

## WP1 TASK 1.3a

# Hydrogen investment acceptance

## ABSTRACT

Task 1.3a had two main research questions: (1) What is the level of awareness and acceptance among citizens (as consumers and community member nearby facilities) regarding hydrogen projects and products? What are key determinants of awareness and acceptance? (2) What are the investors' attitudes and willingness to invest in hydrogen projects, and how are the projects financed? The first question was analyzed by means of a survey targeted at citizens in Lappeenranta, and the second by analysis of investors' online discussions in USA, Australia and Finland, complemented by interviews in seven Finnish hydrogen projects. The findings indicate a moderately positive overall investor sentiment, where Finland seems to have a small leading edge compared to USA and Australia, but from the investor point of view the uncertainties are still very high and many types of public sector and regulatory support is needed to get the market growing. Concerning the citizen acceptance of hydrogen, it is on average very high. Most willing people are to accept local establishment, and they are seen to influence the living and well-being of the area.

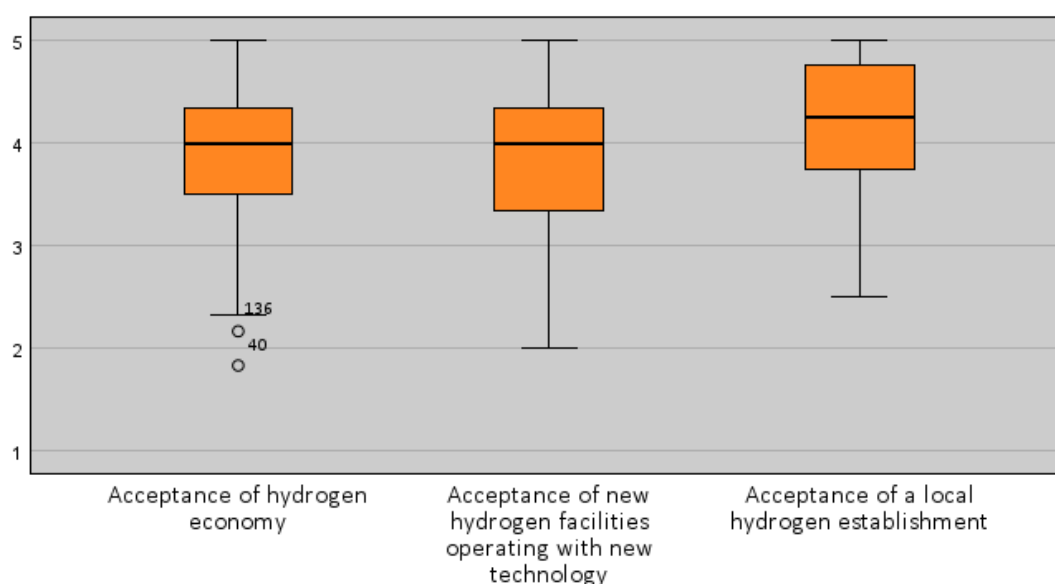
## MOTIVATION

The investments to clean hydrogen and its derivatives hold great promises in terms of achieving carbon neutrality on a global scale, but also in strengthening the Finnish economy. However, many final investment decisions are being held back by regulatory and market uncertainties. It is important to identify the main drivers and barriers from the investors' perspective. Furthermore, understanding the level and drivers of citizens' acceptance can indirectly contribute to solving the regulatory and demand visibility challenges.

## RESULTS

At the individual level acceptance is closely attached to information and knowledge. The acceptance can be seen as a process moving from the generic level of accepting changes that are expected in energy transition and leading to various innovation. In the present study this

