

Thailand Chemical

Chemical boom and bust in the post-Covid era

- We are bullish on the polyester chain margin outlook, neutral on the olefins chain and bearish on the upstream aromatics chain, but see higher margins for downstream.
- Recyclability, carbon emission quantity, and energy consumption could be the next factors for the chemical margin trend in which PET and polyester should stand out.
- IVL and IRPC are our top picks.

Two sides of plastics – authentic winners and losers

We believe that in 2022, post economic reopening after the Covid-19 pandemic, the margin trends of petrochemical products will now shift to the supply side impact following a period of supply disruptions and delays and the strong demand growth in 2020-21. Among all major petrochemical chains, we are bullish on polyester and polyvinyl chloride (PVC), neutral on ethylene, propylene and downstream polyethylene (PE) and polypropylene (PP) products, and bearish on the aromatics and butadiene chains, based on the demand-supply balance and the competitiveness of the producers under the high oil and gas prices.

Polyester and PVC are two clear winners

We are most bullish on the polyester chain (PET, polyester fibres)'s margin outlook thanks to its superior recyclability, favourable market structure, import barriers, and high contract prices and margins that have sustained the integrated PET-PTA margin at high levels. We are neutral on olefins chain products for both upstream and downstream as the supply growth of ethylene and propylene and their downstream PE and PP are projected to outpace demand growth in 2022-23. While we have a bearish view on the upstream margins for the aromatics chains of paraxylene (PX) and benzene (BZ) due to the high supply growth, we expect the margins of downstream products for PX (mostly polyester) and BZ (mostly the styrene monomer (SM) chain) to remain strong in 2022-23, backed by the strong demand for automobile parts and home appliances.

Carbon emissions could be the next factor for the chemical margin trend

On top of the demand-supply balance, we believe there are three key factors that will significantly influence the margin directions of chemical product chains in 2022-30. The recyclability, carbon emission quantity, and energy consumption of each plastic product are now increasingly more critical to its application, consumer adoption, and the government's policy toward the zero-carbon emissions goal by 2030 under the COP26 agreement. PET and polyester stand out to be the plastics of choice in this context, in our view.

IVL and IRPC are our top picks

IVL and IRPC are our top picks based on the strong margin outlook for polyester and PVC in 2022-23 and their high earnings exposures to specialty product portfolios. IVL stands out for its high EBITDA exposure to products in the polyester, IOD, and specialty chains. IRPC has a high exposure to specialty products like expanded polystyrene (EPS) and compound PE. Hence, we think IRPC is poised to be a key winner in the margin upcycle in 2022-23.



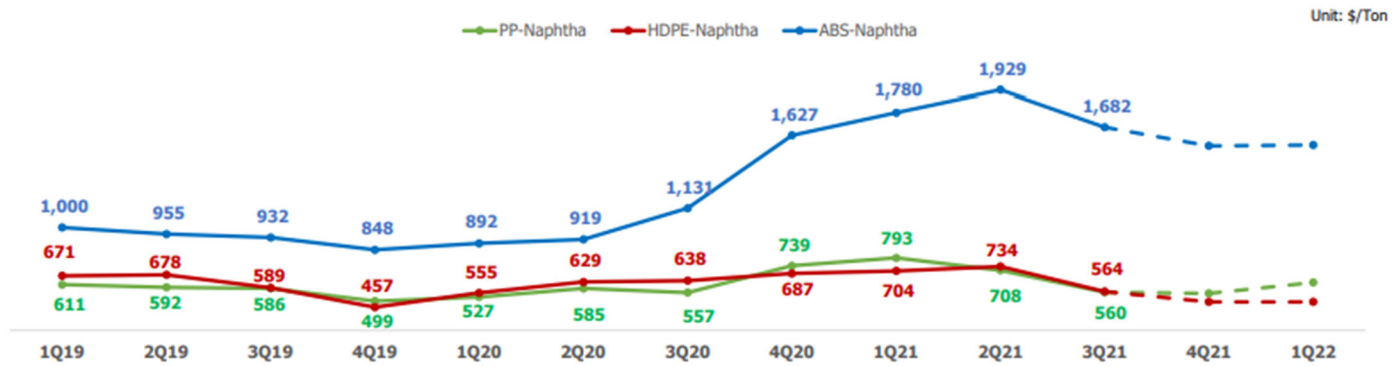
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Chemical boom and bust in the post-Covid era

We believe that in 2022, the year of the global economic reopening after a 2-year period of the Covid-19 pandemic which has hit the global economy severely, the margins of petrochemical products have now shifted to the supply side impact following a period of supply disruptions and delays and the strong demand growth in 2020-21 due to the global lockdowns and logistics disruptions caused by the pandemic.

Exhibit 1: Naptha spread – PP, HPDE, ABS



Source: IRPC

Among all major petrochemical chains, we are bullish on polyester and PVC, neutral on ethylene, propylene and downstream PE and PP products, and bearish on the aromatics and butadiene chains, based on the demand-supply balance and the competitiveness of the producers as a result of the oil and gas price uptrends.

However, the margin trends of downstream products in each petrochemical chain will likely have different directions in the post-pandemic era given the discrepancies in the global demand-supply balance outlook, cross-continental trade flows and logistics barriers, and the demand growth for each product for a variety of applications.

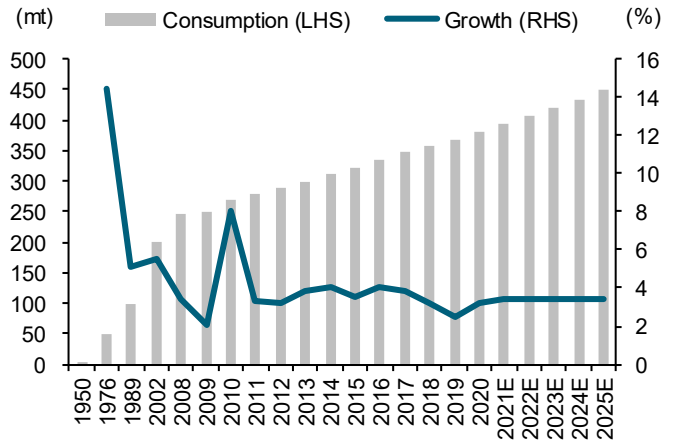
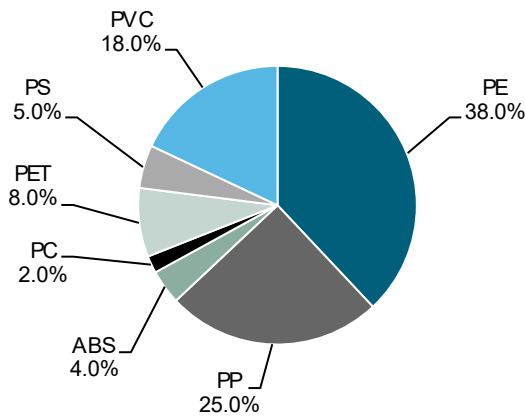
As a result, while we have a bearish view on the upstream margins for the aromatics chains of PX and BZ due to the high supply growth, we expect the margins of downstream products for PX (mostly polyester) and BZ (mostly the SM chain) to remain strong in 2022-23, backed by the strong demand for automobile parts and home appliances.

Key factors to dictate the margin trends of chemical products in 2022 on

On top of the demand-supply balance, we believe there are three key factors that will significantly influence the margin directions of chemical product chains in 2022-30. The recyclability, carbon emission quantity, and energy consumption of each plastic product are now increasingly more critical to its application, consumer adoption, and the government's policy toward the zero-carbon emissions goal by 2030 under the COP26 agreement, which is a key policy framework for the 197 countries that agreed to sign.

Exhibit 2: Global plastics volume breakdown by plastic type

Exhibit 3: Global plastics consumption and growth rates



Source: IIRPC

Source: Eurostat

Plastics remain the material of choice for the next few decades. In 2020, the global plastics market was worth USD579.7b, and is expected to expand at a compound annual growth rate (CAGR) of 3.4% from 2021-28, based on the projections by the US Energy Information Administration (EIA). Increasing consumption in the construction, automotive, and electrical & electronics industries is projected to support market growth, and the regulations on decreasing gross vehicle weights to improve fuel efficiency and eventually reduce carbon emissions are driving plastic consumption as a substitute for metals, including aluminium and steel, for the manufacturing of automotive components.

Stringent regulations regarding the depletion and recyclability of conventional materials, such as metal and wood, are anticipated to drive greater demand for plastics from the construction industries for insulation, pipes, cables, flooring, windows, storage tanks, and others. When used in the automotive and construction industries, plastics enable around 80% weight savings and 30-50% cost savings in individual components, according to Grand View Research.

PE remains the largest and most used plastic in the world. In terms of revenue, PE held the largest share of over 25% in 2020, and is primarily used in the packaging sector, which includes containers and bottles, plastic bags, plastic films, and geo membranes.

Acrylonitrile butadiene styrene (ABS) is a promising product segment in the market. ABS is widely used in consumer goods and electrical and electronics applications and is gaining popularity owing to its excellent rigidity, high strength, and dimensional stability. ABS is also used in manufacturing drain-waste-vent pipe systems, plastic clarinets, golf club heads, musical instruments, enclosures for electrical and electronic assemblies, automotive trim components, and protective headgear among various others.

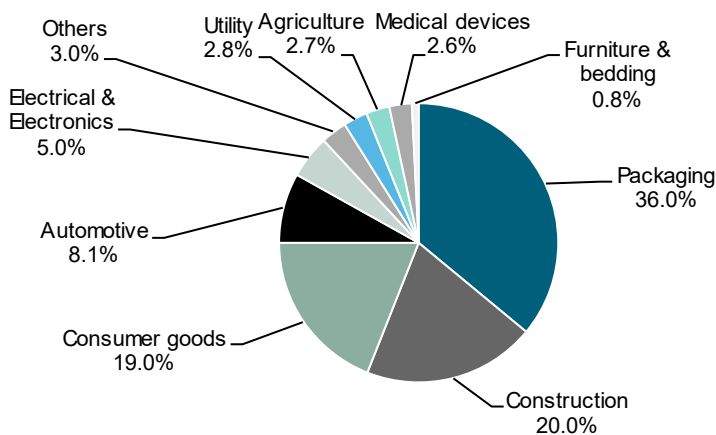
The packaging end-use segment held the largest revenue share of more than 36% in 2020. Packaging is a high-potential end-use segment with moderate penetration. Plastics have been an integral part of the packaging industry.

Furthermore, the advent of bio-based plastic has also played a significant role in food, pharmaceutical, and beverage packaging applications. Plastics such as polyethylene terephthalate (PET) and polycarbonates (PC) are increasingly being used in the packaging of beverages, consumer goods, appliances, toys, and apparel. The packaging of appliances is expected to offer lucrative growth opportunities for the segment.

The impact of the Covid-19 pandemic on the packaging industry is expected to remain moderate over the forecast period. The demand for packaging for healthcare products, groceries, and e-commerce transportation has increased sharply, while the demand for luxury, industrial, and some B2B transport packaging declined due to the suspension or slowdown of industrial production.

Moreover, the demand for plastic in consumer packaging is expected to shift severely toward food packaging owing to the shutdown of restaurants and food service outlets during the pandemic. The stockpile and panic purchases of food, groceries, and other homecare necessities are further expected to boost the aforementioned trend, according to Grand View Research.

Exhibit 4: Global plastics consumption breakdown by industry



Source: Grand View Research

China is a dominant market and supplier of global plastics. Asia Pacific (including China) dominated the market and accounted for over a 44% share of the global revenue in 2020. The growing manufacturing sector is expected to propel the demand for plastics in the automotive, construction, packaging, and electrical and electronics industries. In the recent past, India and China witnessed a spike in automotive production owing to technology transfers to the sector from Western markets.

In addition, the well-established manufacturing base for electrical products and electronics in Taiwan, China, and South Korea is anticipated to provide further impetus to the market, according to Grand View Research. India has a strong chemical manufacturing industry base, which strengthens its plastic production. Rapid urbanisation, improving economic conditions, and increasing infrastructural activities are the factors supporting the growth of the market in Asia Pacific.

China is the largest supplier and producer of plastic components in this region. The growth of the automotive and electronic market and subsequent demand for lightweight components to improve the efficiency of vehicles and reduce the weight of electronics components are the major factors contributing to the demand for plastics in the country.

According to IVL, PET is the most recyclable plastic in the world with the highest recyclability of over 80% worldwide, compared to other plastics which are much more difficult to recycle due to their toughness and greater variety of applications vs PET's limited applications for packaging, bottles and polyester fibre.

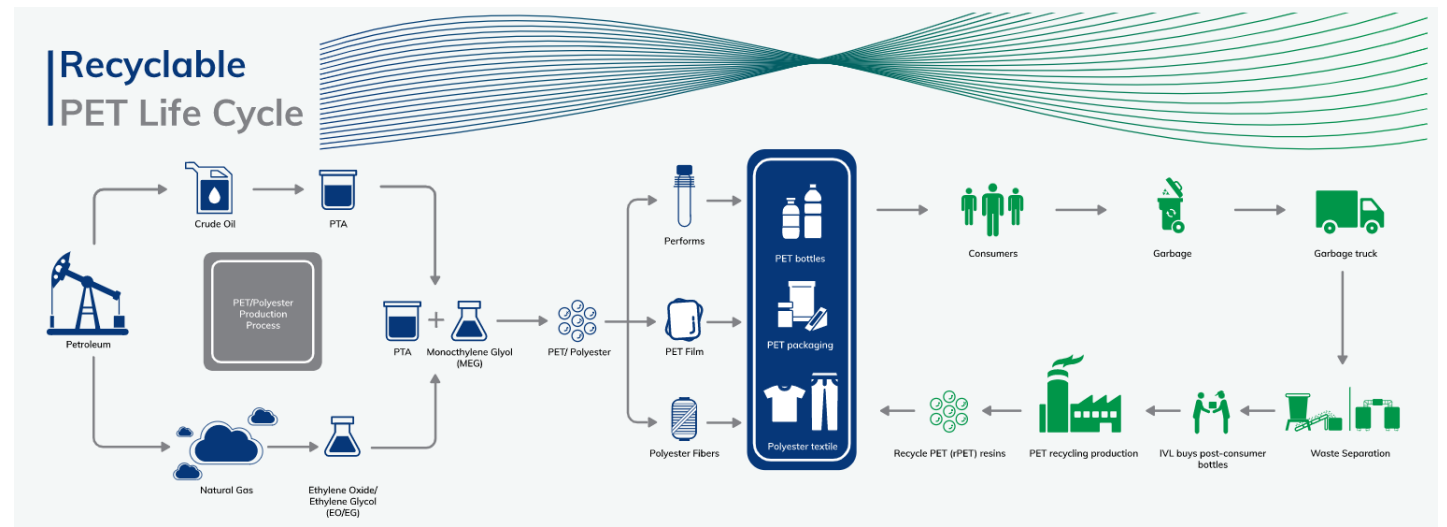
Exhibit 5: Plastics recycling chart

RECYCLE LOCALLY? SYMBOL	1 PETE	2 HDPE	3 PVC	4 LDPE	5 PP	6 PS	7 OTHER	RECYCLE LOCALLY? SYMBOL
NAME	POLYETHYLENE TEREPHTHALATE	HIGH DENSITY POLYETHYLENE	VINYL OR PVC	LOW DENSITY POLYETHYLENE	POLYPROPYLENE	POLYSTYRENE	MISCELLANEOUS	NAME
DESCRIPTION	PET plastic is the most common for single-use bottled beverages, because it is inexpensive, lightweight and easy to recycle. It poses low risk of leaching breakdown products. Recycling rates remain relatively low (around 20%), though the material is in high demand by remanufacturers.	HDPE is a versatile plastic with many uses, especially for packaging. It carries low risk of leaching and is readily recyclable into many goods.	PVC is tough and weathers well, so it is commonly used for piping, siding and similar applications. PVC contains chlorine, so its manufacture can release highly dangerous dioxins. If you must cook with PVC, don't let the plastic touch food. Also never burn PVC, because it releases toxins.	LDPE is a flexible plastic with many applications. Historically it has not been accepted through most American curbside recycling programs, but more and more communities are starting to accept it.	Polypropylene has a high melting point, and so is often chosen for containers that must accept hot liquid. It is gradually becoming more accepted by recyclers.	Polystyrene can be made into rigid or foam products -- in the latter case it is popularly known as the trademark Styrofoam. Evidence suggests polystyrene can leach potential toxins into foods. The material was long on environmentalists' hit lists for dispersing widely across the landscape, and for being notoriously difficult to recycle. Most places still don't accept it, though it is gradually gaining traction.	A wide variety of plastic resins that don't fit into the previous categories are lumped into number 7. A few are even made from plants (polylactide) and are compostable. Polycarbonate is number 7, and is the hard plastic that has parents worried these days, after studies have shown it can leach potential hormone disruptors.	DESCRIPTION
FOUND IN PRODUCTS	Soft drink, water and beer bottles; mouthwash bottles; peanut butter containers; salad dressing and vegetable oil containers; ovenable food trays.	Milk jugs, juice bottles; bleach, detergent and household cleaner bottles; shampoo bottles; some trash and shopping bags; motor oil bottles; butter and yogurt tubs; cereal box liners	Window cleaner and detergent bottles, shampoo bottles, cooking oil bottles, clear food packaging, wire jacketing, medical equipment, siding, windows, piping	Squeezeable bottles; bread, frozen food, dry cleaning and shopping bags; tote bags; clothing; furniture; carpet	Some yogurt containers, syrup bottles, ketchup bottles, caps, straws, medicine bottles	Disposable plates and cups, meat trays, egg cartons, carry-out containers, aspirin bottles, compact disc cases	Three- and five-gallon water bottles, "bullet-proof" materials, sunglasses, DVDs, iPod and computer cases, signs and displays, certain food containers, nylon	FOUND IN PRODUCTS
RECYCLED INTO	Polar fleece, fiber, tote bags, furniture, carpet, paneling, straps, (occasionally) new containers	Laundry detergent bottles, oil bottles, pens, recycling containers, floor tile, drainage pipe, lumber, benches, doghouses, picnic tables, fencing	Decks, paneling, mudflaps, roadway gutters, flooring, cables, speed bumps, mats	Trash can liners and cans, compost bins, shipping envelopes, paneling, lumber, landscaping ties, floor tile	Signal lights, battery cables, brooms, brushes, auto battery cases, ice scrapers, landscape borders, bicycle racks, rakes, bins, pallets, trays	Insulation, light switch plates, egg cartons, vents, rulers, foam packing, carry-out containers	Plastic lumber, custom-made products	RECYCLED INTO

Source: UnderDesign

Understandably, the margin of polyester chain products, mostly PET and fibres, has been much more promising than other plastic chemical products due to their less elastic demand to the global GDP and higher substitutability to other materials and other types of plastics.

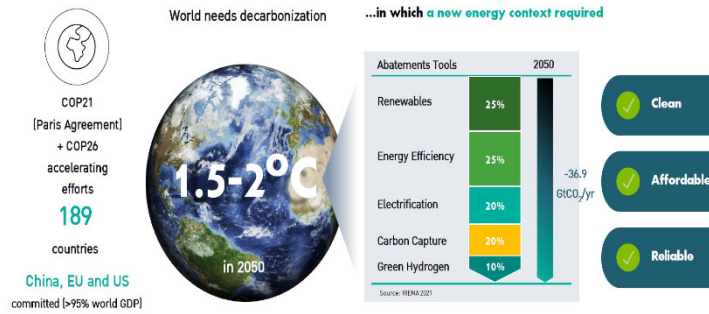
Exhibit 6: PET is the most recyclable plastic in the world



Source: IVL

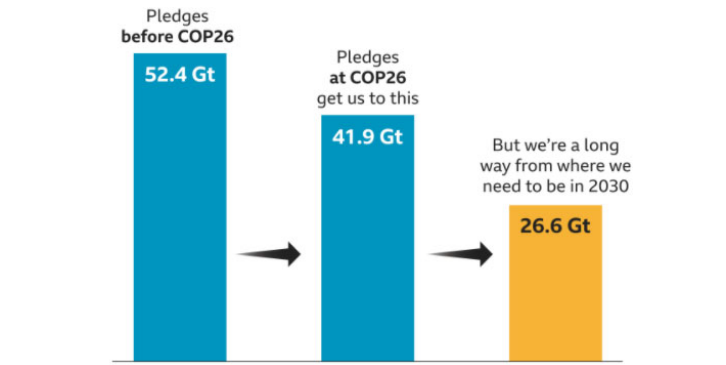
What is the COP26 agreement? Although not legally binding, the COP26 pact has set the global agenda on climate change for the next decade to limit global warming to within 1.5C. However, the COP26 pact would likely only limit global warming to 2.4C, according to the EIA.

Exhibit 7: COP26 agreement



Sources: International Monetary Fund (IMF); World Economic Forum; EIA; International Organisation for Migration

Exhibit 8: Carbon emission cuts needed to limit global warming to 1.5C



Source: Energy Transitions Commission

A carbon credit and “carbon pricing” concept of carbon border tax was recently introduced by European countries for certain energy-intensive products to be imported into the European Union (EU). COP26 also provides a tightening global carbon emissions policy agreed upon by 197 countries, including Thailand, China, the US, and India, during the COP26 climate conference in Glasgow, Scotland.

China and India have only agreed to the commitment to reduce carbon emissions while insisting on “phasing down” rather than “phasing out” coal-fired power plants and coal consumption – the key sources of global carbon emissions.

