McKinsey & Company

Chemicals Practice

Reimagining Mexico's chemical industry

The country's chemical sector could double in size. A shift toward sustainable products, regionalization, and emerging value pools offers an opportunity to fulfill Mexico's potential.

This article is a collaborative effort by Pablo Ordorica Lenero, Manuel Prieto, Rafael Scott, Theo Jan Simons, and Yasmine Zhu, representing views from McKinsey's Chemicals Practice.

October 2022

In the early 2000s, the Mexican chemical sector supplied most of the local manufacturing industries in the country. In the past two decades, however, Mexico has lagged behind a thriving global chemical sector. Mexico has increasingly relied on imports, with the domestic sector facing structural challenges such as feedstock shortages, high energy costs, and limited innovation.

Profound shifts are under way that could revive Mexico's chemical industry, including a move toward sustainable products, chemical-chain integration, and new value pools. Mexico is well positioned to capture those industrial shifts given its sizable market, location, robust recycling chain, and renewable resources.

In this article, we first review the challenges facing the Mexican chemical industry, its strengths, and global trends that could influence its direction. Then we offer four possible pathways: staying the course, focusing on specialty chemicals and value-added solutions, rejuvenating the industry base, and reimagining the industry. In these pathways, growth will depend on infrastructure development, the approach to feedstock sourcing, and the ability to innovate and invest at scale.

Mexico has the potential to double its chemical production output by 2035, add 4 percent to overall GDP growth over the next decade, benefit the manufacturing sector overall, and ease prices for consumers through lower-cost supply. Shorter supply chains could also lead to higher service levels and lower carbon emissions. Capturing the opportunity would require long-term investments that could also deliver sustainable and inclusive growth.

The global chemical industry is thriving, but Mexico has lagged behind

In the past decade, global demand for chemicals has risen 3.5 percent per year, faster than global GDP. Emerging markets accounted for most of the growth. China contributed almost $1 trillion to the increase in demand,[1] representing half of the global growth. This demand growth, coupled with feedstock and technology advantages, allowed the global chemical industry to deliver TSR of more than 10 percent a year since 2010, outperforming the MSCI World Investable Market Index of 8 percent.[2] All the industry's subsectors—petrochemicals, specialty chemicals, and agrochemicals—have delivered similar results.

During the same period, several countries have grown their chemical industries significantly. China's petrochemical industry has doubled its production to serve the fast-growing domestic market. North America and the Middle East, benefiting from advantaged gas feedstocks, have increased petrochemical output by 18 and 30 percent in the past decade, respectively.

In contrast, Mexico has not participated in the success story of the global chemical industry. While the country's demand for chemicals has increased 2 percent per year in the past decade,[3] domestic production of chemicals has shrunk. In fact, Mexico's chemical production has declined by about 30 percent in the past decade, mainly because of decreasing petrochemical and agrochemical production (Exhibit 1).

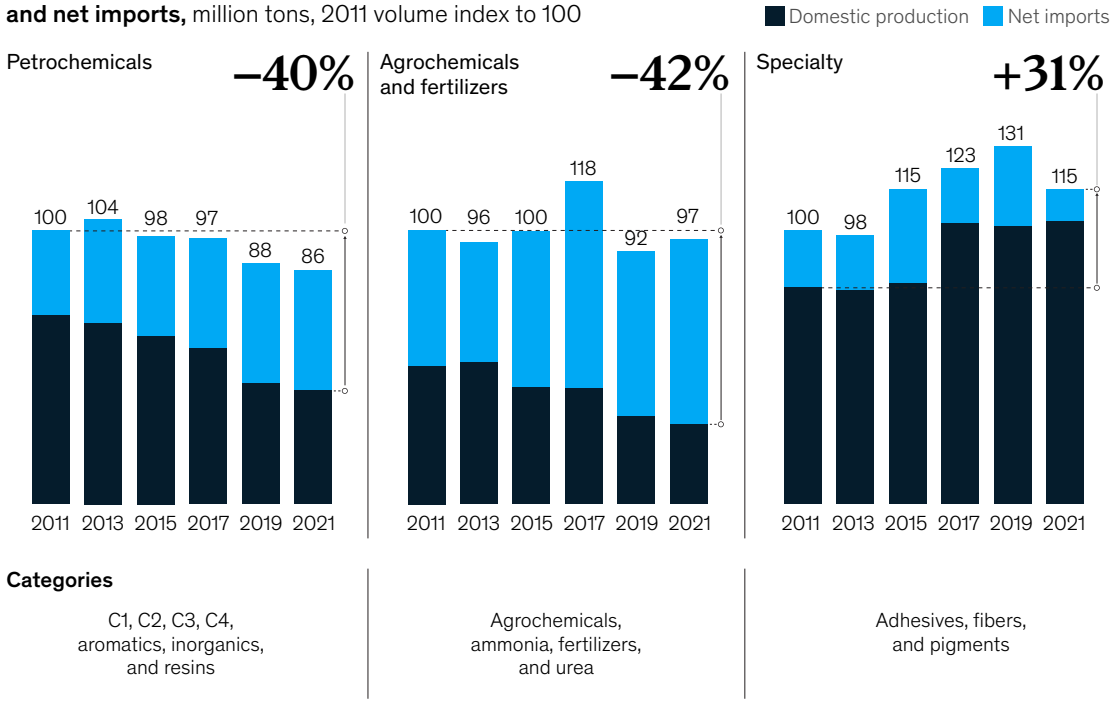
As a result, Mexico now relies on significant imports of chemicals to support its local manufacturing industry. Mexico's manufacturing industry is large, representing 20 percent of the country's GDP. This is higher than those of economies such as Brazil, the

