

LNG in India's Fertiliser Sector: A Trillion-Rupee Subsidy Burden

High and Volatile LNG Prices Driving Ballooning Fertiliser Subsidy

Executive Summary

Liquefied natural gas (LNG) prices have been extremely volatile in the last two years. The Russia-Ukraine war has exacerbated the situation and is impacting gas-based urea fertiliser prices globally and in India. Gas is a major input for urea so higher gas prices not only impact fertiliser prices but also result in high subsidies.

Since the onset of the COVID-induced global economic crisis, India's fertiliser sector has seen a massive increase in subsidy outlay. The recently announced Budget for fiscal year (FY) 2022/23 pegged the fertiliser sector subsidy at Rs1.05 trillion (US\$14.2bn), above a trillion rupees for a third year in a row. The fertiliser subsidy has become a sticky item in the expenditure list of the Union Budget due to the record high global gas prices.

Global gas and fertiliser prices have reached a record high due to the war. This could lead to a much higher subsidy requirement for FY2022/23. The gas futures are US\$55/MMBtu (metric million British thermal unit), which is close to the record prices reached in 2021.

This does not bode well for the fertiliser sector as the use of LNG, in the form of imported Re-gasified LNG (R-LNG), has been increasing rapidly. In FY2020/21, the use of R-LNG was as high as 63% of the total gas consumption in the fertiliser sector. Owing to limited domestic gas production and the limited allocation of domestic gas to the fertiliser (urea) sector, the incremental consumption of gas in the sector has come from imported LNG.

**Incremental consumption
of gas in fertiliser
production comes
from LNG.**

Urea prices surged to US\$690/tonne or Rs51.4/kg in October 2021, a 144% year-on-year increase,¹ and the war has driven prices higher to US\$790/tonne or Rs58.8/kg. Gas prices saw an increase from US\$8.21/MMBtu in January 2021 to US\$36.22/MMBtu in January 2022.² However, urea, which has an input of almost 70% gas, is provided to the agriculture sector at a uniform statutorily notified

¹ The Hindu. [India faces record fertilizer subsidy in 2021-22](#). December 1, 2021.

² LNG prices based on India spot import prices reported in IHS Markit LNG and Gas Prices Data released on December 27, 2021.

maximum retail price of Rs242 per 45kg bag or Rs5.3/kg or US\$71/tonne. The government also provides relief in the input cost by the pooling of gas used in the fertiliser sector. Urea units are connected to a national grid to ensure supply of gas at a uniform price by pooling the price of domestic gas and imported LNG. Owing to the pooling of gas and resultant uniform delivery of gas prices, there is a massive subsidy outgo for the urea sector in India.

Growing government fertiliser subsidies are increasing India's already excessive reliance on fossil fuel imports. To meet the current urea requirement of 60MT from indigenous sources, the government should make fertiliser a top priority for domestic gas allocation. Moreover, a policy reset would be timely in light of the emerging opportunities for zero-emissions, domestically manufactured alternatives. Green ammonia – produced using green hydrogen from water electrolysis powered by renewable energy – is expected to become increasingly cost-competitive this decade. Development of green ammonia production at scale is critical to decarbonise the fertiliser sector and to reduce India's reliance on imported LNG, especially with the spot gas prices forecast to remain above US\$50/MMBtu³ for most of 2022, which would result in yet another high subsidy outgo for the fertiliser sector.

Growing government fertiliser subsidies are increasing India's already excessive reliance on fossil fuel imports.

Indian Fertiliser Landscape and Role of LNG

Fertiliser use is rampant in India. More than 50 million tonnes of chemical fertiliser were used in a single fiscal year on average over the last decade.⁴ The chemical fertilisers used in India can be classified into: nitrogenous (urea) and phosphatic & potash (P&K) fertilisers [di-Ammonium phosphate (DAP), murate of potash (MOP), complexes and single super phosphate (SSP)].

Owing to its historical use and subsidy policies,⁵ the balance tilts heavily towards nitrogenous urea use, even though there is a recommended ratio of nitrogen, phosphorus and potassium (N:P:K) of 4:2:1 for Indian soil conditions. The ratio was close to ideal in FY2009/10 but the introduction of the Nutrient Based Subsidy

³ CME Group. [LNG Japan/Korea Marker Futures and Options](#). Accessed on March 07, 2022.

⁴ Lok Sabha. [Fertiliser Consumption](#). March 2020.

⁵ Swarajyamag. [Ashok Gulati On How Skewed Subsidy Policies Are Killing The Fertiliser Industry](#). December 2015.

(NBS) regime for P&K fertilisers in 2010⁶ and the resultant decontrolling of prices led to a rapid increase in prices of non-urea fertilisers, making urea the preferred fertiliser.