Exhibit 9: Wind farms



Source: Energy Transitions Commission

Exhibit 10: Solar farms

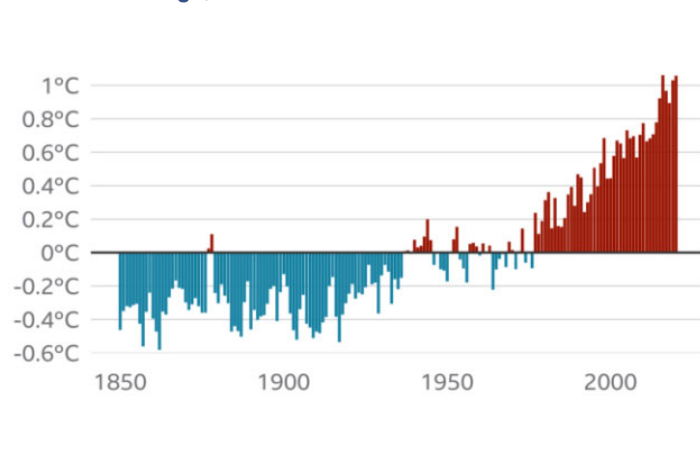


Source: Energy Transitions Commission

The key takeaways from the COP26 climate summit to limit global warming to 1.5C includes seven key ways to tackle climate change:

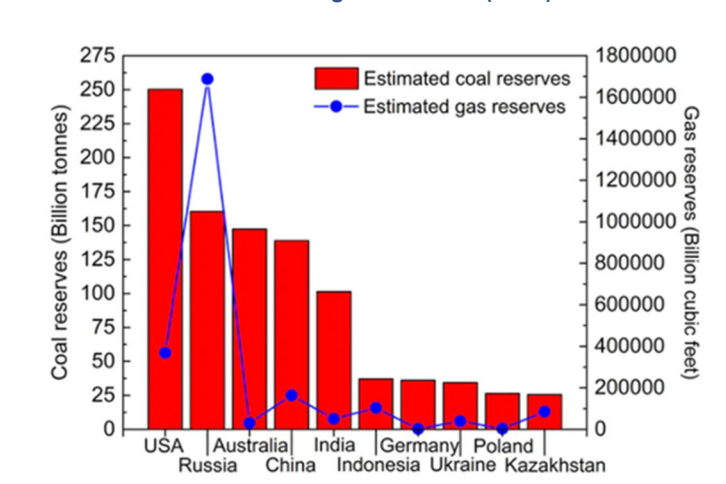
- **Keep fossil fuels in the ground.** This essentially prohibits coal mining and using fossil fuels such as oil, gas, and coal that release carbon dioxide (CO₂) into the atmosphere when burnt for their energy. Australia, the world’s leading coal exporter, declined to sign a deal at the COP26 summit aimed at phasing out coal consumption.
- **Curb methane emissions,** mainly from “flaring” – the burning of natural gas during the oil extraction process. At COP26, nearly 100 countries agreed to cut methane emissions in a deal led by the US and EU, which aims to limit methane emissions by 30% from 2020 levels within 2030.
- **Higher renewable power.** The process called decarbonization, switching from fossil-based coal, gas, and oil for power generation to renewable energy, is critical for the reduction of carbon emissions. This is where energy storage systems (ESS) can play a significant role in stabilising the power generated from solar and wind farms by storing the excess power in ESS and releasing it when needed.
- **Reduce coal consumption,** which accounts for 40% of global CO₂ emissions. However, China and India are still reluctant to fully commit to the coal consumption cuts and only agreed to a weaker commitment to “phase down”, not “phase out” coal consumption.
- **Phase out or abandon petroleum fuel consumption** and replace internal combustion engine vehicles with EVs. The idea remains highly challenging to achieve. Switching from the current internal combustion engine (ICE) vehicles using the refined oil products of diesel, gasoline, jet, and fuel oil, to EVs that predominantly use power generated from renewable and ESS sources will be key.
- **Plant more trees.** Leaders from over 100 countries, with about 85% of the world’s forests, promised to curb deforestation and plant more trees by 2030 to expand forest growth, the best method of soaking up carbon from the atmosphere.
- **Remove greenhouse gases from the air.** The emerging technologies that artificially remove CO₂ from the atmosphere, called “carbon capture utilisation and storage” (CCUS) technology is becoming more prevalent worldwide.
- **Provide financial aid to poorer countries.** Many coal-dependent countries are facing severe energy and power shortages that could affect the poor. The agreement pledged to significantly increase financial support to help poorer countries cope with the impact of climate change and make the switch to clean energy. The prospective amount was raised to USD1tr by 2025 for developed countries to help poorer countries, up from the USD100b pledged by 2020, which was missed.

Exhibit 11: Annual mean land and ocean temperature above or below average, 1850 to 2020



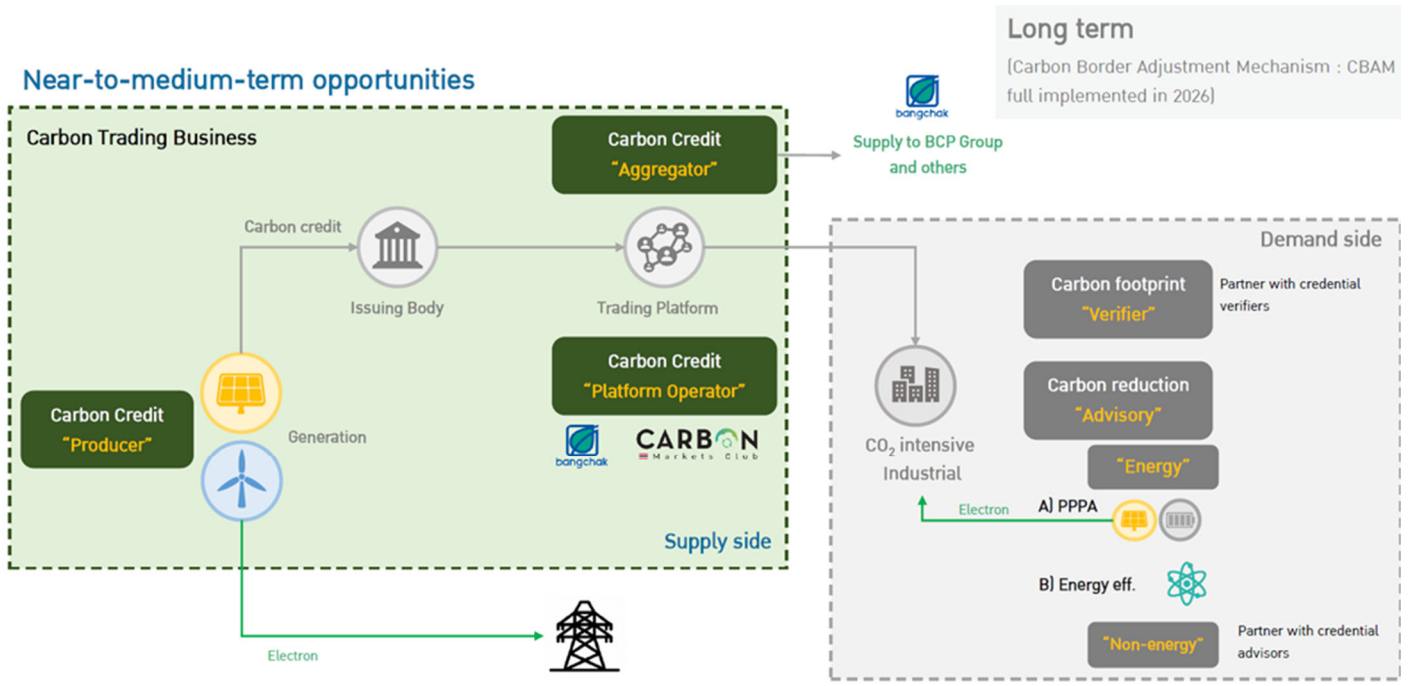
Note: Average calculated from 1951 to 1980
Source: University of California, Berkley

Exhibit 12: Global coal and gas reserves (2020)



Source: EIA

Exhibit 13: Potential carbon credit trading

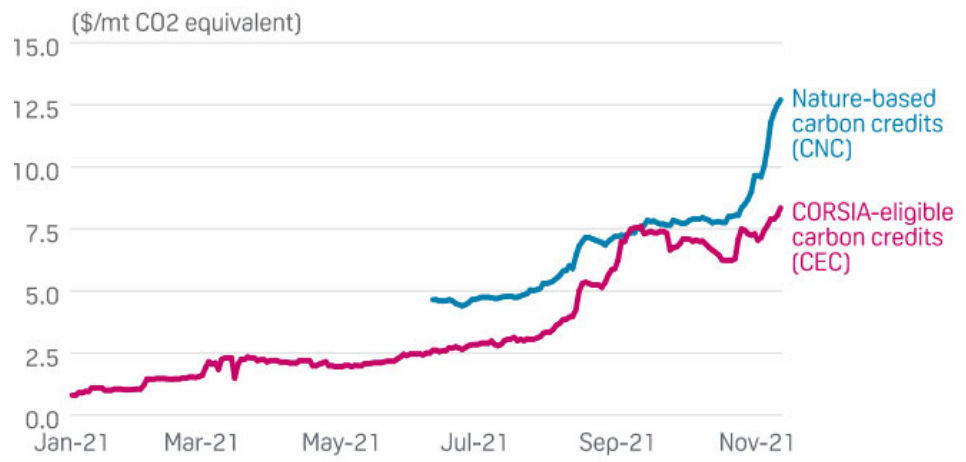


Source: BCPG

Under the COP26 pact, representatives struck a deal on Article 6 of the 2015 Paris Agreement, which gives any country hosting an emissions reduction project the tools to decide if the reductions will be counted toward its own target or sold elsewhere for other purposes, allowing for more transparent trading on carbon credits.

In 2021, there was significant growth in every carbon market, with a near doubling of voluntary market transactions and the launch of China's national Emission Trading System, which accounts for 40% of China's carbon emissions. Markets in Europe, California, Quebec, New Zealand, Australia and the Regional Greenhouse Gas Initiative – the first mandatory market-based program in the US to reduce greenhouse gas emissions – saw record prices in Nov-21 after the COP26 summit.

Exhibit 14: Carbon credit prices



Source: Bloomberg

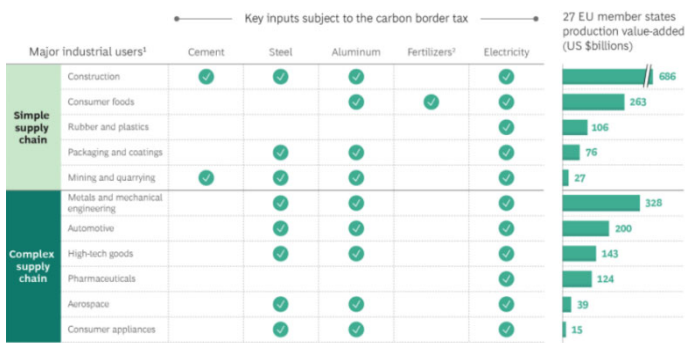
Carbon border tax – a key milestone to awaken countries to environmental awareness and policies

After years of discussion, the EU in Jul-21 announced its plan to impose a “carbon border tax” on exporters and non-EU manufacturers for the products exported to the EU market via the carbon emissions associated with those goods and materials.

What is a carbon border tax? A carbon border tax (CBT) is essentially a concept of “carbon pricing”, to levy a charge for each metric tonne of carbon dioxide emitted by an industry. It is now embedded in a number of countries’ climate and sustainability policies, including Thailand under the country’s zero emission vehicle target.

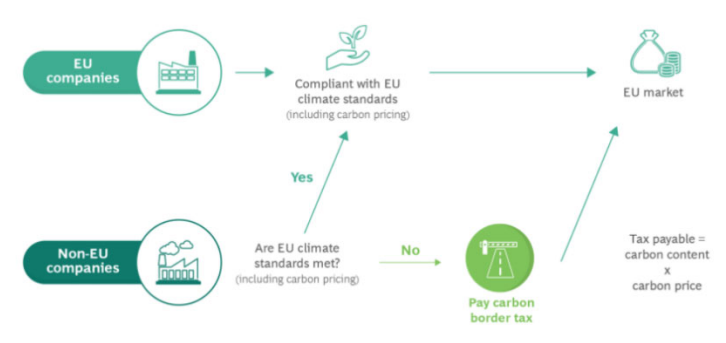
Unlike its predecessor, the carbon credit, CBT is the first time pricing will apply equally to imports, leading to a global reverberation from the CBT impact throughout global value chains, and could eventually redefine the competitive balance between nations in many industries. CBT is a true impetus for global producers to accelerate efforts to slash their carbon footprints.

Exhibit 15: 12 industries to have a carbon border tax imposed upon them



Source: [BCG.com](https://www.bcg.com)

Exhibit 16: Carbon border tax by EU vs non-EU companies



Source: [BCG.com](https://www.bcg.com)

The petrochemical industry is one of the first on the list of 12 industries – construction, consumer foods, rubber and plastics, packaging and coatings, mining and quarrying, metal and mechanical engineering, automotives, high-tech goods, pharmaceuticals, aerospace, consumer appliances – that will be subject to CBT, effective in January 2026 onward.

The biggest initial impact from CBT will be on the cost of such high-carbon inputs as steel, cement, aluminium, chemicals, and electricity. EU importers and non-EU producers of these inputs will be required to pay an estimated €75 per metric tonne of CO2 emissions (tpc).

Exhibit 17: Russia faces the steepest fees from the EU’s carbon border tax



Source: Bloomberg

Exhibit 18: Carbon border tax is an alarming signal for petrochemical producers in developing countries



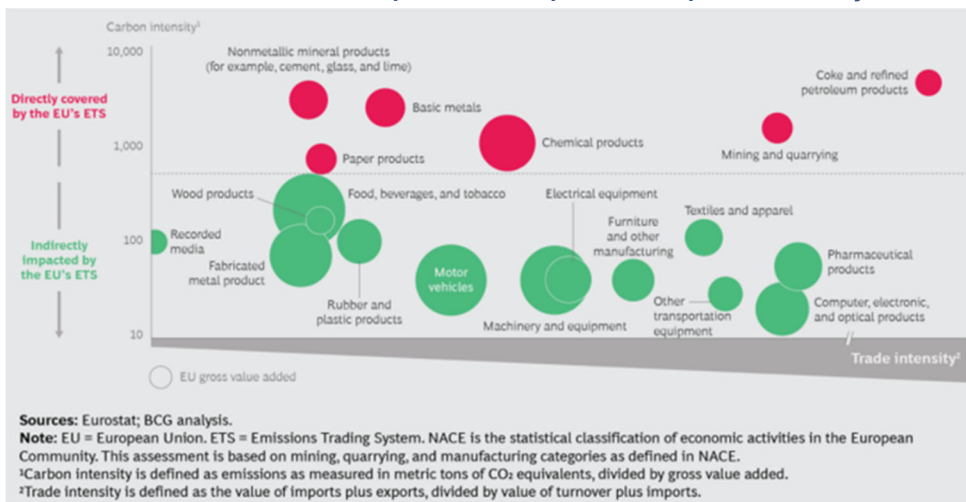
Source: [Wattsupwiththat.com](https://www.wattsupwiththat.com)

While the new EU's Carbon Tax Adjustment Mechanism (CBAM) law will impact all countries exporting to the EU, the countries without carbon pricing mechanisms like India, China, Indonesia, the Philippines, and Thailand, and even developed ones like Australia and Poland are likely to be significantly affected by CBAM by 2026.

This could increase the cost of materials made by more carbon-intensive producers, such as China, Russia, Thailand, and India, by 15% to 30% overnight. And the effect will increase during subsequent years: the tax rate is projected to approach €100 tpc by 2030, and more products will likely fall within its scope at that point.

Companies have to measure their current emissions and carbon tax exposure across their supply chains and product lines, develop a resilient carbon strategy playbook, and identify opportunities to turn the climate challenge into a source of competitive advantage. They would also benefit from engaging with EU decision makers to help shape the future of climate policy. Thai chemical producers have to prepare their carbon emission strategies to fully address the CBT that will be effective by January 2026.

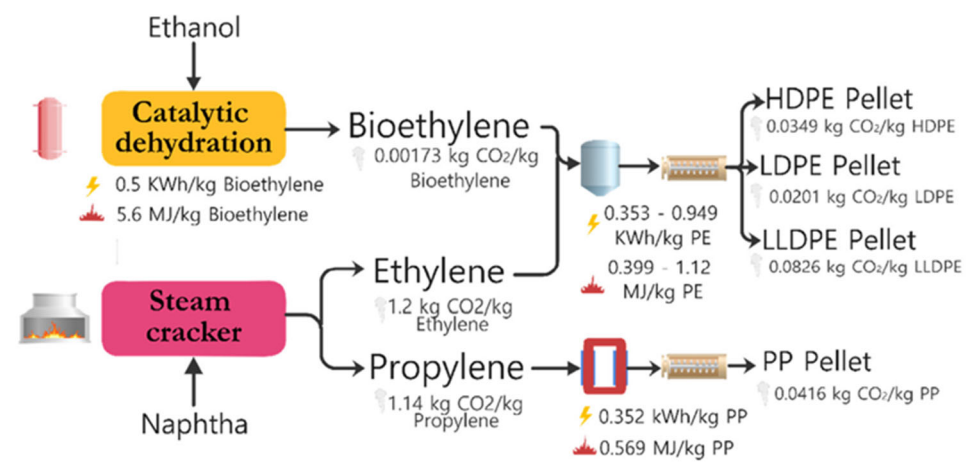
Exhibit 19: Carbon border tax: implications for products imported to EU by sector



Source: [BCG.com](https://www.bcg.com)

The CBT will be implemented in stages, with January 2023 through December 2025 serving as a transitional phase. During this time, importers of steel, aluminium, cement, fertilizers, and electricity must calculate and report their emissions – but will not yet have to pay a carbon tax. In the second stage, which will commence in January 2026, companies will have to purchase import permits. The EU may also extend the scheme at this time to cover other products.

Exhibit 20: Energy consumption and carbon emissions from olefins production process

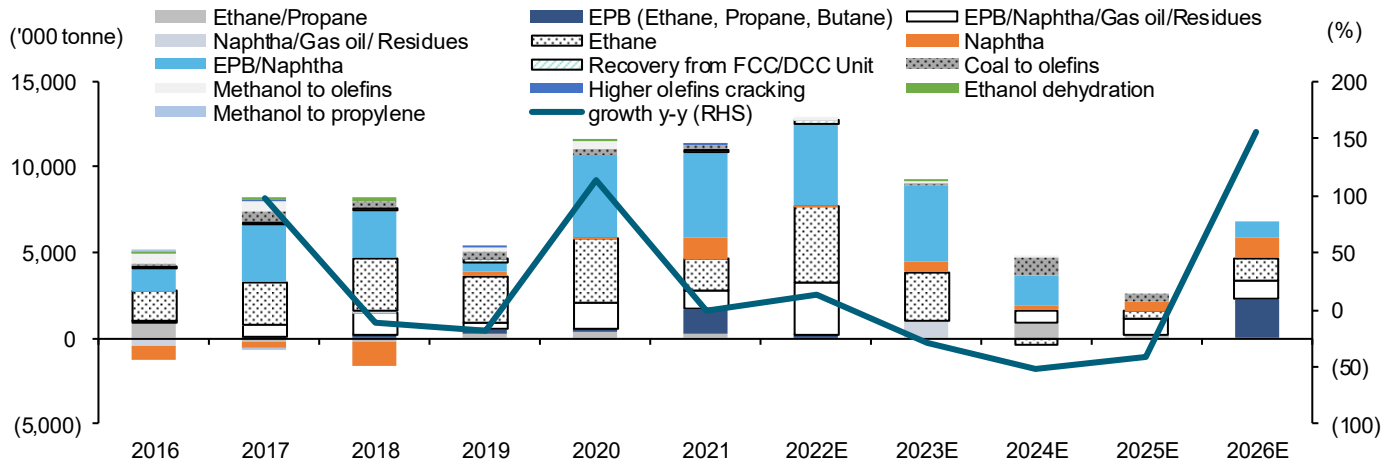


Source: [MDPI](https://www.mdpi.com)

Ethylene chain: more bearish margin outlook in 2022-23

According to IRPC, the supply growth of ethylene is projected to outpace the demand growth in 2022, a third consecutive year of oversupply since 2020 thanks to the naphtha-based supply growth from China and other Asian countries. This includes Thailand from SCC via its naphtha-based capacity expansion of Map Ta Phut Olefins (MOC, not listed) by 0.45mtpa to 2.05mtpa from debottlenecking since 2Q21 and PTTGC's 0.75mtpa naphtha-based Olefins Reconfiguration Project (ORP) since 3Q21.

Exhibit 21: Additional ethylene capacity by feedstock



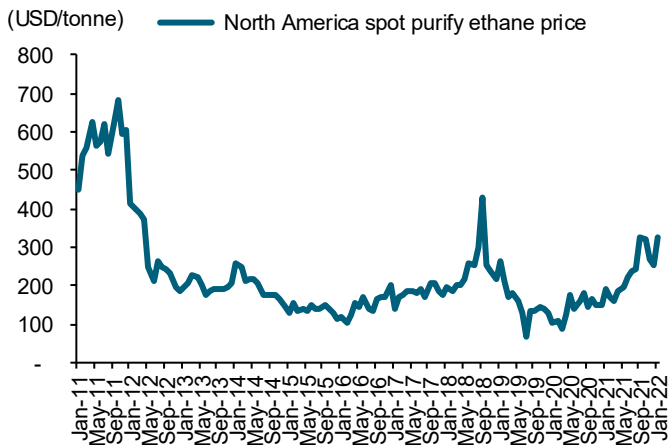
Source: IRPC

As the price of naphtha, a product produced from crude oil via the refinery process, has moved up significantly in tandem with the sharp rise in the crude oil price, the ethylene-naphtha margins of the naphtha-based producers have markedly narrowed to USD400-450/t, the estimated industry breakeven level in Jan-Feb 2022.

Meanwhile, the ethane-based producers of ethylene, mainly in the US, have continued to enjoy the significant margin expansion as the cost of ethane feedstock remains low, while the price of ethylene has jumped much higher as a result of the higher naphtha prices.

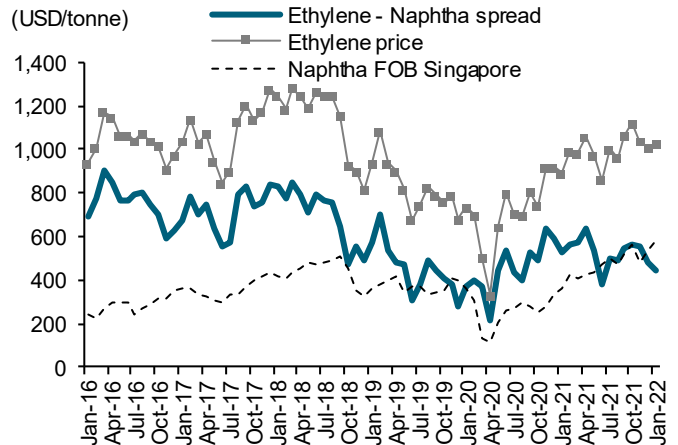
Hence, the naphtha-based producers, mostly in Asia and Europe, have been hit hard by the diversity of the ethylene-feedstock margins, with the Asian and European naphtha-based producers seeing weaker margins while the ethane-based producers in the US have witnessed a rising margin.

Exhibit 22: North America spot purified ethane price



Source: Bloomberg

Exhibit 23: Naphtha spread – Ethylene

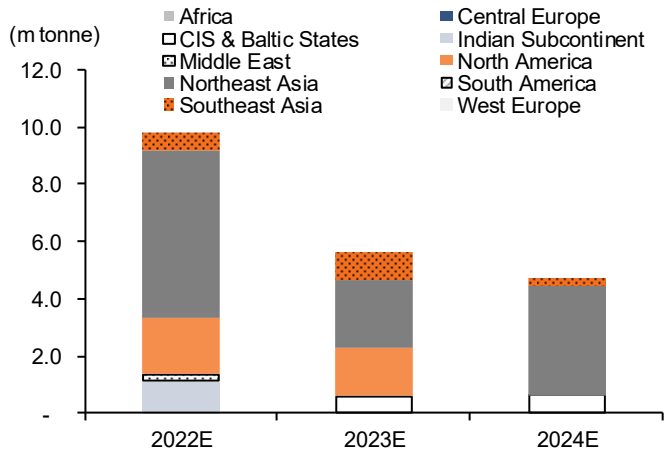


Source: Bloomberg

Margin of downstream PE is now under pressure. According to IRPC, the PE margin is likely to decline in 2022-23, as the supply additions are projected to remain high at almost 10mt in 2022, 5.7mt in 2023, and 4.5mt in 2024, far higher than the projected demand growth of 4-5mtpa in the same period.

