Clean Hydrogen Partnership

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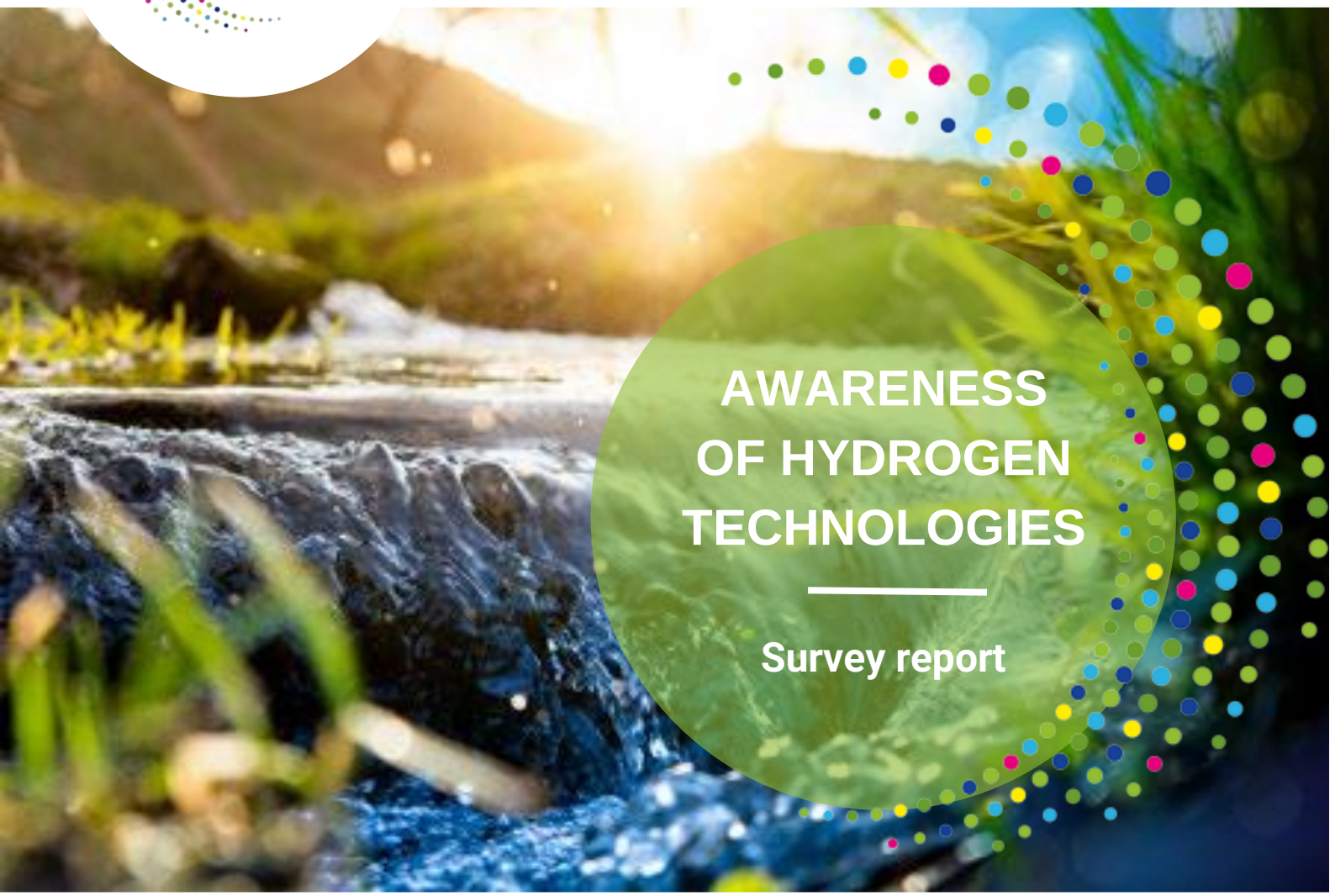

AWARENESS OF HYDROGEN TECHNOLOGIES

Survey report

MAY 2023

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Acronyms used for the 27 EU member states

AT	Austria	FI	Finland	LV	Latvia
BE	Belgium	FR	France	MT	Malta
BG	Bulgaria	GR	Greece	NL	Netherlands
CY	Cyprus	HR	Croatia	PO	Poland
CZ	Czechia	HU	Hungary	PT	Portugal
DE	Germany	IE	Ireland	RO	Romania
DK	Denmark	IT	Italy	SE	Sweden
EE	Estonia	LT	Lithuania	SI	Slovenia
ES	Spain	LU	Luxembourg	SK	Slovakia
EU27	All 27 EU member states				

ABSTRACT

Usage of hydrogen energy is low - just over one in ten has used it - but awareness is high at 82%. Approximately one in ten have never heard of hydrogen energy. The overall image of hydrogen is positive in terms of environmental impact compared to fossil and nuclear energy, although gasoline and diesel remain the fuels most frequently used for cars.

Half of those with gasoline or diesel cars are likely to switch to a car powered by an alternative source of energy in the next two years. 73% said that their preferred choice for switching would be for a hybrid (40%) or electric battery (33%) vehicle. One in ten (11%) would choose hydrogen. Cost is a key factor in the decision and is also the key obstacle for those unlikely to switch, although six in ten are ready to pay more for a cleaner energy.

Seven in ten agree that hydrogen energy can reduce energy dependence and believe that it's a sustainable energy source. Hydrogen is also seen as safe - six in ten believe it is as safe as any other energy source. Awareness of hydrogen is high as more than eight out of ten respondents in the EU have recently seen, read or heard something about it.

1. INTRODUCTION

1.1 Context

In order to increase social acceptance and trust in hydrogen-based technologies throughout the European Union, public awareness activities are essential. They are needed in particular to tackle any potential knowledge gaps or areas of mistrust amongst the general public which could hinder potential uptake in usage of these technologies.

The Clean Hydrogen Joint Undertaking, an EU public-private partnership, aims to support hydrogen technologies in Europe. One of the objectives of the partnership is to increase public and private awareness, acceptance and uptake of clean hydrogen solutions.

For this purpose, a public opinion survey was launched to analyse and assess European citizens' attitudes towards and level of knowledge of hydrogen technologies and determine a baseline for monitoring changes in public opinion over time.

This report presents the results of this survey, conducted in Autumn 2022. and explores a range of issues, including knowledge and awareness of energy in general and of hydrogen energy in particular.

1.2 Aims of the study

The main objectives of the survey were:

- To understand perceptions on the use of fuel cells and hydrogen (FCH) technologies in terms of:
    - Overall awareness, acceptance and uptake of hydrogen technologies
    - Perceptions of the safety and sustainability of hydrogen technologies
- To create a benchmark metric that will be able to track changing perceptions in the European population over time
- To provide a basis for further analysis and recommendations

2. ANALYSIS OF THE RESULTS

2.1 Knowledge and awareness of energy sources

This section explores knowledge and perceptions about energy sources in general and hydrogen in particular, before focusing on the way in which citizens perceive the energy-related issues which face their country.

2.1.1 AWARENESS OF ENERGY SOURCES

Respondents were asked the extent to which they had seen, read or heard anything about alternative energy sources. The awareness levels for all alternative energies are very high with more than nine in ten respondents aware of solar and wind energy (respectively 95% and 94%).

Over eight in ten respondents (82%) are aware of hydrogen energy.

This very high level of awareness is consistent across all sociodemographic subgroups of the population with no notable differences by age, gender, or level of education.

A02. As you may know, in the last years, several new clean energy sources have been developed to promote alternatives to reduce dependence upon traditional fossil fuels like oil, gas or coal.Have you seen, read, or heard anything about each of the following energy sources?

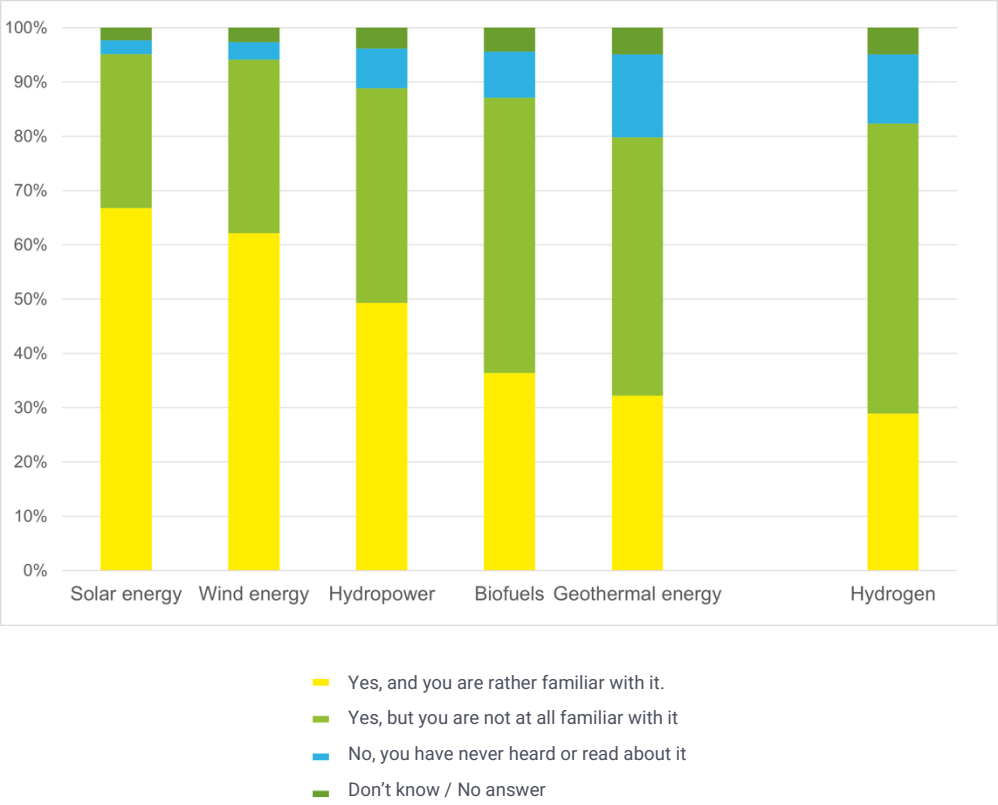

Chart 1: AO2: Awareness of types of alternative energy at EU27 level

Among the renewable energies, solar and wind energy are the most widely known. There is a particularly high level of awareness in Southern Europe like Greece, Cyprus, and Malta.

Hydrogen is an energy source with which the public is less familiar. However, people are more familiar with hydrogen than geothermal energy in one third of the EU countries, especially in the Netherlands and in Malta and **overall awareness of hydrogen is slightly higher than geothermal energy** (82% compared to 80%).

The type of energy with the widest range in the level of awareness across the different EU Member States is hydropower. In Denmark only 18% of the population is familiar with hydropower, while in Greece and Austria it is over 70%. The highest level of familiarity for all energy sources is seen in Slovakia whereas Cyprus always ranks in the bottom three.

In section 0 (

2.3 Perceptions of hydrogen) of our report, we have included a more detailed analysis which focuses solely on hydrogen awareness.

2.1.2 ENVIRONMENTAL IMPACT OF ENERGY SOURCES

Respondents were asked to rate each type of energy type in terms of its impact on the environment. The scale used was from 0 to 10, where 0 signified no impact and 10 signified a very negative impact.

Fossil energy is widely recognised to have the most negative impact on the environment with an EU average of 7,7 out of 10. This is followed by nuclear energy with an overall EU average of 6,3.

By contrast, **hydrogen is considered much more positively in terms of its environmental impact** with an average rating of 3.9. The environmental impact of solar, wind and hydropower energies are rated the most positively with average ratings of respectively 2.6, 3 and 3.4

A03. According to what you know, could you tell us to what extent each of the following sources has an impact or not on the environment?

0 Has absolutely no impact on the environment
10 Has a very negative impact on the environment

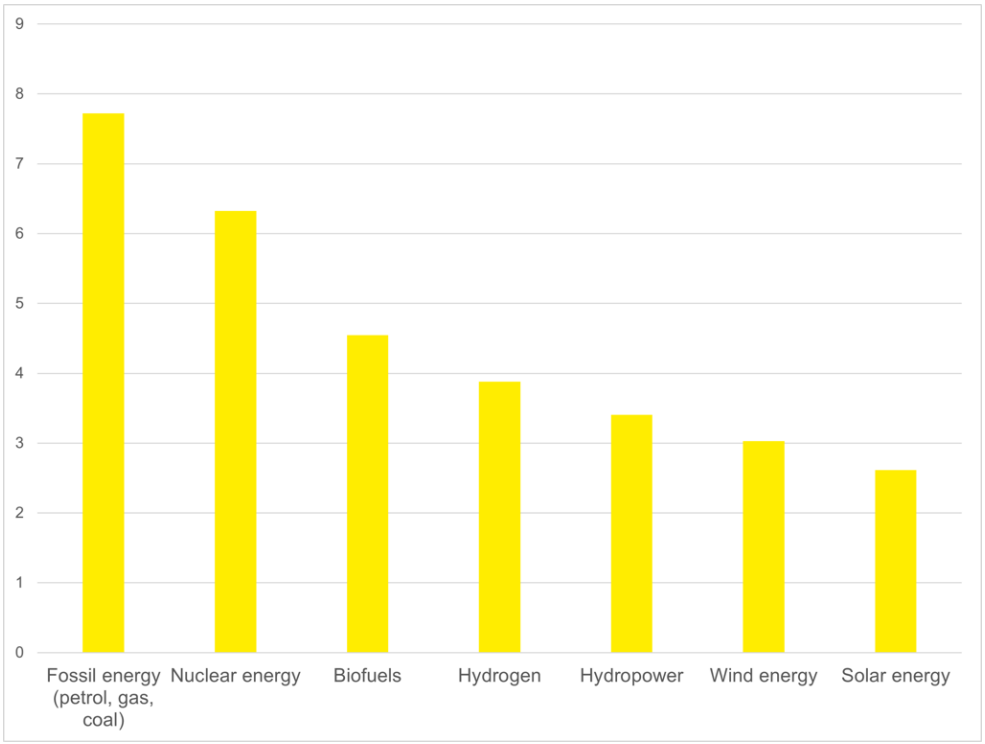

Chart 2: A03: Perceptions of environmental impact at EU level on a scale of 0-10 where 0 has absolutely no impact on the environment and 10 has a very negative impact on the environment

In all EU Member States, **fossil and nuclear energy are considered to be the two types of energy which have the most negative impact on the environment**. However, this overall "average" view obscures the wide range of opinion at the level of individual Member State. Opinion is most polarised over the environmental impact of nuclear energy which ranges from 7,2 in Greece to 3,5 in Denmark.