[1] Measured as the total value of chemical consumption for a country in 2015 real dollars. For more, see Eren Çetinkaya, Nathan Liu, Theo Jan Simons, and Jeremy Wallach, "Petrochemicals 2030: Reinventing the way to win in a changing industry," McKinsey, February 21, 2018.
[2] Based on a data set of 555 chemical companies, including 244 base-chemical or petrochemical companies and 154 specialty-chemical companies.
[3] Based on agrochemicals, petrochemicals, resin, specialty chemicals, and volume reported in "Anuario Estadístico de la Industria Química Edición 2022," Asociación Nacional de la Industria Quimica (ANIQ), 2022.

Exhibit 1

The different sectors of the chemical industry in Mexico have experienced uneven growth.

Mexico's chemical consumption split by domestic production and net imports, million tons, 2011 volume index to 100



Source: *Statistics yearbook*, Asociación Nacional de la Industria Química (ANIQ), 2021

McKinsey & Company

European Union, India, and the United States, where manufacturing accounts for 12 to 17 percent of GDP (Exhibit 2). However, Mexico's dependence on chemical imports is much higher—about 28 percent of total demand—than other similar manufacturing-oriented economies such as China and Japan.

Several major challenges are holding the industry back:

— *Feedstock shortages.* The declining supply of critical feedstocks such as natural gas and ethane, as well as the fall in refining utilization rates (from about 75 percent in 2000 to about 40 percent in 2021[4]), have left many downstream chemical facilities idle. The petrochemical industry has felt the impact: utilization has fallen from 70 percent in 2000 to less than 60 percent in 2021.[5]

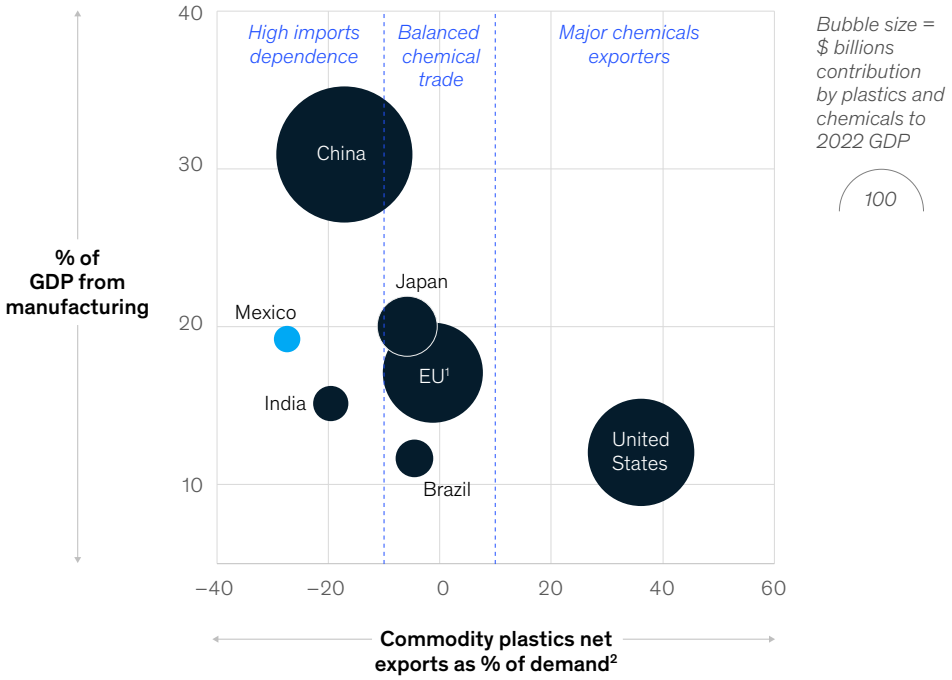
— *High energy costs.* Regulated power prices in Mexico are higher than they are in countries with established chemical industries such as China and the United States.[6] Moreover, industrial companies in Mexico face barriers to accessing