Today, gas is a critical feedstock and fuel for urea production and accounts for 70-80% of the cost of production, depending on feedstock prices and the energy efficiency of the production plant. Urea units are connected to a national grid to ensure supply of gas at a uniform price by pooling the price of domestic gas and imported LNG. At present, there are 31 urea units in India, of which 30 use gas and one uses naphtha as feedstock. Owing to the pooling of domestic and imported gas prices and resultant uniform delivery of gas prices, there is a massive subsidy outgo for the urea sector in India.

The tenfold rise in LNG prices in 2021 further exacerbated the subsidy outgo. For instance, in FY2021/22, the budget estimate had to be almost doubled to accommodate the higher subsidy outgo resulting from increased LNG prices and resultant expensive fertiliser imports. The subsidy outgo was increased by 75% to Rs1.40 trillion or US\$19bn⁷ for FY2021/22 on account of increasing gas prices during the year. Also in FY2020/21, the government added Rs63,000 crore (~US\$8.45bn) to the initial estimate of Rs71,000 crore (~US\$9.53bn) for the fertiliser subsidy. The fertiliser sector's annual subsidy burden has been more than Rs60,000 crore (~US\$8bn) for a decade, and the increasing LNG prices have added to the fiscal strain, resulting in almost twice the outgo.

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Due to the high gas prices prevailing globally, the budget outlay for the fertiliser subsidy in FY2022/23 is Rs1.05 trillion (~US\$14.2bn) – the third consecutive year that it has been more than 1 trillion rupees. Of the Rs1.05 trillion, Rs63,222 crore (~US\$8.5bn) has been allocated to urea subsidies for both indigenous urea production and urea imports. The remaining Rs42,000 crore (~5.6bn) has been allocated for other nutrient-based subsidies including indigenous and imported P&K. Gas prices increased 200% from US\$8.21/MMBtu in January 2021 to US\$24.71/MMBtu in January 2022,⁸ and this ongoing trend of high prices indicates the allocation for the fertiliser subsidy is likely to be revised higher at the end of the

⁶ Under the NBS Policy, a fixed amount of subsidy was fixed annually for P&K fertilizers depending on their nutrient content while the price was decided by fertilizer companies as per market dynamics.

⁷ All currency conversions across report done at 1 USD = INR 74.5.

⁸ LNG prices based on JKM spot import prices reported by Bloomberg.

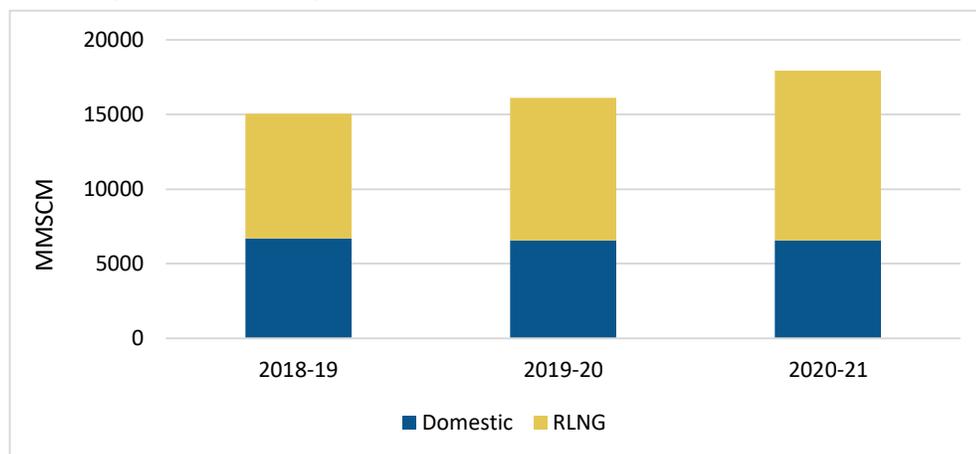
year. High and volatile gas prices, and the Indian fertiliser sector's high dependence on the fossil fuel, point to a looming subsidy risk.

Sectoral Gas Demand: Increased Dependence on Imported LNG

The fertiliser sector's use of imported LNG, in the form of R-LNG, has been increasing rapidly – in FY2020/21 R-LNG accounted for as much as 63% of the sector's total gas consumption. A policy reset would be timely given that the growing government fertiliser subsidies are increasing India's excessive reliance on fossil fuel imports. Green ammonia is emerging as a zero-emissions domestically manufactured alternative and is set to become increasingly cost-competitive this decade.

Green ammonia will be a zero-emissions, domestically manufactured alternative for future fertiliser production.