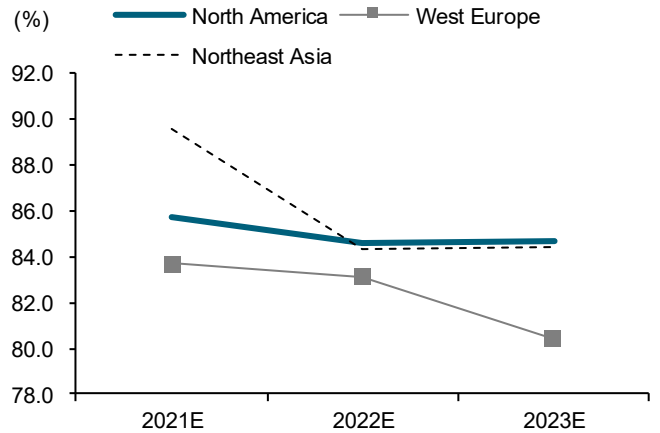
The imbalance of the demand-supply growth will likely lead to a lower average global utilisation rate from 84-90% in 2021 down to 81-85% in 2024, with the producers in Western Europe likely to see the sharpest drops in their utilisation rates thanks to the high cost structures of their ageing legacy assets and the higher imported feedstock cost of naphtha and liquefied natural petroleum (LPG), the two key feedstocks used by most European ethylene producers.

Exhibit 24: Additional PE capacity



Source: IRPC

Exhibit 25: PE operating rate in North America, Western Europe and Northeast Asia

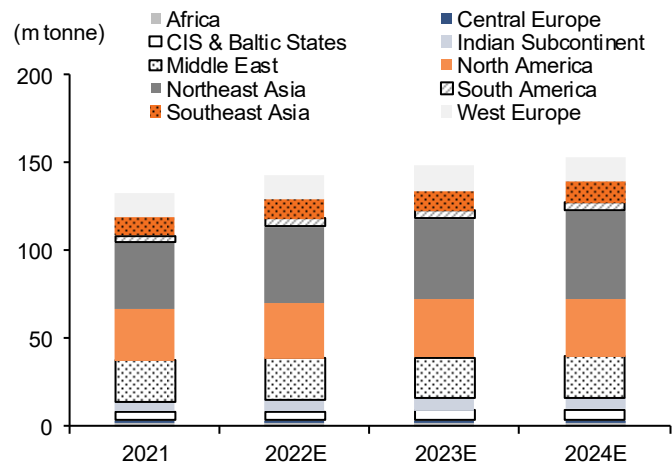


Source: IVL

Worsened by the spikes in the naphtha feedstock price, we expect the margins of the naphtha-based ethylene producers to remain weak, averaging USD450-500/t in 2022-24.

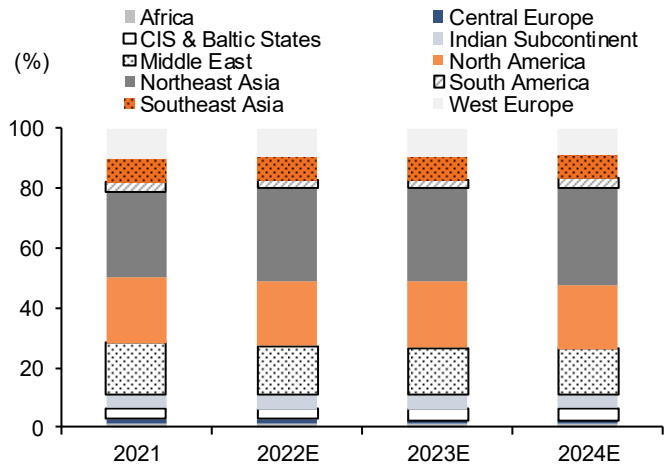
As new ethylene supplies from China (under Northeast Asia) and US (North America) are expected to continue to rise in 2022-24, the margin pressure ripples could be at the highest level to the last competitive producers in Europe, Northeast Asia, excluding China, and Southeast Asia, all using naphtha as a key feedstock to produce ethylene.

Exhibit 26: PE – total capacity breakdown by region



Source: IRPC

Exhibit 27: PE – total capacity breakdown by region (%)

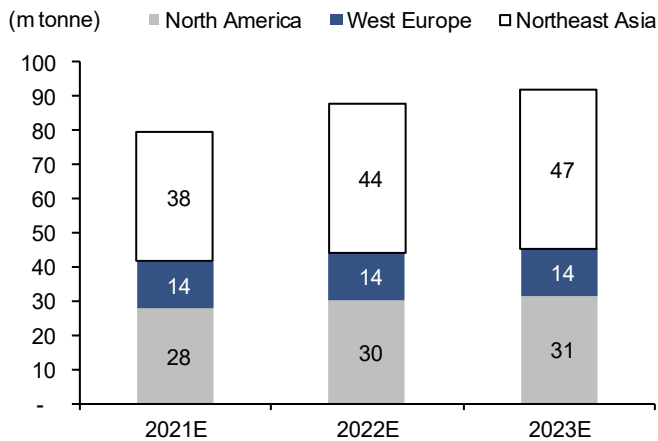


Source: IRPC

Focusing on three regions – North America (ethane crackers), Western Europe (naphtha), and Northeast Asia (naphtha) – we think that in 2021-23, the PE production and capacities in these three regions should see significant diversions in their economic profitability.

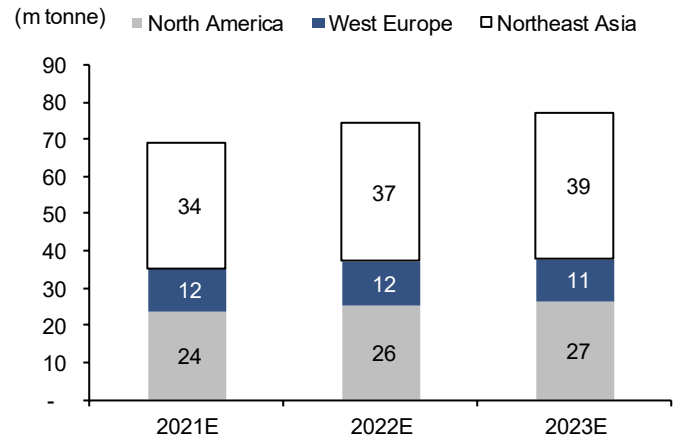
The new naphtha-based suppliers in Northeast Asia, excluding China, should see their margins under pressure as their cost structures are much less competitive than their peers in China (new technology advantages and economies of scales) and North America (low-cost ethane and propane feedstock).

Exhibit 28: PE capacity in North America, Western Europe and Northeast Asia



Source: IVL

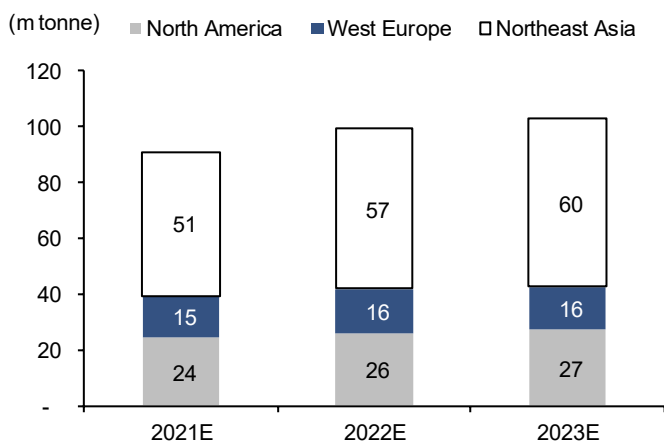
Exhibit 29: PE production in North America, Western Europe and Northeast Asia



Source: IVL

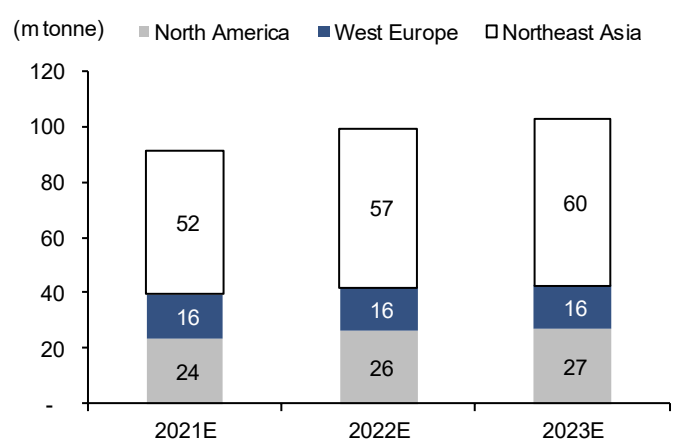
Will PE trading flows alleviate the margin pressure? We don't think so. While the PE market in North America and Europe are net import markets, the projected PE import flows to North America and Europe are likely to come from other regions (Middle East, Africa, India, and the Commonwealth of Independent States (CIS)), not from Northeast Asia. The ongoing trade conflict between the US and China and the looming Russian invasion of Ukraine could potentially disrupt the supply and trading flows into the North America and Europe markets, in our view.

Exhibit 30: PE supply in North America, Western Europe and Northeast Asia



Source: IVL

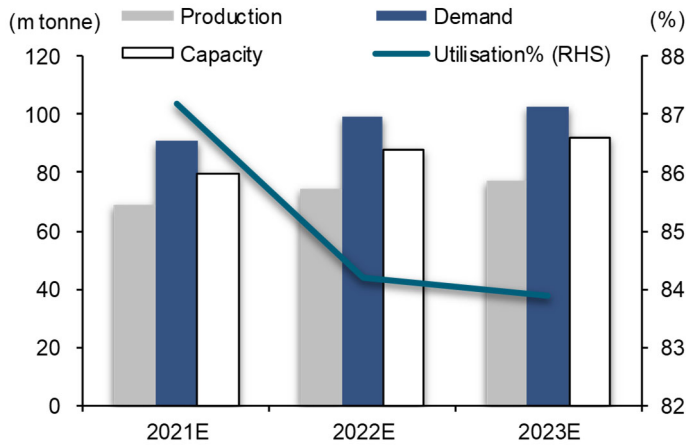
Exhibit 31: PE demand in North America, Western Europe and Northeast Asia



Source: IVL

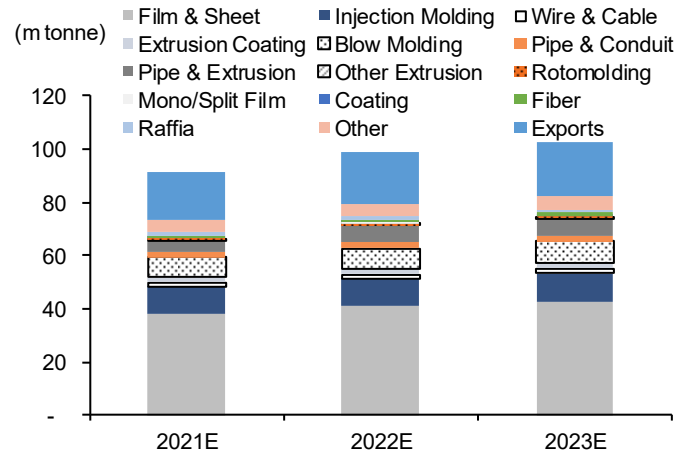
In conclusion, we believe the margins of PE and ethylene and the utilisation rates for producers of ethylene and PE will likely decline from the 2021 level, with the producers in Southeast and Northeast Asia feeling the biggest pinch as a result of their less competitive cost structures and the oversupply in Asia compared with the import markets in Europe and North America.

Exhibit 32: PE – production, capacity, utilisation in North America, Western Europe and Northeast Asia



Source: IVL

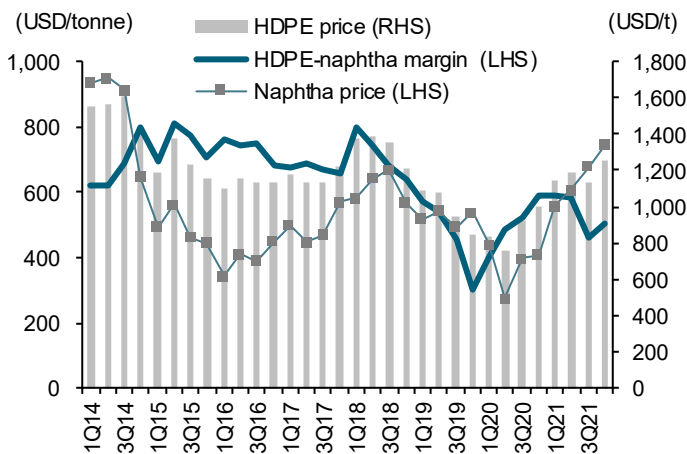
Exhibit 33: PE demand breakdown by usage in North America, Western Europe and Northeast Asia (%)



Source: IVL

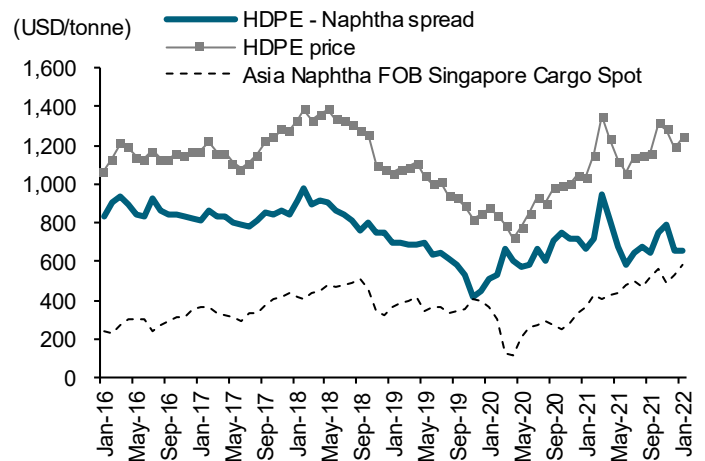
Margin outlook for PE. As the PE supply growth should outpace the demand growth in 2022-23, we project the margin of high-density PE (HDPE) over naphtha to decline from USD650/t in 2021 down to USD500/t in 2022-23, thanks to the rising supply in China.

Exhibit 34: HDPE price, HDPE-naphtha margin vs naphtha price



Sources: PTTGC; FSSIA estimates

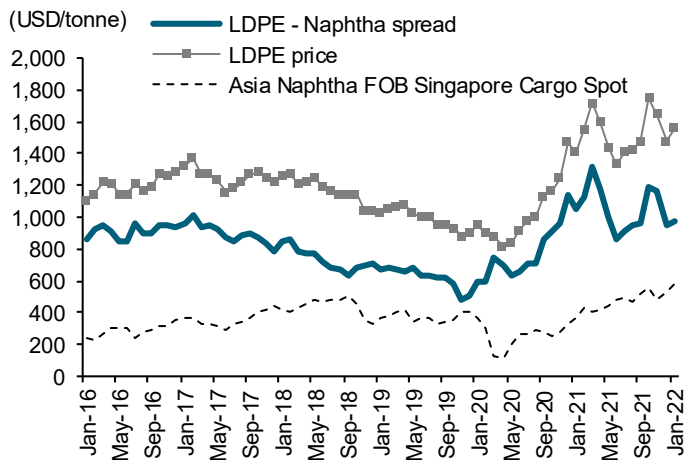
Exhibit 35: Naphtha spread – HDPE



Source: Bloomberg

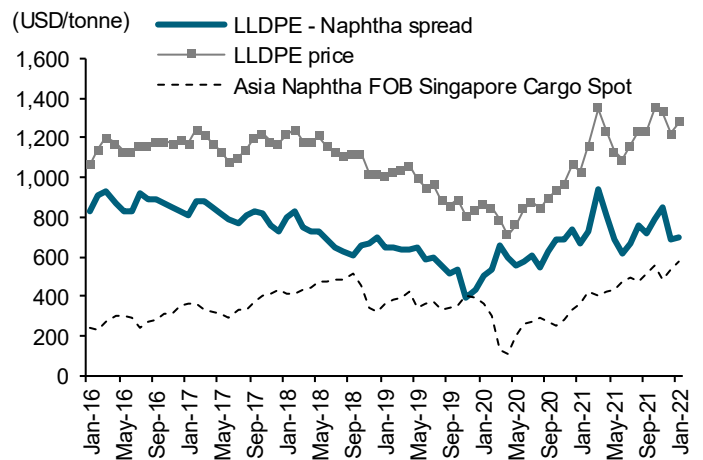
Meanwhile, the margins of other PE plastics are likely to stay at healthier levels than HDPE's, given the much more balanced demand and supply situation for linear density PE (LDPE) and low LDPE (LLDPE). We expect the margins of LDPE-naphtha and LLDPE-naphtha to average USD800/t and 650/t in 2022-23, respectively.

Exhibit 36: Naphtha spread – LDPE



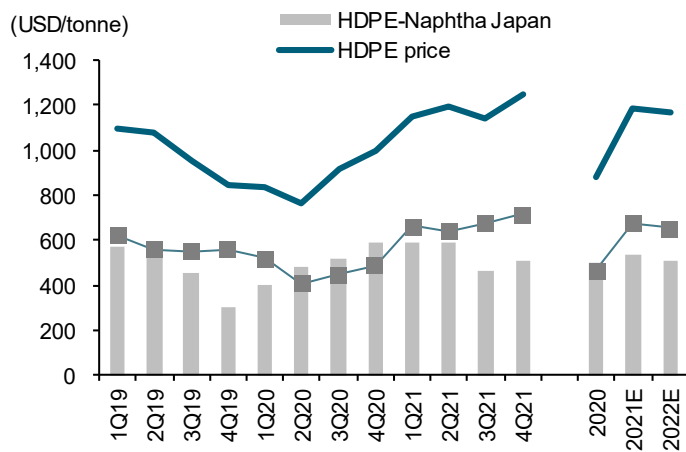
Source: Bloomberg

Exhibit 37: Naphtha spread – LLDPE



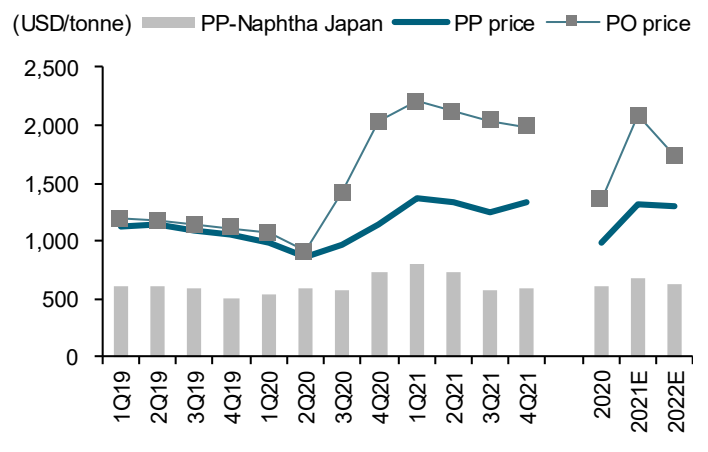
Source: Bloomberg

Exhibit 38: HDPE price and HDPE-naphtha margin



Source: PTTGC

Exhibit 39: PP-naphtha margin, PP price, and PO price

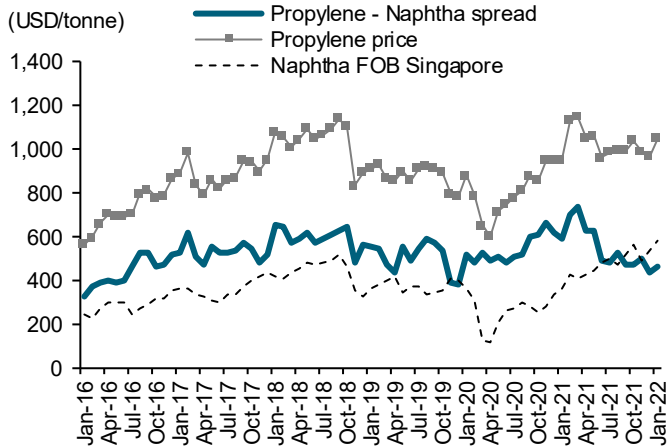


Source: PTTGC

Propylene: downcycle is coming in 2022-23

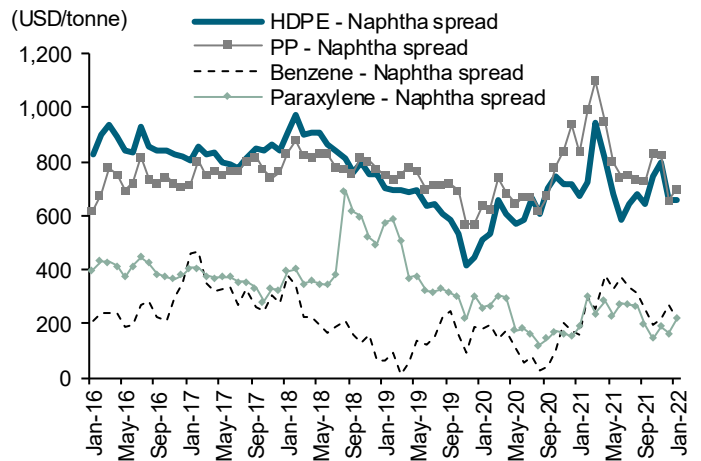
The margins of propylene-naphtha and its derivative PP have been under pressure in the past three years before and during the pandemic period in 2019-21, hovering around USD400-500/t. It only spiked above USD500/t in 1Q21 due to the delays in new supplies, mainly the delay of Petronas' USD27b Refinery and Petrochemical Integrated Development (RAPID) project in Pengerang, Malaysia, with a 630ktpa capacity of propylene, 165ktpa of benzene, and 180ktpa of butadiene, with a total capacity of 1.29mtpa.

Exhibit 40: Naphtha spread – Propylene



Source: Bloomberg

Exhibit 41: Polyolefins margin plunged since Apr 2021



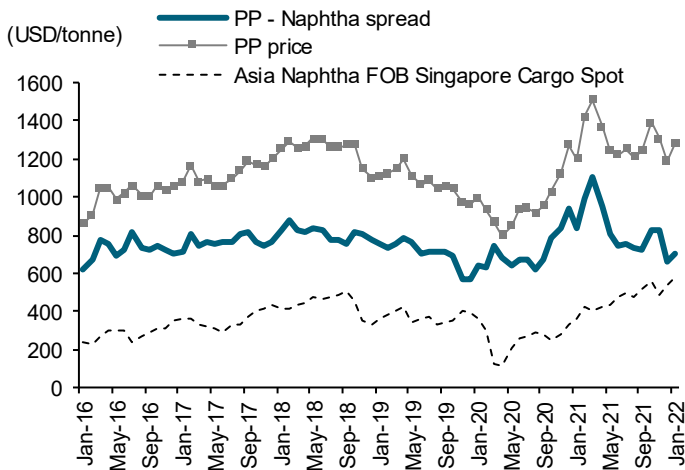
Source: Bloomberg

The petrochemical production plant is an integrated refinery and petrochemical complex with an upstream 300kbpd refinery capacity under the JV with Saudi Aramco. In March 2020, the RAPID complex was hit by a fire incident and initially the company planned to restart the project in 1Q21, but it was delayed to 4Q21 after the Malaysian government imposed restrictions to curb the spread of Covid-19.

Other derivative products include 350ktpa of LDPE, 400ktpa of HDPE, and 900ktpa of PP. Its upgrading unit fluid catalytic cracker is also able to produce up to 730ktpa of propylene, according to Argus.

