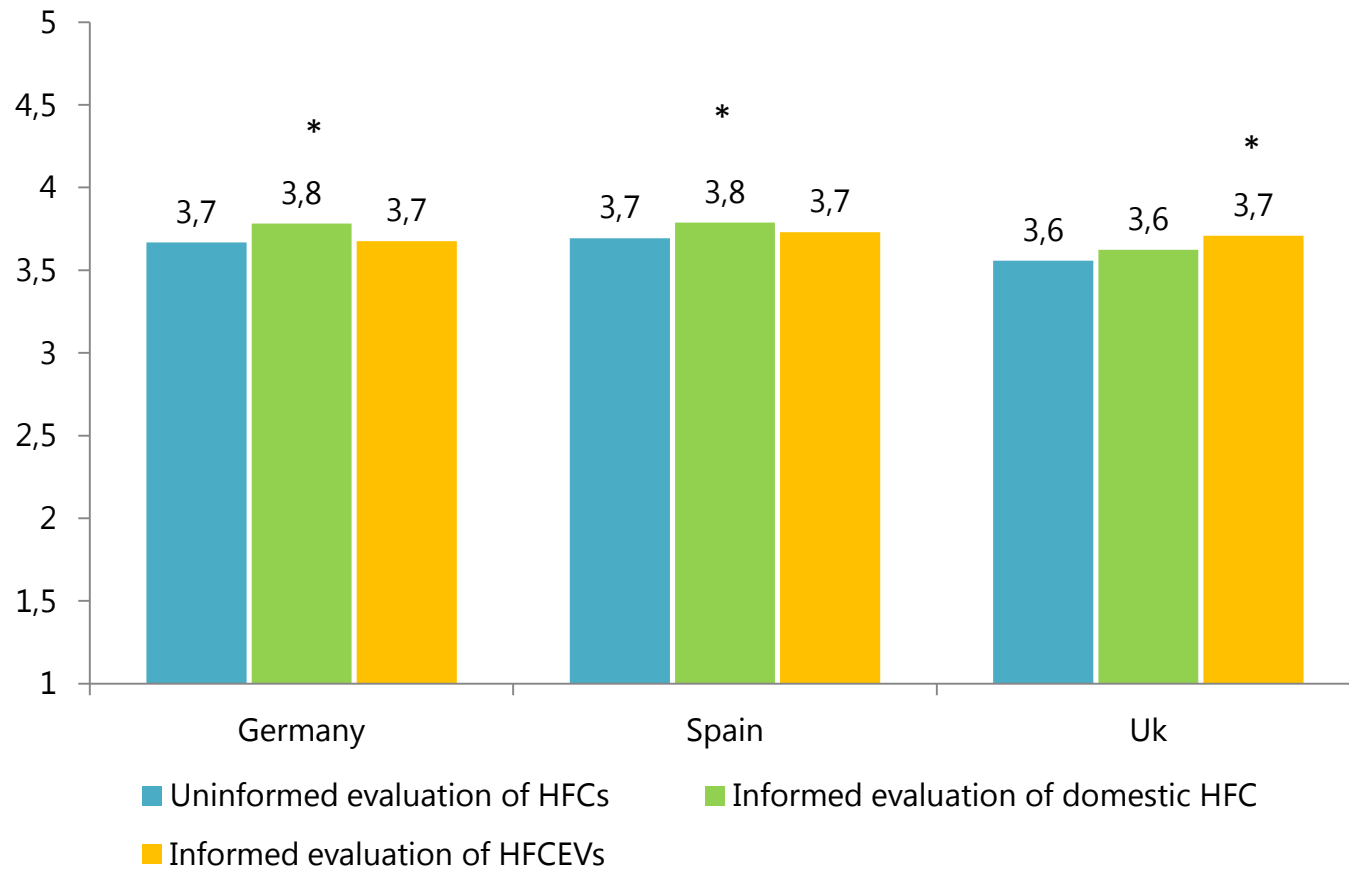
UK



Spain



# Changes from uninformed evaluation to informed evaluation



# Discussion and outlook

- In countries with advanced hydrogen support (e.g. Germany, Norway) the awareness of the technology is higher in the public (except from the UK). Uninformed evaluation, however, is very similar in all countries
  - Home fuel cells are evaluated slightly better than hydrogen fuel cell vehicles and also receive a higher acceptance in all three countries.
    - Respondents from the UK are more critical towards the technologies than those from Germany or Spain
  - Providing information can have a (small) positive effect on the evaluation of the technology
- More information is needed in all countries
- Outlook: Further analyses planned

## Thank you for listening

Uta Schneider<sup>1</sup>, Paul Upham<sup>2</sup>, Christian Oltra<sup>3</sup>, Elisabeth Dütschke<sup>1</sup>, Mònica Lores<sup>3</sup>,  
Rosier Sala<sup>3</sup>

1: Fraunhofer ISI

Breslauer Str. 48, D-76139 Karlsruhe, Germany

e-mail: [Uta.Schneider@isi.fraunhofer.de](mailto:Uta.Schneider@isi.fraunhofer.de), [Elisabeth.Duetschke@isi.fraunhofer.de](mailto:Elisabeth.Duetschke@isi.fraunhofer.de),

web: <http://www.isi.fraunhofer.de>

2: Institute for Environmental Communication

Leuphana Universität

Scharnhorststraße 1, D-21335 Lüneburg, Germany

e-mail: [paul.upham@leuphana.de](mailto:paul.upham@leuphana.de), web: <http://www.leuphana.de/en/institute/infu.html>

3: Department of Environment

Sociotechnical Research Centre (CISOT)

CIEMAT

Gran Via de les Corts Catalanes, 604, 4<sup>o</sup> 2<sup>a</sup> 08007 Barcelona, Spain

e-mail: [christian.oltra@ciemat.es](mailto:christian.oltra@ciemat.es), [monica.lores@ciemat.es](mailto:monica.lores@ciemat.es), [rosier.sala@ciemat.es](mailto:rosier.sala@ciemat.es)

web: <http://www.ciemat.es/CISOTportal>



# ANNEX

# Sample description

Sample		BELGI UM	FRANC E	GERM ANY	NORW AY	SLOVE NIA	SPAIN	UK
N		1021	1022	1011	1033	1014	1034	1013
Sex	male	47%	48%	49%	49%	49%	49%	52%
Age group	18-34	27%	28%	23%	28%	27%	29%	28%
	35-44	18	18	18	19	19	21	18
	45-54	19	17	19	18	18	18	17
	55+	36	36	40	35	35	32	37
Education	Primary	13%	24%	3%	8%	5%	8%	9%
	Secondary	46	25	75	40	60	31	30
	Tertiary (or higher education)	41	51	24.7	52	35	61	61
Size of place of residence	<2.000	9%	21%	8%	12%	27%	6%	12%
	2.000-20.000	46	33	31	29	38	19	23
	20.001-199.999	32	27	29	35	18	31	32
	200.000-1.000.000	7	10	19	17	14	23	17
	>1.000.000	5	9	13	6	2	21	16