Figure 1: Total Domestic Gas and R-LNG Consumption in Fertiliser Sector FY2018/19 to FY2020/21



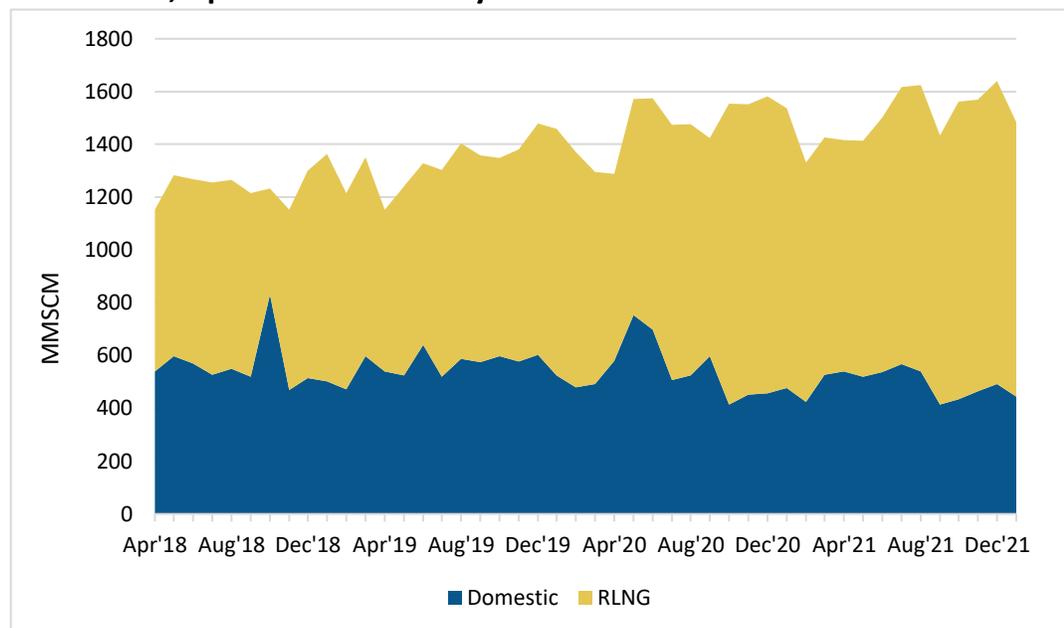
Source: IEEFA analysis based on PPAC's monthly reports on Natural Gas Production, Availability and Consumption.

The incremental consumption of gas in the sector has come from imported LNG. The Cabinet Committee of Economic Affairs (CCEA) in a 2013 review capped the supply of domestic gas to the fertiliser sector at 31.5 Million Metric Standard Cubic Meters per day (MMSCMD), or approximately 957 MMSCM per month, to lower the government's subsidy burden.⁹ However, the progressive decline in supply of domestic gas (lower than this limit) has resulted in increased dependence on imported LNG for fertiliser production. Figure 2 shows the month-wise

⁹ Standing Committee on Chemicals & Fertilizers. [Implementation Of New Urea Policy -2015](#). December 2017.

consumption of R-LNG and domestic gas in the fertiliser sector. The dependence on R-LNG has been increasing at a rapid rate, hitting a record high import share of 70% in September and October 2021.

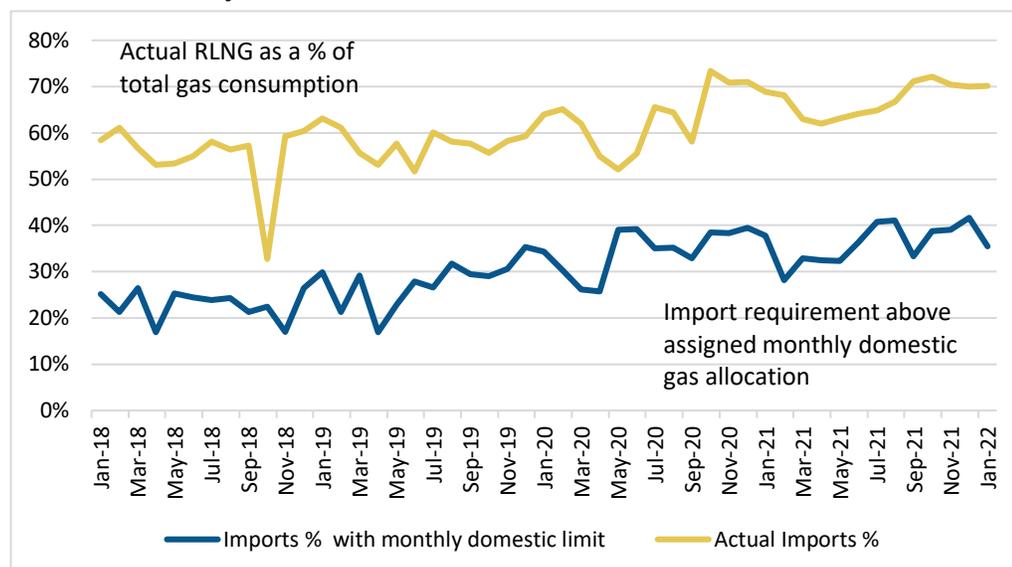
Figure 2: Monthwise R-LNG Use and Domestic Gas Use in Fertiliser Production, April 2018 to January 2022



Source: IEEFA analysis based on PPAC's monthly reports on Natural Gas Production, Availability and Consumption.