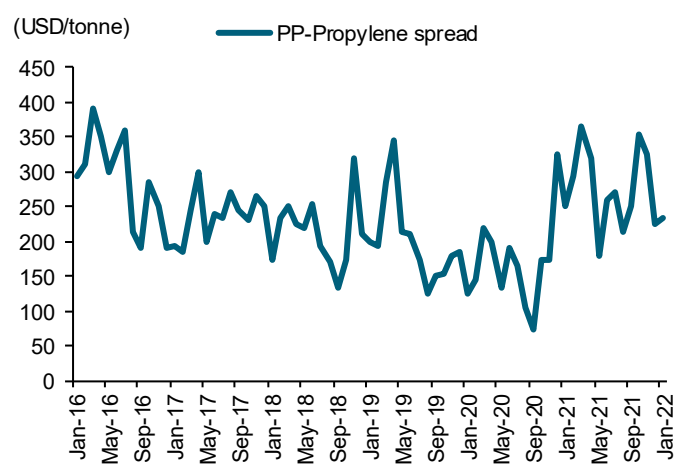
Even with the delay of RAPID, the margin of PP-naphtha has remained weak at USD500-700/t after peaking in 1Q21 as a result of the delay in the new supplies in Malaysia and China due to the lockdowns on the Covid-19 pandemic.

Exhibit 42: Margin and price of PP vs naphtha price



Source: Bloomberg

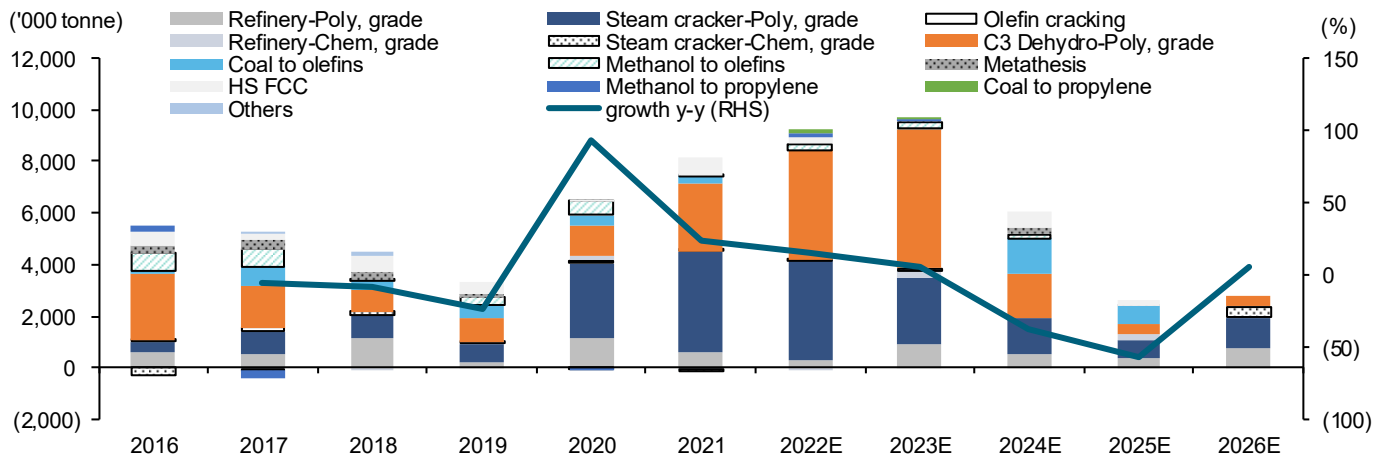
Exhibit 43: PP-propylene margin



Source: Bloomberg

According to IRPC, the projected new supply of propylene will be significant in 2022-23 at 9-10mtpa, up from 8.2mtpa in 2021 and 6.6mtpa in 2020, far above the projected demand growth of 4-5mtpa. Hence, we think the margin of propylene-naphtha is likely to weaken and hover around USD450-550/t, which would be a multi-year low level since 2016.

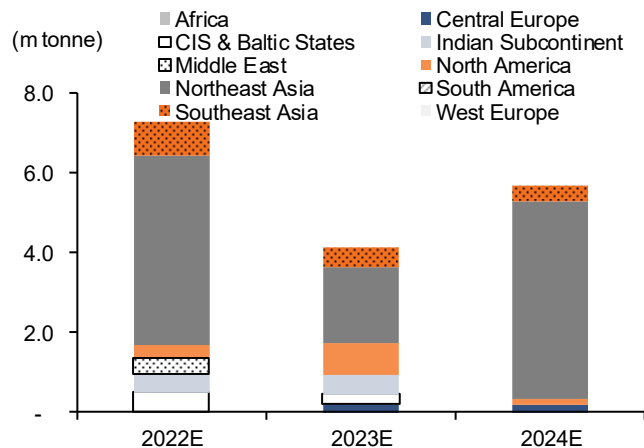
Exhibit 44: Additional propylene capacity by feedstock



Source: IRPC

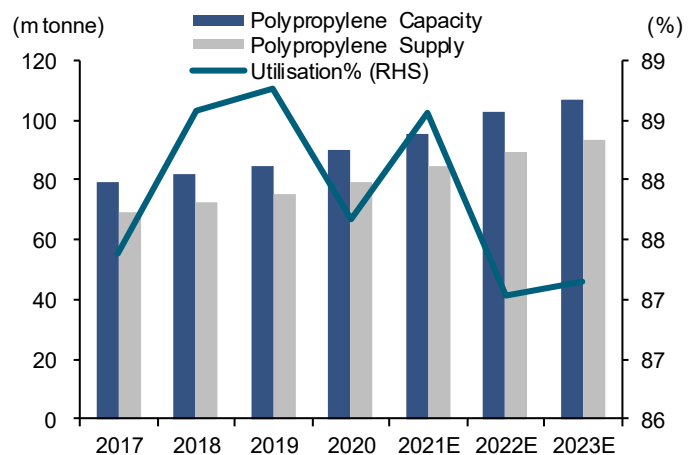
The new supply of PP is expected to rise markedly in 2022 to 7.5mtpa, mostly coming from China's naphtha-based and gas-based propane dehydrogenation (PDH) plants using imported propane as a key feedstock. According to IVL, the projected global utilisation rate of PP producers should drop from 89% in 2021 to 87% in 2022-23, due to the new supply impact that should outweigh the strong demand impact.

Exhibit 45: Additional PP capacity



Source: IRPC

Exhibit 46: PP capacity, production and utilisation rate

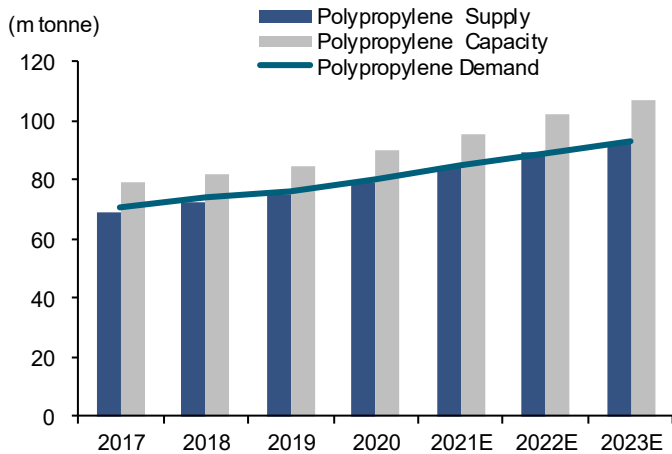


Source: IVL

Unlike in 2018-20, when the demand-supply additions of PP were relatively balanced, the supply growth in 2022 is projected to outpace the demand growth before turning to a balanced market again in 2023, according to IVL.

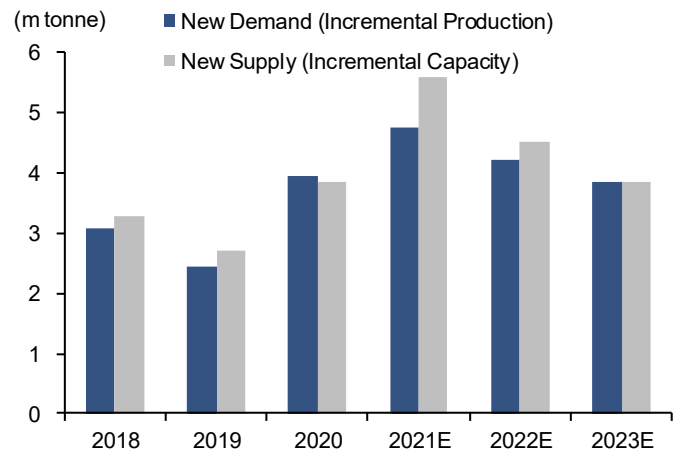
Most of the new supplies will come from Northeast Asia, mainly the PDH plants in China which saw a running rate of 80% in December 2021, down from 86% in November 2021, as the margin hit a record low at RMB-1,815/t (USD-283/t), due to the high price of propane feedstock. China's LPG imports fell 7.6% m-m in December 2021 to only 1.87mt, but were still up 12.3% y-y, according to China's General Administration of Customs data released in January 2022.

Exhibit 47: PP capacity, supply, demand



Source: IVL

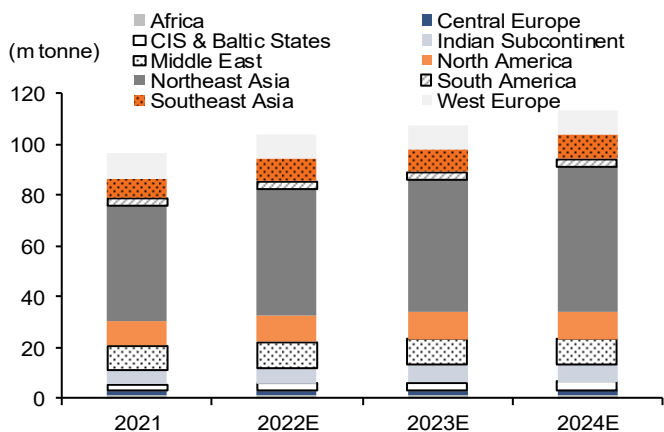
Exhibit 48: PP new supply and new demand



Source: IVL

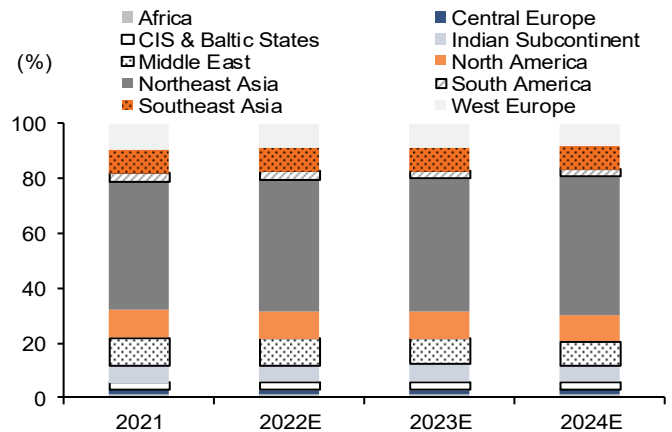
China's propane imports fell 11.5% m-m to 1.46mt in December 2021 as a result of the planned maintenance shutdown of PDH plants in China or lower operating rates due to the loss-making margin.

Exhibit 49: PP – total capacity breakdown by region



Source: IRPC

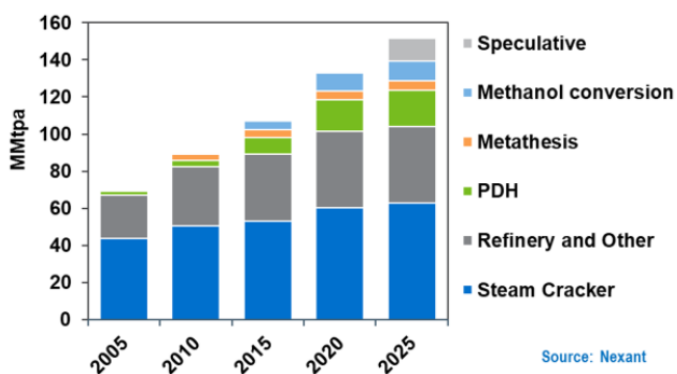
Exhibit 50: PP – total capacity breakdown by region (%)



Source: IRPC

While we expect the utilisation rates of China's PDH plants to be low due to the low margin caused by the high propane feedstock cost, we think the margin of PP will still be weak due to the new supplies from other countries. In 2022 onward, China plans to add over 30 new PDH plants with a capacity of over 30mtpa, either under construction or planned for the coming years, according to Nexant.

Exhibit 51: Global propylene capacity by process, 2005-23



Source: Nexant

Sources: Nexant

Exhibit 52: PDH margin



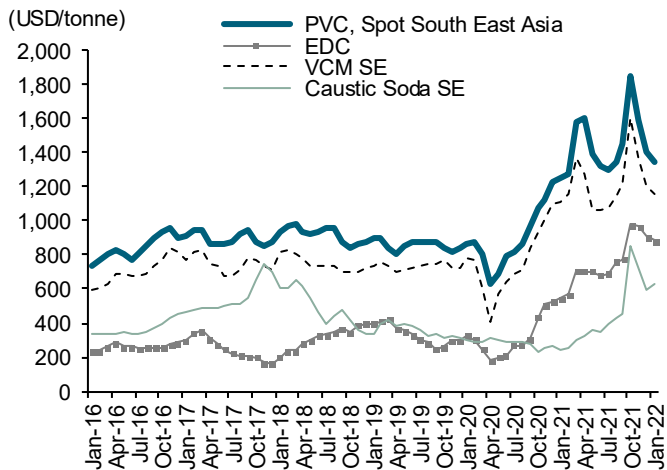
Source: Bloomberg

PVC: stronger for longer margin upcycle as a star in the dark chemical night

PVC has seen an upcycle margin since 2020 with its global utilisation rate likely to rise from 78% in 2020 to 92% in 2023, thanks to the limited new supply, strong demand and supply control in China due to its high emissions.

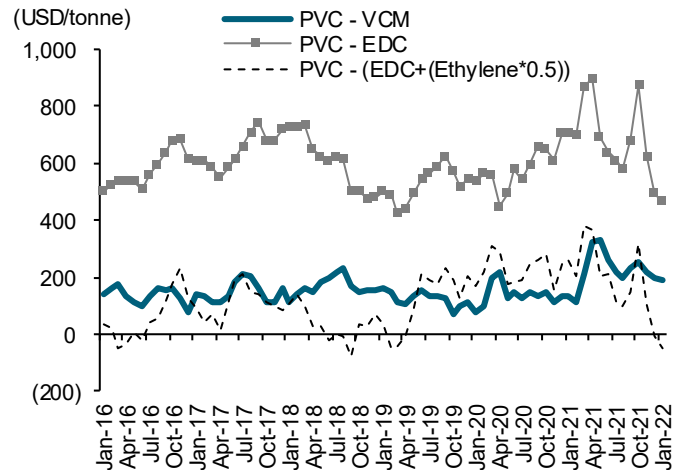
The margin of PVC over ethylene dichloride (EDC) has stayed high at over 1,300/t and even spiked to USD1,900/t in October 2021, driven by the globally strong demand. We project the PVC margin to average USD1,300-1,500/t in 2022-23, given the tighter supply in China and strong demand outlook.

Exhibit 53: Prices of PVC and its feedstock



Source: Bloomberg

Exhibit 54: PVC price and margin



Source: Bloomberg

PVC is produced through the liquid-phase polymerization of the intermediate product vinyl chloride monomer (VCM), which is synthesized in several different ways, essentially with either coal-derived calcium carbide or petroleum- or natural gas-derived ethylene as an initial feedstock.

However, two factors have significantly affected the cost competitiveness of China's PVC producers since 2021, and should continue to tighten the global PVC supply in 2022-23. First is the spike in the coal price to over USD200/t due to the higher demand for electricity and the tight supply which has elevated the global coal price by over 5x from its bottom level of only USD50-60/t before 2021.

Second, carbide-based PVC consumes almost 3x higher amounts of energy to produce one tonne of PVC than ethylene-based PV, and the quality of carbide-based PVC is inferior to ethylene-based PVC.

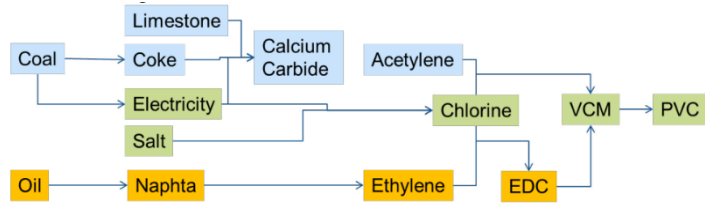
Exhibit 55: Comparison of carbide-based vs ethylene-based PVC

	Carbide-based	EDC/Ethylene-based	Comments
Regions	China	Rest of the world	
Energy consumption	7,389	2,519	kWh Per ton of PVC
Raw materials	Limestone, coal	Salt, ethylene	
Environmental concerns	Dry carbide slack and carbide liquid waste are	More environmentally friendly	
Quality of PVC	Low: Normally used for low end applications such as pipe for construction	Excellent and can be adopted for high-end applications	
Cost competitiveness	High but declining due to rising costs of coal, electricity, and environment	Can be competitive if oil price is lower	

Source: FSSIA estimates

China is the world's largest PVC producer, and about 80% of its total 30mtpa PVC capacity uses coal-based carbide as a feedstock, with the rest using ethylene-based feedstock. The Chinese government, in its effort to establish a self-sufficient industry for PVC, and with its ample coal reserves but dependence on importing oil and gas, has driven the booming carbide-based PVC capacity growth in the past few years.

Exhibit 56: Carbide-based (coal-based) vs petroleum-based PVC production process



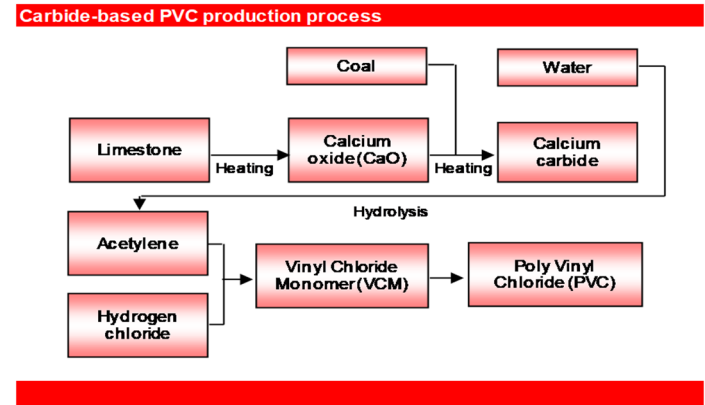
Source: Asian Development Bank

Exhibit 57: Global PVC planned and announced capacity by region (2025)



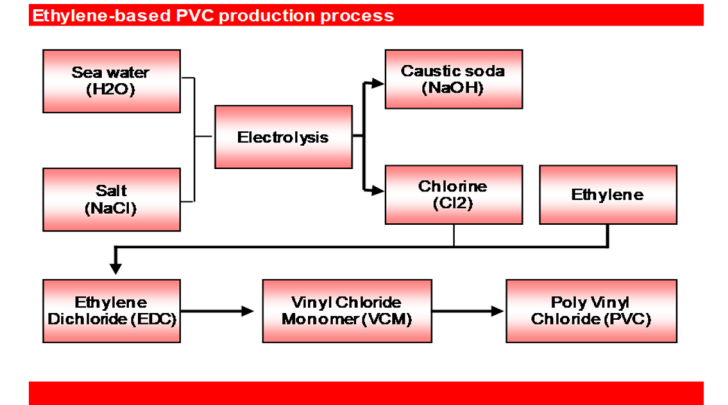
Sources: Global Data

Exhibit 58: Carbide-based PVC process



Source: FSSIA

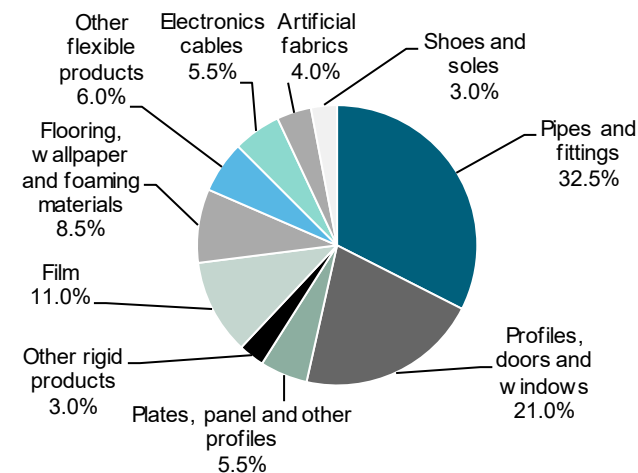
Exhibit 59: Ethylene-based PVC process



Source: FSSIA

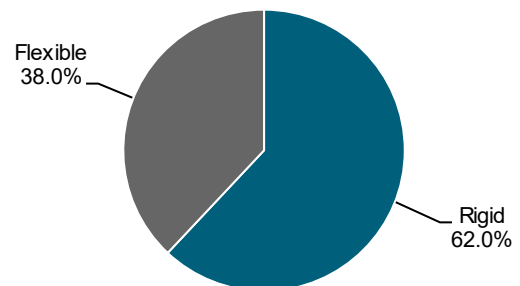
As many countries, including China and the EU, have plans to achieve their own zero emission targets, the highly polluted and energy intensive carbide-based PVC production in China is likely to be gradually phased out in the long term. Lower running rates in the short term after China's energy crisis in 2H21 and the recent price spikes for gas, LNG, coal, and oil, are effectively tightening the global PVC industry.

Exhibit 60: PVC demand breakdown by application (2020)



Sources: Bloomberg

Exhibit 61: PVC demand breakdown by rigidity (2020)



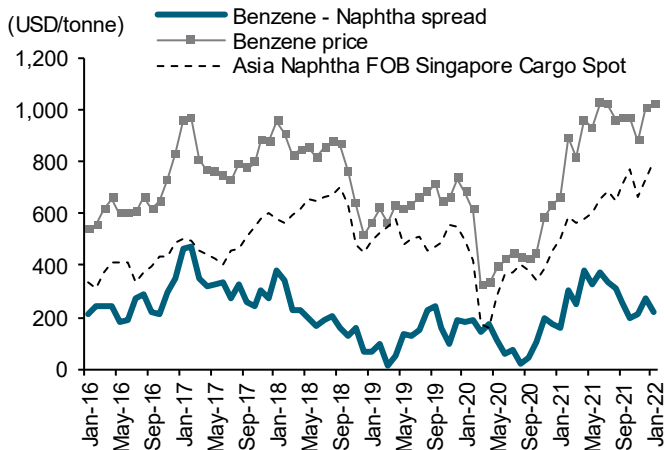
Sources: Bloomberg

Aromatics: losing momentum for both upstream and downstream

In the aromatics chain, we see a manifest downtrend in the margin of both upstream PX and BZ and downstream products, as we estimate that higher supplies will outpace the demand growth in 2022-23.