In several EU Member States, hydrogen is considered to have a relatively low negative impact on the environment compared to other types of energy, particularly in Germany where the average rating of its

impact was 3,5. Respondents in France (4,4), Spain (4,4) and Sweden (4,5) were most likely to believe hydrogen has a negative impact.

A03. According to what you know, could you tell us to what extent each of the following sources has an impact or not on the environment? ***HYDROGEN***

Chart 3: A03: perceptions of environmental impact of hydrogen by Member State on a scale of 0-10 where 0 has absolutely no impact on the environment and 10 has a very negative impact on the environment

The socio-demographic analysis reveals few differences. Women (4.3) are less likely than men (3.5) to have a positive assessment of the impact of hydrogen energy on the environment of hydrogen. Older respondents were much more positive (2.9) about the impact of hydrogen energy on the environment than younger age groups (where the average rating was higher than 4.5 for those aged between 15 and 39 years).

2.1.3 SOURCES OF INFORMATION ON ENERGY

This section looks at the sources of information that respondents use when looking for information on energy.

Traditional media (like television) and online are the sources most likely to be used by the public when seeking information on energy: 54% of respondents say they go on the Internet to get this information, 47% would find it on television and 30% would discuss the issue with friends and relatives. Only 6% of respondents claim never to look for information about energy.

Fewer than three respondents in ten find such information via social networks (28%) or in other newspapers and magazines (19%). Another 19% would rely on radio as an information source on energy.

B09. When you look for information on energy in general, which of the following sources, if any, do you use?

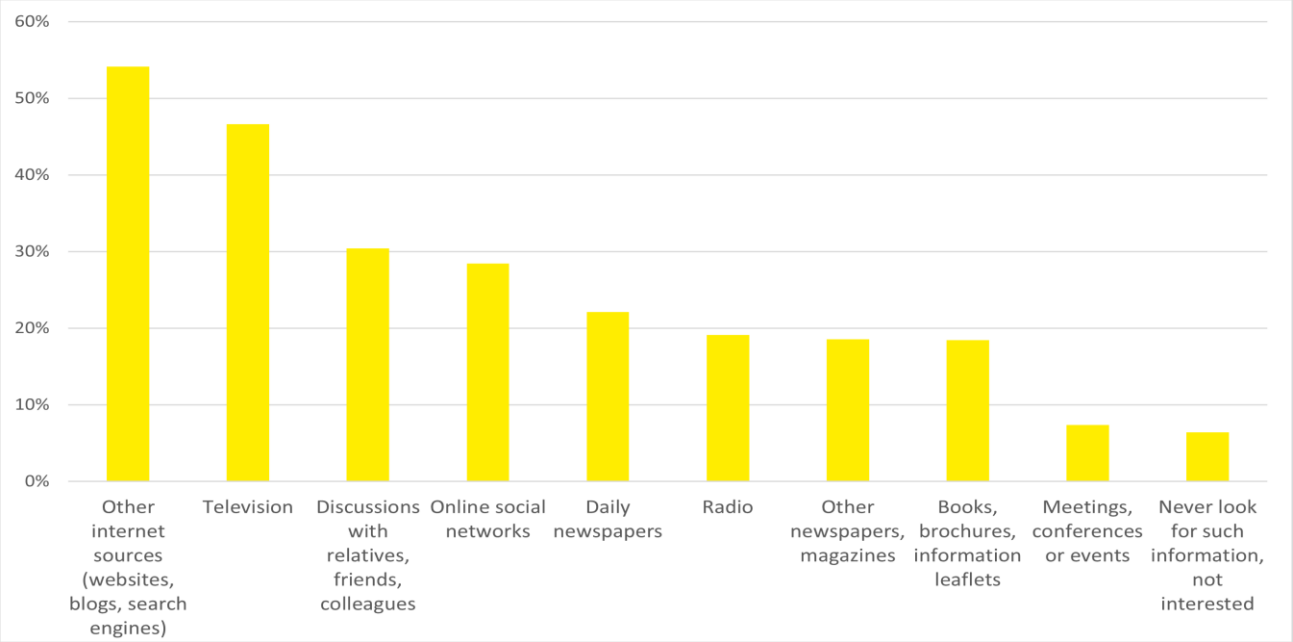

Chart 4 : Sources of information on energy (overall percentage)

2.1.4 IMPORTANT ENERGY AND ENVIRONMENT-RELATED ISSUES

Respondents were also asked which they felt were the most important energy and environment related issues facing their country. Each of the issues presented to respondents were considered by a large majority of respondents to be an important issue facing their country.

With the current context of the global energy crisis, **energy dependence is seen as being an important issue for their country by 90% of respondents.**

Water scarcity and air pollution (both at 87%) are also widely considered as important issues, followed closely by greenhouse gas emissions (83%).

A01. To what extent do you feel that each of the following represents an important issue facing [country] at the moment?

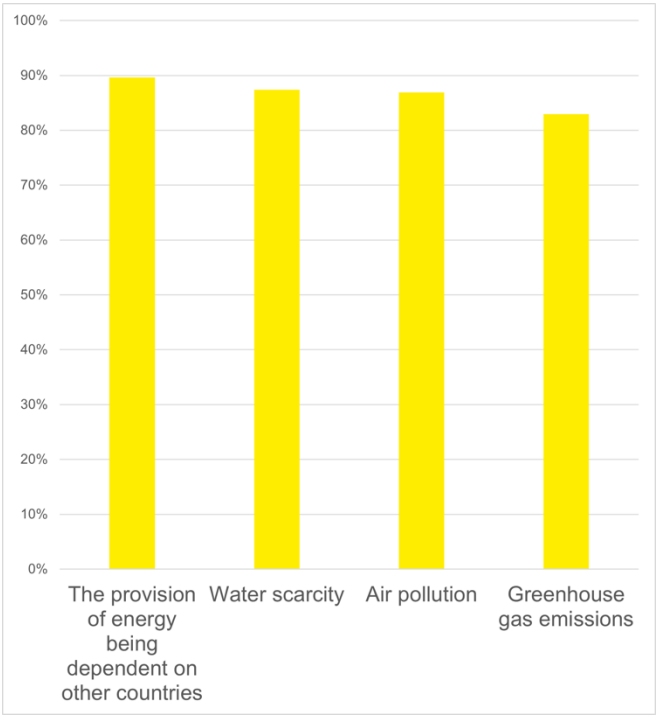

Chart 5: A01: "very" & "fairly" important energy and environment-related issues (shown as combined percentage)

The same pattern can be observed across all EU Member States. While the energy problem is a widespread concern across all countries, less than half of those surveyed in the Baltic states and Finland expressed concern about water scarcity. For example, only 23% of Latvians are concerned about water scarcity (very and fairly important), compared to 96% of Spanish respondents.

Latvian (55%), Estonian (60%), and Czech citizens (68%) are less concerned than other EU Member States about air pollution and also about greenhouse gas emissions (50%, 55% and 63% respectively).

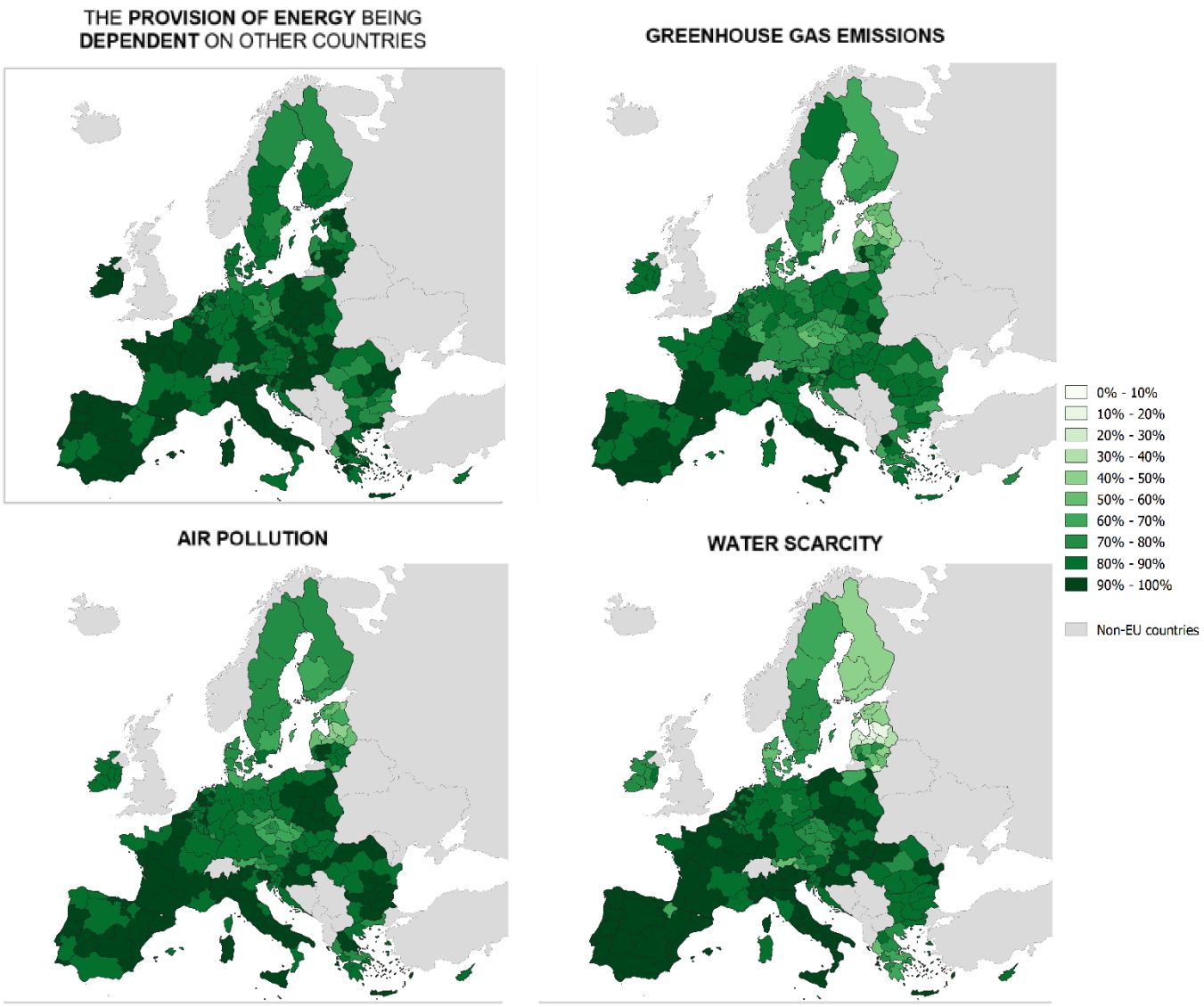

Chart 6: AO1 “very" & "fairly" important energy and environment-related issues by Member State (shown as combined percentage)

2.2 Energy and mobility

The survey examined citizens' behaviour in terms of their own energy consumption habits in relation to daily mobility. Different questions were asked to determine current and future trends of energy consumption as well as to measure people's willingness to switch to a more environmentally friendly energy source.

2.2.1 CURRENT SITUATION

Respondents were first asked about the type(s) of vehicle they use for professional or private reasons. **Just over three quarters (77%) use a car at least once a week.** Bicycles and public transport were both mentioned by around 4 in 10 (41% and 40% respectively), while motorbikes are used by around one in ten (11%).

B01. How often do you use each of the following, for professional or private reasons? (Answers "at least once a week" - % EU)

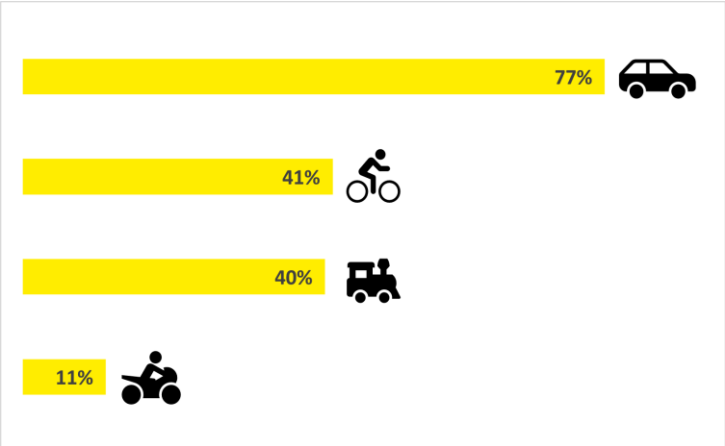

Chart 7: B01 – total % at EU level who use each vehicle at least once a week

While car usage is consistently high across all EU Member States, the use of public transport varies significantly. Spanish (54%), Luxembourgish (49%), and Hungarian respondents (49%) are more likely to frequently use public transport. Public transport usage is lowest in Cyprus (7%), Slovenia (20%), Croatia (24%), Malta (25%) and the Netherlands (30%).