As shown in Figure 3, even if the allocated 957 MMSCM per month were to be supplied to the fertiliser sector (which is currently not the case) imports would be at least 25% of the gas requirement for the majority of months, and up to 40% for most months since the onset of the COVID-19-induced crisis. The actual imports have been upwards of 50% (with the exception of October 2018).

Figure 3: Monthwise R-LNG Use in Fertiliser Production vs Projected R-LNG Use After Monthly Domestic Gas Allocation of 957 MMSCM, April 2018 to January 2022



Source: IEEFA analysis based on PPAC's monthly reports on Natural Gas Production, Availability and Consumption.

The daily requirement of gas for urea units in India is 46-50 MMSCMD on average. The domestic gas allocation is only 14-17 MMSCMD. The gap is met through imported LNG, which is given to the fertiliser sector at subsidised prices, leading to a massive subsidy burden on the government.

Pooled Gas Pricing Results in Massive Subsidy Outgo With LNG Price Surge

On July 1, 2015, the government introduced a policy to supply gas at a uniform delivered price to all fertiliser plants on the gas grid for the production of urea.¹⁰ The policy – ‘Pooling of Gas in Fertiliser (Urea) Sector’ – called for the pooling of domestic gas and R-LNG to arrive at a uniform gas price for all urea units. The government’s subsidy to the urea unit consists of the difference in the actual weighted average delivered price of gas over a month.

The policy was implemented to bring uniformity to the input price, which varied from plant to plant depending on the combination of domestic and R-LNG used. It also aimed to ensure that the output cost was primarily a variable of the conversion efficiency of a plant, measured in gigacalories (Gcal) per metric tonne (MT). To further incentivise improvements in plant efficiency and lower the subsidy burden, the government introduced the New Urea Policy-2015 (NUP-2015). This policy

¹⁰ MoPNG. Guidelines for Pooling of Gas in Fertilizer (Urea) Sector. May 2015.

provided revised energy efficiency norms for different plant categories and gave incentives for performances above the notified parameters.

However, the subsidy outgo for the fertiliser sector and particularly the urea units has continued to rise rapidly. For FY2021/22, the government revised the fertiliser subsidy to a record Rs1.40 trillion (~US\$18.8bn) as against the budgeted amount of Rs80,000 crore¹¹ (~US\$10.7bn). The highest pay out in the initial budgeted subsidy outgo, at 54% of the entire amount, was for indigenous urea, next was imported urea at 25%, while other nutrient-based subsidies, including payments for indigenous and imported P&K fertilisers, made up the 21% balance.¹² As per the revised estimates for FY2021/22 presented in the budget, the largest revision was for P&K fertilisers, which increased by 200% compared to the initial budget estimate. A possible reason for a year-on-year increase in P&K spend could be the unaffordable LNG prices and the record-high imported urea prices. Despite a higher allocation to other nutrient-based subsidies, the urea subsidy forms 60% of the entire fertiliser subsidy outlay.

**Globally, fertiliser prices
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The surge in gas prices was a key reason for the almost doubling in the subsidy budget. Globally, fertiliser prices went up by some 200% in 2021. Urea prices surged to US\$690/tonne or Rs51.4/kg in October 2021, a 144% year-on-year increase.¹³ These have taken a further hit with the ongoing Russia-Ukraine war and reached a record high US\$790/tonne or Rs58.8/kg. Since June 1 2015, when the NUP-2015 was implemented, urea has been provided to all farmers at a uniform statutorily notified maximum retail price of Rs242 per 45kg bag or Rs5.3/kg or US\$71/tonne.¹⁴ A comparison of the global gas prices (depicted by spot imported prices in India), fertiliser prices (depicted by Black Sea Urea Free-on-Board, or FOB, prices) and the notified urea price of approximately Rs5360/tonne or US\$71.6/tonne is depicted below.