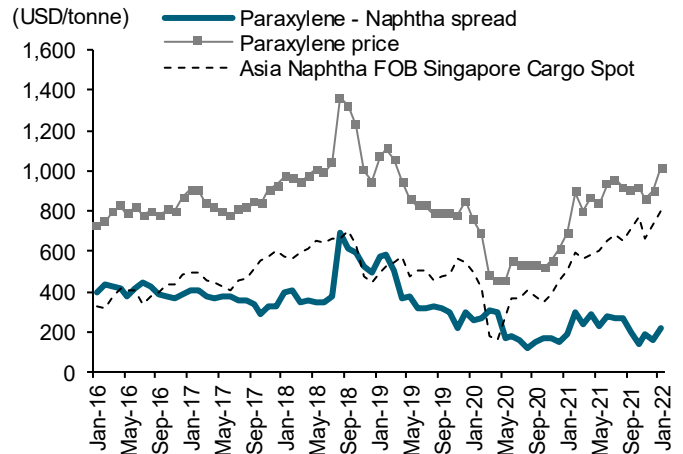
We expect the margins of BZ-naphtha and PX-naphtha to remain weak in 2022-23, with the BZ-naphtha margin averaging USD200/t in 2022 and USD230/t in 2023, while the margin of PX-naphtha should remain at depressed levels below USD300/t, slightly above our estimated industry cash cost level of 200/t.

Exhibit 62: Naphtha spread – Benzene



Source: Bloomberg

Exhibit 63: Naphtha spread – Paraxylene



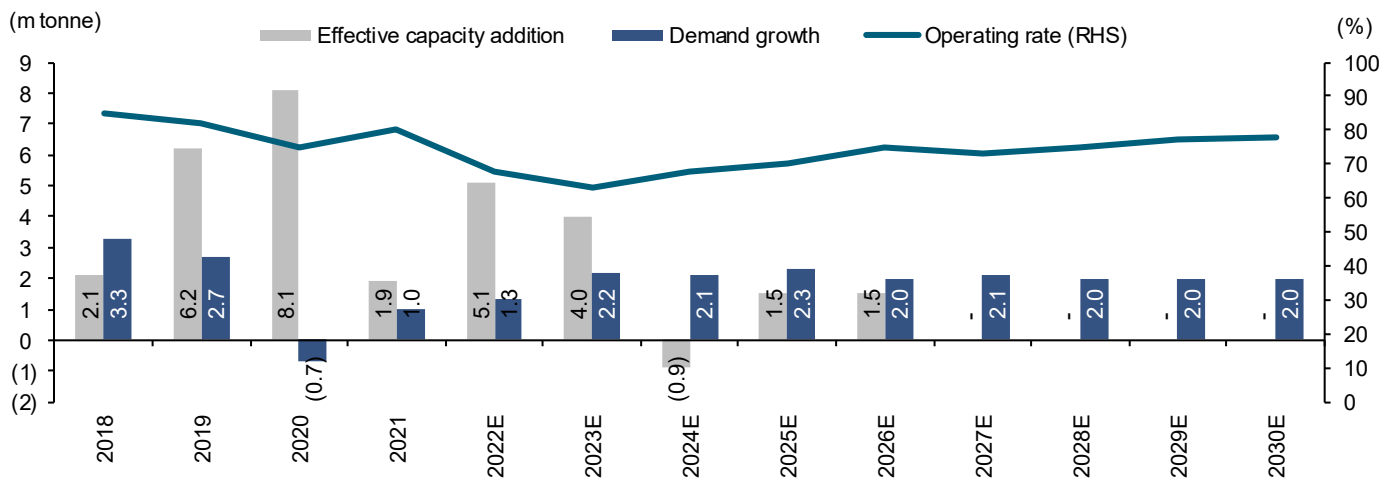
Source: Bloomberg

PX: margin downcycle continues in 2022-23

According to Thai Oil (TOP TB, BUY, TP THB67), the PX industry utilisation rate in the Asia Pacific region is expected to decline from 81% in 2021 down to 65% in 2023, dragged down by the higher new supply despite the expected strong demand for polyester downstream products.

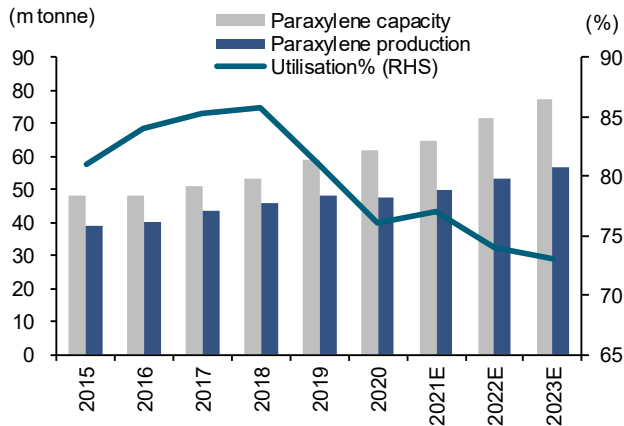
Globally, the utilisation rate of PX is also expected to plunge sharply from 78% in 2021 to 73% in 2023 as the new supply is projected to far outpace the demand growth in 2022-23, based on IVL's estimate.

Exhibit 64: Asia Pacific/Middle East paraxylene capacity addition and demand growth



Source: TOP

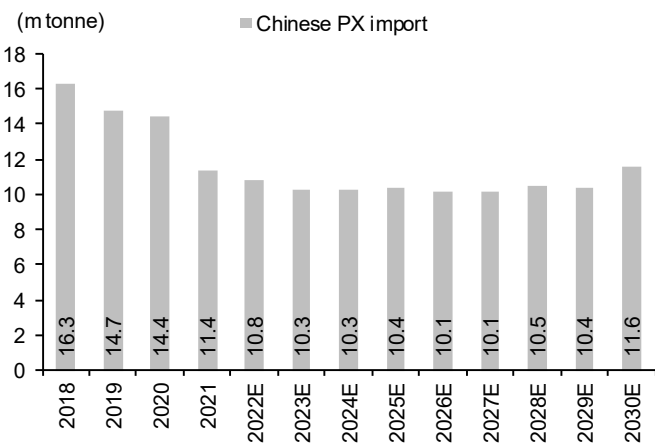
Exhibit 65: PX capacity, production and utilisation rate



Source: IVL

TOP estimates that China's imports of PX will decline further in 2022 to 10.8mt, down from 16.3mt in 2018 and 11.1mt in 2021, given China's policy to improve its self-sufficiency level for a number of commodity and chemical products, including PX, PVC, polyester fibres, refinery products, olefins, and aromatics.

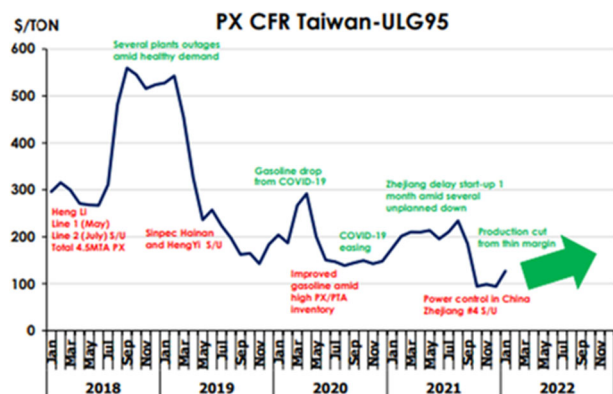
Exhibit 67: Chinese PX imports



Source: TOP

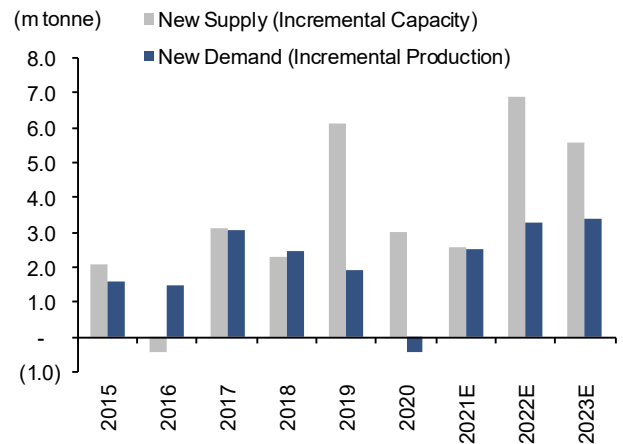
In December 2021 to 2022, China plans to add four new PX plants with a total capacity of 6.8mt. This could put pressure on the PX-naphtha margin in Asia Pacific. However, in the short term, the PX-naphtha margin should recover from its highly depressed levels below USD100/t, caused by China's power crunch in Sep-Oct 2021, as the demand recovers in tandem with the PX industry utilisation rates in China.

Exhibit 69: PX – Gasoline



Source: TOP

Exhibit 66: PX new supply and new demand



Source: IVL

Exhibit 68: China paraxylene operating rate



Source: TOP

Exhibit 70: Paraxylene plant start-ups in Dec 2021 to 2022

Country	Company	Nameplate capacity (k ton)	Start-up
China	Zhejiang 4	2,200	Dec-22
China	Shenghong (Lianyungang)	2,800	Apr-22
China	Dongying Weilian 2	1,000	Apr-22
China	Sinopec Jiujiang	890	Dec-22

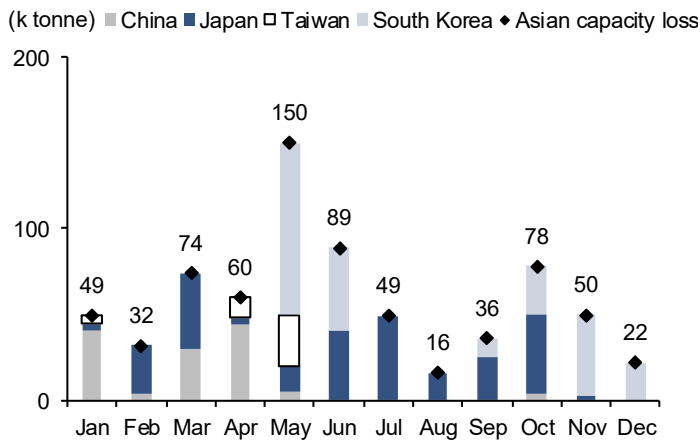
Source: TOP

Benzene: downcycle margin is coming in 2022-23

After the strong margin during 2021 due to the supply disruptions in the US and the global logistics problems due to the Covid-19 pandemic, the benzene-naphtha margin is now entering a downcycle again, dropping from over USD300/t in mid-2021 to below USD200/t in February 2022.

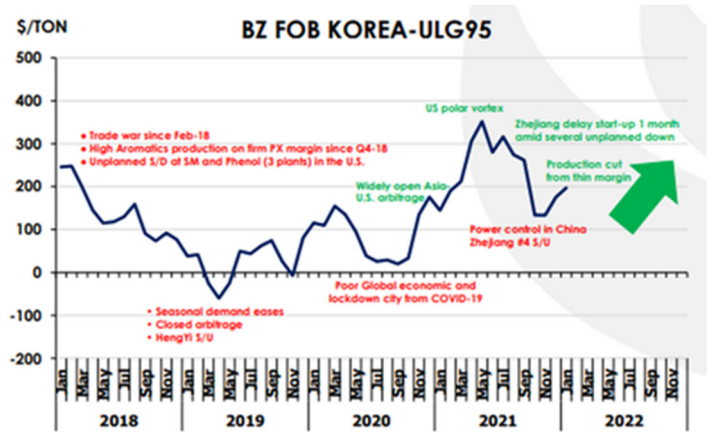
In 2Q22, the new benzene supply should rise markedly and we project it to peak at 150ktpa in May 2022 as the new supplies from China come on stream. This should lead to the benzene-naphtha margin weakening to USD100-150/t in 2Q22, and it will likely stay lower than USD200/t on average in 2H22 into 2023, based on our estimate.

Exhibit 71: Asian benzene maintenance by country (2022E)



Source: TOP

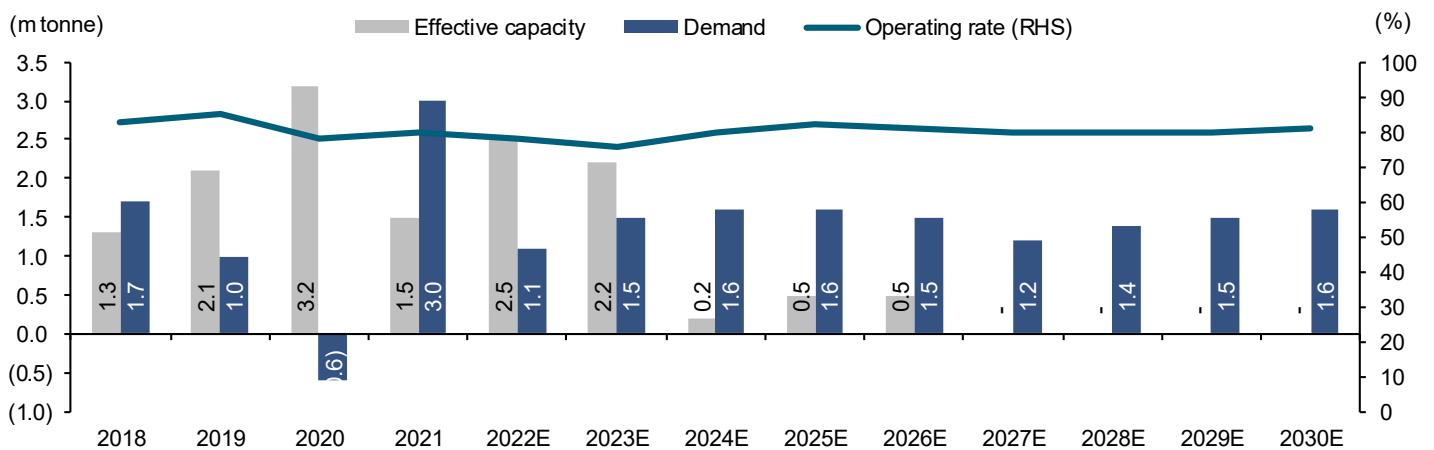
Exhibit 72: Benzene – Gasoline



Source: TOP

We expect the benzene-naphtha margin to stay weak below USD200/t in 2022-23, as the additional supply should be higher than the demand growth by over 1mtpa in 2022-23, while we project demand to grow at a 3.4% CAGR in 2021-28. We expect the industry’s operating rate to stay in the range of 70-80% throughout 2021-25, the period for which we have information on announced new projects.

Exhibit 73: Asia Pacific/Middle East benzene effective capacity addition and demand growth



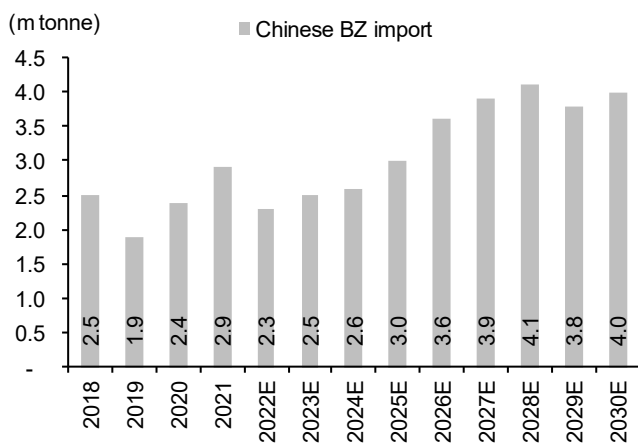
Source: TOP

Unlike other chemical producers, China has remained a net importer of benzene, mainly from the US, to be used as a key feedstock to produce the SM downstream products of ABS, polystyrene (PS), PC, and EPS foam. Most of these SM downstream products are used for automotives and home appliances, the two fastest growing products for domestic demand.

Northeast Asia is the largest SM producing and consuming region, accounting for nearly 48% of global capacity in 2020. China is the largest producer in Northeast Asia, accounting for a 27% share of the regional capacity. South Korea is the second largest producer, accounting for approximately 9% of the regional capacity, followed by Taiwan and Japan, both accounting for around 6%.

Regarding demand, Northeast Asia is also a large styrene consumer and represents 55% of the global consumption. This can be attributed to the booming Chinese market over the last several decades. In 2020, China accounted for 34% of styrene consumption in Northeast Asia, compared to South Korea, Taiwan, Japan and Southeast Asia, which consume far smaller volumes.

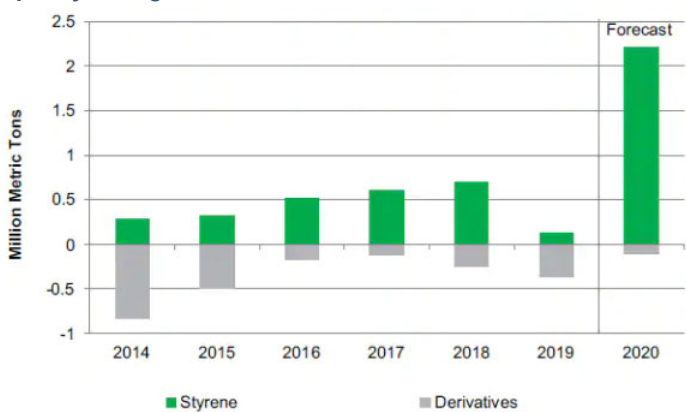
Exhibit 74: Chinese benzene imports



Source: TOP

According to the National Development and Reform Commission, China plans to build five new benzene plants in 2021-22 with a total capacity of 2.2mtpa. China's benzene imports were estimated at 2.9mt 2021, up from 2.4mt in 2020, accounting for over 40% of global benzene imports.

Exhibit 76: China's styrene monomer vs derivative net capacity change



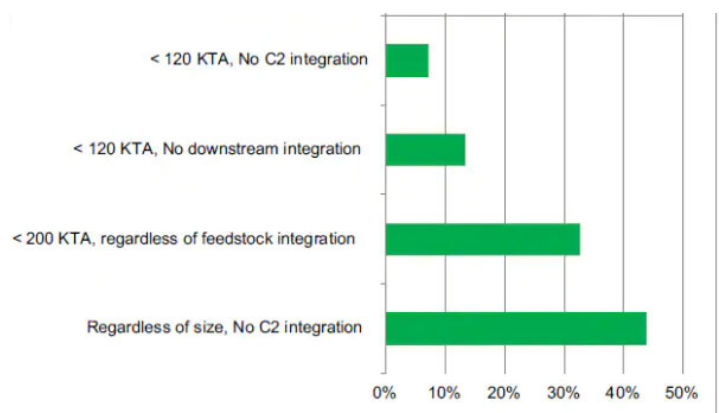
Source: IHS

Exhibit 75: Benzene plant start-ups in Dec 2021 to 2022

Country	Company	Nameplate capacity (k ton)	Start-up
China	Zhejiang 4	790	Dec-22
China	Fujian Gu Lei	200	Jan-22
South Korea	Hyundai Chemical	150	Jan-22
China	Shenghong (Lianyungang)	790	Apr-22
China	Dongying Weilian 2	333	Apr-22
India	HPCL Energy	240	Apr-22
China	Sinopec Jiujiang	100	Dec-22

Source: TOP

Exhibit 77: China's styrene plant competitiveness

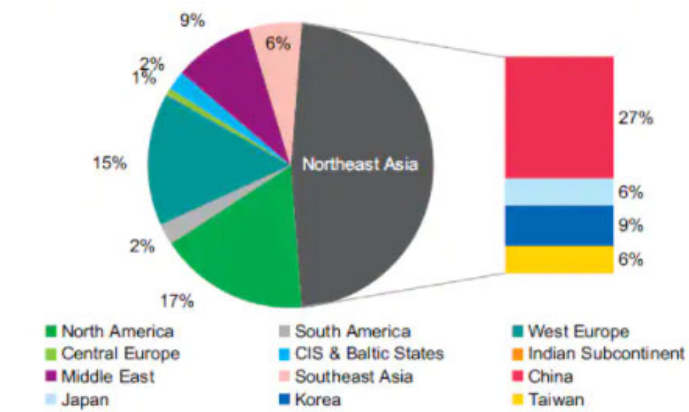


Source: IHS

With new capacities being commissioned in China, the self-sufficiency rate has consistently increased, reducing China's net imports of benzene to only 11% of total benzene consumption in 2020, down from 43% in 2014.

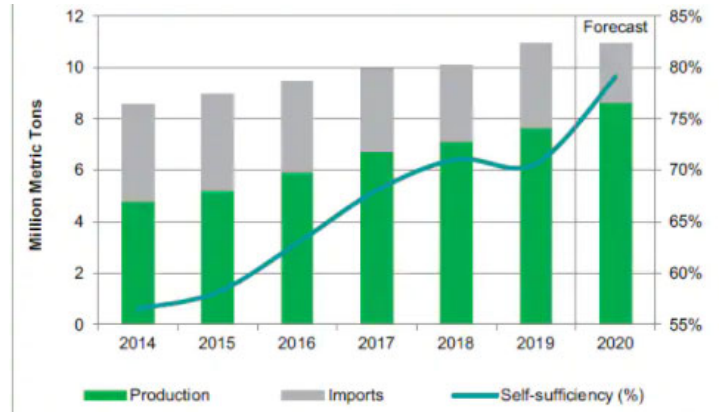
Based on the scale and feedstock integration, most Chinese benzene producers have no integration in ethylene feedstock (42% of total capacity) and no downstream integration (13%), leading to lower competitiveness for Chinese benzene producers vs their peers in other regions. Hence, China still needs to import benzene and ethylene as a feedstock, restricting Chinese producers from running at high operating rates historically.

Exhibit 78: Global styrene monomer capacity share in 2020



Source: IHS

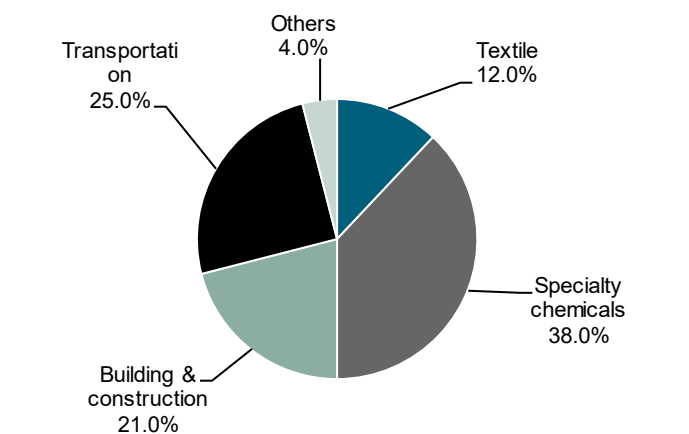
Exhibit 79: China's styrene self-sufficiency ratio



Source: IHS

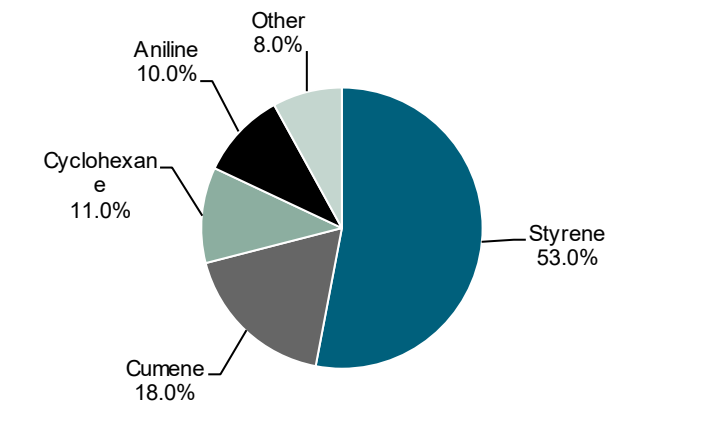
With a market size of 53mt in 2020, benzene is used as a feedstock to produce a number of downstream products, including SM, cumene/phenol, cyclohexane, and aniline, and these downstream products are consumed in automotive parts (transportation), textiles (fibres), building & construction (insulators, coatings), and specialty chemicals for household appliances and toys.

