



Green and Blue Ammonia: Outlook for Carbon-Free Ammonia Market

A new strategic study from the IHS Markit Agribusiness Team

The need for the study: why carbon-free ammonia and why now?

Mega-trends driving the need to understand carbon-free ammonia



Decarbonization

- Provided it is produced with the use of renewable energy, ammonia by its nature (NH_3) is carbon-free and offers unique opportunities across multiple traditional and new end-user applications



Energy Transition

- Major shift towards renewable energy
- Existing electrolysis technology that can be used for the production of green ammonia
- Reduction of emissions in power generation and the role of ammonia to reduce those



Hydrogen Economies

- Ammonia (NH_3) is considered as one of the means of carrying hydrogen (H_2)
- Understanding of the challenges and opportunities across the wider ammonia-hydrogen-energy supply chain



Sustainability & Emissions

- Evolving ETS & carbon credit schemes
- Climate agenda and emissions from the production of ammonia and use of ammonia-derivative products

Ammonia emerging as a critical enabler and catalyst for hydrogen and net-zero economies & emissions reduction targets

In recent years the imperative of the impact of climate change has driven a number of key sustainability issues up the political and industrial agendas.

- ✓ Are there good alternatives to fossil fuels to supply our energy needs?
- ✓ What is the commercial viability for green and blue ammonia investments?
- ✓ What is the potential for the up-scale of carbon-free ammonia as a fuel, energy storage, hydrogen provision and energy carrier?
- ✓ Will the need to reduce carbon emissions affect the fertilizer sector and if so, how?

The questions we've listed are examples of those being asked of us on a daily basis by clients with a wide range of agendas, from concerned producers wondering if hydrogen might be a disruptor making their products / industry redundant to financial investors looking for the next 'big thing' for investments.

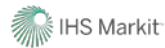
This study will seek to provide a detailed review of the current state-of-play in the development of this emerging sector, assessing the requirements for regulation and certification to underwrite developments, looking at the potential for the use of ammonia in transportation, hydrogen provision and as an energy carrier, and providing forecasts and scenarios for the development of the sector through to 2050. It will also examine the threats and opportunities the decarbonization agenda holds for the nitrogen fertilizer industry and whether carbon-free ammonia signals a change in the mix of fertilizers produced for the future.

Carbon-free ammonia as a major game changer and disruptor with a wide range of opportunities across many industries

Key features & benefits of the carbon-free ammonia study from IHS Markit

Overview of regulatory framework and discussion of the issues that need to be resolved to provide the industry with supportive structures.

Explains the need for agreed rules and certification, and the consequences if they are not put in place. Explains the role of ammonia in new hydrogen economies.



Review of carbon trading & carbon credit schemes in relation to ammonia, and their relevance to the development of carbon-free ammonia.

Provides understanding of the role carbon trading and carbon credit schemes will play in the decarbonizing agenda for energy and agriculture.



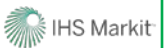
Review and forecasts of the availability of renewable energy and the investment required for green ammonia.

Provides understanding of the potential constraints and investments required for the up-scale of carbon-free ammonia supply.



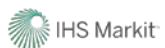
Analysis of the technologies and costs of production for green and blue ammonia.

Identifies the cost structure for carbon-free ammonia & viability of carbon-free production, either as a raw material for fertilizers, or as a fuel.



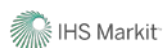
Detailed project review of carbon-free ammonia developments, including carbon storage & carbon sequestration options for blue ammonia.

Follows currently planned investments, partnerships, initiatives and scale-up of new carbon-free ammonia supply and monitors developments of existing ammonia producers



Analysis of regional availability of carbon-free ammonia to 2050. Evolution of the global ammonia trade, fleet and infrastructure.

Analyzes regional surpluses & deficits. Instructs how global ammonia trade may develop, including the emergence of new ammonia bunkering hubs & non-traditional trade flows.



Analysis of potential ammonia demand in emerging sectors: transportation; hydrogen provision; energy carrier through to 2050

Assesses the potential of new market segments. Provides understanding of the changes needed to implement this, including opportunities & potential bottlenecks.