The Netherlands shows the highest proportion of bicycle usage (70%), followed by Poland (55%), Denmark (49%), Germany (47%) and Belgium (46%).

Those who said that they used a car were asked about their current fuel consumption patterns.

B02. Which of the following fuels do you currently use in the car that you most frequently use?(ONLY TO FREQUENT USERS OF CARS - %EU)

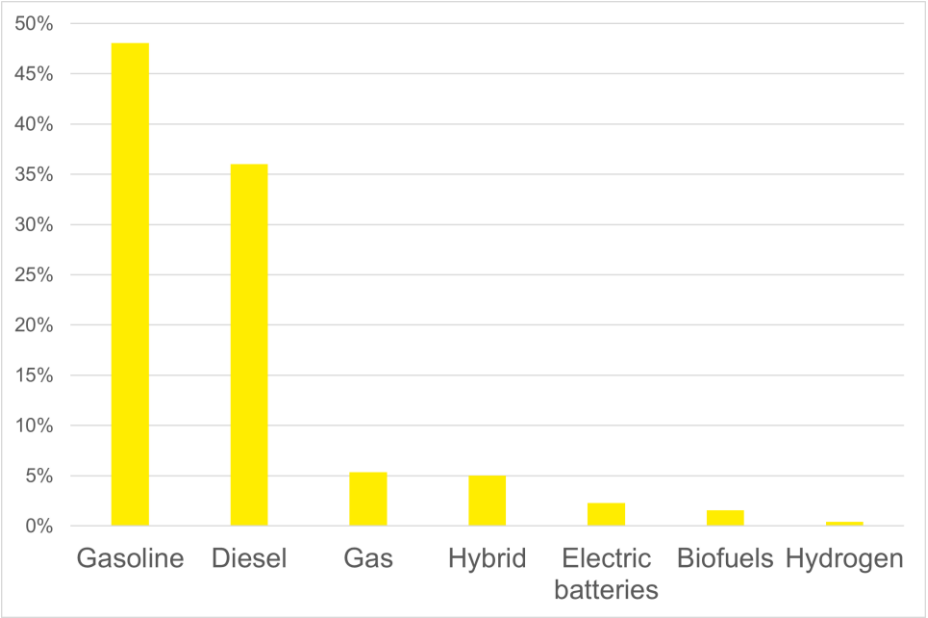

Chart 8: B02: types of fuels used at EU level among frequent car users shown as percentage

Gasoline and diesel are the main fuels used most frequently for cars, accounting between them for 81% of car users. Alternative energy types on the other hand are used by a much smaller proportion of respondents. Electric energy accounted for 8% of energy used most frequently, including both hybrid cars (6%) and fully electric (2%). Gas (LPG or CNG) accounted for 6%, with biofuels only mentioned by 2% of those surveyed.

Only 0.4% of those surveyed say that they use a hydrogen-powered car most frequently.

Gasoline and diesel consumption patterns vary a little between EU Member States. In the Netherlands for example, diesel was mentioned by only one in ten respondents. Alternative fuel consumption is consistently low across all EU Member States, although slightly higher usage was observed in some countries. In Sweden for example, respondents are more likely to use electric batteries (5%) or hybrid energy (9%) for their cars. Hybrid cars are also more likely to be mentioned in Italy (9%) and Ireland (9%). Gas usage in cars is more common in Bulgaria (17%) and in Italy (14%).

2.2.2 CONSIDERING SWITCHING TO A CLEANER ENERGY

Frequent users of gasoline or diesel cars were then asked about their likelihood of switching to a new vehicle “not using gasoline or diesel”.

Half (49%) of respondents overall answered that they are likely or very likely to switch to a car powered by an alternative source of energy in the next 2 years, although this varies considerably by EU Member State as illustrated below.

B03. How likely are you to consider switching your current car for a vehicle not using diesel or gasoline in the next 2 years?

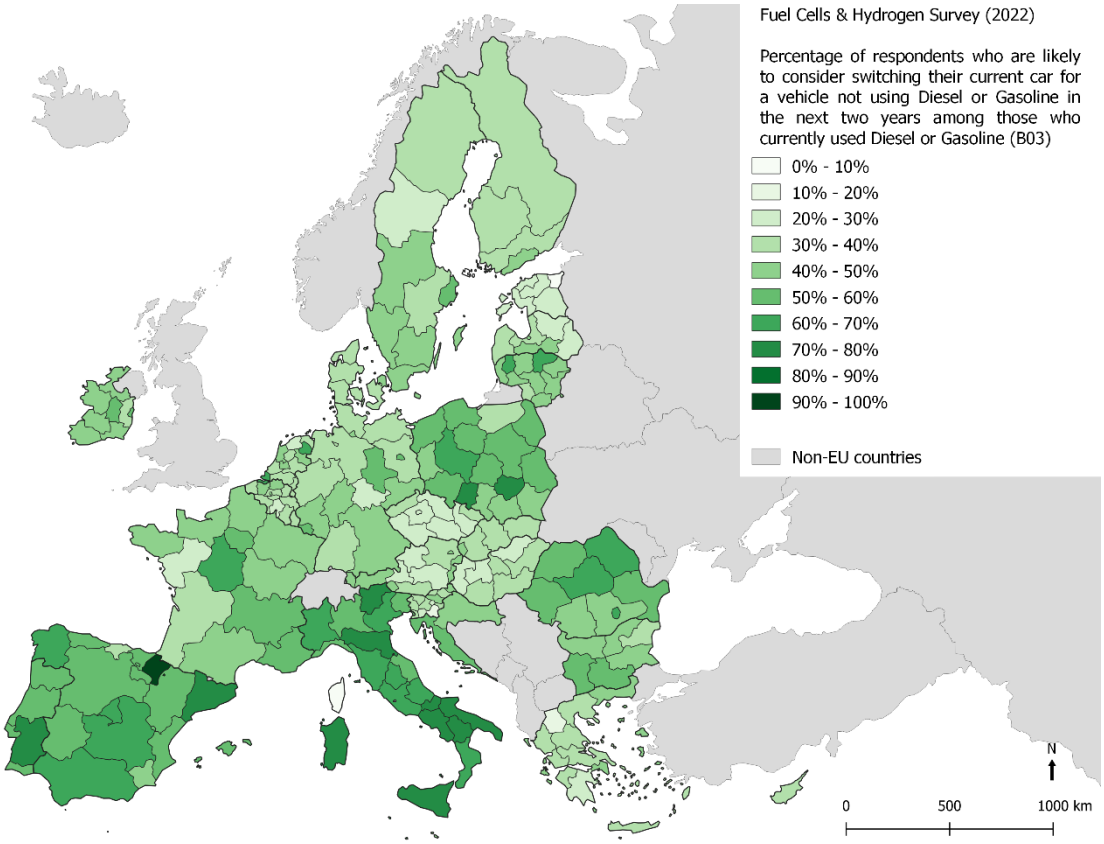

Chart 9: B03 – combined percentage by Member State of "very" & "fairly" likely to switch their car for vehicle not using diesel of gas in next two years

The likelihood of switching to a vehicle not using diesel or gasoline is higher in Southern European countries - particularly in Italy (68%), Spain (61%), Romania (56%) and Portugal (54%). Conversely, Estonians (22%), Czechs (26%), and Hungarians (31%) were least likely to say they would switch.

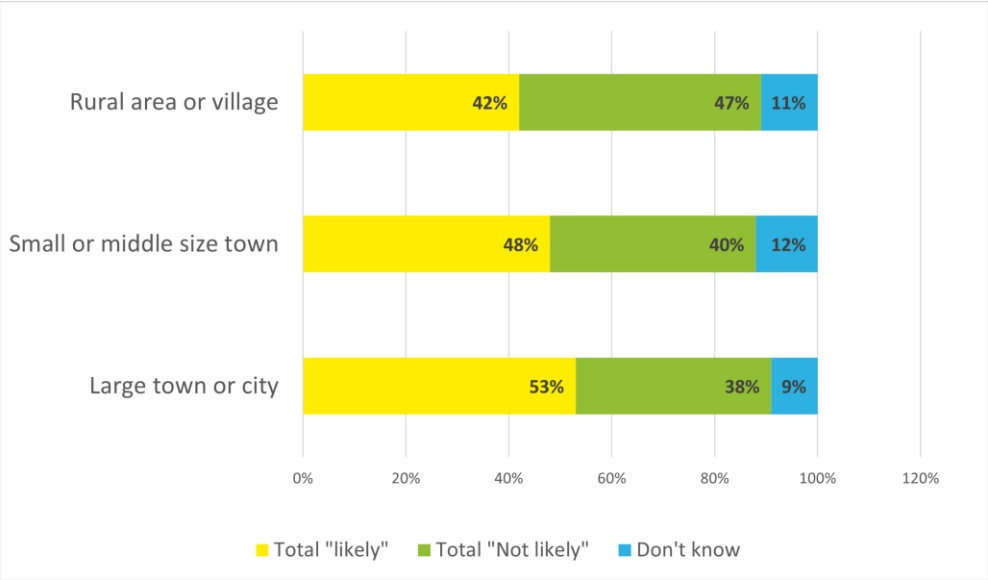

Chart 10: B03 - "% likely and % unlikely to switch their car for vehicle not using diesel of gas in next two years shown by level of urbanisation at EU level

The likelihood of switching to a vehicle not using diesel or gasoline was higher amongst respondents living in urban areas, with 53% of those living in large cities who said they would be likely to switch. There were also differences observed by level of with those who finished their studies at a later age more likely to say they were likely to switch to an alternative fuel (53%).

Respondents were then asked about the main considerations which would affect their decision to switch to a vehicle not using diesel or gasoline. This question was asked of those who said either that they were “very likely” or “fairly likely” to switch in the next two years.

B04a. How much would the following points influence your decision to switch to a car using an alternative energy?

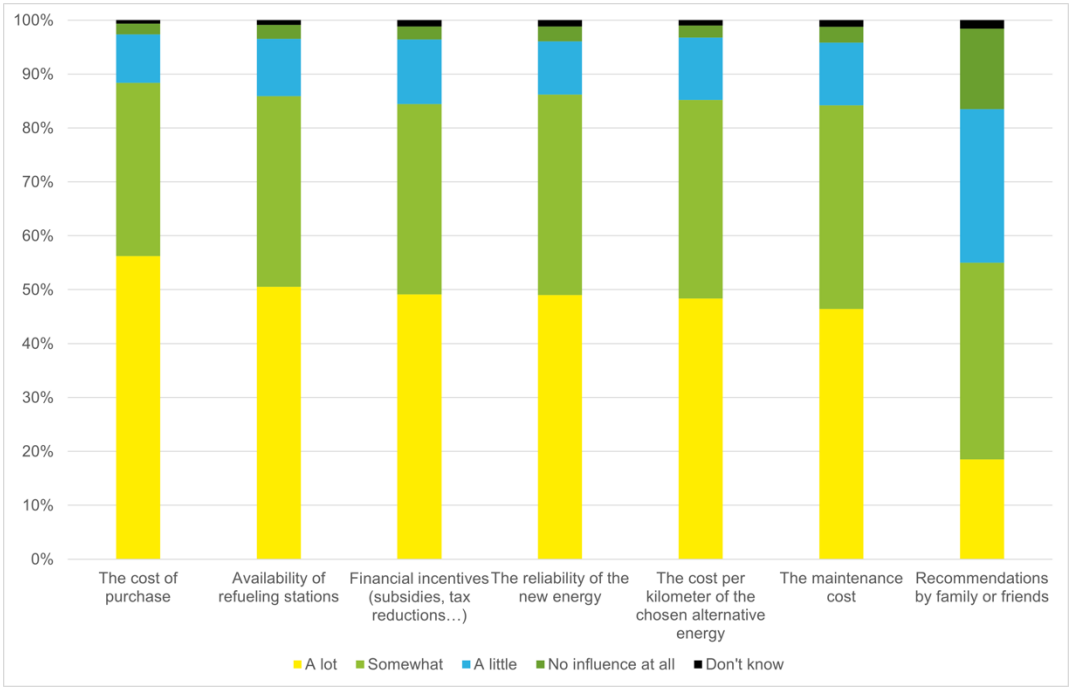

Chart 11: B04a - Influences on decision to switch to a car using an alternative energy shown as % at EU level

The cost of purchasing the new vehicle (88%) and the availability of refuelling stations (86%), were the factors most likely to influence (a lot or somewhat) the switching decision.

Reflecting the key concern of the cost of switching, **more than eight out of ten respondents said that some form of financial incentive (i.e. subsidies, tax reduction…) would also influence their decision**.

The reliability of the alternative energy was a concern for 86% of respondents who felt it would influence their decision.

Respondents who said that they were "very" or "fairly" likely to switch to a vehicle not using diesel or gasoline in the next two years were then asked about their preferred types of alternative energy.

B04b. If you were to switch to a new car using an alternative energy, which of the following would be your preferred choice?