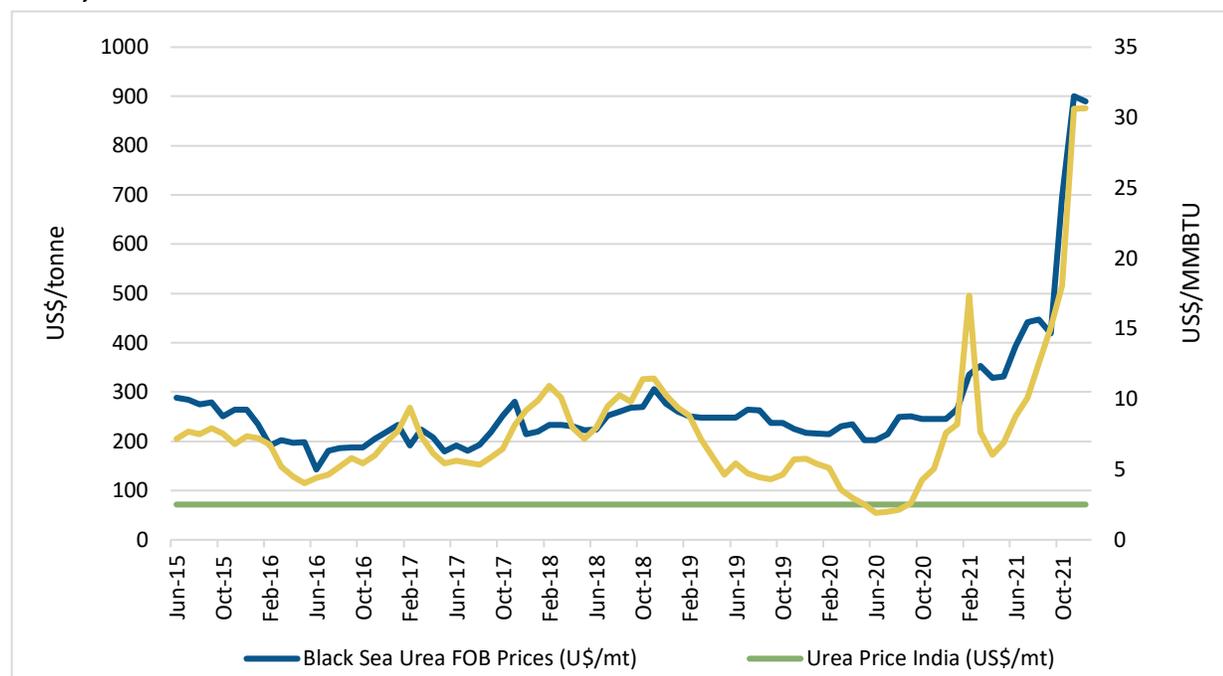
¹¹ The Hindu. [India faces record fertilizer subsidy in 2021-22](#). December 1, 2021.

¹² India Budget. [Note on Demand for Grants 2021-22, Department of Fertilisers](#).

¹³ The Hindu. [India faces record fertilizer subsidy in 2021-22](#). December 1, 2021.

¹⁴ Financial Express. [Fertiliser subsidy: FY23 outlay seen at Rs 1.3 lakh crore](#). January 5, 2022.

Figure 4: Global Urea Prices, Spot LNG Prices and Notified Urea Price in India, June 2015 to December 2021



Source: World Bank Commodity Prices Pink Sheet Data, IHS Markit LNG & Gas Prices Data, Indian Ministry of Chemicals and Fertilisers.

Rising gas and global fertiliser prices have led to a big increase in the subsidy burden, which was already high due to various government schemes. In FY2020/21, the government added Rs63,000 crore (~US\$8.45bn) to the initial estimate of Rs71,000 crore (~US\$ 9.53bn) for the fertiliser subsidy. The fertiliser sector's annual subsidy burden has been more than Rs60,000 crore (~US\$8bn) for a decade, and the increasing LNG prices have added to the fiscal strain resulting in almost twice the outgo. The table below gives a snapshot of the subsidy outgo of the fertiliser sector and the doubling of subsidies due to higher gas prices.

Rising gas and global fertiliser prices have led to a big increase in the subsidy burden.

Table 1: Year-wise Fertiliser Sector Subsidy (In Rs. Crore) From FY2010/11 to FY2020/21

Year	Indigenous Urea Subsidy	Imported Urea Subsidy	Total P&K Subsidy	Total Fertiliser Subsidy**
2010-11	15,081	6,454	41,500	65,837
2011-12	20,208	13,716	36,108	73,791
2012-13	20,000	15,133	30,567	70,592
2013-14	26,500	11,538	29,427	71,280
2014-15	38,200	12,223	20,667	75,067
2015-16*	36,000	12,278	21,938	72,415
2016-17*^	38,000	7,470	18,843	66,313
2017-18*^	31,974	7,223	22,237	66,468
2018-19^	32,190	14,318	24,080	70,605
2019-20^	43,050	14,049	26,335	79,998
2020-21^	74,488	25,050	38,917	133,947
2021-22*^ (BE)	43,236	19,550	20,720	79,530
2021-22*^ (RE)	48,612	36,250	64,912	140,122
2022-23* (BE)	46,597	20,590	42,000	105,222
* Total includes freight or excludes recovery on urea				
^ Total includes marginal amounts for city compost				
** Totals may not match due to rounding off				