[4] "Presentación inversionistas," PEMEX, May 2022.
[5] Analysis across more than 30 Mexican petrochemicals of their production divided by capacity, based on Chemical Market Analytics (CMA) by OPIS, a Dow Jones company.
[6] Based on countries' reported industrial power prices during 2021; McKinsey Power Prices Database.

Exhibit 2

Mexico relies heavily on imported chemicals for its manufacturing industry.

Countries' manufacturing GDP share vs chemical net-exports ratio



[1]EU net trade represents Austria, Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.
[2]Reflects 2022 net-export position and demand for polyethylene (PE), polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC), and polyethylene terephthalate (PET).
Source: Chemical Market Analytics by Oil Price Information Service (OPIS), a Dow Jones company; S&P Global Market Intelligence

merchant prices through the Mexican wholesale electricity market (MEM). Historically, MEM prices have been 20 to 35 percent lower[7] than the basic power service and are usually competitive with those of countries such as the United States.

— *Lagging infrastructure.* Government investment in Mexican infrastructure to enable logistics and energy flows has declined 40 percent[8] as a percentage of GDP (from 0.5 percent of GDP in 2015 to 0.1 percent in 2020). In addition, Mexico's reported gas production has declined, and existing gas import pipelines are bottlenecked, which limits the supply available to petrochemical complexes in southern Mexico. In comparison, China invested 5 to 6 percent of GDP in infrastructure in 2020.[9]

— *Limited innovation.* Mexico's chemical patent applications are equal to about 0.5 percent of those submitted by filers in the United States, and 15.0 percent of filers in Brazil. A recent drop in research and development funding in the chemical industry has exacerbated the problem (Exhibit 3).

[7] Based on 2020–21 data from Federal Electricity Commission (CFE) and Centro Nacional de Control de Energía (CENACE).
[8] According to Center for Economic and Budgetary Research (CIEP) analysis of Secretariat of Finance and Public Credit of Mexico (SHCP) data; for more, see *Infraestructura en México: Prioridades y deficiencias del gasto público*, CIEP, June 2020.
[9] "Infrastructure investment," OECD, accessed October 20, 2022.

Exhibit 3

Chemicals innovation in Mexico is low compared to other countries.

Global chemicals patent applications by location of inventor, 2011–20

		China	United States	Japan	European Union	India	Brazil	Saudi Arabia	Mexico
Population, millions		1,410	332	126	447	1,390	214	35	130
Yearly patent applications	2011–14, avg	111,633	97,043	81,144	9,180	3,957	1,310	417	568
	2015–19, avg	212,639	96,216	79,344	10,736	3,565	1,332	904	482
	Growth %	90	–1	–2	17	–10	2	117	–15
Technology focus of chemical patent, 2011–20	Water								
	Petroleum								
	Glass								
	Cement								
	Biochemistry								
	Adhesives								
	Coatings								
	Agriculture								

Number of patents in relevant technology focus, thousands
- > 200
- 100–200
- 10–100
- 1–10
- < 1

Source: World Bank; McKinsey analysis

— *Economic and investment uncertainty.* Similar to many other countries, Mexico faces uncertain economic growth prospects. The GDP growth rates achieved in 2019 are not forecast to return until 2024,[10] while inflation rates have reached a ten-year high. Moreover, according to the World Economic Forum and other agencies, Mexico ranks in the third or bottom quartile for most business-enabling benchmarks.[11]

Trends that could spur Mexico's chemical industry

Looking forward, Mexico has the opportunity to reignite the growth of its chemical industry. Several strengths could accelerate its growth potential:

— *Sizable market.* Mexican consumption of chemicals is equivalent to about $40 billion of chemical goods,[12] with high growth potential supported by demand from a robust manufacturing industry. This puts Mexico among the 15 largest consumers of petrochemicals globally.