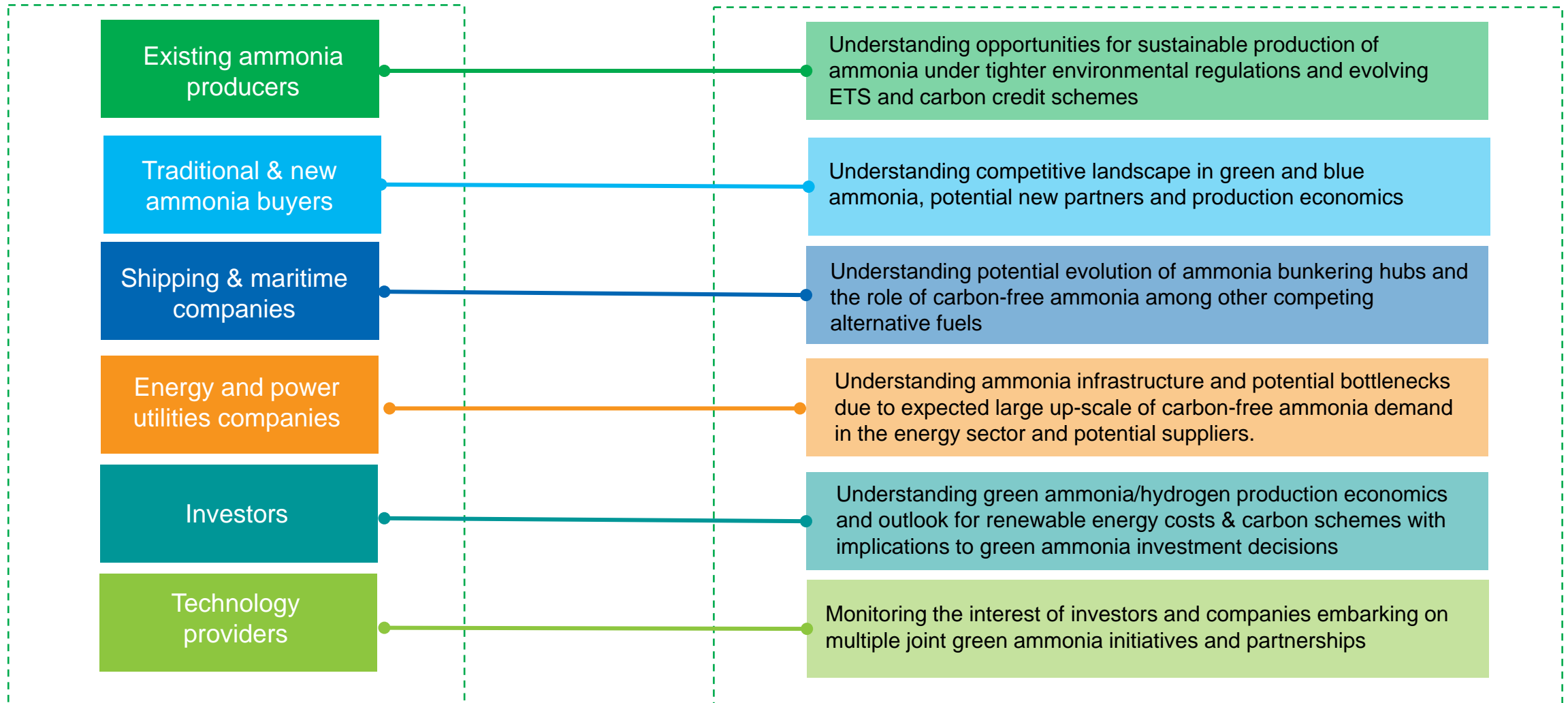


Analysis of demand for carbon-free ammonia in fertilizers: potential impact on the overall mix of products consumed.

Explains the choices and potential dilemmas facing the fertilizer industry from the decarbonizing agenda & wider energy transition. Reviews carbon intensity aspects in the agribusiness industry



Who should want this study and why?



