# Challenges and opportunities to produce Green Hydrogen in Latin America

November 2021

## The need for a roadmap to develop Green Hydrogen in Latin America

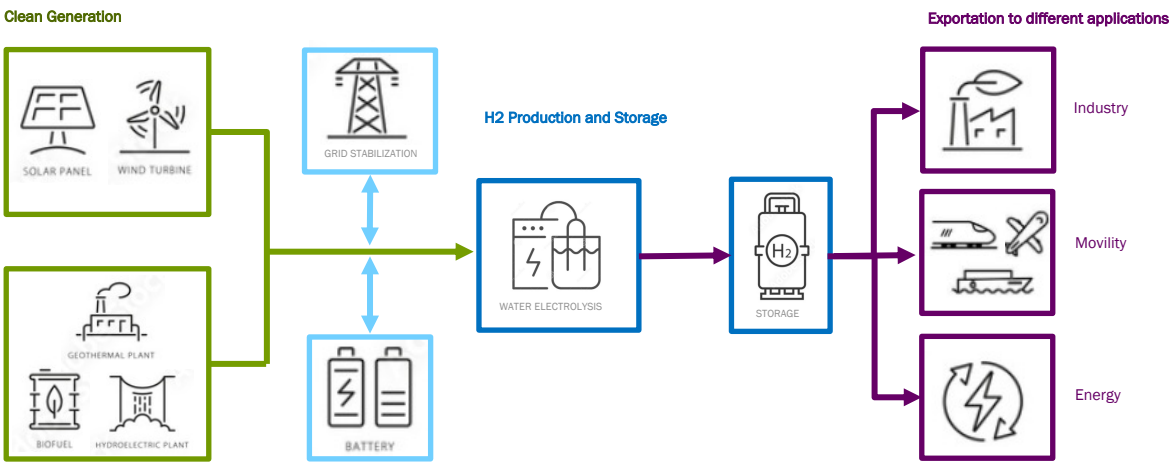
The production of green hydrogen (from renewable resources) or its variants with low emission content responds to the need to mitigate the impact of climate change and meet emission reduction targets or carbon-neutral objectives (NZE - Net Zero Emissions).

Thus, unlike its current uses, mainly in the chemical industry and oil refining, hydrogen appears as an energy vector that will allow decarbonizing those sectors that cannot be reached by electrification, basically transport, in particular long-distance transportation of heavy cargo, and power generation.

The economics of green hydrogen is in its development phase, with growing interest from governments, private players and international organizations. The value chain integrates different processes that had worked in isolation until today, changing the energy paradigm and therefore the equations that define it.

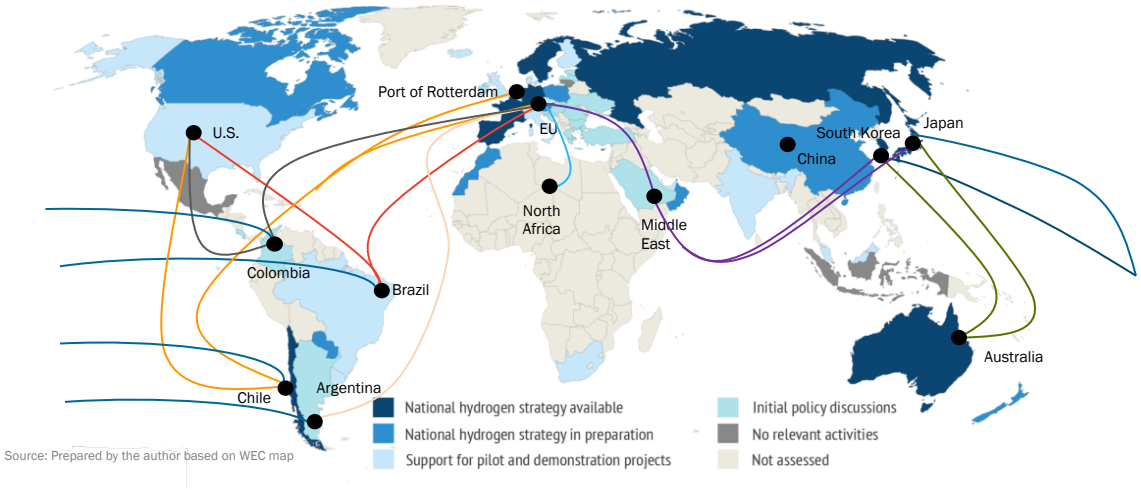
Creating a global hydrogen exchange market poses great challenges and opportunities both for exporters and importers. Countries with vast expansions of land, along with excellent renewable resources, such as Latin American countries, Australia, the Middle East and North Africa, provide the necessary conditions for competitive hydrogen prices, compared to the expected local production prices in countries such as Japan, South Korea, the European Union and the United States, which face a deficit of renewable generation capacity basically due to the shortage of space to expand their renewable generation.