— *Location for nearshoring.* Companies based in Mexico could serve Latin American and US

[10] Based on various macroeconomic scenarios from the McKinsey Global Institute.
[11] Across 100 legal certainty metrics from Doing Business, Global Innovation Index, Global Peace Index, Heritage Foundation, Legatum Prosperity Index, World Bank, and World Economic Forum. For more, see Klaus Schwab and Saadia Zahidi, *The global competitiveness report: Special edition 2020*, World Economic Forum, 2020.
[12] "Anuario Estadístico de la Industria Química Edición 2022," 2022.

markets with favorable trade partnerships and short shipping distances (transport from Mexico is now about 50 percent cheaper and 80 percent faster than from Asian countries[13]).

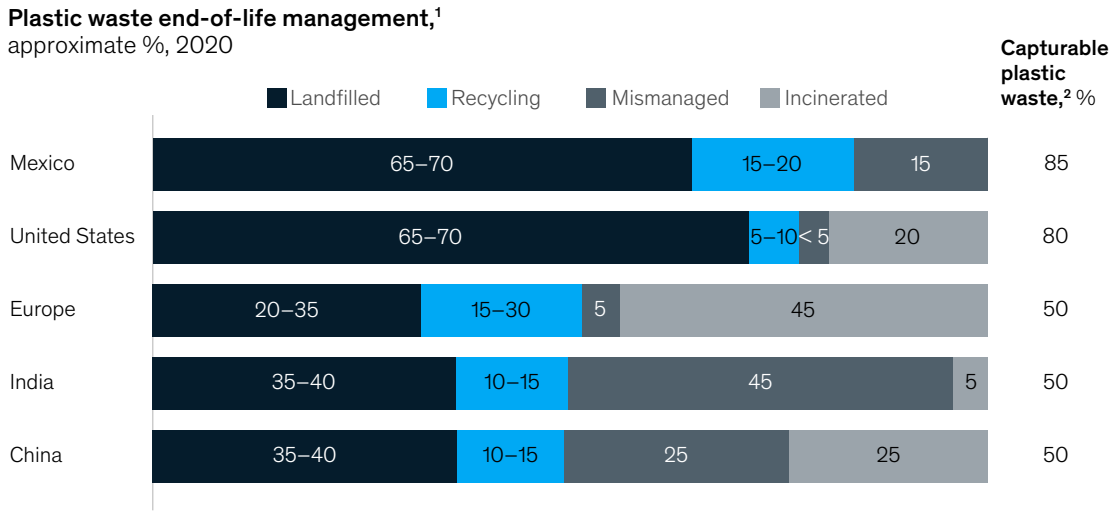
— *Access to competitive feedstocks and reserves.* Mexico has large natural-gas reserves, such as the Lakach deepwater field. Also, the potential opening of the Dos Bocas refinery, as well as the country's refinery improvement plan, could generate additional naphtha and propylene by-products that benefit the chemical industry. In addition, Mexico's proximity to the Gulf Coast provides access to ample and economical feedstock imports.

— *An established recycling chain.* Mexico has established itself as a significant player in the mechanical recycling of plastics and an early adopter of food-grade recycled polyethylene terephthalate (rPET). About 15 to 20 percent of total plastics are recycled in Mexico, compared with 10 to 15 percent in Brazil, India, and the United States. Mexico's high recycling rate reflects the fact that 85 percent of waste is collected and can be diverted into recycling streams, with limited volumes being mismanaged or incinerated (Exhibit 4).[14]

— *Renewable resources.* Mexico has access to some of the world's most favorable solar- and wind-energy resources. New solar and wind projects today could offer levelized cost of electricity (LCOE) as low as about $30 per megawatt-hour (MWh),[15] 10 to 20 percent cheaper than the world average, which puts

Exhibit 4

Mexico has access to a large volume of available plastic-waste feedstock.