Contents & structure of the Outlook for Carbon-Free Ammonia Market

Brief Outline of the Report Structure

Executive Summary

- Key conclusions
- Main takeaways for key stakeholders

Current state and outlook of carbon-free ammonia market

- What is competitive landscape today & why new investments are expected?
- What are the soft and hard barriers for the upscale of green ammonia?
- What role will blue ammonia play in the transition period?
- What are key regulatory changes globally driving the interest in green NH₃?

Overview of regulatory framework & policies

- Review of current regulatory framework globally
- Policy initiatives relevant to green & blue ammonia
- Development of hydrogen roadmaps & national strategies and the potential role of ammonia in the new hydrogen economies
- Certification and accreditation issues

Carbon credit and emissions trading schemes

- Current schemes and their relevance to ammonia production
- Cost implications to ammonia production economics
- Scenarios for CBAM (carbon border adjustment mechanism) & ETS extension
- Impact of carbon schemes on price construction of green and blue ammonia
- Evolving concept of “Green Premium” in the global ammonia market

Cost structure for green & blue ammonia production

- Review of energy sources
- Outlook for carbon costs
- Technology for blue and green ammonia
- The economics of production of blue and green ammonia
- OPEX and CAPEX for blue and green ammonia projects

Outlook for carbon-free ammonia supply to 2050

- Listing and mapping of projects
- Profiles of green and blue ammonia projects
- Potential for carbon-free ammonia supply by region
- Supply forecasts to 2050
- Impact of new green/blue ammonia capacity on trade flows: potential of new export-orientated projects vis-a-vis new import substitution projects

Outlook for carbon-free ammonia demand to 2050

- Carbon-free ammonia use in transportation
- Carbon-free ammonia use as an energy carrier
- Carbon-free ammonia use for hydrogen provision
- Carbon-free ammonia use in fertilizers and chemicals
- Quantifying the potential of the new end-user sectors & scenarios
- The outlook for ammonia demand by carbon footprint and end-use to 2050
- Detailed review of global ammonia infrastructure
- Outlook for changes of the global ammonia supply chain with new uses
- Competition of carbon-free ammonia with alternative fuels/energy sources

