

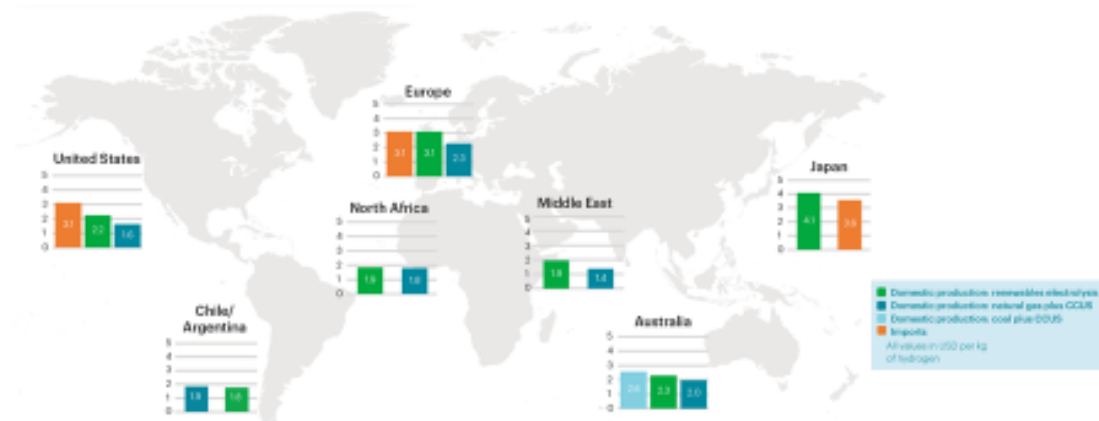
THE EMERGING GLOBAL CLEAN HYDROGEN MARKET

The recent launch of the **first liquefied hydrogen carrier vessel** in *Japan* is a historic event that captured headlines in the media. Just like the first LNG tanker more than half a century ago, it marks the beginning of a new era. And, it is again Japan that leads the way in establishing the first **international trade routes** for shipping clean hydrogen from *Australia* and *Brunei* to Japan. Many will be watching these pilot trades closely, eager to benefit from the lessons learned.

As an eventful hydrogen year 2019 draws to a close, it is becoming clear that a **global** clean hydrogen market is emerging. In an increasing number of countries with ample low-cost energy resources, governments and companies are seriously reviewing the possibilities of developing a **clean hydrogen export industry**. Australia and Brunei have already been mentioned, with Australia explicitly focusing on exports in their recently published **hydrogen strategy**. But we observe similar trends, to a varying degree, in *New Zealand, South Africa, Morocco, Tunisia, Portugal, Spain, Scotland, Chile, and Argentina*. Furthermore, there are clear signs that the opportunities of exporting clean hydrogen are under review in *Saudi Arabia, United Arab Emirates, Kuwait, Oman, Qatar, and Russia*. Obviously, we need to wait and see how fast this will develop, but in a growing number of cases, **concrete projects and shipping routes** are being considered. In several countries the focus is on **green hydrogen** from cheap solar or wind-energy (like Portugal, New Zealand, Morocco, Argentina), but in others it's both green hydrogen and **blue hydrogen** from fossil fuels with CCUS.

As we are getting a sense of which countries are potential **next-exporters** of clean hydrogen, the same is the case for potential **net-importing** countries. In Asia, *Japan and Korea* have already clearly signaled the need for large-scale imports of clean hydrogen. In Europe, *Germany, the Netherlands, and Belgium* are among the countries where most experts think that if the scaling-up in the use of clean hydrogen in the next ten years is successful, the domestic production won't be sufficient to meet the demand. Particularly in the **manufacturing industry**, the potential demand for clean hydrogen resulting from a hydrogen-focused decarbonisation pathway will be so big that it will outpace supply growth. Just to mention one striking number: only replacing the current grey hydrogen use in European industry by green hydrogen would already require a **doubling of the entire European electricity production**. When it comes to clean hydrogen trade within Europe and between Europe and North-Africa, a dedicated hydrogen pipeline-infrastructure, on the basis of re-purposed gas pipelines, may well become the preferred cross-border transport mode. For the *US*, the IEA also expects a net-import demand if clean hydrogen use takes off. The IEA graph below provides a good overview of the **global hydrogen trade landscape** that may emerge from these trends.

Kick-start international hydrogen trade



Multiple opportunities exist for international hydrogen trading routes, which could contribute to energy diversification and security, particularly in Europe and Japan.

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It is very hard to predict how long it will take before we see a **robust global clean hydrogen** market emerge. In the case of LNG, it took about half a century. Much will depend on whether the world will be successful in **scaling up cost competitive production and use** in the next ten years. In addition, key questions will be whether a clear winner will emerge from the currently considered **transport modes** (i.e., liquefied, ammonia, or liquid organic hydrogen carrier), and how fast the **cost of shipping** will come down. Governments need to play a key role in setting the right **framework conditions** and stimulate common standards and guarantees of origin.

My sense is that hydrogen trade developments are moving **faster** than we thought just one year ago. It will be exciting to track how this new global market will shape up in the years to come. **IPHE** stands ready to help and facilitate where it can, in cooperation with **IEA** and other key players in the energy arena.

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