[1]Mexico data comes from Informe del Medio Ambiente RSU / ECOCE; Europe reflects data from the European Union and the OECD; other countries' plastic-waste data comes from the OECD.
[2]Includes landfilled and recycled plastic waste.
Source: Advancing sustainable materials management: 2018 tables and figures, US Environmental Protection Agency (EPA), December 2020; ECOCE; European Environment Agency (2018); "Informe de la situacíon del medio ambiente en México," Government of Mexico, 2018; OECD

[13] Considers inland trucking from Mexico to the United States and ocean freight for China using Freightos database.
[14] Analysis across *Second report of the National Agreement for the New Plastics Economy in Mexico (2o informe del Acuerdo Nacional para la Nueva Economía del Plástico en México* [ANIPAC] in Spanish), ANIPAC, December 2021; "Global plastics outlook: Plastic waste by region and end-of-life fate (edition 2021)," OECD, accessed October 20, 2022; "Basic diagnostic for comprehensive waste management," ("Diagnostico básico para la gestión integral de los residuos" in Spanish), Secretariat of Environmental and Natural Resources, May 2020.
[15] Most economical new-build LCOE for solar-photovoltaic and wind energy in 2020, from McKinsey Power Solutions.

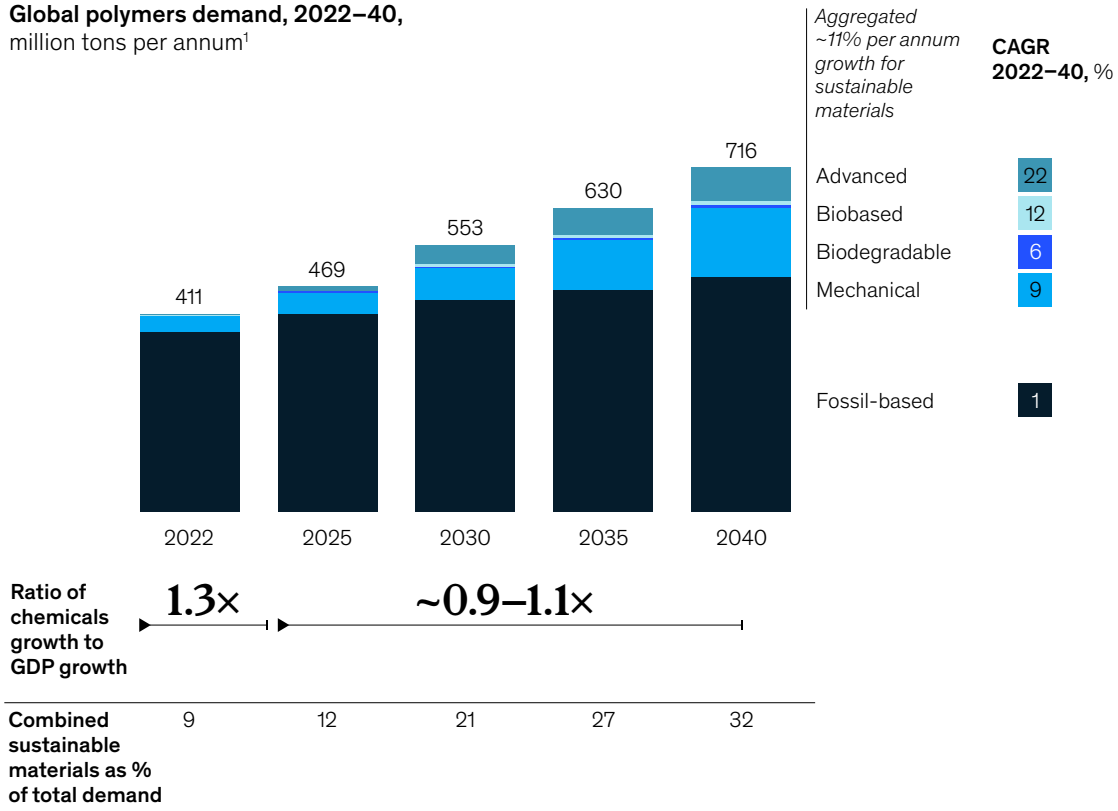
Mexico among the top five countries in the world providing low-cost solar energy.[16]

— *Labor availability.* According to the Economist Intelligence Unit, Mexico's average hourly wage is about 90 percent lower than that of the United States and about 65 percent lower than China's.[17] The lower wages in the Mexican labor market could give chemical companies an advantage in new-build and operating costs.