Exhibit 80: Global benzene demand breakdown by industry



Source: Research Nester

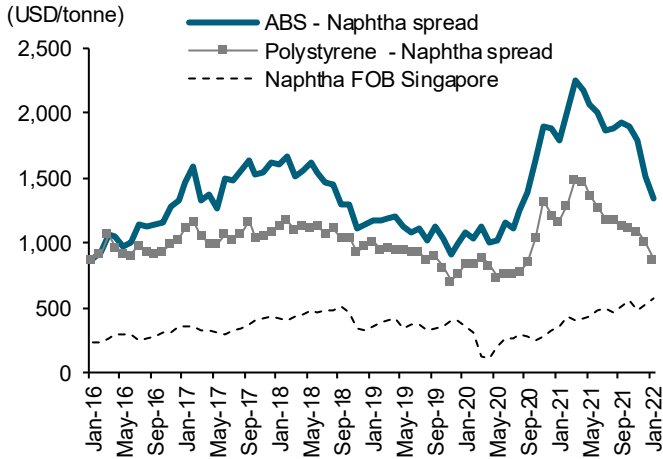
Exhibit 81: Global benzene demand breakdown by application



Source: Research Nester

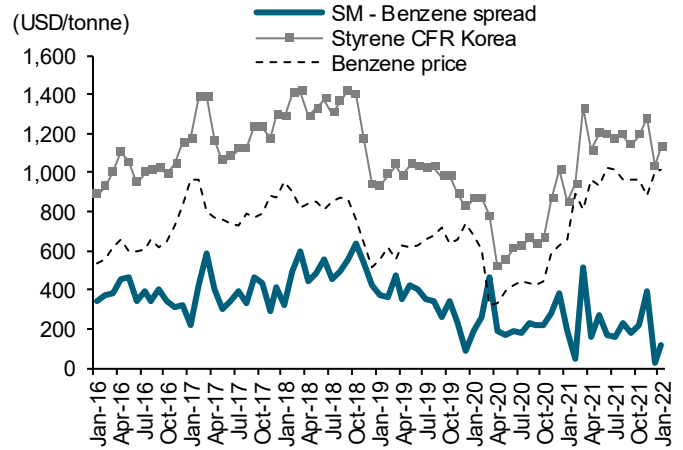
The largest downstream application is SM, which is converted into ABS, EPS, and PS. In 2020-21 the margin of ABS over butadiene and SM was strong due to the tight supply and high demand, but it has since declined to USD1,000-1,200/t in February 2022 from its peak at USD2,300/t in January 2021, and is likely to stay around USD1,000/t in 2022-23, slightly higher than the estimated industry breakeven margin of USD800/t.

Exhibit 82: Naphtha spread – ABS



Source: Bloomberg

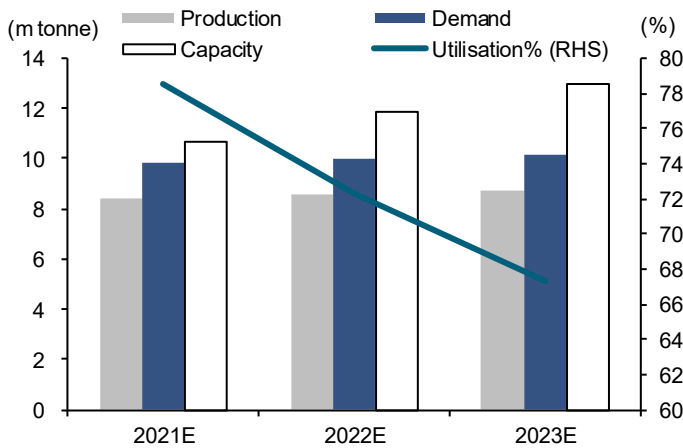
Exhibit 83: Benzene spread – Styrene



Source: Bloomberg

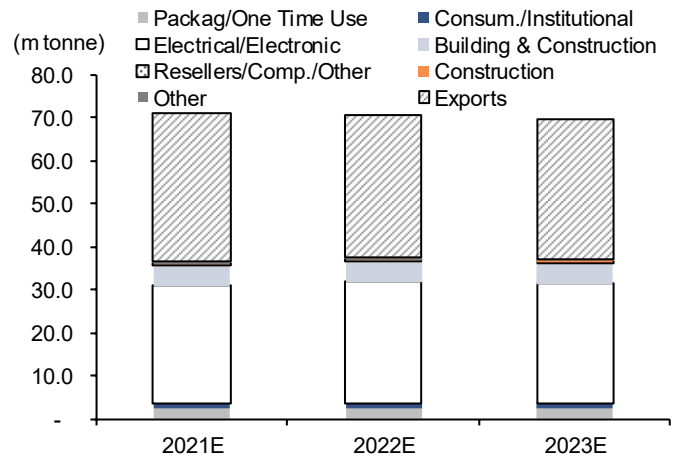
Meanwhile, we expect the margin of PS to drop in 2022-23 as a result of the higher supply from China for export to North America and Western Europe, with the demand for electrical and electronic products remaining the largest demand group for benzene.

Exhibit 84: PS – production, capacity, utilisation in North America, Western Europe and Northeast Asia



Source: IVL

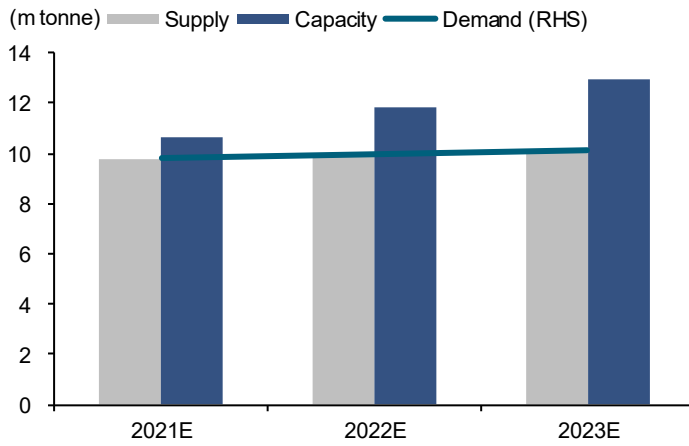
Exhibit 85: PS demand breakdown by usage in North America, Western Europe and Northeast Asia (%)



Source: IVL

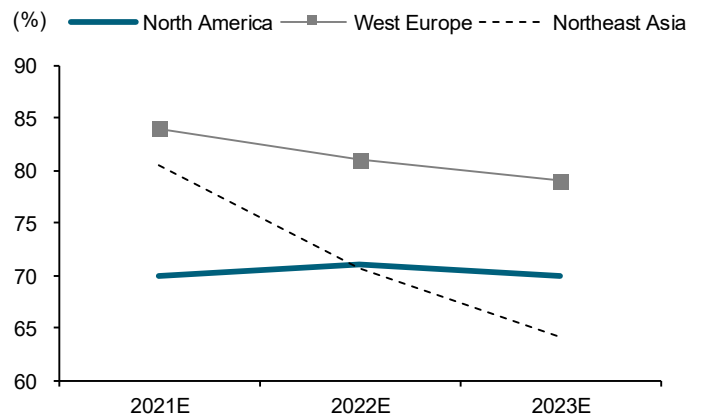
Based on the oversupply from China's new benzene and SM, we expect that the operating rates of PS producers will decline in Northeast Asia, while in North America and Western Europe, the operating rates should stay high thanks to the strong demand in their domestic markets and net imports.

Exhibit 86: PS – supply, capacity, demand in North America, Western Europe and Northeast Asia



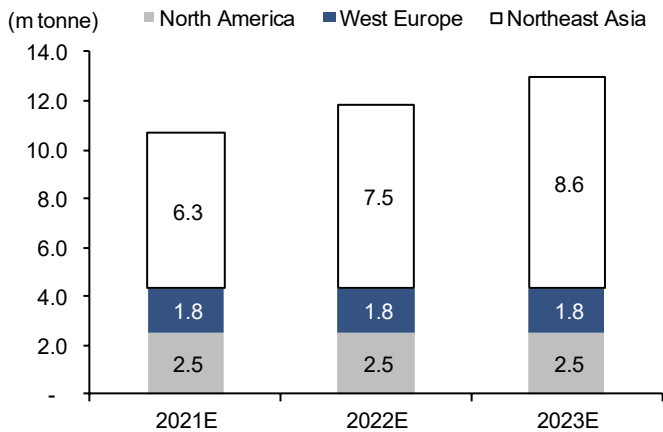
Source: IVL

Exhibit 87: PS operating rate in North America, Western Europe and Northeast Asia



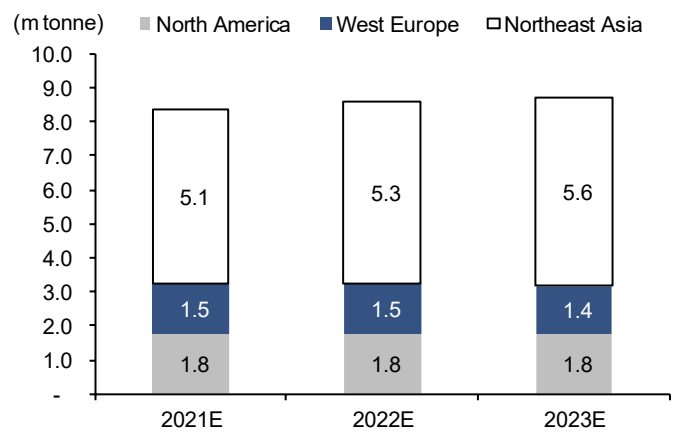
Source: IVL

Exhibit 88: PS capacity in North America, Western Europe and Northeast Asia



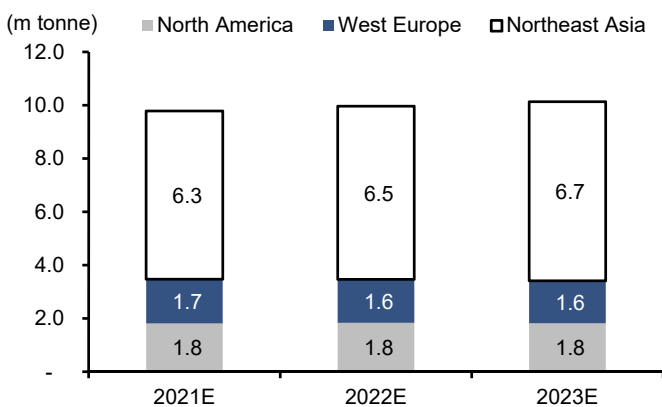
Source: IVL

Exhibit 89: PS production in North America, Western Europe and Northeast Asia



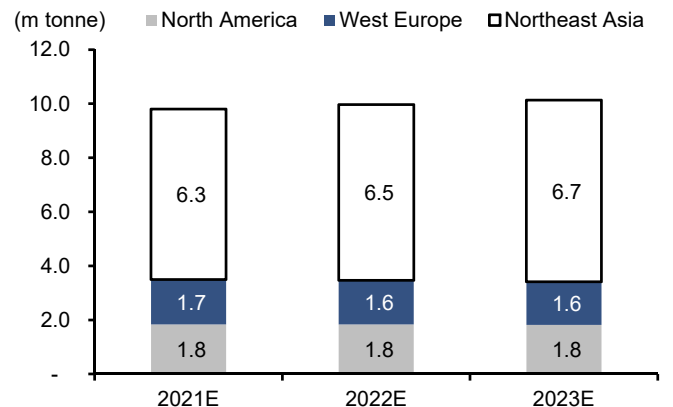
Source: IVL

Exhibit 90: PS supply in North America, Western Europe and Northeast Asia



Source: IVL

Exhibit 91: PS demand in North America, Western Europe and Northeast Asia



Source: IVL

Butadiene: the weakest link in the chemical chain in 2022-23

According to IRPC, the butadiene market size was estimated at 12.4mt in 2020, and the market is projected to register a CAGR of over 3.5% during 2021-26.

The market was negatively impacted by Covid-19 in 2020. Considering the ongoing pandemic scenario, automotive manufacturing units and building construction projects were temporarily halted. Thus, this negatively impacted the demand for styrene-butadiene and polybutadiene rubber, which are used in tires, building crack fillers, concrete additives, etc., which declined the demand for butadiene.

However, the use of protective gloves made from nitrile rubber has increased in the current situation, thus stimulating the demand for the butadiene market.

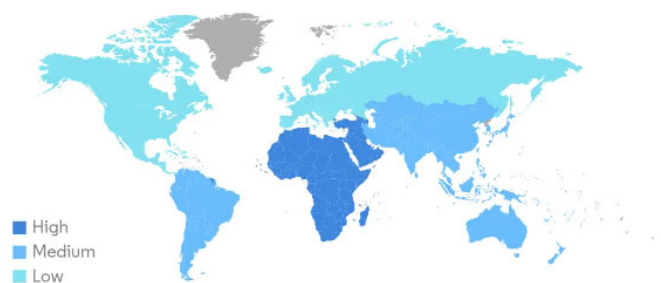
Over the short term, the developing downstream market in Asia Pacific should drive the market's growth, mainly from synthetic rubber used as a raw material for the production of car tires and rubber gloves.

Synthetic rubber: Polybutadiene dominated the market, holding a share of almost 30%. However, we expect the ABS segment to witness the highest CAGR during 2021-26. Polybutadiene rubber (BR) is a synthetic rubber used as a substitute for natural rubber.

Commercially, polybutadiene is available in two types, i.e., solid polybutadiene and liquid polybutadiene, out of which solid polybutadiene holds the larger share in terms of consumption. Furthermore, solid polybutadiene is divided into four types – high cis, low cis, high trans, and high vinyl polybutadiene – depending on the choice of the catalyst system.

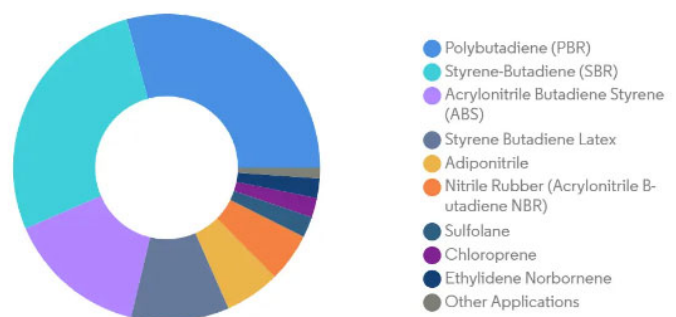
The innovation of bio-butadiene to produce products like synthetic rubber, thermoplastic elastomers, nylon, etc., is likely to create opportunities for the market in the coming years.

Exhibit 92: Global butadiene market growth rate by region, 2021-26



Source: IRPC

Exhibit 93: Global butadiene market demand breakdown by application, 2020



Source: IRPC

The Asia-Pacific region dominated the global butadiene market. The downstream market in Asia Pacific witnessed a huge spur in the past few years, owing to which the demand for butadiene has witnessed a rapid increase due to its requirement.

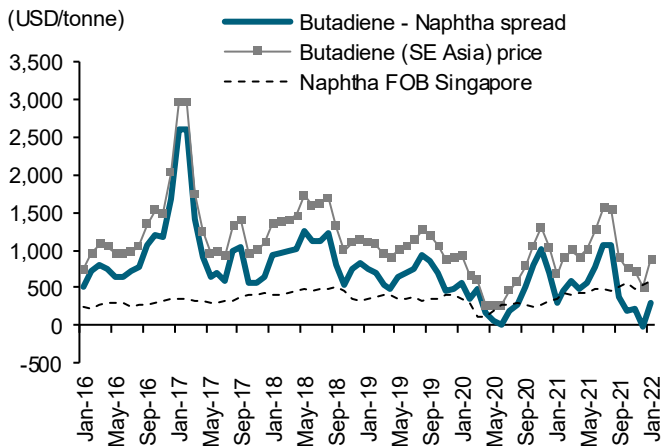
China is one of the largest chemical manufacturing hubs in the world, with a wide range of industries. The Chinese butadiene market should witness significant growth due to the presence of a large number of indigenous players.

China's automobile industry is key to butadiene demand. We project that China will produce 704m tires per year by 2025, including 527m passenger radial tires, 148m truck/bus radial tires, 29m bias truck tires, 20,000 extra-large industrial tires, 12m agricultural tires, and 54,000 aircraft tires. In addition, China could produce 120.7m motorcycle tires and 420m bicycle tires annually by 2025. This would be instrumental in propelling the market demand for butadiene in the country over 2021-26.

India is a large market for rubber. In India, there are 41 tire manufacturers and around 6,000 non-tire manufacturers producing seals, conveyor belts, extruded and moulded rubber profiles to be used in automotive, railway, defence, aerospace, and other applications.

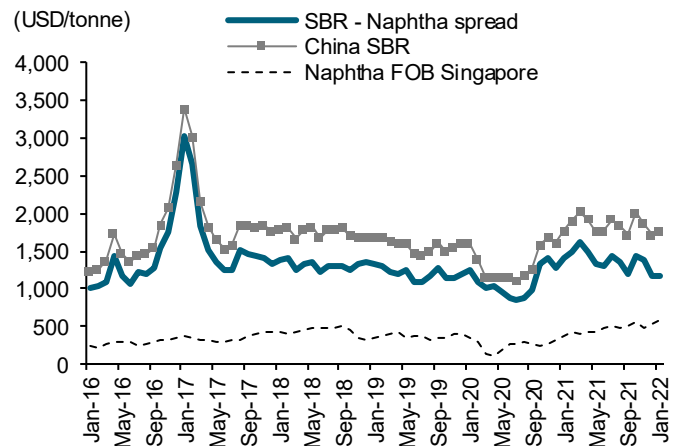
Additionally, India is currently the second highest consumer and producer of footwear in the world. The country is currently producing around 9% of the global annual production of footwear, according to IRPC. The footwear sector in India is one of the largest in the region behind China.

Exhibit 94: Naphtha spread – Butadiene and SBR price



Source: Bloomberg

Exhibit 95: Naphtha spread – SBR



Source: Bloomberg

A fragmented market structure led to weak pricing power for butadiene. The global butadiene market is fragmented in nature, with the top five players occupying less than 30% of the market share as of 2020. These companies include China Petroleum & Chemical Corporation (Sinopec), China National Petroleum Corporation, TPC Group, Royal Dutch Shell PLC, and Exxon Mobil Corporation, among others.

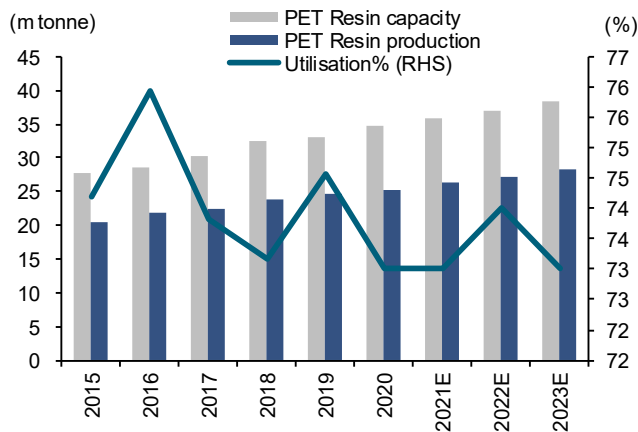
Weak margin outlook for butadiene in 2022-23. Despite the projected strong demand outlook, we expect the margin of butadiene to enter a downcycle in the range below USD100/t, down from over its USD1,000/t peak and USD450/t average in 2020-21 during the Covid-19 pandemic when the demand for gloves spiked over 5x y-y.

Polyester & PET: the crown jewels of the global chemical universe

Among all petrochemical chains, we are most bullish on the margin outlook of the polyester chain, which includes the downstream products of PET and polyester fibres. While the margin of intermediate PTA is likely to remain weak due to China's new supply influx, we think the integrated PET-PTA margin will be high at USD700/t in North America and Europe and USD250/t in Asia, thanks to the superior market structure outside Asia with its greater concentration, less competition, and high entry barriers.

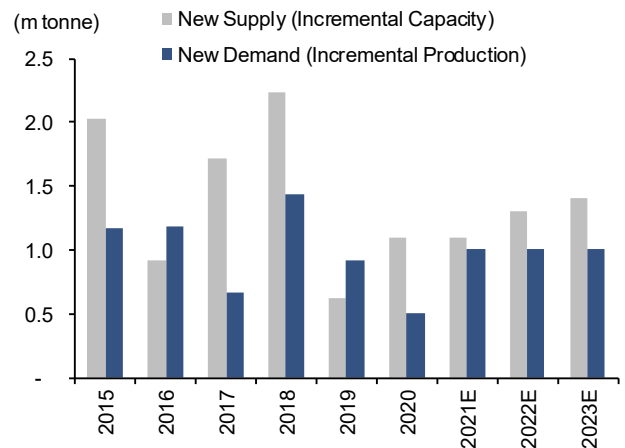
According to IVL, the world's largest PET producer, the PET industry utilisation rate is projected to rise from 73% in 2020-21 to 74% in 2022 before dropping back to 73% in 2023. The demand growth in 2022-23 is forecast to grow by almost 1mtpa vs the projected supply growth of 1.2-1.5mtpa during the same period, allowing the margin of integrated PET-PTA to stay high, in our view.

Exhibit 96: PET capacity, production and utilisation rate



Source: IVL

Exhibit 97: PET new supply and new demand

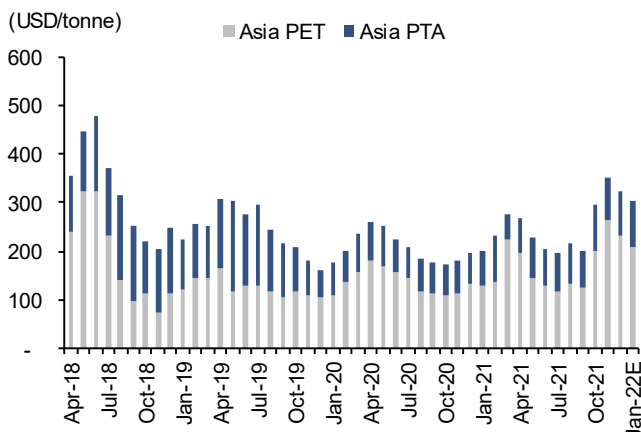


Source: IVL

IVL has continued to see a stronger polyester product margin trend, particularly for its two key products, PET and PTA, which saw their integrated PET-PTA margin jump markedly to USD326/t in December 2021 in Asia and USD848/t in Western markets (North America and Europe), driven mainly by the m-m higher PTA-paraxylene (PX) margin to offset the m-m weaker PET-PTA margin.