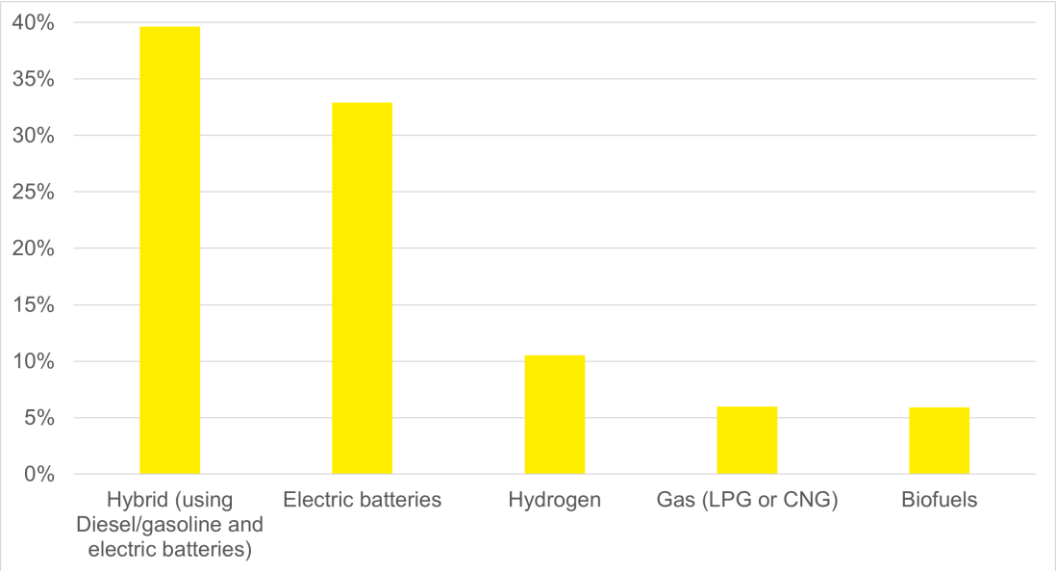

Chart 12: B04b: preferred choice of new car using an alternative energy at EU level shown as overall %

Around three quarters (73%) of those likely to switch said that their preferred choice would be for a hybrid (40%) or electric battery (33%) vehicle. **One in ten (11%) said that hydrogen would be their preferred choice, ahead of gas (LNG or CNG) (6%) and biofuels (5%).**

Respondents in Malta (52%), Denmark (48%) and Ireland (45%) were most likely to express a preference for electric batteries. In Cyprus (47%), Italy (46%), and Spain (45%) hybrid cars were the most frequently mentioned.

Hydrogen was most likely to be the preferred option in Luxembourg (19%), Austria (15%), Germany (15%) and Czechia (15%).

The preference for biofuels or gas as an alternative energy was consistently low across all EU Member States. Respondents in France (11%) and Austria (10%) were the most likely to choose biofuels while around one in ten chose gas in Greece (12%) and Poland (10%).

Respondents who said that they were unlikely to switch to an alternative to diesel or gasoline were asked why they would not consider it.

B05. Which of the following are the main reasons for not considering moving to an alternative fuel?

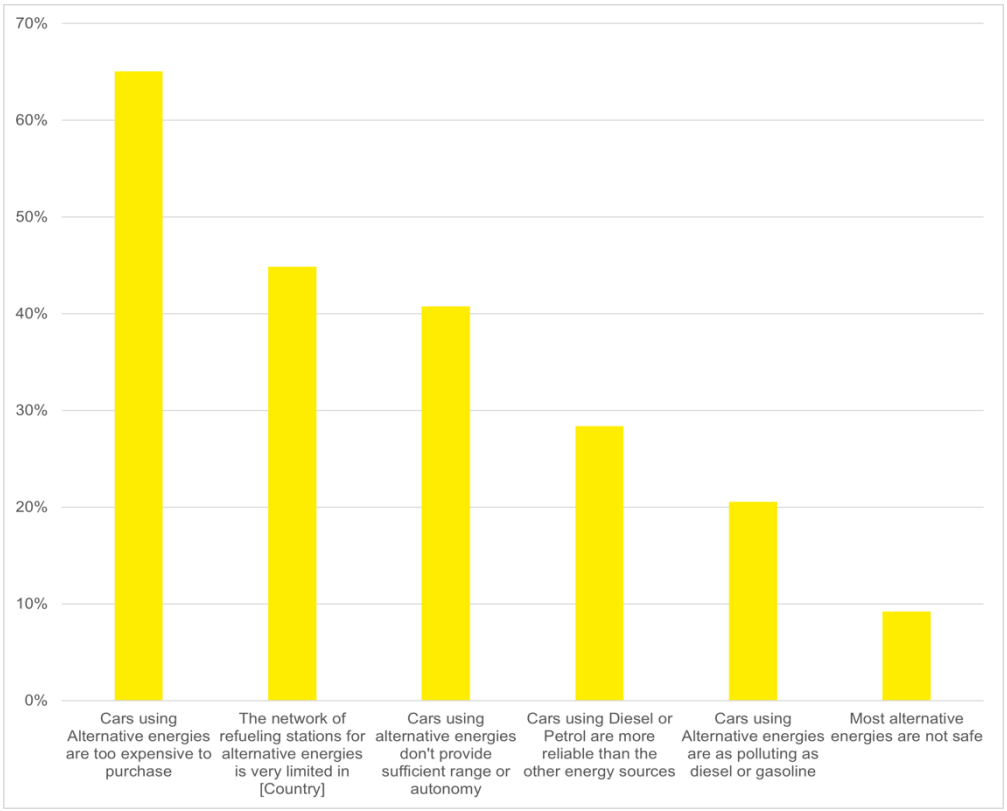

Chart 13: B05 – main reasons for not considering moving to an alternative fuel, shown as total % at EU level

The main obstacle to switching is the perceived cost of doing so with 65% who perceive that cars using alternative energies are too expensive. Other reasons include the network of refuelling stations (45%) and the insufficient range or autonomy of cars using alternative energies (41%). The current network of refuelling stations was least likely to be seen as an issue in the Netherlands (28%), Denmark (30%), and Sweden (31%).

Respondents in Austria (43%), Czechia (41%) and Estonia (40%) were more concerned about the reliability of cars using alternative fuels than in other EU Member States.

Very few people believe that the alternatives are unsafe, with only around one in ten (9%) in the EU overall who expressed this as a factor in the decision. The highest proportions are seen in Luxembourg (22%), Austria (15%), and France (13%).

Although the data shows that the perceived cost is a key barrier to switching for many, **when asked whether they would be ready to pay more for cleaner energy for their personal needs, over six in ten (63%) would do so.**

B06. For your personal energy needs (like heating or fueling your car), to what extent would you be ready to pay more for a cleaner energy produced from sources that emit less greenhouse gases?

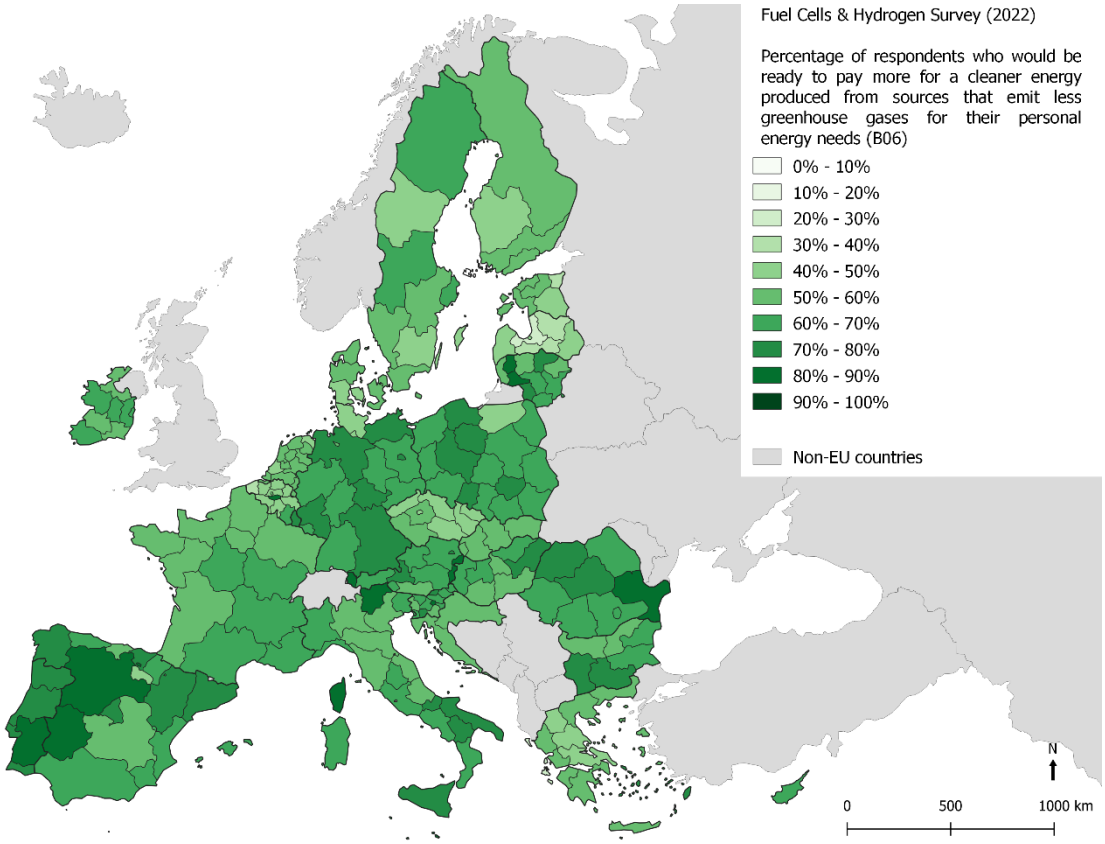

Chart 14: B06: Willingness to pay more for cleaner energy by Member State, showing combined %"Yes, definitely" & "Yes, to some extent"

A majority of at least half of the respondents surveyed say they would be willing to pay for a cleaner energy across almost all EU Member States, with the exception of Latvia (40%), Czechia (46%), and Belgium (47%).

2.3 Perceptions of hydrogen

2.3.1 GENERAL AWARENESS

A02. *Have you seen, read or heard anything about each of the following energy sources? Hydrogen*

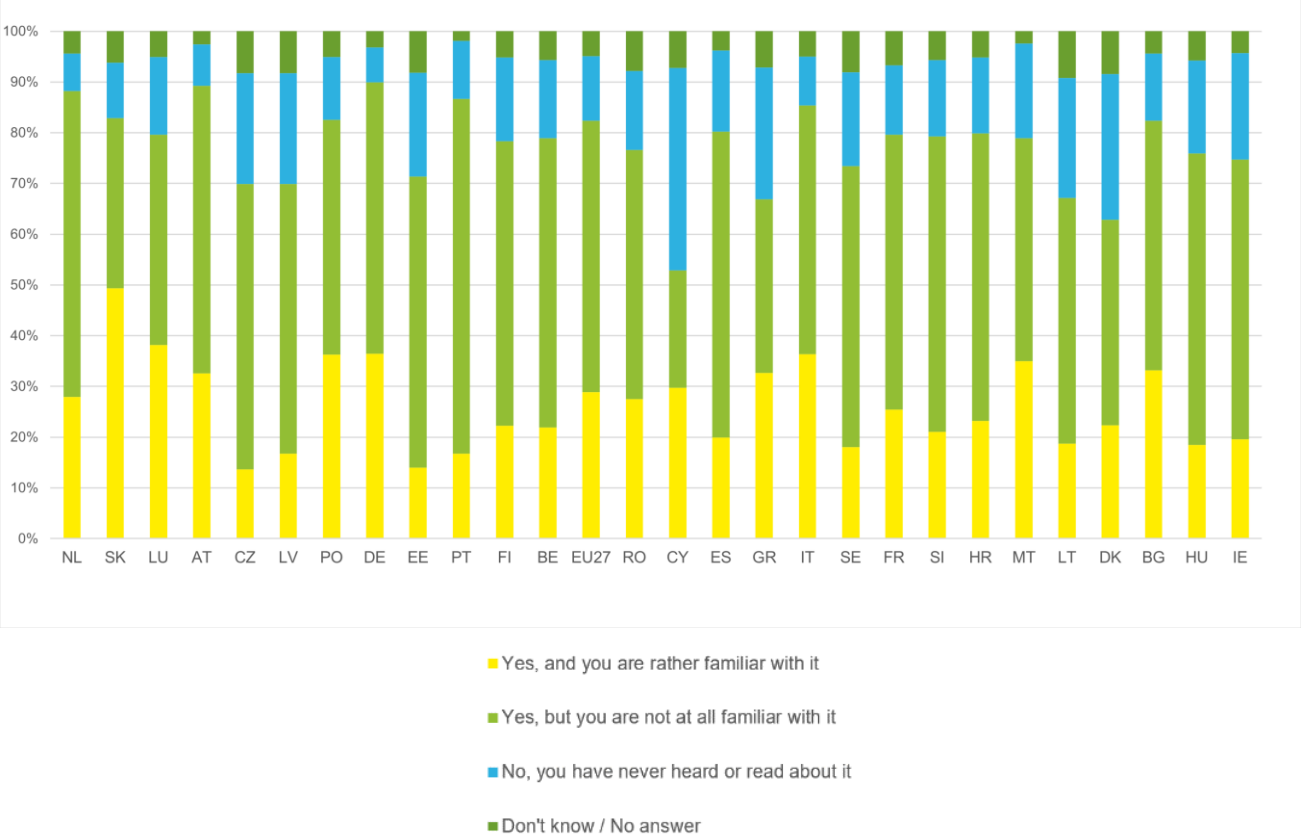

Chart 15: Have you seen, read or heard anything about hydrogen, shown as % by Member State

More than eight out of ten respondents in the EU have seen, read or heard something about hydrogen (82%). Three in ten (29%) consider themselves to be rather familiar with hydrogen, while 53% have heard of it but are not at all familiar with it. Only 13% of respondents have never heard about it.