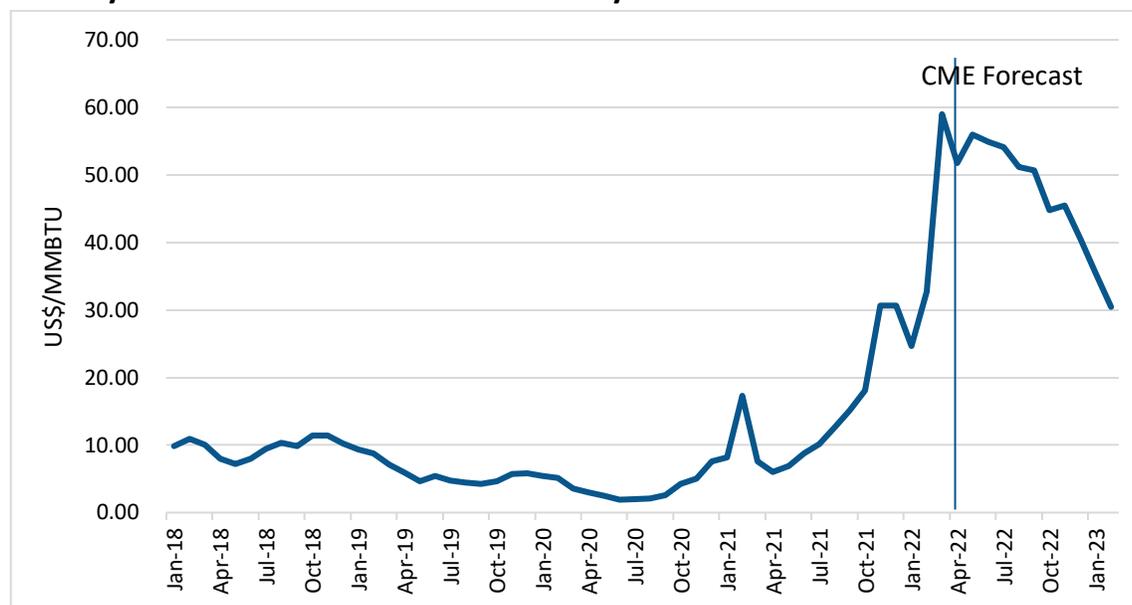
Source: Fertiliser Association of India, India Budget 2021-22.

Spot gas prices are forecast to remain above US\$50/MMBtu till September 2022¹⁵ meaning yet another high subsidy outgo for the fertiliser sector. Spot prices are expected to remain volatile due to the Russia-Ukraine conflict which is disrupting supplies to Europe and putting upward pressure on gas prices.¹⁶ Surging oil prices are also likely to result in higher contract gas prices out of Qatar and Australia which still use oil-linked gas contracts. The graph below shows gas price volatility over the past four years. Recently, gas prices touched an all-time high and are expected to remain on the higher side for 2022.

¹⁵ CME Group. LNG Japan/Korea Marker Futures and Options. Accessed on March 07, 2022.

¹⁶ Bloomberg Quint. European Gas, Power Rebound as Tensions Over Ukraine Mount. January 21, 2022.

Figure 5: Month-wise Spot Import Prices in India From January 2018 to January 2022 and Forecast Price to January 2023



Source: IHS Markit LNG & Gas Price Data, CME JKM Forecast of March 2022.

According to an India Ratings and Research report,¹⁷ a US\$1/MMBtu change in LNG prices could result in an increase of Rs1,120/tonne¹⁸ or US\$15/tonne in the urea subsidy burden. The budget announcement of a fertiliser subsidy outlay of Rs1.05 trillion (~US\$14.2bn) in FY2022/23 – above one trillion for a third year in a row – makes it a sticky item on the revenue expenditure side.¹⁹

The increasing global gas and fertiliser prices also point to the possible insufficiency of this subsidy outlay, which most likely will have to be revised by the government later in the year. While urea formed a major part of the subsidies for many years, the high LNG prices in FY 2021/22 resulted in a much higher allocation to the P&K fertilisers. High dependence on Russia for P&K imports (almost 60% of NPK and 17% of MoP²⁰) will be detrimental to India. Overall fertiliser prices will reach new highs with urea prices going up due to volatile gas prices and P&K prices rising due to supply disruptions.

¹⁷ India Ratings and Research. [Continued Low Domestic Gas Prices to Benefit Fertiliser & City Gas Distribution Entities](#). April 7, 2021.

¹⁸ Report assumes a weighted average energy consumption of 5.826Gcal/t and INR/USD of 74.5.