Mexico's strengths may allow it to capture the following global trends. But the window of opportunity will close within ten years, given the global speed of change and the moves by companies and investors to capture energy transition and sustainability trends. Establishing a

Exhibit 5

Sustainable materials are expected to drive global demand growth for polymers.



[1]Demand for polymers includes high-density polyethylene (HDPE), linear low-density polyethylene (LLDPE), low-density polyethylene (LDPE), polyethylene (PE), polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC), and polyethylene terephthalate (PET), and polyester fiber; does not include 180 million tons of mixed plastic waste from previous production that is assumed to be reused.
Source: McKinsey Chemicals Demand Model

[16] Based on McKinsey LCOE model by country.
[17] "Economic indicators database," EIU Viewpoint, Economist Intelligence Unit, accessed October 20, 2022.

presence in new value pools could lead to higher margins and attract new investment.

Growth in the market for sustainable materials and circular economy

Growth of fossil-based chemicals is anticipated to slow to 1 percent per year, while materials made from sustainable feedstock[18] are forecast to grow about 11 percent per year to 2040, representing more than 30 percent of overall polymer demand by 2040 (Exhibit 5). Country regulations and consumer brand commitments, such as the National Agreement for the New Plastics Economy in Mexico, could spur growth and support further investment.

Mexico's position as an early adopter and regional leader in collection rates for PET mechanical recycling offers the potential to expand to other polymers. Investment in high-density polyethylene (HDPE), low-density polyethylene (LDPE), polypropylene (PP), and polystyrene (PS) mechanical-recycling capacity could increase the supply of recycled content destined for both the domestic and export markets, particularly in nonfood applications. Advanced recycling (such as pyrolysis and methanolysis) provides opportunities to process harder-to-recycle plastics and packaging formats and generate content approved for food contact. Large international producers in Mexico could access recycled feedstock and scale chemical-recycling technologies using their global partnerships and consortiums.

The energy transition's impact on decarbonization

Chemicals play a key role in the energy transition. Products made from chemicals have a lower effect on greenhouse-gas emissions compared with materials such as glass and aluminum.[19] They also form the basis of materials for electric vehicles, renewable equipment, and green buildings. Through its nationally determined contribution (NDC), Mexico has committed to unconditionally reducing emissions by 22 percent below a business-as-usual scenario by 2030.[20]

Mexico's chemical companies could not only improve energy operational efficiency but also consider carbon-neutral or zero-carbon methods for production (for example, electric crackers, hydrogen furnaces, or ammonia burners) to reduce Scope 1 and 2 emissions, leveraging lower-cost renewable resources in Mexico. Moreover, Mexican chemical players could collaborate with the country's large customer base for chemicals to replace high-emission materials (such as aluminum and paper in packaging) with recycled plastics and other low-carbon chemicals to reduce Scope 3 emissions.

Nearshoring and regionalization trends could spur new investment

Regionalization is gaining momentum.[21] North America imports significant volumes of manufactured goods from Asia but is facing global supply chain issues, increasing labor costs in Asia, volatile logistical costs, and pressure to lower carbon emissions, all of which could accelerate the need for regionalization and nearshoring. In addition, the recently signed US Inflation Reduction Act of 2022 creates incentives to localize cleantech manufacturing. This could encourage regionalized production and sourcing of related value chains such as solar-panel materials and inverters.

Mexico is the United States' third-largest trade partner behind the European Union and China.[22] Mexico could be a candidate for companies looking into nearshoring opportunities, given the country's free-trade agreements and proximity to the United States. Mexico could also be an attractive destination to serve the US market because of lower labor costs, the absence of tariffs, comparatively

[18] Mechanically recycled, advanced-recycled, or bio-based materials.
[19] *Climate impact of plastics*, McKinsey, July 2022.
[20] *Experts Blog*, "Mexico publishes unambitious updated NDC," blog entry by Carolina Herrera, Natural Resources Defense Council (NRDC), January 7, 2021.
[21] *Globalization in transition: The future of trade and value chains*, McKinsey Global Institute, January 2019.
[22] According to the Office of the US trade representatives: 2019 U.S. goods imports from the European Union 27 were $515 billion, followed by China ($452 billion) and Mexico ($358 billion).

low transportation costs, and shorter transit time. We identified ten industries that have high potential for regionalization (Exhibit 6). Mexico's chemical industry, particularly specialties, could take advantage of this megatrend by supplying nearshoring manufacturing industries.