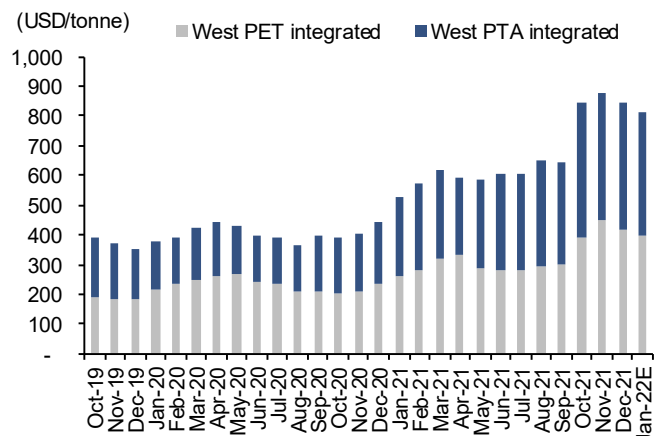
While the integrated PET-PTA margin in Asia is at its highest level since the 1H18 cyclical peak, the integrated PET-PTA margin of USD848/t in Western markets is also at its highest level since 4Q19, thanks to strong demand growth, higher import barriers in the form of higher tax rates, and a sharp rise in the intercontinental freight cost triggered by seaport traffic jams that are likely to continue in 2022.

Exhibit 98: Integrated PET-PTA margin in Asia



Source: IVL

Exhibit 99: Integrated PET-PTA margin in Western market



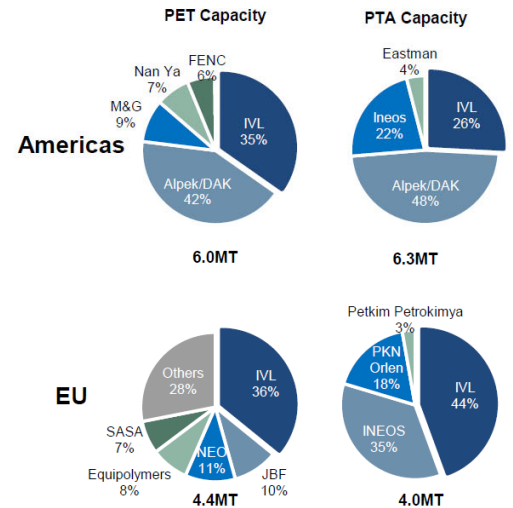
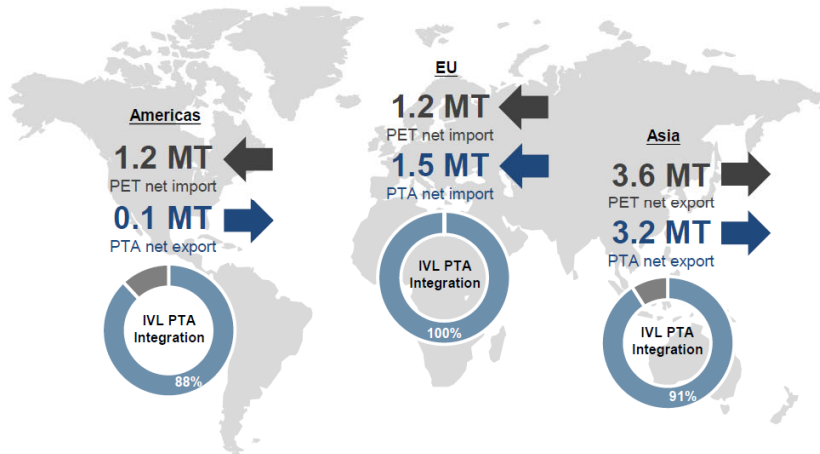
Source: IVL

Thanks to its superior characteristics, quality, and recyclability, the integrated PET-PTA margin has continued to strengthen, particularly in Western markets. Four advantages for PET and PTA – superior recyclability, favourable market structure, import barriers, and high contract prices and margins – have contributed to the highly sustainable and strong integrated PET-PTA margin in Western markets, commanding a USD500/t premium over the integrated PET-PTA margin in Asia (USD820/t vs USD300/t in October 2021).

Exhibit 100: Favourable market structures in North America and Europe resulting in higher PET margins

Advantaged integrated platforms in short Western markets

IVL hold leading positions in Western markets

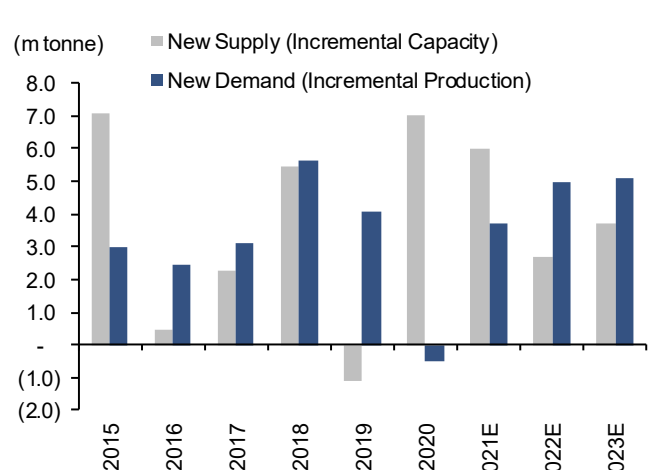
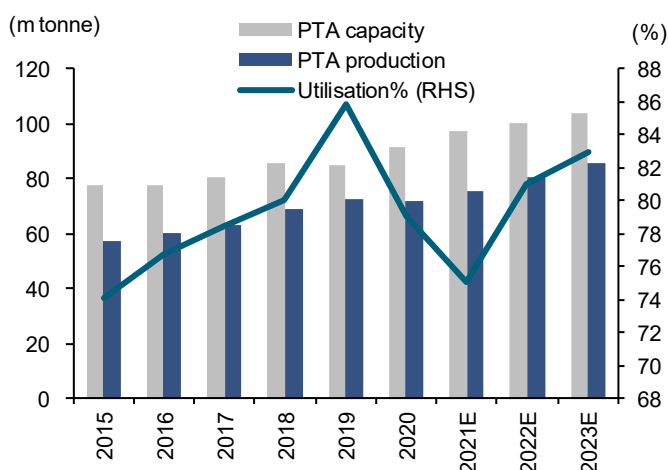


Source: IVL

More favourable market structure. Unlike the PET market in Asia with a number of suppliers in China, India, and other North and Southeast Asian countries, the number of PET producers in North America and Europe is much more limited and concentrated, with only three major producers (IVL, Alpek, and M&G for a combined market share of 86%) in the Americas (North and South American continents) and five major players in the EU (five players for a combined 72% market share).

Exhibit 101: PTA capacity, production and utilisation rate

Exhibit 102: PTA new supply and new demand



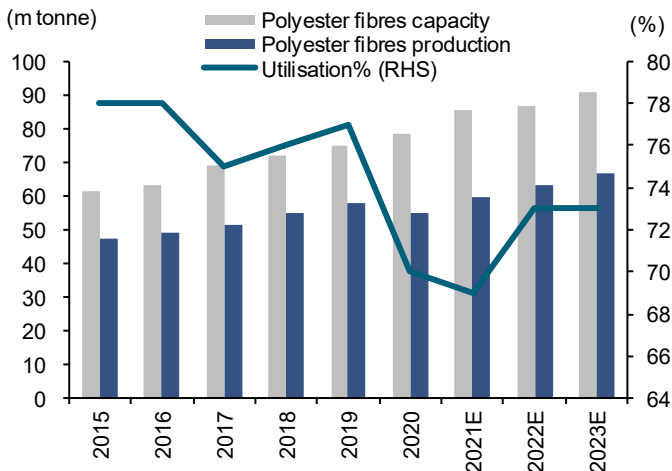
Source: IVL

Source: IVL

For the PTA upstream market, there is a similar picture, with only three major producers in the Americas (IVL, Alpek, and Inoes for 96%) and Europe (IVL, Ineos, and PKN Orlen for 97%). This is probably the most compelling reason why the margins of PET-PTA and PTA-PX in the Americas and Europe are much higher than the margins in Asia, in our view.

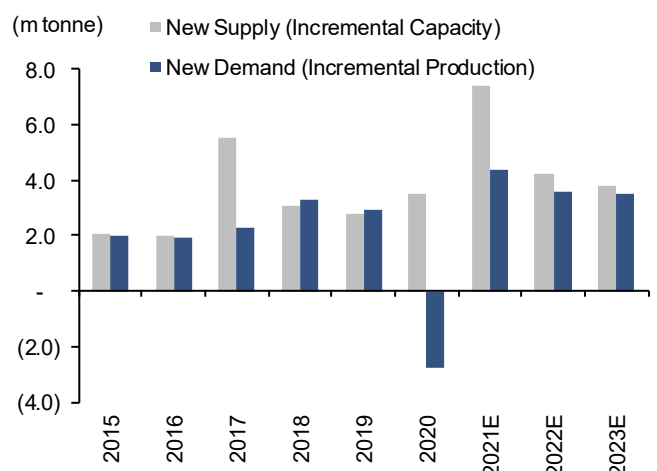
Import market structure. Both the Americas and Europe are net import markets for PET and PTA, with the Americas' net imports amounting to 1.2mtpa of PET and net exports totalling 0.1mtpa of PTA and Europe's net imports at 1.2mtpa of PET and 1.5mtpa of PTA as of 3Q21. As a result, import parity costs, including the freight cost for shipping and land transportation will add meaningful costs to the prices of PET and PTA in Western markets.

Exhibit 103: Polyester fibres capacity, production and utilisation rate



Source: IVL

Exhibit 104: Polyester fibres new supply and new demand



Source: IVL

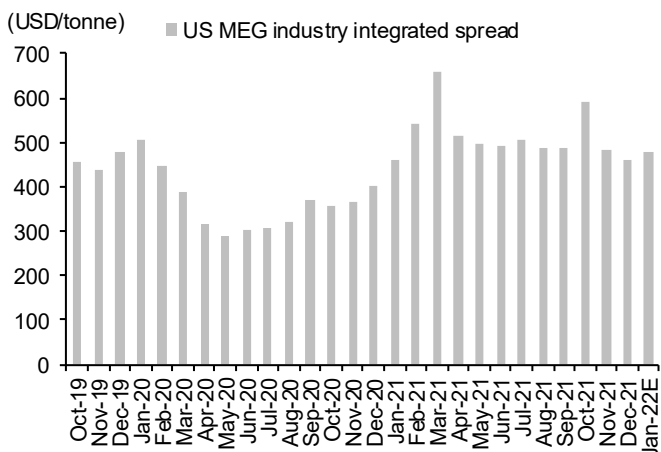
Margin outlook for the intermediate IOD products MTBE and MEG in 2022.

Meanwhile, the most vulnerable IOD products are the intermediate products of methyl tert-butyl ether (MTBE) and mono ethylene glycol (MEG). MTBE, a key gasoline blending agent to improve the octane of the gasoline sold at oil stations, has seen its margin over butane and methanol, the two key feedstocks, sharply decline in 2020-21 as a result of the LPG price hikes, given that butane is a key component of LPG.

We think the MTBE-butane margin will rebound in 2022-23 in the range of USD200/t, but should average above USD200/t at USD220/t, above its breakeven level of USD130/t, based on our estimate.

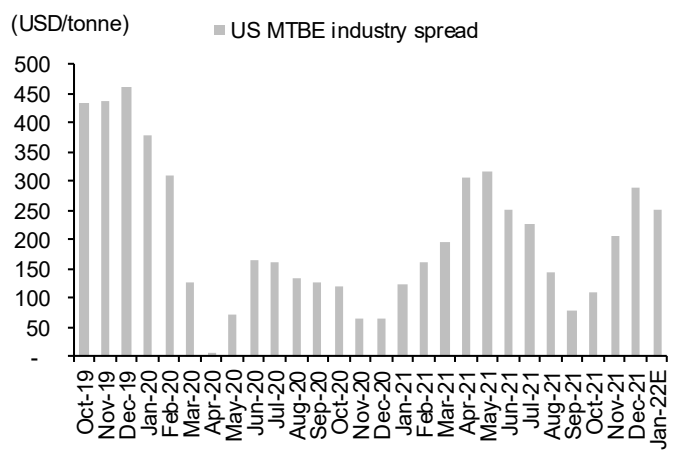
MEG margin should remain healthy in 2022. Unlike MTBE, we think the margin of MEG-ethylene will remain strong in 2022, driven by the high demand for MEG as a key intermediate feedstock to produce ethylene oxide derivatives (EOD). EOD command a 3x higher EBITDA margin than the normal ethylene glycol (EG) used in the production of polyester fibres and PET plastics.

Exhibit 105: US MEG industry integrated spread



Source: IVL

Exhibit 106: US MTBE industry spread



Source: IVL

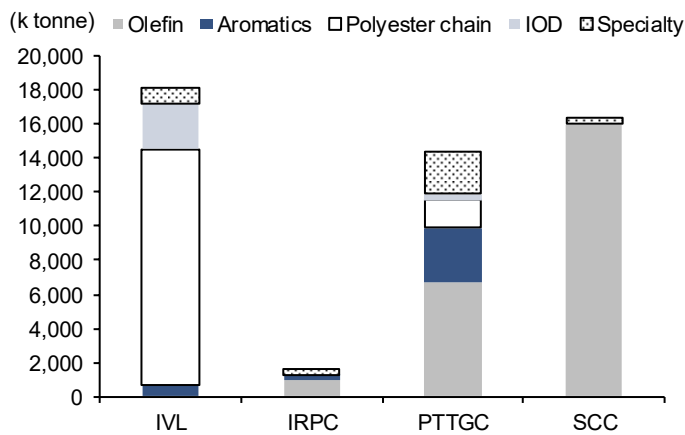
Polyester and PVC are two key winners

As we expect the polyester and PVC chains to see the most promising margin outlook in 2022-23, we analysed the revenue and EBITDA exposures of four key petrochemical companies listed on the SET and determined that IVL and IRPC are our top picks thanks to their high exposures to the products with favourable margin outlooks.

IVL stands as our number one pick in the Thai petrochemical sector, given its high EBITDA exposure to the products in the polyester, IOD, and specialty chains. We classify the specialty chemical chains as those products with 1) high margin sustainability; 2) an EBITDA margin over 10-15%; and 3) high entry barriers. In IVL's case, the specialty products include isopropyl alcohol, naphthalene dicarboxylate, a number of high value-added (HVA) PET products and fibres.

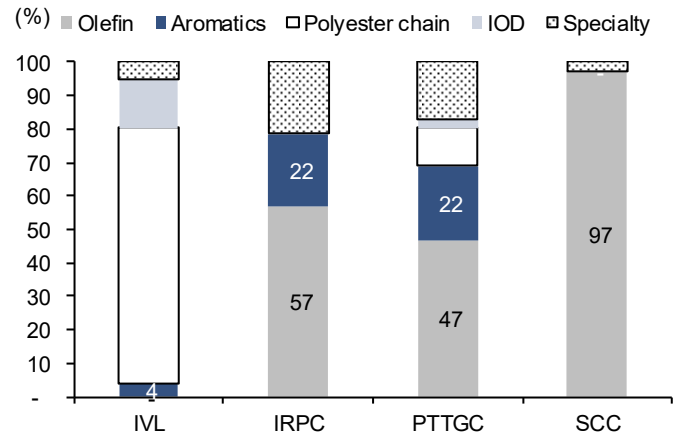
Most of IVL's IOD products are specialty chemical products, including propylene oxide (PO), surfactants, ethanolamine, and purified ethylene oxide (PEO). Hence, IVL, post the acquisition of Oxiteno in 1Q22, should increase its exposure to the profitable and sustainable products by over 40%, based on our estimate.

Exhibit 107: Petrochemical capacity breakdown by end product (excluding intermediate and upstream)



Sources: IVL, IRPC, PTTGC, SCC, FSSIA estimates

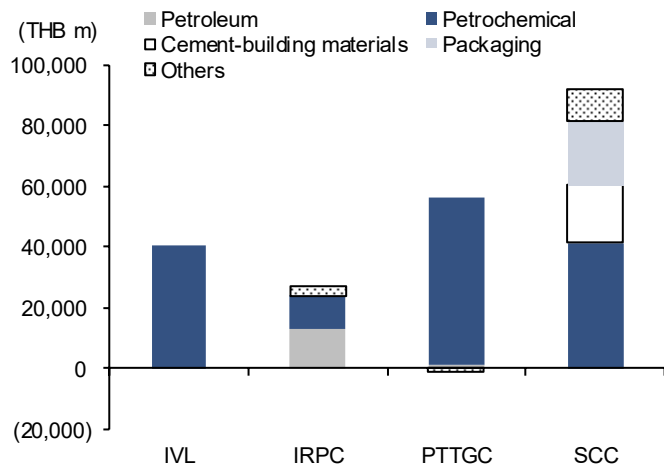
Exhibit 108: Petrochemical capacity breakdown (%) by end product (excluding intermediate and upstream)



Sources: IVL, IRPC, PTTGC, SCC, FSSIA estimates

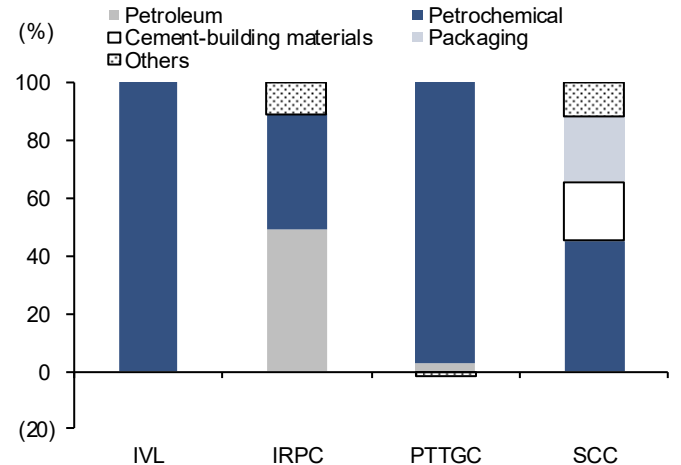
IRPC has a high exposure to specialty products such as EPS and compound PE, most of them being under the SM downstream chain. Hence, we think IRPC is poised to be a key winner in the margin upcycle that we project in 2022-23.

Exhibit 109: EBITDA breakdown



Sources: IVL, IRPC, PTTGC, SCC, FSSIA estimates

Exhibit 110: EBITDA breakdown (%)



Sources: IVL, IRPC, PTTGC, SCC, FSSIA estimates

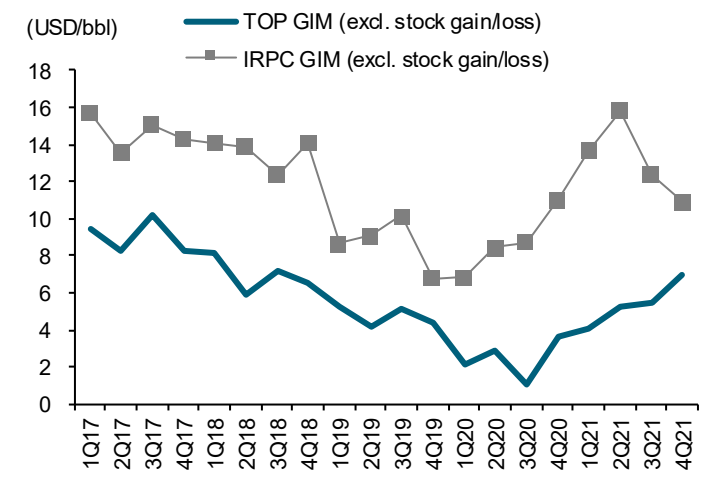
PTTGC and SCC: likely losers on olefins downcycle. We think Thailand's two key producers in the olefins chain, PTTGC and SCC, will likely face a challenging outlook for their PE and PP margins, given the oversupply outlook that could continue to pressure the margins of PE and PP in 2022-23.

While PTTGC has the benefit of its gas-based cracker, we think it has largely lost its competitive advantage after it completed and started up a new naphtha cracker, the Olefins Reconfiguration Project, with a capacity of 750ktpa (500ktpa of ethylene and 250ktpa of propylene), which effectively dilutes PTTGC's gas feedstock competitiveness from 80% down to 40% of total feedstock in 2022-23.

Despite having a higher HVA production capacity than PTTGC (SCC's 45-50% vs PTTGC's 20-25% of their total chemical capacities, based on our estimate), we think SCC will continue to feel the pinch of the high costs of naphtha and LPG feedstock in 2022-23. Hence, we remain bearish on SCC's chemical earnings in 2022-23.

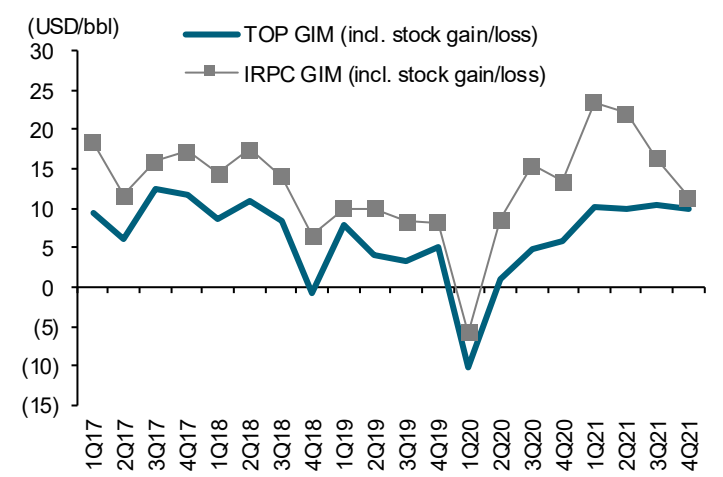
TOP: still in the doldrums on aromatics margin downcycle. In term of petrochemical exposure, we think TOP is likely to be a loser on the weak aromatics margin outlook in 2022-23, given TOPs' limited downstream capacity in the aromatics chain. However, TOP could be deemed as a good investment choice as a leading refinery company in the Thai refinery sector thanks to the rising market GRM outlook in 2022.