The team

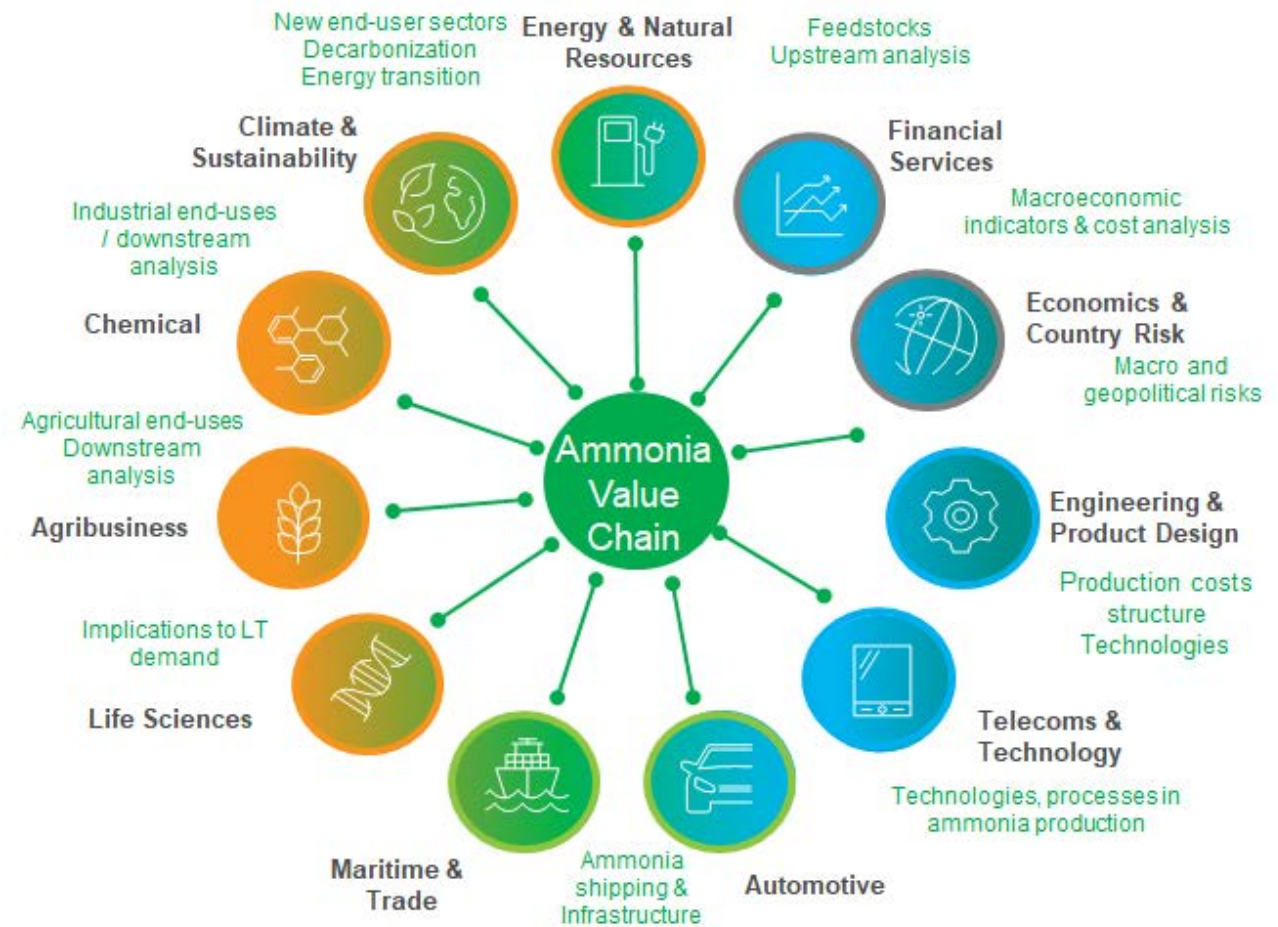
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Addressing Strategic Challenges with Interconnected Areas of Expertise



IHS Markit's unique capabilities across the entire ammonia value chain

IHS Markit Agribusiness: In-Depth Understanding of the Ammonia Value Chain

- Daily monitoring of the ammonia market & price discovery
- Monthly analysis of trade-flows and short-term forecasts
- Long-term outlook for supply/demand/trade and industry cost structure
- The World's Top 40 Ammonia Buyers one-off report

This block contains several report covers and data visualizations:

- Ammonia Report Agribusiness | Fertecor**: A report cover with a table of data and a line chart showing market trends.
- Ammonia Futures Agribusiness | Fertecor**: A report cover featuring a line chart of ammonia futures prices.
- Ammonia Outlook Agribusiness | Fertecor**: A report cover with an image of an ammonia plant and the text "October 2020".
- The World's Top 40 Ammonia Buyers**: A report cover with an image of an ammonia plant and the text "Leading ammonia buyers in 2019 defined by sector and geography".