While extremely high, as seen earlier, **awareness of hydrogen energy is lower than most other types of energy** – for example almost all respondents were aware of solar energy (95%), wind energy (94%) while around nine in ten claimed to have seen, read or heard something about hydropower (89%) or biofuels (87%). However, **awareness of hydrogen energy is slightly higher than that of geothermal energy** (80%).

Overall **awareness of hydrogen energy is highest in Germany (90%) and Austria (89%).** It is also high in the Netherlands (88%) and Portugal (87%), **Slovakia stands out with the highest proportion of respondents (49%) who claim to not only be aware but to also be familiar with hydrogen.** The countries where awareness of hydrogen is lowest are Cyprus (53%), Denmark (63%) and Greece (67%).

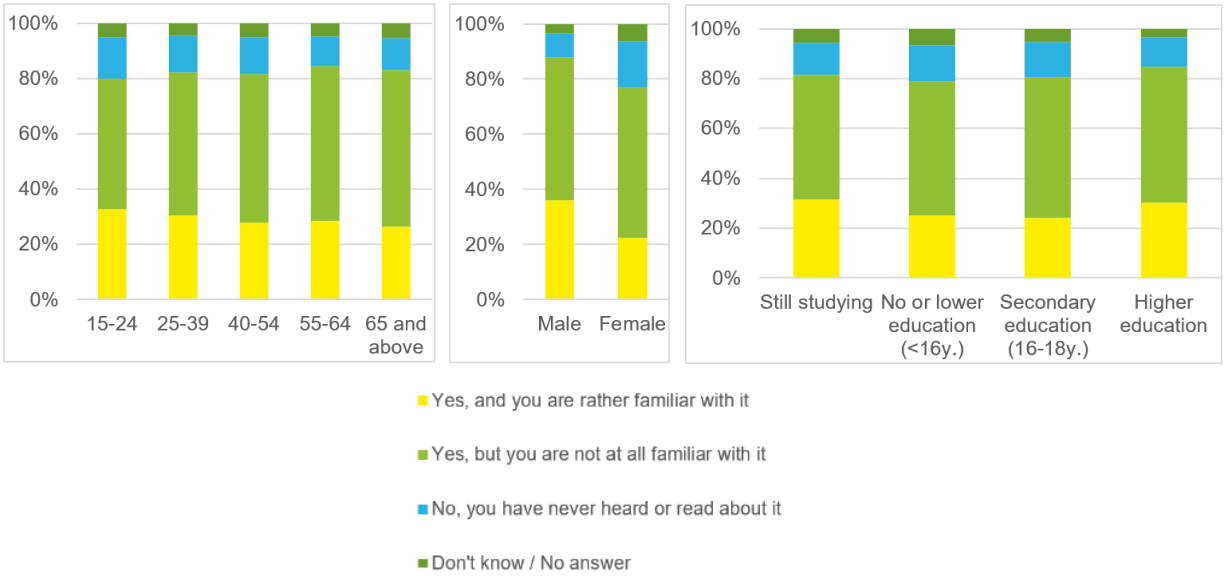

Chart 16: Have you seen, read or heard anything about hydrogen, shown as % by key sociodemographic groups.

Looking at socio-demographic groups, there are little differences: **awareness levels of hydrogen energy are high amongst all subgroups of the population.** It's worth noting however that women are generally less like to say that they are familiar with this type of energy than men (22% compared to 36%).

2.3.2 PERCEPTIONS OF HYDROGEN

Within the context of the energy crisis resulting from the Russian invasion of Ukraine, it is perhaps not surprising that the survey reveals that that **a large majority of seven in ten respondents (70%) feel that hydrogen can play an important role in reducing the energy dependence of their country**. A quarter of respondents (25%) totally agreed with this statement.

Only 13% disagreed that hydrogen energy could help tackle energy dependence with 17% who didn't know.

B07. To what extent do you agree or disagree with each of the following statements regarding Hydrogen energy and technologies?

Statement 1: Hydrogen is a good solution for reducing the energy dependence of [Country]

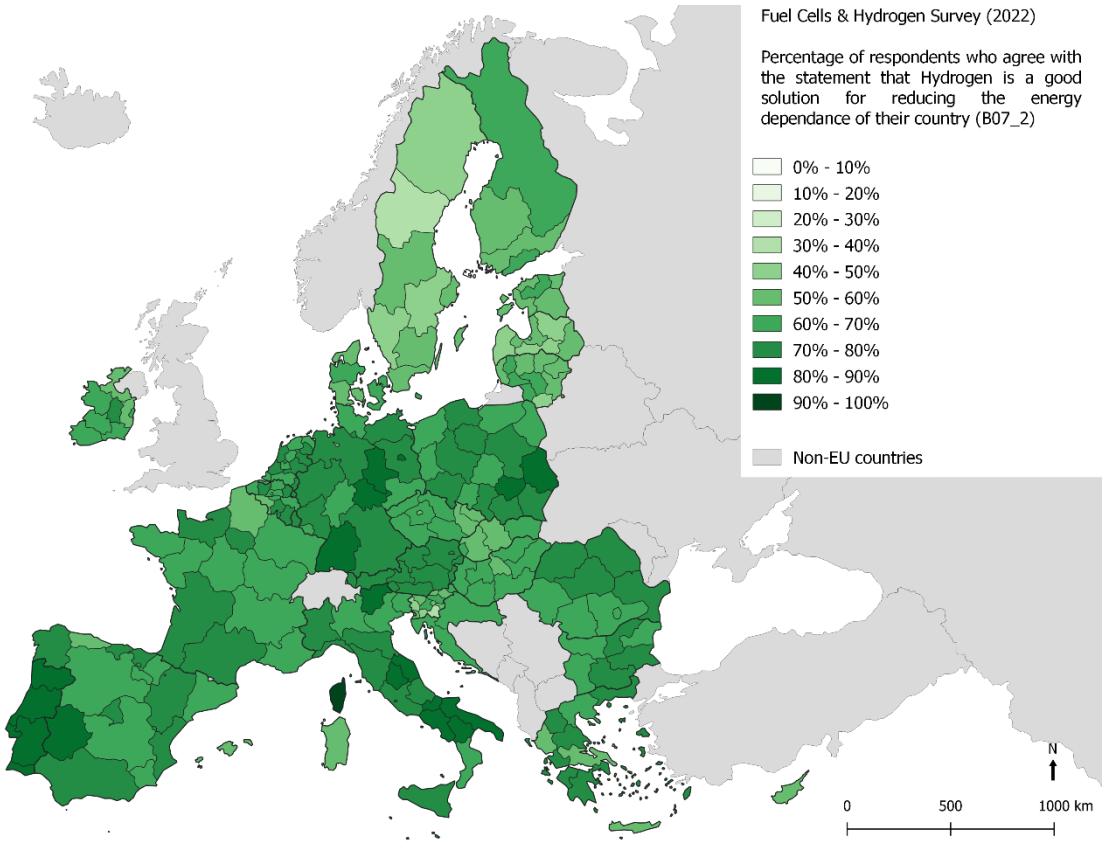

*Chart 17: Answers to question B07 for Hydrogen is a good solution for **reducing the energy dependence** of [Country] – shows combined % for "Totally agree" & "tend to agree" by Member State*

Respondents in Portugal were most likely to agree that hydrogen energy is a good solution for reducing energy dependence (82%), followed by Germany and Italy (both 75%). The proportion is lower in Northern Europe where only around half agreed with this in Sweden (50%) and Latvia (52%).

The perception of the risk linked to the use of hydrogen is key to the development of its use by the general public. **Six in ten (59%) respondents in the EU believe that hydrogen is as safe as any other energy source.** One in five (18%) totally agreed with this statement. Only 17% disagreed that hydrogen energy was safe but there was a high level of don't know responses (24%) suggesting a key gap in current public knowledge and a potential area for communication activities to improve public confidence.

B07. To what extent do you agree or disagree with each of the following statements regarding Hydrogen energy and technologies?

Statement 2: Hydrogen is as safe as the use of any other energy source

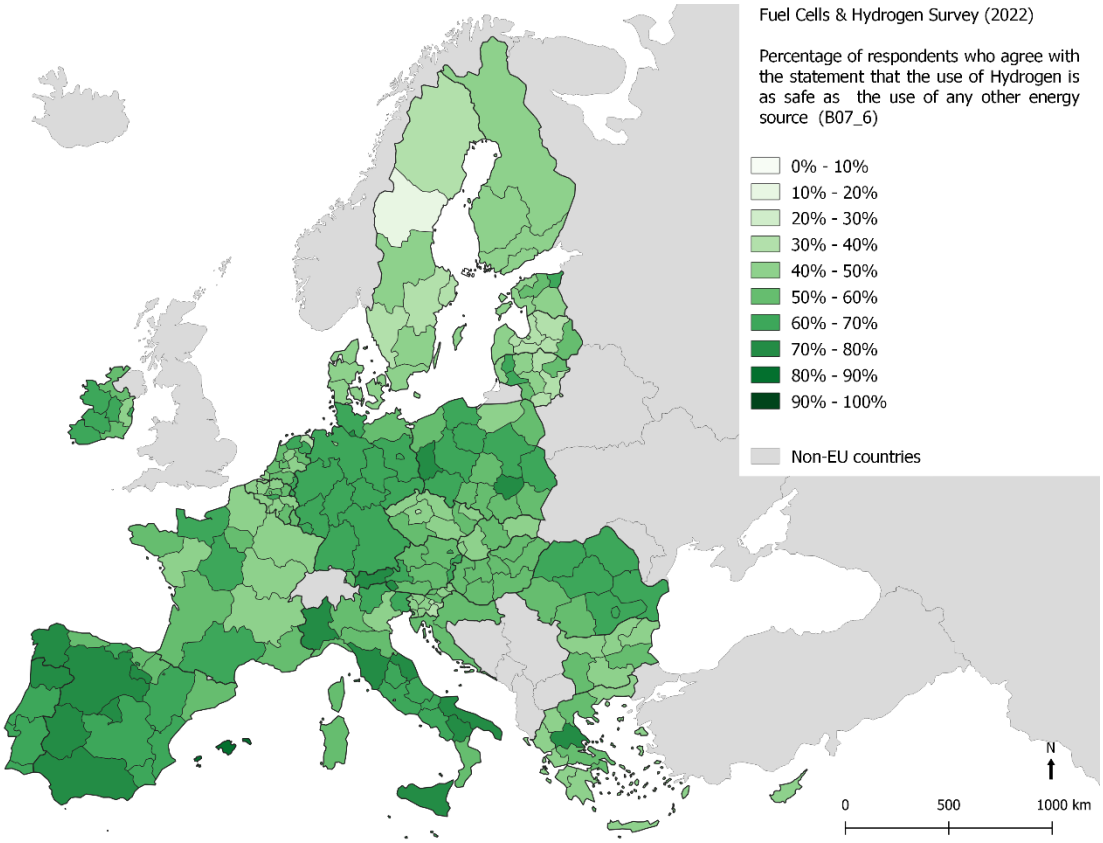

*Chart 18: Answers to question B07 for Hydrogen is **as safe** as the use of any other energy source - " shows combined % for "Totally agree" & "tend to agree" by Member State*

This opinion is prevalent in the Iberian Peninsula and in Germany where around two thirds of people agree with this statement. Northern countries, in particular Sweden and Latvia are less convinced about the safety of hydrogen with fewer than four respondents out of ten who agree that it is as safe as other energy sources. Finally, the sociodemographic analysis shows a notable difference by gender, with women much less likely then men to consider hydrogen to be a safe energy source.

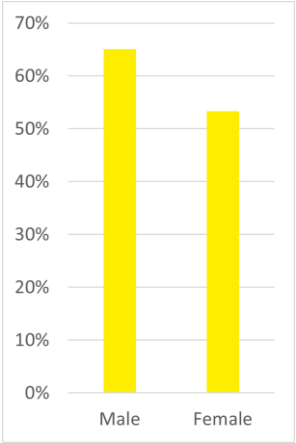

*Chart 19: Answers to question B07 for Hydrogen is **as safe** as the use of any other energy source - " shows combined % for "Totally agree" & "tend to agree" by gender*

2.3.3 IMPACT ON THE ENVIRONMENT

When asked to rate the impact of hydrogen on the environment on a scale of 0-10 (0 meaning no impact and 10 meaning very negative impact), hydrogen rates well compared to other energy types with a relatively low score of 3,9 out of ten at EU level. There is little variation between countries, and in all Member States hydrogen is generally perceived to be a type of energy with a low impact on the environment.