Exhibit 111: TOP, IRPC GIM excl. stock gain/loss



Sources: TOP; IRPC

Exhibit 112: TOP, IRPC GIM incl. stock gain/loss



Sources: TOP; IRPC

Exhibit 113: Peer comparisons

Company	BBG code	Rec	Share Price (LCY)	Target price (LCY)	Up side (%)	Market Cap (USD m)	3Y EPS CAGR (%)	----- PE -----		---- ROE ----		---- PBV ----		EV / EBITDA	
								21E (x)	22E (x)	21E (%)	22E (%)	21E (x)	22E (x)	21E (x)	22E (x)
THAILAND															
Indorama Ventures	IVL TB	BUY	47.25	70.00	48	8,196	74.8	9.7	8.8	19.4	18.4	1.7	1.5	7.5	6.9
Irpc Pcl	IRPC TB	BUY	3.78	5.80	53	2,386	nm	4.7	6.0	20.2	14.3	0.9	0.8	4.7	5.6
Ptt Global Chem	PTTGC TB	BUY	54.75	75.00	37	7,626	54.8	7.9	9.5	10.5	8.2	0.8	0.8	6.9	9.6
Siam Cement	SCC TB	BUY	395.00	483.00	22	14,644	23.2	10.0	8.0	13.7	15.4	1.3	1.2	11.0	8.7
Eastern Polymer	EPG TB	BUY	10.10	16.00	58	874	20.4	23.2	16.8	11.3	14.6	2.6	2.3	16.2	12.6
Vinythai Public	VNT TB	NA	38.50	NA	NA	1,413	nm	17.5	17.5	11.5	10.6	1.9	1.8	nm	nm
THAILAND avg						35,139	25.9	9.8	9.0	14.6	14.3	1.3	1.2	8.6	8.0
INDIA															
Reliance Industries	RIL IN	NA	2,389.00	NA	NA	215,381	21.0	34.2	26.8	8.6	7.9	2.6	2.0	22.1	16.5
INDIA avg						215,381	21.0	34.2	26.8	8.6	7.9	2.6	2.0	22.1	16.5
TAIWAN															
Formosa Plastics	1301 TT	NA	105.00	NA	NA	23,991	40.6	9.5	11.2	19.7	15.4	1.7	1.7	9.1	11.4
Nan Ya Plastics	1303 TT	NA	88.60	NA	NA	25,221	28.9	8.8	11.9	21.1	16.0	1.7	1.7	7.6	10.9
Formosa Chem&Fi	1326 TT	NA	80.10	NA	NA	16,851	19.2	11.5	14.3	10.8	8.5	1.2	1.2	8.6	11.9
Formosa Petro	6505 TT	NA	97.30	NA	NA	33,268	88.6	17.9	19.5	15.3	13.2	2.7	2.6	11.3	11.9
TAIWAN avg						99,330	40.0	12.5	14.7	17.0	13.6	1.9	1.9	9.4	11.5
SOUTH KOREA															
Hanwha Solutions	009830 KS	NA	32,550	NA	NA	5,225	21.5	7.0	9.5	12.6	7.6	0.8	0.8	6.7	6.7
Lotte Chemical	011170 KS	NA	228,000	NA	NA	6,558	79.7	5.2	8.1	11.2	6.8	0.6	0.5	3.0	3.8
Lg Chem	051910 KS	NA	589,000	NA	NA	34,894	107.9	11.5	16.3	19.5	12.2	2.0	1.7	6.6	7.1
Kumho Petro	011780 KS	NA	160,500	NA	NA	4,081	16.9	2.4	4.1	49.3	22.7	1.1	0.9	1.8	2.7
Oci	010060 KS	NA	99,000	NA	NA	1,982	nm	4.5	4.4	19.9	16.7	0.8	0.7	4.0	3.6
SOUTH KOREA avg						52,740	85.0	9.3	13.2	20.1	12.1	1.6	1.4	5.7	6.2
MALAYSIA															
Petronas Chem	PCHEM MK	NA	9.23	NA	NA	17,639	49.4	11.3	13.3	20.5	15.8	2.2	2.1	7.5	8.1
Lotte Chemical Titan	TTNP MK	NA	2.23	NA	NA	1,213	31.8	4.7	15.0	9.4	3.2	0.4	0.4	0.6	1.3
MALAYSIA avg						18,852	49.0	10.9	13.4	19.8	14.9	2.1	2.0	7.1	7.6
Average (Asia)						421,442	47.7	22.9	20.2	13.0	10.6	2.2	1.9	15.2	12.9
US															
Eastman Chem	EMN US	NA	121.10	NA	NA	16,281	20.0	13.5	12.5	16.6	20.0	2.6	2.6	9.6	9.7
Dupont De Nem	DD US	NA	77.96	NA	NA	39,986	54.3	18.5	16.2	7.0	9.2	1.5	1.5	11.8	11.2
Celanese	CE US	NA	144.07	NA	NA	15,564	29.4	7.9	9.2	49.7	38.1	4.2	3.3	6.8	7.8
Westlake Chem	WLK US	NA	108.61	NA	NA	13,883	62.8	7.2	7.6	27.5	20.6	1.8	1.2	5.0	5.1
Ppg Industries	PPG US	NA	146.67	NA	NA	34,614	17.2	21.9	19.6	25.3	25.9	5.4	4.9	15.4	14.1
Alpek Sa De Cv	ALPEKA MM	NA	26.14	NA	NA	2,724	30.9	7.0	8.6	18.9	13.7	1.2	1.1	4.0	4.6
Avg (US)						123,052	30.5	15.9	14.6	21.4	20.4	3.1	2.8	11.0	10.5
ME/Europe															
Saudi Basic	SABIC AB	NA	121.00	NA	NA	98,033	130.6	15.7	18.8	13.4	11.6	2.0	2.0	8.5	9.3
Saudi Kayan	KAYAN AB	NA	19.26	NA	NA	7,932	#DIV/0!	13.0	17.6	15.7	10.0	1.8	1.6	8.3	10.4
Yanbu National	YANSAB AB	NA	66.90	NA	NA	10,075	45.2	22.2	22.3	10.9	12.1	2.5	2.5	11.4	11.1
Industries Qatar	IQCD QD	NA	17.85	NA	NA	29,567	54.8	12.9	12.4	22.7	21.0	3.0	2.7	13.9	12.0
Basf Se	BAS GR	NA	64.85	NA	NA	68,412	73.8	9.9	10.9	16.0	13.3	1.6	1.6	6.8	7.1
Arkema	AKE FP	NA	123.65	NA	NA	10,617	29.9	11.5	12.9	14.1	11.3	1.6	1.5	6.2	6.6
Lanxess Ag	LXS GR	NA	47.83	NA	NA	4,730	40.4	10.7	9.4	9.5	11.4	1.3	1.2	6.2	5.3
Solvay Sa	SOLB BB	NA	105.35	NA	NA	12,949	(4.1)	11.9	11.6	13.4	11.9	1.5	1.5	6.1	5.9
Avg (ME/Europe)						242,315	40.9	13.4	15.1	15.2	13.2	2.0	1.9	8.5	8.7
Petrochem under coverage						33,726	26.0	9.1	8.3	14.2	13.8	1.2	1.1	8.6	8.0
Average (all)						786,808	41.7	18.9	17.7	15.0	12.9	2.3	2.0	12.5	11.3

Share price as of 22 February 2022

Sources: Bloomberg, FSSIA estimates

Corporate Governance report of Thai listed companies 2020

EXCELLENT LEVEL										
AAV	ADVANC	AF	AIRA	AKP	AKR	ALT	AMA	AMATA	AMATAV	ANAN
AOT	AP	ARIP	ARROW	ASP	BAFS	BANPU	BAY	BCP	BCPG	BDMS
BEC	BEM	BGRIM	BIZ	BKI	BLA	BOL	BPP	BRR	BTS	BWG
CENTEL	CFRESH	CHEWA	CHO	CIMBT	CK	CKP	CM	CNT	COL	COMAN
COTTO	CPALL	CPF	CPI	CPN	CSS	DELTA	DEMCO	DRT	DTAC	DTC
DV8	EA	EASTW	ECF	ECL	EGCO	EPG	ETE	FNS	FPI	FPT
FSMART	GBX	GC	GCAP	GEL	GFPT	GGC	GPSC	GRAMMY	GUNKUL	HANA
HARN	HMPRO	ICC	ICI	III	ILINK	INTUCH	IRPC	IVL	JKN	JSP
JWD	K	KBANK	KCE	KKP	KSL	KTB	KTC	LANNA	LH	LHFG
LIT	LPN	MAKRO	MALEE	MBK	MBKET	MC	MCOT	METCO	MFEC	MINT
MONO	MOONG	MSC	MTC	NCH	NCL	NEP	NKI	NOBLE	NSI	NVD
NYT	OISHI	ORI	OTO	PAP	PCSGH	PDJ	PG	PHOL	PLANB	PLANET
PLAT	PORT	PPS	PR9	PREB	PRG	PRM	PSH	PSL	PTG	PTT
PTTEP	PTTGC	PYLON	Q-CON	QH	QTC	RATCH	RS	S	S & J	SAAM
SABINA	SAMART	SAMTEL	SAT	SC	SCB	SCC	SCCC	SCG	SCN	SDC
SEAFCO	SEAOIL	SE-ED	SELIC	SENA	SIRI	SIS	SITHAI	SMK	SMPC	SNC
SONIC	SORKON	SPALI	SPI	SPRC	SPVI	SSSC	SST	STA	SUSCO	SUTHA
SVI	SYMC	SYNTEC	TACC	TASCO	TCAP	TFMAMA	THANA	THANI	THCOM	THG
THIP	THRE	THREL	TIP	TIPCO	TISCO	TK	TKT	TTB	TMILL	TNDT
TNL	TOA	TOP	TPBI	TQM	TRC	TRC	TSC	TSR	TSTE	TSTH
TTCL	TTW	TU	TVD	TVI	TVO	TWPC	U	UAC	UBIS	UV
VGI	VIH	WACOAL	WAVE	WHA	WHAUP	WICE	WINNER	TRUE		

VERY GOOD LEVEL										
2S	ABM	ACE	ACG	ADB	AEC	AEONTS	AGE	AH	AHC	AIT
ALLA	AMANAHA	AMARIN	APCO	APCS	APURE	AQUA	ASAP	ASEFA	ASIA	ASIAN
ASIMAR	ASK	ASN	ATP30	AUCT	AWC	AYUD	B	BA	BAM	BBL
BFIT	BGC	BJC	BJCHI	BROOK	BTW	CBG	CEN	CGH	CHARAN	CHAYO
CHG	CHOTI	CHOW	CI	CIG	CMC	COLOR	COM7	CPL	CRC	CRD
CSC	CSP	CWT	DCC	DCON	DDD	DOD	DOHOME	EASON	EE	ERW
ESTAR	FE	FLOYD	FN	FORTH	FSS	FTE	FVC	GENCO	GJS	GL
GLAND	GLOBAL	GLOCON	GPI	GULF	GYT	HPT	HTC	ICN	IFS	ILM
IMH	INET	INSURE	IRC	IRCP	IT	ITD	ITEL	J	JAS	JCK
JCKH	JMART	JMT	KBS	KCAR	KGI	KIAT	KOOL	KTIS	KWC	KWM
L&E	LALIN	LDC	LHK	LOXLEY	LPH	LRH	LST	M	MACO	MAJOR
MBAX	MEGA	META	MFC	MGT	MILL	MITSIB	MK	MODERN	MTI	MVP
NETBAY	NEX	NINE	NTV	NWR	OCC	OGC	OSP	PATO	PB	PDG
PDI	PICO	PIMO	PJW	PL	PM	PPP	PRIN	PRINC	PSTC	PT
QLT	RCL	RICHY	RML	RPC	RWI	S11	SALEE	SAMCO	SANKO	SAPPE
SAWAD	SCI	SCP	SE	SEG	SFP	SGF	SHR	SIAM	SINGER	SKE
SKR	SKY	SMIT	SMT	SNP	SPA	SPC	SPCG	SR	SRICHA	SSC
SSF	STANLY	STI	STPI	SUC	SUN	SYNEX	T	TAE	TAKUNI	TBSP
TCC	TCMC	TEAM	TEAMG	TFG	TIGER	TITLE	TKN	TKS	TM	TMC
TMD	TMI	TMT	TNITY	TNP	TNR	TOG	TPA	TPAC	TPCORP	TPOLY
TPS	TRITN	TRT	TRU	TSE	TVT	TWP	UEC	UMI	UOBKH	UP
UPF	UPOIC	UT	UTP	UWC	VL	VNT	VPO	WIJK	WP	XO
YUASA	ZEN	ZIGA	ZMICO							

GOOD LEVEL										
7UP	A	ABICO	AJ	ALL	ALUCON	AMC	APP	ARIN	AS	AU
B52	BC	BCH	BEAUTY	BGT	BH	BIG	BKD	BLAND	BM	BR
BROCK	BSBM	BSM	BTNC	CAZ	CCP	CGD	CITY	CMAN	CMO	CMR
CPT	CPW	CRANE	CSR	D	EKH	EP	ESSO	FMT	GIFT	GREEN
GSC	GTB	HTECH	HUMAN	IHL	INOX	INSET	IP	JTS	JUBILE	KASET
KCM	KKC	KUMWEL	KUN	KWG	KYE	LEE	MATCH	MATI	M-CHAI	MCS
MDX	MJD	MM	MORE	NC	NDR	NER	NFC	NNCL	NPK	NUSA
OCEAN	PAF	PF	PK	PLE	PMTA	POST	PPM	PRAKIT	PRECHA	PRIME
PROUD	PTL	RBF	RCI	RJH	ROJNA	RP	RPH	RSP	SF	SFLEX
SGP	SISB	SKN	SLP	SMART	SOLAR	SPG	SQ	SSP	STARK	STC
SUPER	SVOA	TC	TCCC	THMUI	TIW	TNH	TOPP	TPCH	TIPIP	TPLAS
TTI	TYCN	UKEM	UMS	VCOM	VRANDA	WIN	WORK	WPH		

Description

Score Range

Excellent

90-100

Very Good

80-89

Good

70-79

Disclaimer:

The disclosure of the survey results of the Thai Institute of Directors Association ("IOD") regarding corporate governance is made pursuant to the policy of the Office of the Securities and Exchange Commission. The survey of the IOD is based on the information of a company listed on the Stock Exchange of Thailand and the Market for Alternative Investment disclosed to the public and able to be accessed by a general public investor. The result, therefore, is from the perspective of a third party. It is not an evaluation of operation and is not based on inside information.

The survey result is as of the date appearing in the Corporate Governance Report of Thai Listed Companies. As a result, the survey results may be changed after that date. FSS International Investment Advisory Company Limited does not confirm nor certify the accuracy of such survey results.

* CGR scoring should be considered with news regarding wrong doing of the company or director or executive of the company such unfair practice on securities trading, fraud, and corruption SEC imposed a civil sanction against insider trading of director and executive; ** delisted

Source: Thai Institute of Directors Association (IOD); FSSIA's compilation

Anti-corruption Progress Indicator 2020

CERTIFIED										
2S	ADVANC	AI	AIE	AIRA	AKP	AMA	AMANAHA	AP	AQUA	ARROW
ASK	ASP	AYUD	B	BAFS	BANPU	BAY	BBL	BCH	BCP	BCPG
BGC	BGRIM	BJCHI	BKI	BLA	BPP	BROOK	BRR	BSBM	BTS	BWG
CEN	CENTEL	CFRESH	CGH	CHEWA	CHOTI	CHOW	CIG	CIMBT	CM	CMC
COL	COM7	CPALL	CPF	CPI	CPN	CSC	DCC	DELTA	DEMCO	DIMET
DRT	DTAC	DTC	EASTW	ECL	EGCO	FE	FNS	FPI	FPT	FSS
FTE	GBX	GC	GCAP	GEL	GFPT	GGC	GJS	GPSC	GSTEEL	GUNKUL
HANA	HARN	HMPRO	HTC	ICC	ICHI	IFS	INET	INSURE	INTUCH	IRPC
ITEL	IVL	K	KASET	KBANK	KBS	KCAR	KCE	KGI	KKP	KSL
KTB	KTC	KWC	L&E	LANNA	LHFG	LHK	LPN	LRH	M	MAKRO
MALEE	MBAX	MBK	MBKET	MC	MCOT	MFC	MFEC	MINT	MONO	MOONG
MPG	MSC	MTC	MTI	NBC	NEP	NINE	NKI	NMG	NNCL	NSI
NWR	OCC	OCEAN	OGC	ORI	PAP	PATO	PB	PCSGH	PDG	PDI
PDJ	PE	PG	PHOL	PL	PLANB	PLANET	PLAT	PM	PPP	PPPM
PPS	PREB	PRG	PRINC	PRM	PSH	PSL	PSTC	PT	PTG	PTT
PTTEP	PTTGC	PYLON	Q-CON	QH	QLT	QTC	RATCH	RML	RWI	S & J
SABINA	SAT	SC	SCB	SCC	SCCC	SCG	SCN	SEAOIL	SE-ED	SELIC
SENA	SGP	SIRI	SITHAI	SMIT	SMK	SMPC	SNC	SNP	SORKON	SPACK
SPC	SPI	SPRC	SRICHA	SSF	SSSC	SST	STA	SUSCO	SVI	SYNTEC
TAE	TAKUNI	TASCO	TBSP	TCAP	TCMC	TFG	TFI	TFMAMA	THANI	THCOM
THIP	THRE	THREL	TIP	TIPCO	TISCO	TKT	TTB	TMD	TMILL	TMT
TNITY	TNL	TNP	TNR	TOG	TOP	TPA	TPCORP	TPP	TRU	TSC
TSTH	TTCL	TU	TVD	TVI	TVO	TWPC	U	UBIS	UEC	UKEM
UOBKH	UWC	VGI	VIH	VNT	WACOAL	WHA	WHAUP	WICE	WIJK	XO
ZEN	TRUE									

DECLARED										
7UP	ABICO	AF	ALT	AMARIN	AMATA	AMATAV	ANAN	APURE	B52	BKD
BM	BROCK	BUI	CHO	CI	COTTO	DDD	EA	EFORL	EP	ERW
ESTAR	ETE	EVER	FSMART	GPI	ILINK	IRC	J	JKN	JMART	JMT
JSP	JTS	KWG	LDC	MAJOR	META	NCL	NOBLE	NOK	PK	PLE
ROJNA	SAAM	SAPPE	SCI	SE	SHANG	SINGER	SKR	SPALI	SSP	STANLY
SUPER	SYNEX	THAI	TKS	TOPP	TRITN	TTA	UPF	UV	WIN	ZIGA

Level	
Certified	This level indicates practical participation with thoroughly examination in relation to the recommended procedures from the audit committee or the SEC's certified auditor, being a certified member of Thailand's Private Sector Collective Action Coalition Against Corruption programme (Thai CAC) or already passed examination to ensure independence from external parties.
Declared	This level indicates determination to participate in the Thailand's Private Sector Collective Action Coalition Against Corruption programme (Thai CAC)

Disclaimer:

The disclosure of the Anti-Corruption Progress Indicators of a listed company on the Stock Exchange of Thailand, which is assessed by Thaipat Institute, is made in order to comply with the policy and sustainable development plan for the listed companies of the Office of the Securities and Exchange Commission. Thaipat Institute made this assessment based on the information received from the listed company, as stipulated in the form for the assessment of Anti-corruption which refers to the Annual Registration Statement (Form 56-1), Annual Report (Form 56-2), or other relevant documents or reports of such listed company. The assessment result is therefore made from the perspective of Thaipat Institute that is a third party. It is not an assessment of operation and is not based on any inside information. Since this assessment is only the assessment result as of the date appearing in the assessment result, it may be changed after that date or when there is any change to the relevant information. Nevertheless, FSS International Investment Advisory Company Limited does not confirm, verify, or certify the accuracy and completeness of the assessment results.

Note: Companies participating in Thailand's Private Sector Collective Action Coalition Against Corruption programme (Thai CAC) under Thai Institute of Directors (as of June 24, 2019) are categorised into: 1) companies that have declared their intention to join CAC, and; 2) companies certified by CAC.

Source: The Securities and Exchange Commission, Thailand; * FSSIA's compilation

GENERAL DISCLAIMER

ANALYST(S) CERTIFICATION

Suwat Sinsadok, CFA, FRM, ERP FSS International Investment Advisory Securities Co., Ltd

The individual(s) identified above certify(ies) that (i) all views expressed in this report accurately reflect the personal view of the analyst(s) with regard to any and all of the subject securities, companies or issuers mentioned in this report; and (ii) no part of the compensation of the analyst(s) was, is, or will be, directly or indirectly, related to the specific recommendations or views expressed herein.

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Company	Ticker	Price	Rating	Valuation & Risks
Indorama Ventures	IVL TB	THB 47.25	BUY	The key downside risks to our EV/EBITDA-based TP are weaker-than-expected margins for PX-PTA and PET-PTA, lower demand for polyester, and delays in IVL's projects.
IRPC PCL	IRPC TB	THB 3.78	BUY	Key risks to our positive view and EV/EBITDA-based target price are weaker-than-expected oil product demand growth and lower-than-expected PP-naphtha and SM-benzene margins.
PTT Global Chemical	PTTGC TB	THB 54.75	BUY	The key downside risks to our EV/EBITDA-based TP are the weaker-than-expected HDPE price and HDPE-naphtha margin.
Siam Cement	SCC TB	THB 395.00	BUY	Downside risks to our SOTP based TP include 1) a lower-than-expected demand for chemicals, CBM, and packaging; 2) rising coal costs for its cement and packaging units; and 3) weaker demand from the automobile industry that could erode the demand for SCC's chemical unit and its dividend contributions.
Eastern Polymer Group	EPG TB	THB 10.10	BUY	Downside risks to our EV/EBITDA-based target price include 1) a sharp rise in feedstock prices, driven mostly by a higher oil price; and 2) lower-than-expected demand for plastics used for insulators and the automobile and packaging industries.
Thai Oil	TOP TB	THB 53.00	BUY	Downside risks to our EV/EBITDA-based TP are a sharp rise in oil price and weak demand for refined oil products.

Source: FSSIA estimates

Additional Disclosures

Target price history, stock price charts, valuation and risk details, and equity rating histories applicable to each company rated in this report is available in our most recently published reports. You can contact the analyst named on the front of this note or your representative at Finasia Syrus Securities Public Company Limited

FSSIA may incorporate the recommendations and target prices of companies currently covered by FSS Research into equity research reports, denoted by an 'FSS' before the recommendation. FSS Research is part of Finasia Syrus Securities Public Company Limited, which is the parent company of FSSIA.

All share prices are as at market close on 22-Feb-2022 unless otherwise stated.

RECOMMENDATION STRUCTURE

Stock ratings

Stock ratings are based on absolute upside or downside, which we define as (target price* - current price) / current price.

BUY (B). The upside is 10% or more.

HOLD (H). The upside or downside is less than 10%.

REDUCE (R). The downside is 10% or more.

Unless otherwise specified, these recommendations are set with a 12-month horizon. Thus, it is possible that future price volatility may cause a temporary mismatch between upside/downside for a stock based on market price and the formal recommendation.

* In most cases, the target price will equal the analyst's assessment of the current fair value of the stock. However, if the analyst doesn't think the market will reassess the stock over the specified time horizon due to a lack of events or catalysts, then the target price may differ from fair value. In most cases, therefore, our recommendation is an assessment of the mismatch between current market price and our assessment of current fair value.

Industry Recommendations

Overweight. The analyst expects the fundamental conditions of the sector to be positive over the next 12 months.

Neutral. The analyst expects the fundamental conditions of the sector to be maintained over the next 12 months.

Underweight. The analyst expects the fundamental conditions of the sector to be negative over the next 12 months.

Country (Strategy) Recommendations

Overweight (O). Over the next 12 months, the analyst expects the market to score positively on two or more of the criteria used to determine market recommendations: index returns relative to the regional benchmark, index sharpe ratio relative to the regional benchmark and index returns relative to the market cost of equity.

Neutral (N). Over the next 12 months, the analyst expects the market to score positively on one of the criteria used to determine market recommendations: index returns relative to the regional benchmark, index sharpe ratio relative to the regional benchmark and index returns relative to the market cost of equity.

Underweight (U). Over the next 12 months, the analyst does not expect the market to score positively on any of the criteria used to determine market recommendations: index returns relative to the regional benchmark, index sharpe ratio relative to the regional benchmark and index returns relative to the market cost of equity.