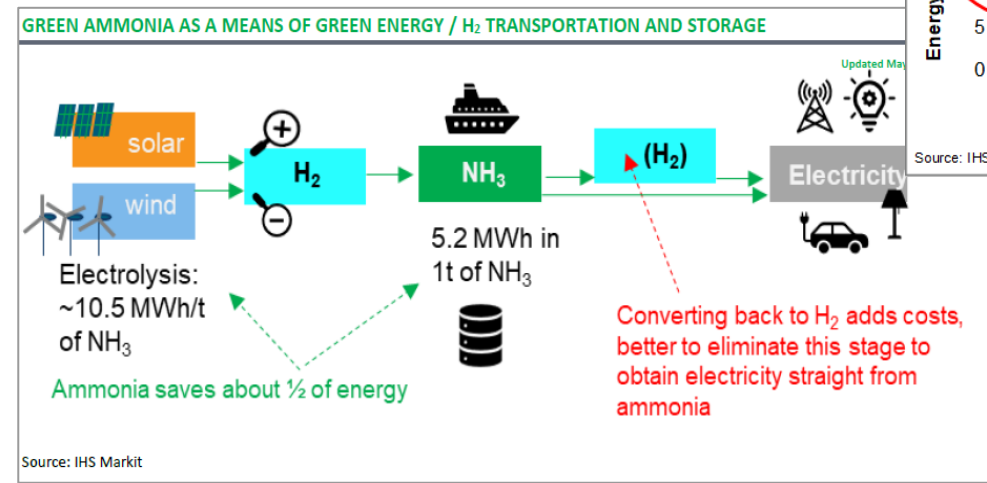
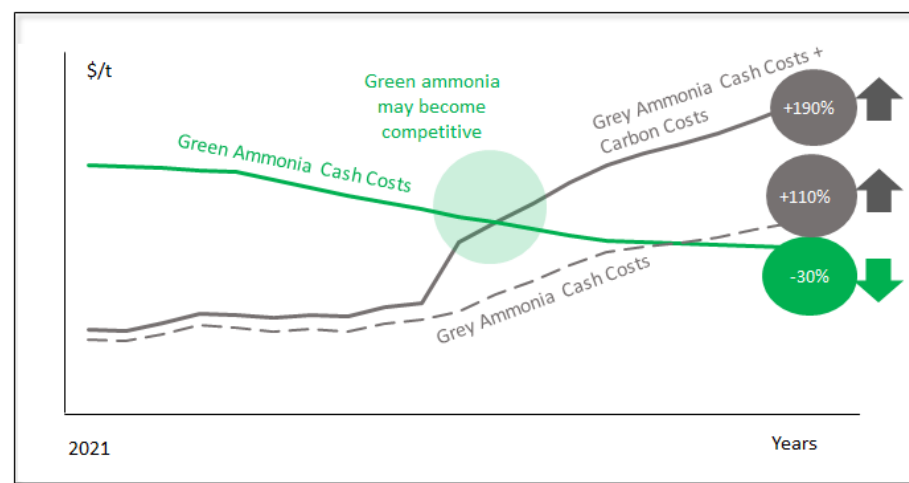
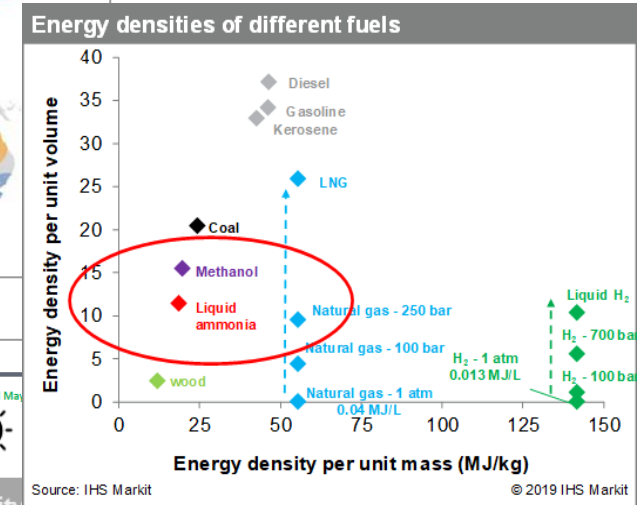
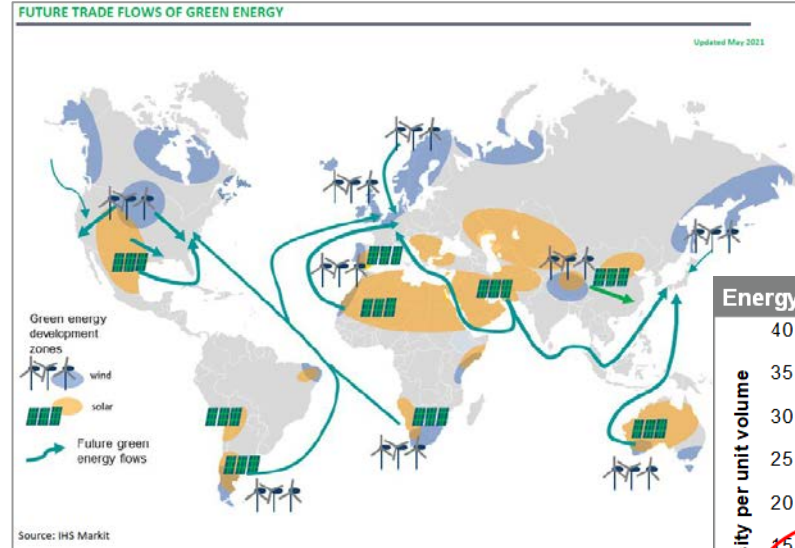