A03. According to what you know, could you tell us to what extent each of the following sources has an impact or not on the environment? Hydrogen

0 Has absolutely no impact on the environment
10 Has a very negative impact on the environment

Chart 20: A03: perceptions of environmental impact of hydrogen - average for each Member State on scale of 0 to 10 where 0 means it has absolutely no impact on the environment and 10 means it as a very negative impact

In Sweden (4.53), France (4.38), Spain (4.38) and Cyprus (4.14), respondents are slightly more likely to view hydrogen as having a negative impact on the environment. Perceptions of the environmental

impact of hydrogen vary according to age, with older respondents less likely to see hydrogen energy as having a negative impact on the environment.

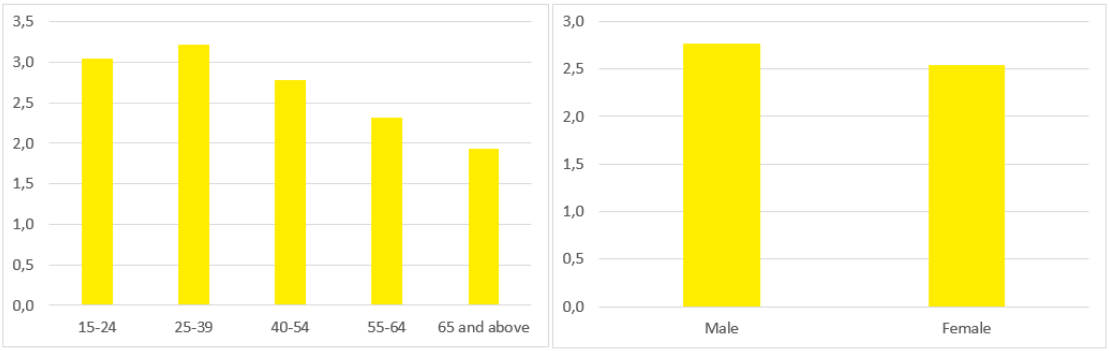

Chart 21: A03: perceptions of environmental impact of hydrogen - average by key sociodemographic groups on scale of 0 to 10 where 0 means it has absolutely no impact on the environment and 10 means it as a very negative impact

B07. To what extent do you agree or disagree with each of the following statements regarding Hydrogen energy and technologies?

Statement 3. Hydrogen is a sustainable energy source

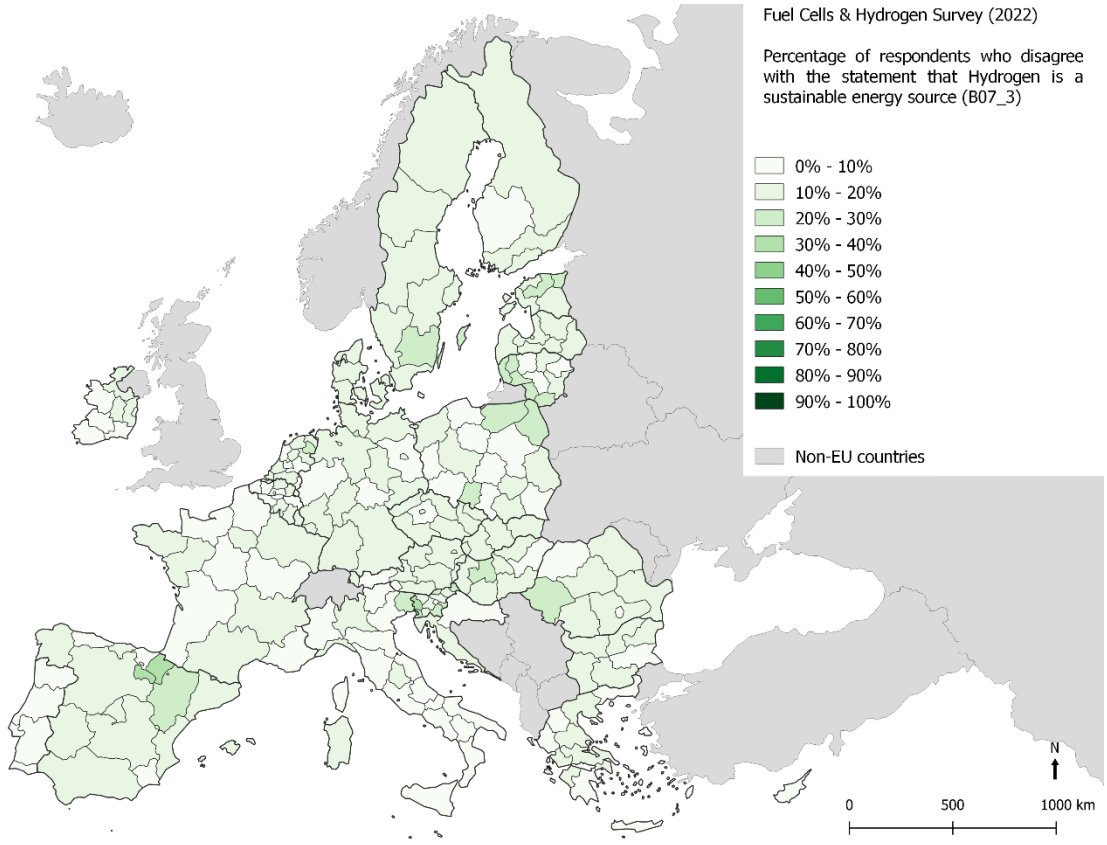

Chart 22: Answers to question B07 for Hydrogen is a sustainable energy source - shows combined % of "Totally disagree" & "tend to disagree" by Member States

In general, **seven out of ten Europeans (69%) consider hydrogen to be a sustainable energy source, with only 11% who do not agree**. The proportion who disagree that it is a sustainable energy source is highest in Slovenia (19%) and Estonia (18%). Respondents in Malta (5%), Portugal (7%) and Cyprus (7%) were the least likely to disagree that it is sustainable.

One in five (20%) didn't know, indicating a lack of awareness of the environmental benefits of hydrogen as an alternative energy source. The proportion of people who didn't know was around a third in Sweden (36%), Cyprus (33%), Denmark (32%) and finally Latvia, Lithuania and Finland (all 31%),

B07. To what extent do you agree or disagree with each of the following statements regarding Hydrogen energy and technologies?

Statement 4. Hydrogen is as polluting as diesel or gasoline

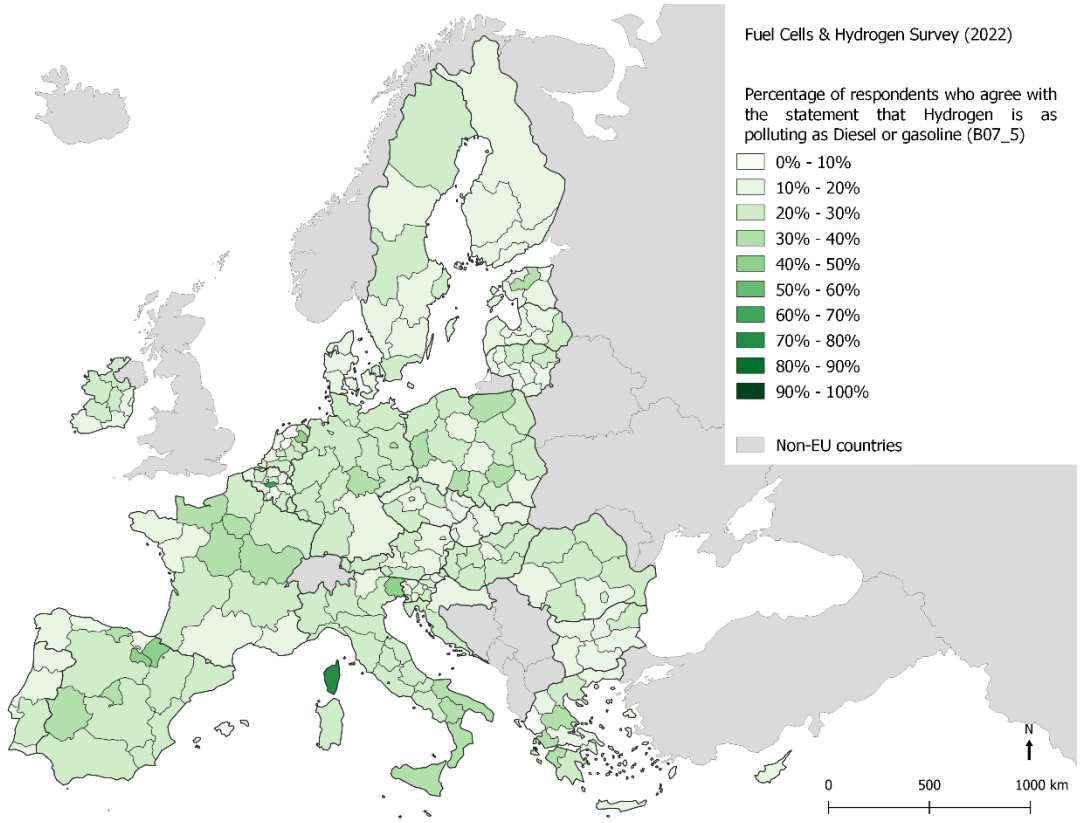

Chart 23: Answers to question B07 for Hydrogen is as polluting as diesel or gasoline - shows combined % for "Totally agree" & "tend to agree" by Member State

Only a minority of one in five respondents in the EU (22%) believe that hydrogen is as polluting as oil-based fuels. It is a similar picture across all EU Member States, ranging from a high of 25% in France and Italy, to only 15% in Cyprus.

The socio-demographic analysis shows that younger respondents are more likely to associate hydrogen energy with pollution. The difference between men and women is not large, although men are more likely tend to perceive hydrogen to be as polluting as diesel or gasoline.

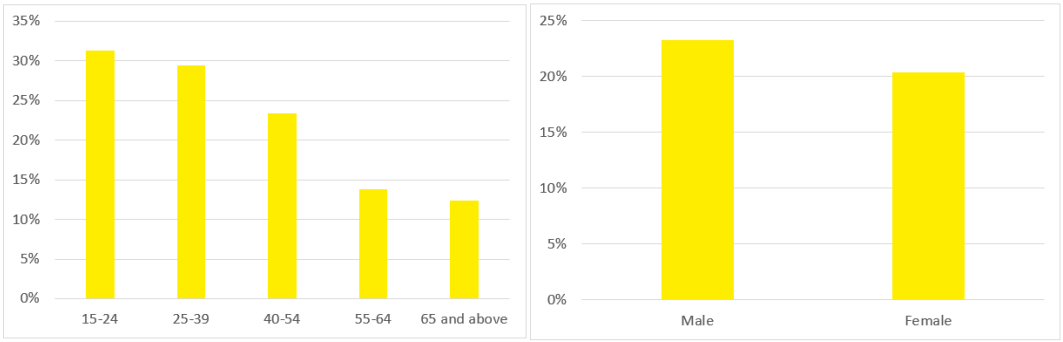

Chart 24: Answers to question B07 for Hydrogen is as polluting as diesel or gasoline - shows combined % for "Totally agree" & "tend to agree" by key sociodemographic groups

It is worth noting the high level of don't know responses (22%) – again confirming that the potential benefits of hydrogen over traditional energy sources are not widely understood and could form the potential focus of future communication campaigns. The level of don't know was highest in Cyprus (41%) but was almost as high in Denmark and Sweden (both 36%).

2.3.4 HYDROGEN APPLICATIONS

This section looks at the level of awareness of three hydrogen applications – as a fuel for transport, industrial usage and use in the home. **The most widely known application is the use of hydrogen as a fuel for transport (76%),** followed by its use in certain industries to reduce their impact on environment (56%). The use of hydrogen for heating houses or building is less well known with only 42% aware of this application.

The following charts present awareness of hydrogen application for transport.

A04. Have you heard before of each of the following Hydrogen applications?

1. Hydrogen as a fuel for transport (cars, buses, trucks…)

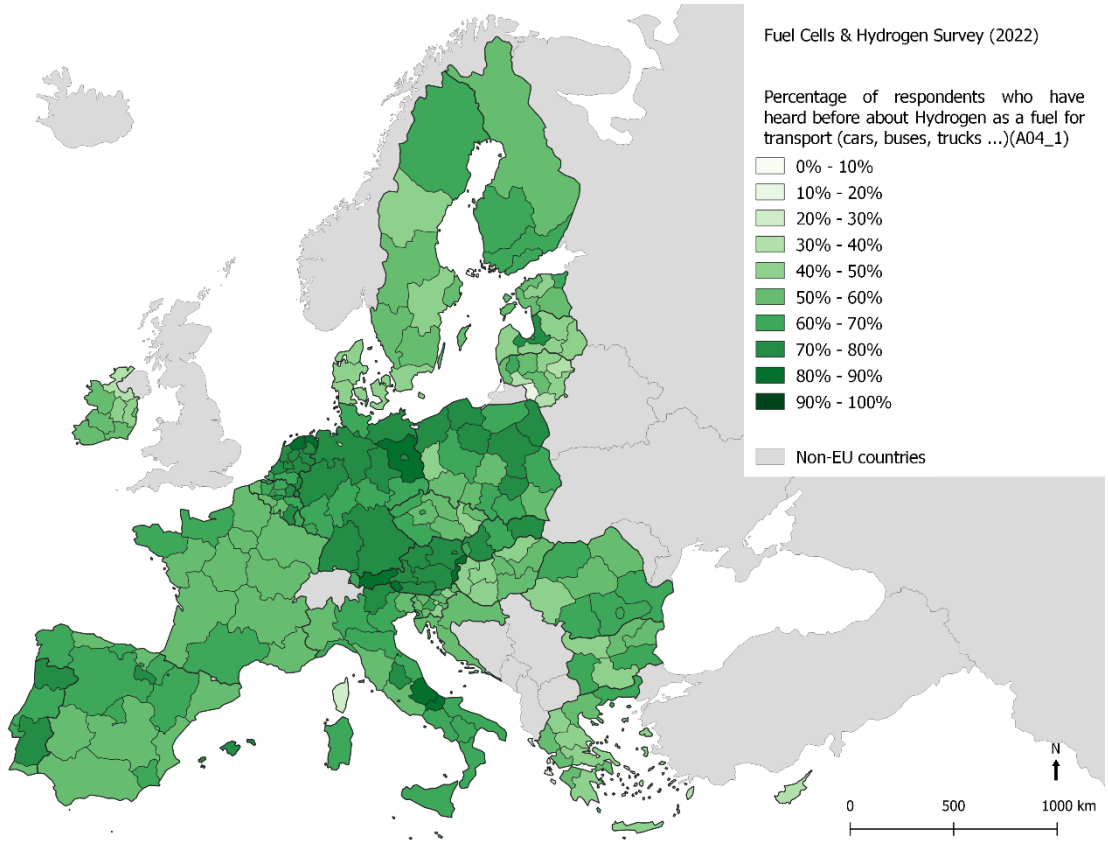

*Chart 25: Shows total % aware at question A04 of **Hydrogen as a fuel** for transport (cars, buses, trucks…) by Member State*

The awareness of hydrogen as a fuel for transport is high with three quarters of respondents in the EU (76%) claiming to be aware. This **high level of awareness can be seen in all EU Member States**, reaching more than 8 respondents out of 10 in the Netherlands (84%), Austria (84%), Slovakia (84%) and Czechia (83%). Even in Ireland where awareness is lowest, two thirds (66%) claim to be aware of hydrogen usage as a fuel for transport.