Value chain of Green Hydrogen




Source: Prepared by the author

Expected International Market

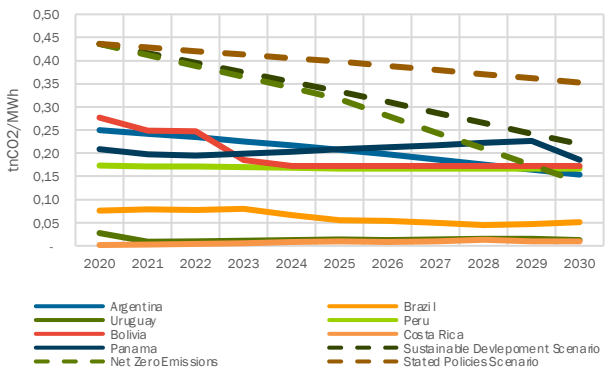



Source: Prepared by the author based on WEC map

However, for this market to operate in a dynamic way, the following aspects need to be solved:

- Define policies, regulatory frameworks and clear incentives from governments.
- Establish adequate rules and standards.
- Develop business models that can ensure the financing of large-scale private production projects.
- Develop the necessary infrastructure and overcome existing technological challenges to store and transport large volumes.

CO2 emission factors from the power grid (2020-2030)




'Net Zero Emissions, Sustainable Development Scenario and Stated Policies Scenario' represent projections of the global emission factor based on different scenarios defined by the EIA in the World Energy Outlook.'

Source: Prepared by the author.

## INVESTMENT OPPORTUNITIES IN LATIN AMERICA

The Latin American region has structural advantages for the production of green and low-carbon hydrogen. These opportunities refer to different structural factors in each country which allow for a more competitive hydrogen production than in developed countries. A brief analysis of each of them can be found below:

### Low emissions from the grid

The countries, in general, have an energy matrix with a very small share of fossil fuels and abundant hydroelectric and renewable resources with low carbon emissions. This offers the opportunity of withdrawing power from the grid to produce green or low-carbon hydrogen without being conditioned by the location of a renewable resource or its intermittence. In addition, as there is no variable energy source, more efficient methods than the current ones could be used to produce hydrogen and convert it into different carriers for its transportation.

### Regulatory framework

A national strategy with clear regulations and objectives and a roadmap with defined times are essential to develop hydrogen as an energy vector. Several countries in the region, like Chile and Colombia, have already published national hydrogen strategies together with the roadmaps and regulatory frameworks to develop it and create an exporting industry.

### Renewable resources and large expansions of land

The wealth of renewable resources in large parts of Latin America, along with large expansions of land and low population density, make this region especially attractive for the development of green hydrogen. South America concentrates one third of the hydro resources in the planet. Chile has the best solar resource in the Atacama desert, and the best wind resource can be found in the Argentinean Patagonia. The combination of these resources in certain countries, for instance, Uruguay and Costa Rica, offers more stability for power generation.

### Fossil resources

There is a large number of conventional and non-conventional natural gas fields that are a source for methane reforming (gray hydrogen), as well as coal fields for coal gasification (brown hydrogen). This generates an advantage for the production of blue hydrogen (produced from methane through CCUS) in Latin America. These fields also potentially provide a large amount of competitive large-scale storage both for the captured CO2 and for the hydrogen produced.

**Table 1: Opportunities in Latin America**

| | |
|---|---|
| Low emissions from the grid | Uruguay, Costa Rica and Brazil hace very low emission factors (0.03 – 0.08 tnCO2/mwh) |
| Regulatory framework | Chile and Colombia have national strategies that aim at exporting H2. |
| Renewable resources and large expansions of land | Chile, Argentina, Brazil y Mexico are some of the conutries with large renewable resources and the expansión of land requiered for their development. |
| Fossil Resources | Argentina, Brazil, Peru, Colombia, among other countries, have exploitable oil and gas resources. |

Source: Prepared by the author

## INVESTMENT OPPORTUNITIES IN ARGENTINA

Today, the domestic market consumes approximately 0.4 ton/year of hydrogen and shows very specific uses (mainly in the production of fertilizers and in oil refining).

Argentina offers excellent structural conditions for the development of large-scale hydrogen projects to supply the domestic market and export both green H2 (produced through electrolysis using renewable energy) and blue hydrogen (produced from methane reforming with CCUS). Early positioning by interested players can be advantageous.

Although these technologies still pose great challenges, and entering international markets requires business models that are still incipient as well as a clear regulatory framework, Argentina has important advantages not only in terms of the quality of its renewable resources and the abundance of shale gas but also on account of its strong know how in managing gas pipeline networks for transport and distribution. It is expected that, if hydrogen production starts developing, the gradual implementation of H2 in the existing pipeline networks (blending) will be possible.

And, in addition, there is a R&D network in the country with a long track record on this subject, which undoubtedly consists in a more than relevant ecosystem of qualified resources to revitalize the development of green H2 as an energy vector.

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