







GREEN HYDROGEN HUBS IN COLOMBIA




Uribia (La Guajira)	LCOH	LCOH	Other Aspects
2020	5.5	2.6	
2030	2.9	1.9	
2040	1.5	1.3	
2050	0.8	1.0	

Infrastructure 
 1,843,079 available hectares
 Water scarcity (need for desalination projects and community involvement)
Stakeholders
 La Guajira Chamber of Commerce, Promigas, TGI, Cerrejon, Ecopetrol, Hocol and Salinera del Caribe

Barranquilla (Atlantico)	LCOH	LCOH	Other Aspects
2020	6.5	3.3	
2030	3.4	2.4	
2040	1.7	1.8	
2050	0.9	1.3	




Infrastructure 
 291,016 available hectares
 Water available
Stakeholders
 Monomeros, Barranquilla Chamber of Commerce, Electricaribe, Barranquilla Port

Cartagena (Bolívar)	LCOH	LCOH	Other Aspects
2020	7.0	4.7	
2030	4.7	3.4	
2040	1.9	2.5	
2050	1.0	1.8	



Infrastructure 
 2,205,332 available hectares
 Water available
Stakeholders
 Ecopetrol, Yara, Promigas, Cartagena Chamber of Commerce, Ports of Cartagena and Mamonal




La Guajira
Barranquilla

Sonsón (Antioquia)	LCOH	LCOH	Other Aspects
2020	6.51	3.68	
2030	2.18	2.95	
2040	1.73	2.66	
2050	0.89	2.54	



Infrastructure 
 4,000,000 available hectares
 Water available
Stakeholders
 EPM, OPEX, Celsia, Antioquia University, Medellin Chamber of Commerce

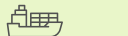


Cartagena

Manizales (Caldas)	LCOH	LCOH	Other renewable energies	Other Aspects
2020	6.4	3.68	 	
2030	3.4	2.95		
2040	1.7	2.66		
2050	0.9	2.71		

Infrastructure 
 702,150 available hectares
 Water available
Stakeholders
 HPSG Colombia, Mabe Colombia, CHEC-EPM, Efigas

Antioquia

Yumbo (Valle del Cauca)	LCOH	Other renewable energies	Other Aspects
2020	7.0	 	
2030	4.9		
2040	3.2		
2050	2.1		

Infrastructure 
 1,608,388 available hectares
 Water available
Stakeholders
 Fanalca, Celsia, Vatia, Gases de Occidente, Buenaventura Port

Manizales

Valle del Cauca

Additional comments on the identified green hydrogen hubs

The **Cartagena Hub** in the Mamonal industrial area can meet the relevant demand for hydrogen from companies such as Ecopetrol (90,000 t/year) and for ammonia from companies such as Yara (136,000 t/year).

The **Barranquilla Hub** can supply the current consumption by Monomeros (50.000 t/y) for fertiliser.

The **Valle del Cauca Hub** in Yumbo, an important industrial zone, has adequate infrastructure for green hydrogen. It further has the potential to increase local demand for green hydrogen and Power-to-X (PtX) products such as methanol.

The **Medellin Hub** around and south of Antioquia can cover the national demand for renewable solar, hydro and biomass energy. Companies active and interested in the development of green hydrogen production and consumption projects are, among others, OPEX, EPM, Celsia.

The **Manizales hub** intends to cover a limited local demand and make use of available renewable resources, including residual biomass. There is a good regional infrastructure (Caldas, Risaralda and Quindío) of land routes for the distribution of PtX products.

The conditioned **La Guajira hub** seeks to make use of the region's excellent wind and solar energy potentials that allow for very competitive production costs. It could be positioned as an ammonia export hub thanks to its available port infrastructure. The focus here should be on achieving regional social development through the establishment of these hubs. This requires close cooperation with the communities to find solutions that allow them to benefit from the projects.

Meeting the sustainability criteria in La Guajira would mean the possibility of realising the Hydrogen Valley of the Colombian Caribbean: Cartagena, Barranquilla and La Guajira.

Barriers to Hub implementation

ECONOMIC

- Investment
- Macroeconomic
- Exchange rates

TECHNOLOGY

- Know-how
- Deployment
- Integration in the process

REGULATORY

- Value chain regulation
- Technical standards

ENVIRONMENTAL

- Licenses
- Prior consultation of communities

SOCIAL

- Symmetric information
- Working with communities

POLITICS

- Development and investment
- Energy policy

Electrolysis capacity required to meet potential hydrogen demand

CAPACIDAD	UNIT	2030	2040	2050
National Demand	GW	3	25	69
International Demand	GW	1	5	19
Total	GW	4	30	88

A target of **1% of the total hydrogen import demand by 2030 for Germany, South Korea and Japan** is set to be covered:

- Total demand to be exported: 60,000 tons of hydrogen per year.
- The required hydrogen production will be a maximum of 90,000 tons per year for which an electrolysis capacity of 1 GW will be required.



Scan the QR code to read the full Executive Summary (in Spanish) including detailed information on LCOH, intercontinental transport and policy.