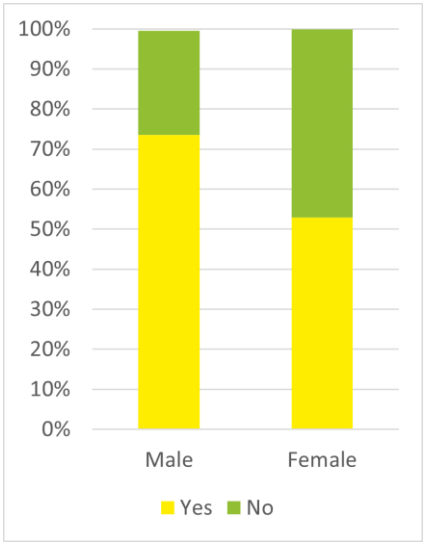

*Chart 26: A04: total % aware of **Hydrogen as a fuel** for transport (cars, buses, trucks…) by gender*

The socio-demographic analysis reveals that men are much more likely to claim to be aware of hydrogen being used as a fuel for transport (84% compared to 69% of women). In contrast, awareness of hydrogen as a fuel is similarly high across all age groups.

Over half (56%) of respondents are aware of the use of hydrogen in industries. Awareness is highest in Germany (62%), Portugal (61%), Romania (61%) and Austria (60%). Respondents were less aware of its use in industry in Finland (47%) and France (48%).

A04. Have you heard before of each of the following Hydrogen applications? 2. Hydrogen used in some industries (to reduce their impact on environment)

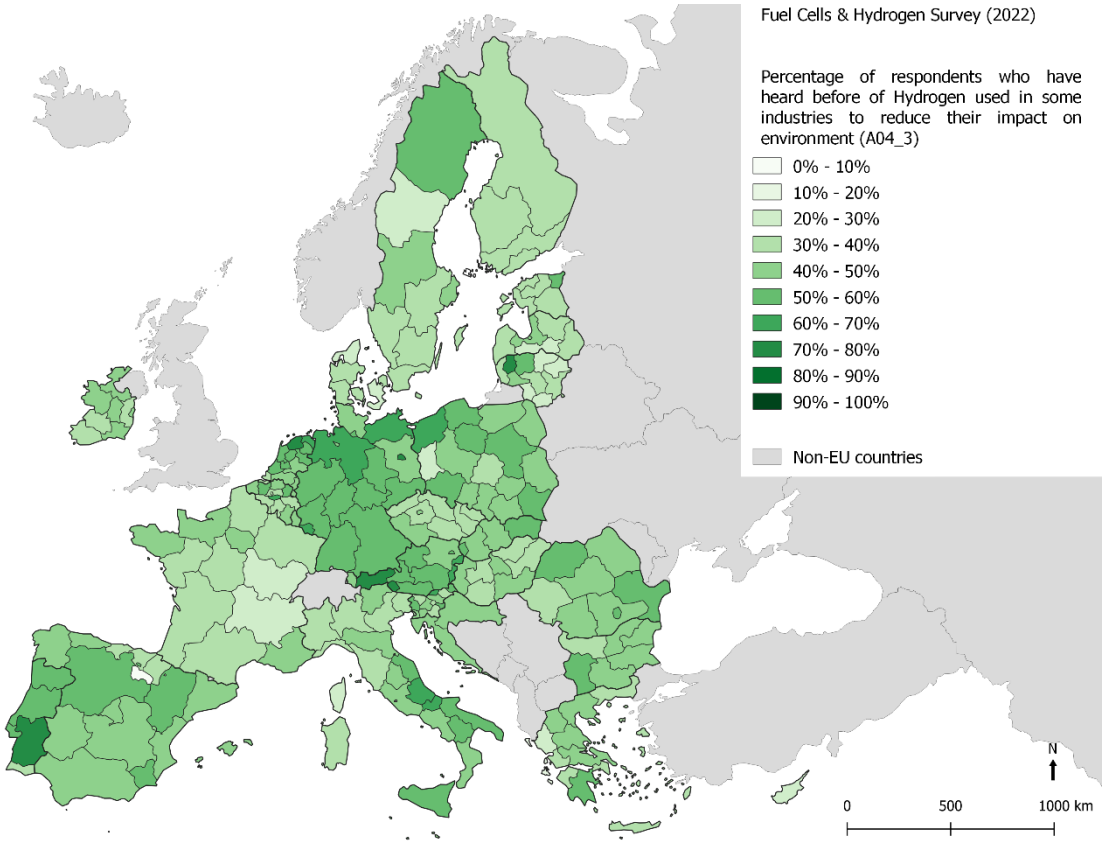

*Chart 27: Shows total % aware at question A04 of for **Hydrogen used in** some **industries** to reduce their impact on environment by Member State*

As observed previously, men are more likely to claim to be aware of the use of hydrogen in industries than women (60% compared to 51%).

The application of hydrogen in the heating of houses and buildings is less widely known by EU citizens with only four in ten (42%) saying that they had heard of it.

A04. Have you heard before of each of the following Hydrogen applications?

3.Hydrogen ***for heating houses or buildings***

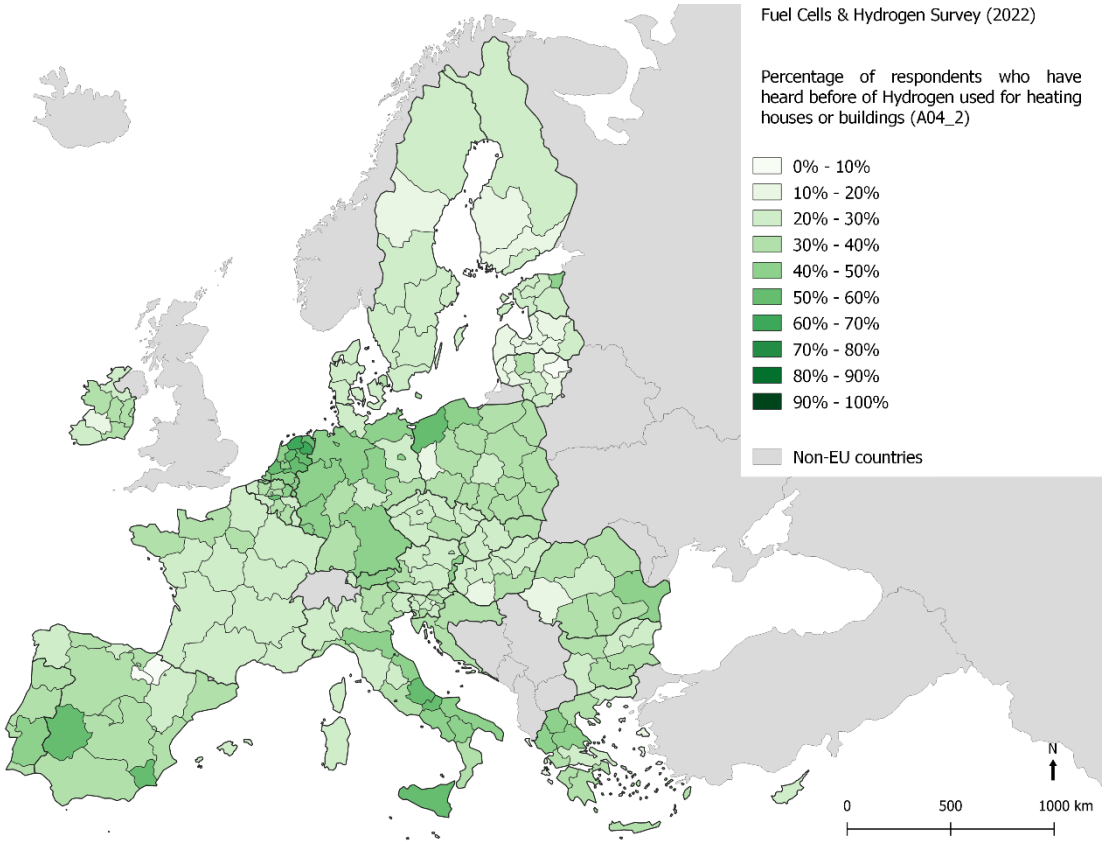

Chart 28: A04: total % aware of ***Hydrogen for heating*** *houses or buildings to reduce their impact on environment by Member State*

Awareness of domestic usage is highest in the Netherlands where almost six in ten (57%) claimed to have heard of the use of hydrogen in heating, closely followed by Cyprus (56%) It was less widely known in the Baltic countries and Finland (25%).

The socio-demographic analysis shows differences according to age and gender. Men and younger respondents are more likely to have heard of the use of hydrogen for heating houses and buildings.

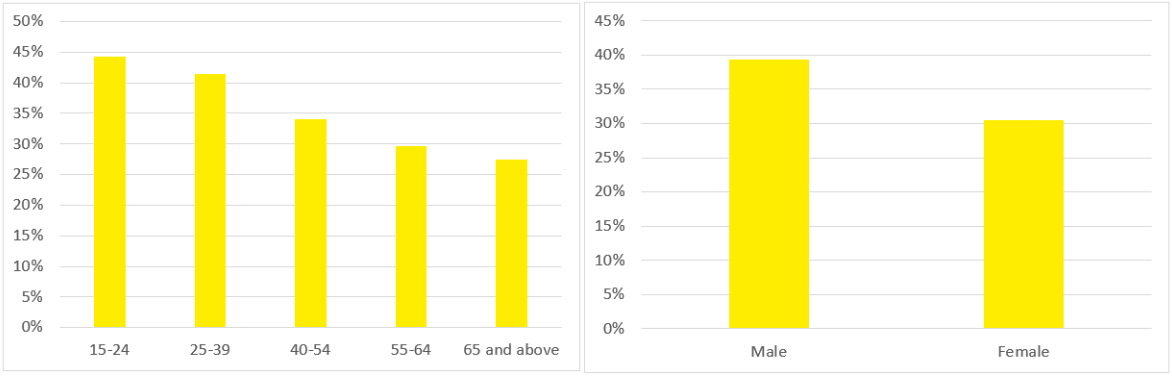

Chart 29: A04: total % aware of ***Hydrogen for heating*** *houses or buildings to reduce their impact on environment by key sociodemographic groups*

2.3.5 PERSONAL EXPERIENCE OF HYDROGEN ENERGY

A05. Have you personally or at your working place experienced any of these Hydrogen applications (vehicle fuel, in industry or in domestic heating).?

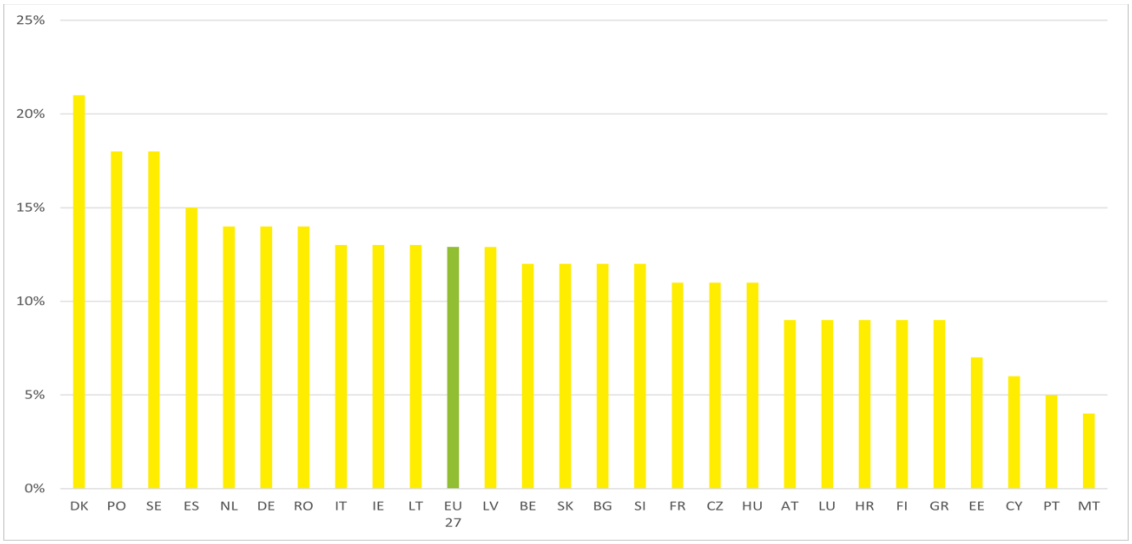

Chart 30: A05: total % by Member State who have experienced hydrogen energy in any of the three applications (vehicle fuel, in industry or in domestic heating).