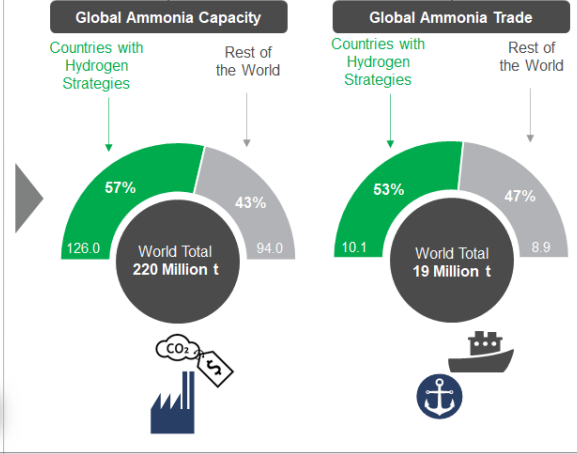
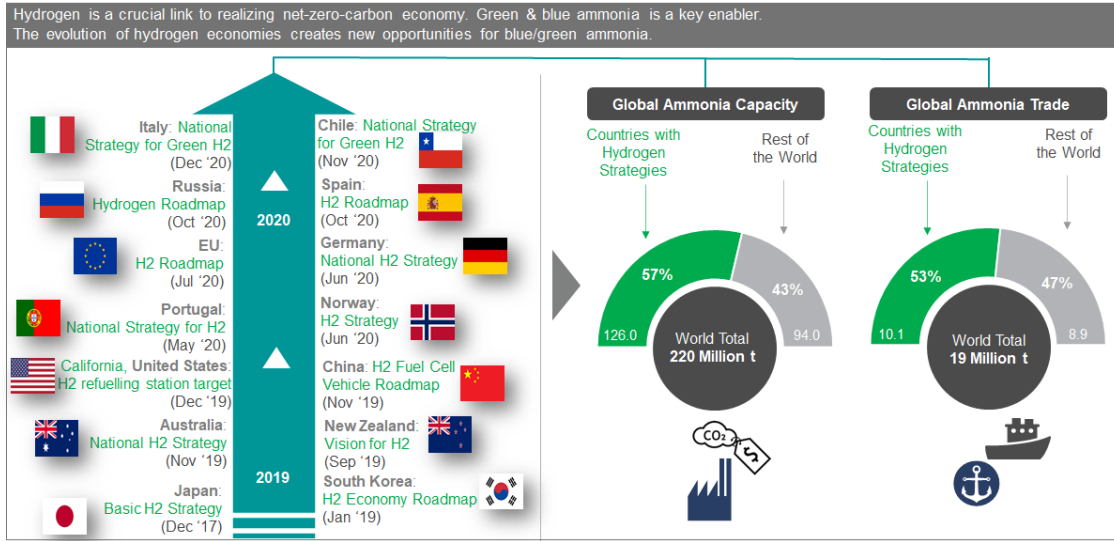
A wide of expertise and proprietary data across wider IHS Markit