¹⁹ Union Budget. [Budget Provisions, net of receipts and recoveries, for the year 2022-2023](#). February 1, 2022.

²⁰ MoneyControl. [India looks towards Canada, Jordan for fertilizers as Russia-Ukraine conflict derails imports](#). March 2, 2022.

Dependence on LNG Increases Risks

As seen in Figure 2, the incremental supply of gas for the fertiliser sector is being met by imported LNG which is mostly purchased on the spot market. Apart from being a massive subsidy burden, the sector's reliance on LNG imports and vulnerability to high gas prices could impact fertiliser availability, and thus food security and the current account deficit (CAD). This would be a massive impost on India.

The fertiliser sector was the biggest consumer of R-LNG in FY2020/21, accounting for around 11,000 MMSCM or 35% of the country's entire R-LNG consumption. The increasing gas prices in the international market have impacted feedstock availability, pricing and urea production across India. India was one of the countries worst affected by the global fertiliser crisis when high gas prices led to plant shutdowns in Europe and export curbs by China and Russia. There was no urea imported into India in October 2021 when gas prices reached a record high of over US\$30/MMBtu.

In the first nine months of FY2021/22, urea imports were down by 33% compared to the same period in FY2020/21.²¹ This translates to a shortfall in urea supply of 2.8 million tonnes which affects food production, and especially food security as the major decline in supply happened at the start of the sowing season. This shortfall, induced by high global gas prices, led to the creation of a black market to sell subsidised crop nutrients illegally at much higher prices than the government's notified prices. A bag of urea was selling for Rs400 (US\$5.4), a 50% markup from the usual Rs266 (US\$3.6) per bag.²²

²¹ Department of Fertilisers. [Month Wise Production and Import](#). Accessed on January 11, 2022.

²² The Economic Times. [Black market for fertilizers is booming in India as prices soar](#). November 29, 2021.

Insulate From LNG Prices and Decrease the Subsidy Burden

Continued efforts to optimise the use of chemical fertilisers will both help to reduce the impact of volatile LNG prices and ensure that, to the extent that subsidies remain, they have the desired effect of promoting appropriate fertilisation regimes and quantities. Excessive, imbalanced use of fertilisers, particularly urea, have resulted in soil degradation in many parts of the country. A third of the total geographical area of India – 120.4 million hectares – is estimated to have degraded soil due to over fertilisation.²³ Studies also indicate that a given mass of nitrous oxide, which is released after the application of fertilisers, warms the planet 300 times more than the same mass of carbon dioxide.²⁴ However, excessive use of fertilisers is far from uniform. Over- and under-use of chemical fertilisers happens in different districts even in the same states, and departures from recommended NPK ratios also varies considerably by region and district.²⁵

About one-third of India's land area has degraded soil due to excessive fertiliser use.

To address inappropriate fertiliser use, the government launched the National Mission on Soil Health Card (SHC) to promote soil test-based balanced and judicious fertiliser application, but its implementation has been slow. A case study of Andhra Pradesh noted that awareness of the scheme is high, but delayed availability of SHC, difficulty in understanding recommendations and lack of extension services were some of the reasons hindering its progress.²⁶ While this report focusses on LNG use and subsidies for fertiliser production and the demand and use side is outside its scope, continued efforts to better match fertiliser use with the specific requirements of different soils, crops and regions will be an important, ongoing challenge for policy-makers and will help to ensure that subsidies result in the best agricultural and environmental outcomes.

To further ensure food and nutrition security, the government has taken a step to revive five urea units to increase urea production by 6.3MT per annum.²⁷ The agriculture minister has noted that India will be self-reliant in fertiliser production by 2023 with these brownfield units coming on stream with Rs40,000 crore (~US\$5.4bn) allocation under the 'Aatmanirbhar Bharat' (self-reliant India)

²³ Down To Earth. [The minimum support price conundrum and Indian farming](#). January 19, 2021.

²⁴ MIT Climate Portal. [Fertilizer and Climate Change](#).

²⁵ Indian Statistical Institute. [Spatial patterns of fertilizer use and imbalances: Evidence from rice cultivation in India](#). January 2022.

²⁶ ICAR. [Farmers' Perception and Constraint Analysis of SHC](#). April 2020.

²⁷ PIB. [Revival of 5 fertilizer units would increase urea production by 63.5 LMTPA](#). June 21, 2019.

programme.²⁸ This would mean that there is indigenous production of fertilisers using indigenous feedstock. That would be difficult to achieve by 2023 – at present the existing urea units are 25% dependent on imports²⁹ and gas production, although increasing, will not be enough to meet the requirement of 35 urea units.