At the EU level, just over one in ten (13%) has experienced hydrogen energy in any of the three applications (vehicle fuel, in industry or in domestic heating). As seen in the chart above, there is significant variety in the level of usage across different Member States, with the highest level of usage observed in Denmark (21%), Poland (18%) and Sweden (18%). Conversely, usage is lowest in Cyprus (6%) and Malta (4%).

2.3.6 INTEREST IN HYDROGEN

This section focuses on the respondents who selected hydrogen as their preferred choice for an alternative energy should they switch from a diesel or gasoline car.

B04b. If you were to switch to a new car using an alternative energy, which of the following would be your preferred choice?

1. ***Hydrogen***

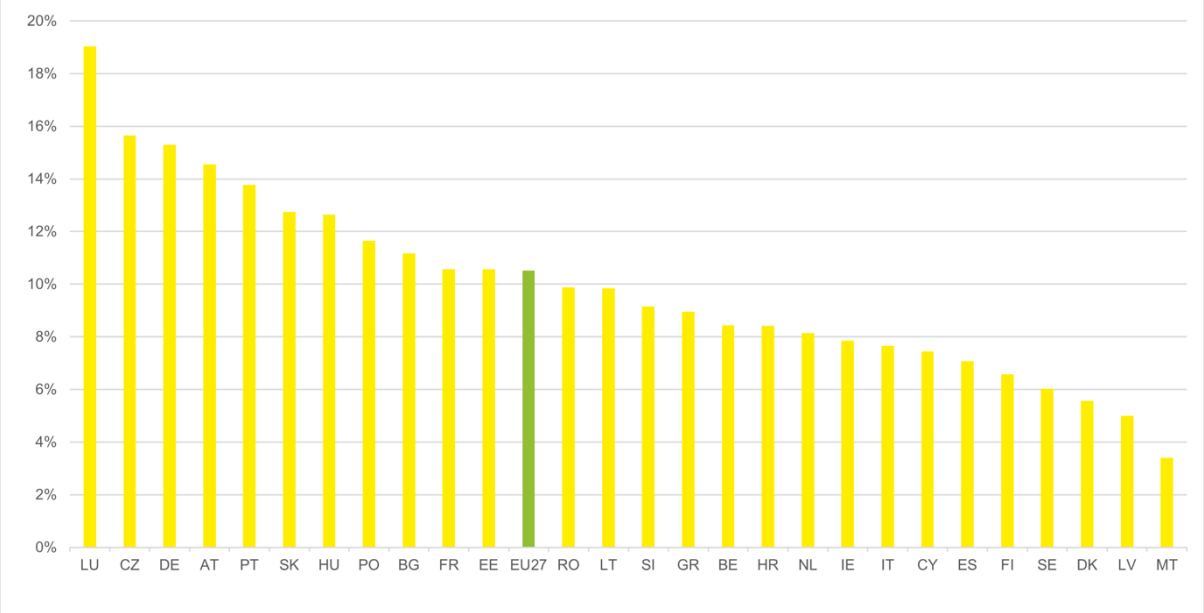

Chart 31: B04B: Total % of those who would switch to a new car using an alternative energy, whose preferred choice would be hydrogen shown by Member State

At EU level, 11% of the population are likely to switch to a car using hydrogen. Likelihood is highest in Luxembourg (19%) and lowest in Malta and the Scandinavian countries.

The socio-demographic data shows that younger respondents are less likely to say that hydrogen would be their preferred choice while men are more likely to choose hydrogen than women.

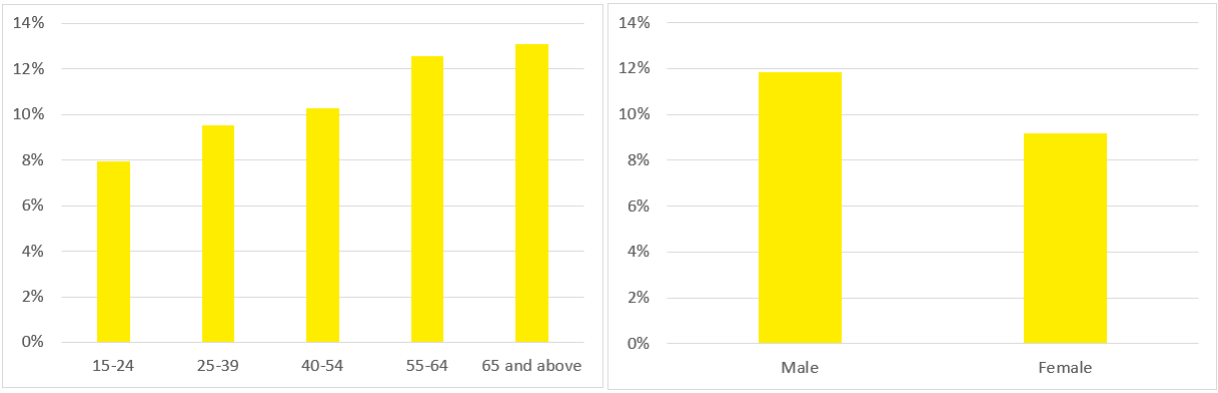

Chart 32: B04B: Total % of those who would switch to a new car using an alternative energy, whose preferred choice would be hydrogen shown by key sociodemographic groups

B08. Would you be interested in receiving more information about Hydrogen technologies and its potential uses in everyday life?

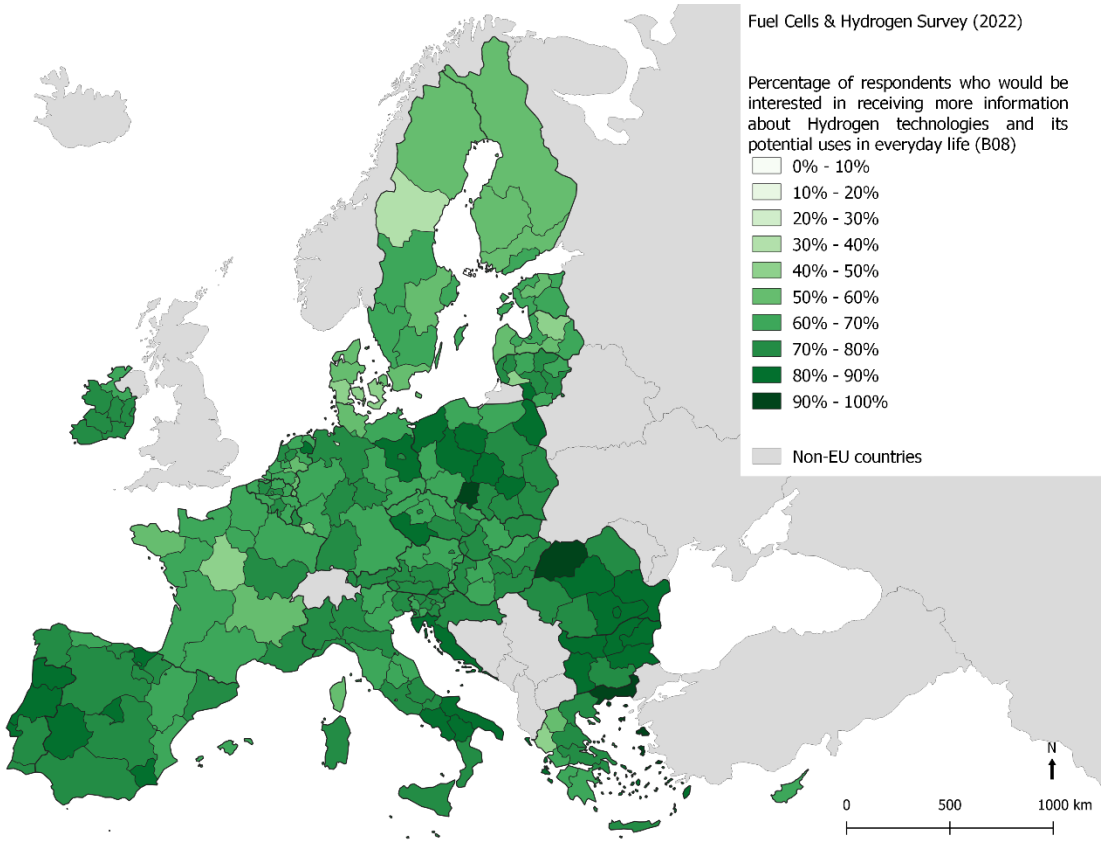

Chart 33: B08 – level of interest by Member State in receiving more information about hydrogen technologies and its potential uses in everyday life (shows combined % "Yes, definitely" & "Yes, to some extent")

Seven in ten respondents (71%) would be interested in receiving more information about hydrogen energy. Interest is highest in the Balkans (Bulgaria 84%, Croatia 80% and Romania 82%) and in Portugal. Conversely, interest is lowest in Finland and Latvia (it is worth noting that Latvia was also one of the countries with the lowest level of awareness of hydrogen energy).

3. CONCLUSION

Although hydrogen use remains low - **around one in ten (13%) has used hydrogen energy -** awareness is by comparison relatively high, with **three in ten respondents (29%) who consider themselves to be rather familiar with hydrogen**. Over half (53%) are aware of it and **only one in ten respondents (13%) have never heard of it**. However, the level of familiarity is lower than for other types of energy sources, with 67% of people rather familiar with solar, 62% with wind, 49% with hydropower, 36% with biofuels, and even 32% with geothermal (although overall awareness of hydrogen actually is slightly higher than for geothermal energy).

Use of hydrogen for transport is the most widely known type of application, with 76% of people having heard of it. Just over half (56%) are aware of its application in industries while 42% of people know about using hydrogen for heating.

Seven in ten respondents (71%) would be interested in receiving more information about hydrogen energy.

The overall image of hydrogen is positive compared to other energy types. Only a minority of people are concerned about its safety - **59% consider it as safe as other technologies at EU level**, although with marked differences between countries (69% in Portugal, but only 38% in Sweden).

Seven in ten respondents (70%) agree that hydrogen has a role to play in reducing energy dependence of their country while 69% believe that it's a sustainable energy source.

In terms of its **impact on the environment**, the public's **perception of hydrogen is mostly positive and comparable to that of renewables (hydropower, wind, and solar).**

Current energy consumption for mobility is widely centered around gasoline and diesel with the two of them accounting for 81% of frequent car drivers. However, there **is widespread awareness of the environmental impact of these fossil fuels** (which average 7.7 on a scale of 0 to 10 where 10 means that it has a very negative impact on the environment). Consequently, there is a widespread willingness to change current energy consumption: **almost half are likely to switch to vehicle not using diesel or gasoline** in the next 2 years. **Six in ten (63%) are also willing to pay more for a cleaner energy** produced from sources that emit less greenhouse gases.

When considering an alternative to fossil fuels, the preferred choice is mostly either hybrid (40%) or electric batteries (33%). **Hydrogen is the preferred choice for 11% of respondents willing to consider changing the type of energy that their car uses.**

The decision to switch would be mostly influenced by cost considerations (cost of purchase of the new car, the cost per kilometer) but also by the availability of refueling stations. **The barriers to switching are also driven by the perceived cost of purchase, the limited network of refueling stations and the insufficient autonomy of cars using alternative energies.**

4. ANNEX - METHODOLOGY

In each EU member state, we surveyed a representative sample of approximately 1000 citizens aged 15 years and above. In all countries, surveys were conducted online. In order to improve the representativeness of the sample, telephone interviews were also conducted in some countries to target those members of the population less likely to be internet users and therefore not represented by a purely online approach. More precisely, a certain number of telephone interviews were conducted with citizens aged 65 years and above. The telephone interviews were conducted in Member States with relatively low internet usage in this age group compared to the EU overall and included the following:

- Slovenia: 230
- Greece: 255
- Romania: 225
- Estonia: 240
- Latvia: 240

The samples in all the countries were stratified by gender, age, administrative region, and type of locality. The representativeness criteria were defined using the latest universe figures published by Eurostat. Our sampling design ensured that ALL administrative regions were covered and for each a number of interviews was allocated proportionally to the size of its population. Broad demographic quotas were set in each country to ensure all subgroups are adequately included and represented in the sample. This stratification was designed using the following sociodemographic variables:

- Gender (Male, Female)
- Age (15-24, 25-39, 40-54, 55 years or more)
- Region: The widest geographical coverage of the population was sampled to ensure representativeness. All NUTS II regions were included in our survey.
- Urbanisation (rural area, small or middle size town, large city).

In total, 25,934 interviews were conducted with fieldwork taking place in Autumn 2022. A national weighting procedure was carried to make sure that the samples match the target population distribution.

Readers are reminded that survey results are estimates, the accuracy of which, everything being equal, rests upon the sample size and upon the observed percentage. Statistical margins of error are not applicable to online polls due to the level of non-response bias.

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