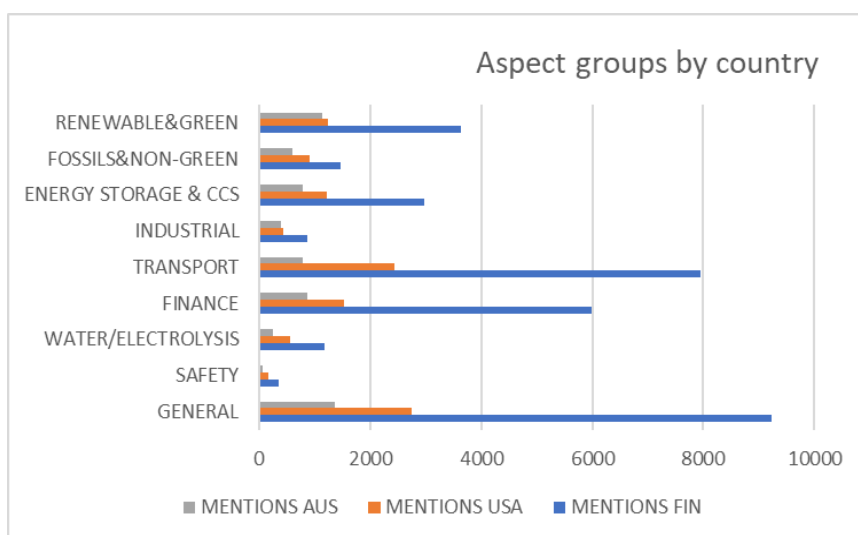
referred to acceptance on hydrogen economy that covers an economic system in which fossil-based energy or raw materials are switched to hydrogen that is produced with clean or low-carbon energy and used as an energy storage or raw material. The generic acceptance requires knowledge of sustainable energy solutions and personal way of life supports sustainable goals. Moving the level of acceptance towards more detailed and focused target like concrete establishments in the close living environment, the acceptance is facilitated by innovative attitudes and interest towards new energy solutions. In addition, the better citizen’s objective knowledge of hydrogen and its characteristics, the higher the acceptance of new facilities being build. Figure 1 illustrates citizen acceptance of hydrogen at different levels (scale 1-5, 5 indicates high acceptance).



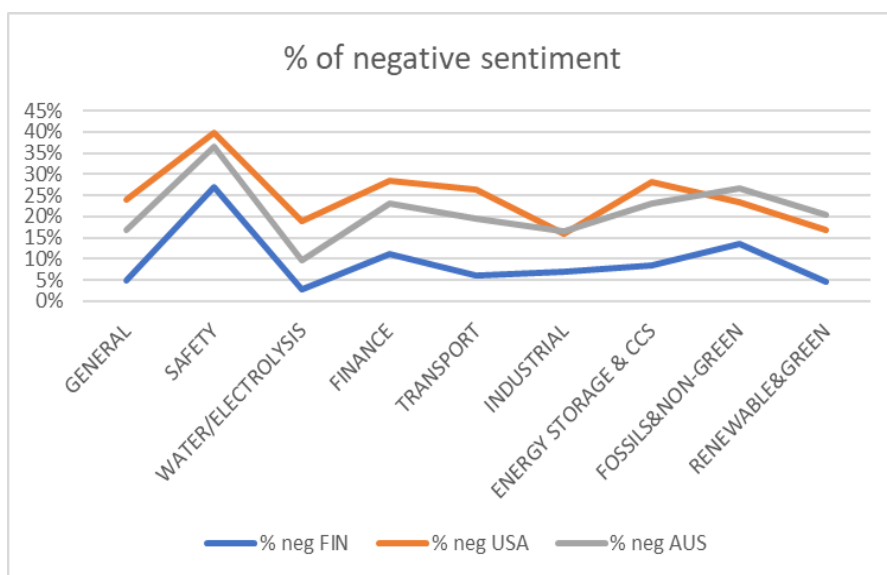
**Figure 1. The citizen acceptance of hydrogen in generic and more specific levels.**

In terms of investors’ attitudes, the aspect-based sentiment analysis of retail investors’ comments in thirteen online discussion forums during Jan 2019 – Mar 2023 revealed that the discussion is way more active in Finland than in USA or Australia. The share of positive sentiment was about 30% in all countries, but negative sentiment was more prevalent in USA and Australia (20-24%) than in Finland (7%). The themes of the investors’ discussions were categorized in nine aspect groups with general aspects, transport and finance being the most common themes (Figure 2). Safety was not much discussed, but the sentiment was more

negative than for other aspect groups (Figure 3). Discussion about investments was most active in Finland in the year 2020, whereas USA and Australia peaked in 2021. Despite the amount of discussion decreased, there was no downward trend in the share of positive sentiment.



**Figure 2. Activity of investor discussion by theme and country.**



**Figure 3. Share of negative sentiment by theme and country.**

The interviews with seven hydrogen projects at different stages of maturity in Finland revealed that the vast scale of required investments necessitates a wide range of funding sources including grants, subsidies, and various types of equity investors. Co-operation

schemes and long contracts for cheap energy supply and final product demand are seen as key promoting factors but numerous barriers are perceived, e.g. in the capacity of electrolyzer production, unclear and unpredictable regulation, permitting processes, and shortage of skilled experts.

### **APPLICATIONS/IMPACT**

The planned hydrogen facilities are mainly still waiting for investment decisions to proceed for building the facilities. Both investors and citizens acceptance are needed for things to happen. Citizen acceptance can be promoted by actively spreading the knowledge related to hydrogen's possibilities in energy transition towards green energy solution. Finland seems to have a small leading edge in investor sentiment compared to USA and Australia, but from the investor point of view the uncertainties are still very high and many types of public sector and regulatory support is needed to get the market growing.

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