- IHS Markit Hydrogen and Renewable Gas Forum / Analytics
- IHS Markit Chemical Industry Databases
- IHS Markit Process Economics Program (PEP)
- IHS Markit Chemical Economic Handbooks (CEH)
- IHS Markit Downstream Capital Cost Index (DCCI)
- Maritime Portal

This block contains several reports and analytics:

- Hydrogen and Renewable Gas Analytics**: A section with a legend for "Region" including Africa, Americas, Asia, Europe, Middle East, and Oceania.
- Power-to-X (electrolysis) projects tracker**: A world map titled "Electrolysis capacity map" showing project locations across North America, Europe, Asia, Africa, South America, and Australia. A legend indicates project status: Advance, Announced, Cancelled, Decommissioned, Early planning, Operating, Stalled, and Under construction.
- Green Ammonia Technology**: A report cover dated October 2020.
- Ammonia**: A report cover dated 15 July 2020.
- Chemical Economics Handbook**: A report cover.

Screenshots from the study



The offering and how to subscribe?

Details of the Offering

- Outlook for Carbon-Free Ammonia Market will be published in **October 2021**
- It will be published as an extensive slide-deck in a **presentation** PowerPoint format.
- Accompanying **data** in Excel to enable the users to incorporate the forecasts and key assumptions used in the outlook in their internal analysis.
- **Webinar recording** with the key takeaways and conclusions from the study
- **Support** from the authours of the study with questions
- **Pre-publication subscribers will be eligible for a discount versus the post publication price.**

How to subscribe?

For details of pricing, and how to subscribe, please contact your account manager.

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Fertecon

Ammonia Report

3 June 2021

Headlines

- PAU plant in Indonesia down
- Ethc production in Egypt also reported down
- Price index spike in the east in wake of worsening supply situation
- Yara agrees June prices of \$430-435 fob with Rabco suppliers

Outlook

Flat to soft in the west but firmer in the east

Fertecon Price Service

Ammonia: Key Prices	3 Jun	27 May	29 May
Base rate	425-435	425-435	425-435
Ammonia - fob Black Sea (\$/t)	425-435	425-435	425-435
Ammonia - fob Middle East (\$/t)	325-330	325-330	325-330
Ammonia - fob Tampa/Gulf (\$/t)	335-340	335-340	345-350

Source: IHS Markit © 2021 IHS Markit

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Fertecon

Ammonia Futures

Monthly short-term ammonia outlook

May 2021 | Editorial 2005/2021

Market Overview

In May 2021, ammonia prices peaked and then remained flat for a while. Since January 2021, different price benchmarks have increased 1.7-1.9 times. In Tampa, the price reached maximum level of \$545/t in April, which was then rolled over for May. Elsewhere, prices caught up with Tampa in May. The spreads between high and low prices narrowed - with prices at the low end firming and the average price running out to be slightly higher in May. The potential for price growth seems to be eliminated for the time being.

India, the largest importer, purchased just 91,100 t in May, compared to 217,500 t in May 2020. Since the beginning of the year, India has imported 19.9% less than in January-May 2020. As was expected, with the rise in prices for ammonia and phosphoric acid, the production of DAP in India has turned out to be unprofitable, and therefore demand for ammonia for the phosphate industry has dropped. The rise in global prices for phosphate fertilizers has led to a general drop in demand for fertilizers from Indian farmers, amid the devastating pandemic, savaging the country. The authorities decided in May to revise and increase the subsidy for P₂O₅ with regard to fertilizers. With the new subsidy level, the production of DAP from imported phosphate rock has become more profitable but returns from the production using imported phosphoric acid are still below the break-even level.

AMMONIA MARKET OUTLOOK

Another consequence of the rise in global prices was the drop in interest in ammonia imports into China. Domestic prices for ammonia in China are usually higher than world prices. In fact, in Q1, the gap between

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Ammonia Outlook

Agribusiness | Fertecon

Quarterly outlook for the international ammonia market
prepared by Fertecon analysts

January 2021

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The World's Top 40 Ammonia Buyers:

Leading ammonia buyers in 2019 defined by sector and geography

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