Some other steps like mandatory neem coating of urea, encouraging organic farming, developing nano fertilisers and signing long-term agreements for supply of fertilisers are being piloted. Zero Budget Natural Farming is also being promoted to use traditional Indian practices for farming. A proposal for direct benefit transfer of subsidies is also being considered but has been on hold due to political considerations.

A move to provide subsidies for urea produced through coal gasification by Talcher Fertilisers Limited (TFL) is expected to reduce urea imports by 1.2MT per annum and result in lower urea imports. But its cost competitiveness is largely unproven, and the environmental and emissions consequences make this a very questionable proposed solution.³⁰

²⁸ Business Standard. [India to be self-reliant in fertilisers production by 2023: Gowda](#). September 13, 2020.

²⁹ ET EnergyWorld. [Modi govt planning surge in big fertilizer plants to achieve second green revolution](#). December 13, 2021.

³⁰ PIB. [Cabinet approves Exclusive subsidy policy for Urea produced through coal gasification by Talcher Fertilizers Limited \(TFL\)](#). April 20, 2021.

Allocate Domestic Gas to Fertiliser Sector and Promote Green Ammonia

To meet the current urea requirement of 60MT from indigenous sources, the government should make fertiliser a top priority for domestic gas allocation. In India, approximately 24.9MMBtu of gas is required to produce 1 metric tonne of urea.³¹ At present, City Gas Distribution (CGD) gets top priority but IEEFA noted in a previous report that India should leapfrog to electricity for cooking and mobility to avoid stranded asset risk, reduce fossil fuel import pressures and expedite decarbonisation. Despite priority allocation of gas to CGD, the penetration of piped natural gas (PNG) and compressed natural gas (CNG) has been very limited due to infrastructure and affordability constraints.³² It would be more prudent to allocate the limited domestic gas to the fertiliser sector where alternatives to fossil fuel-based chemical fertilisers like green ammonia are in a nascent stage for scaled use. Also, unlike the CGD or industrial sectors, prioritising domestic gas for fertiliser production would not require additional infrastructure investment, leading to easier decarbonisation later.

Further, the savings in subsidies as a result of reducing the use of imported LNG could be directed towards the development of green ammonia for producing urea and other fertilisers. Ammonia is the main intermediary for nitrogen in all nitrogen-based fertilisers. At present natural gas is converted to ammonia, which is then converted to urea, making it a very carbon-intensive process. Decarbonising ammonia production involves producing hydrogen through electrolysis of water using clean sources of energy and obtaining nitrogen directly from air using an air separation unit. The main cost here is the electricity. According to a TERI study,³³ the electricity cost needs to be Rs2/kWh to Rs3.3/kWh to make this production method competitive with gas-based fertiliser at a pooled price of US\$8/MMBtu. US\$8/MMBtu is far below the current spot price for gas so alternative production methods have the potential to be much more economical.

The savings in subsidies as a result of reducing the use of imported LNG could be directed towards the development of green ammonia.

Green ammonia will decarbonise fertiliser production, but until it achieves scale domestic gas can be used instead of LNG. Reducing the over-use of fertiliser in India would also help in cutting emissions as well as improving soil health. Massive global

³¹ Economic Times. [Gas price hike likely to burden urea cos by Rs 9,000 crore](#). December 11, 2013.

³² IEEFA. [Role of Gas in Cooking and Mobility in the Transition to Cleaner Energy](#). October 2021.

³³ TERI. [The Potential Role of Hydrogen in India](#). 2020.

investment is being deployed into the development of green hydrogen. In June 2021, the U.S. Department of Energy (DoE) announced the Hydrogen Energy Earthshot with an ambitious target of US\$1 per 1kg in one decade.³⁴

The use of grey hydrogen, produced using natural gas, will make it easier for the fertiliser sector to transition to green hydrogen in the form of green ammonia. Currently, 98% of grey hydrogen is consumed in the production of fertilisers and oil refining, making these hard-to-abate sectors prime candidates for green hydrogen. India is considering mandating a certain percentage of green hydrogen use in these sectors to eventually equalise the cost of green and grey hydrogen. Green hydrogen would then be the preferred choice due to its environmental benefits. There is also a need to incentivise hydrogen production through production-linked incentives to bring in economies of scale and bring down the cost of electrolyzers to US\$400 per kilowatt-hour (kWh).³⁵ Green hydrogen's potential in fertiliser production is critical for decarbonising the agriculture sector and for insulating India from global gas price volatility and a high subsidy burden.

³⁴ US DoE. [DoE Update on Hydrogen Shot, RFI Results, and Summary of Hydrogen Provisions in Bipartisan Infrastructure Law](#). December 2021.

³⁵ Energy Economic Times. [Budget 2022: India needs to invest Rs 3 lakh crore in Green Hydrogen by 2035](#). January 28, 2022.

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