Population and nutrition imperative

The global agriculture industry is facing disruption on a variety of fronts. Higher agricultural productivity will be necessary as the world's population grows: forecasts show a 12 percent increase in population by 2030.[23] But constrained

Exhibit 6

Ten industries will likely benefit from regionalization and chemicals.

Feasibility of regionalization in North America by industry and chemical usage demand

Low *High*

Feasibility of regionalization

Application usage of chemical type, %

< 5 *5–10* *10–15* *> 15*

Chemical use intensity

Regionalization potential	**Industries**[1]	Economic drivers[2]	Noneconomic drivers[3]	Petrochemicals	Specialty	**Sample chemical usage**
High	Medical devices					ABS[5] resins for device housing, thermoplastics
	Semiconductor and electrical components					Substrates, encapsulants, membranes
	Computer and electronics					Plasticizers for component wiring, display materials
	Pharmaceuticals					Active ingredients, water-soluble chemicals
Median	Automotive					Catalysts, rubber
	Electrical equipment					Silicon wafers, photoresists
	Machinery and equipment					Engineering plastics, corrosion inhibitors
	Chemicals					Base chemicals and intermediates
	Mobile and other communication equipment					Plating chemicals, etchants
Low	Aerospace					Epoxy adhesives, synthetic lubricants
	Furniture					Pigments and colorants, adhesives and sealants
	Food and beverage					Flavors and fragrances, additives, PET[6] bottle resin
	Apparel					Polyester fiber, nylon, surfactants
	Textile					Flame retardants, bleaching agents

Note: Excludes industries dealing with natural resources, including agriculture, metals, glass and cement, mining, paper, petroleum, and wood industries.
[1]Resource-intensive industries are not included, such as agriculture, mining, utilities, forestry and paper, and oil and gas. [2]Economic drivers include shifts already unfolding, demand growth, trade intensity, capital intensity, knowledge intensity, product complexity, and access to resources. [3]Noneconomic drivers include national security, national competitiveness, self-sufficiency, and sustainability. [4]Percentage of demand in petrochemical and specialty by end industry.
[5]Acrylonitrile butadiene styrene. [6]Polyethylene terephthalate.
Source: McKinsey analysis

[23] "2022 revision of world population prospects," United Nations, accessed October 20, 2022.

land availability could tighten food supply: 20 to 40 percent of land is already degraded,[24] and weather volatility is increasing. A growing focus on organic farming and sustainability would require more efficient use of fertilizers and biofriendly crop protection chemicals.

Mexico is among the world's top 15 food producers.[25] However, the country's demand for agrochemicals has depended mainly on imports, especially fertilizers, where imports represent more than 40 percent of total demand. Mexico is well placed to revive its fertilizer industry, serve crucial agriculture states such as Michoacan, and develop biological crop protection products with agtech services.

In addition to the trends described above, electrification, biofeedstock growth, demand reconfiguration in developing regions, and other trends could have a potentially favorable impact on Mexico's chemical industry.

Potential growth pathways for Mexico's chemical industry

To assess the prospects of the Mexican chemical industry, we developed four pathways that model the industry's GDP. The discussion is grounded in comparisons among these pathways rather than promoting a specific agenda. One pathway, "stay the course," envisions little or no growth in the industry. The other three project various levels of growth based on levels of infrastructure development, the approach to feedstock sourcing, and the ability to innovate and invest.

If the industry stays its course, Mexico will need to import about $40 billion worth of chemicals (more than half of the country's chemical consumption) by 2035 and incur an extra 5 to 10 percent in logistics and procurement costs, potentially eroding profit margin potential for downstream industries. This could not only erode the value and competitiveness of existing chemical assets in Mexico but also result in the loss of opportunities to capture value in regionalization and sustainability. Those opportunities could be worth $6 billion to $10 billion per year by 2035.

On the opposite side of the spectrum of growth, in the "reimagine the industry" pathway, Mexico could almost double the size of its chemical industry and add 4 percent to GDP over the next 15 years.[26] That includes $7 billion to $17 billion directly in chemical GDP per year and $20 billion to $30 billion indirectly in GDP per year in the rest of the economy, as well as another $4 billion to $5 billion per year in GDP increase from capital spending.[27] This pathway could also create 40,000 direct chemical manufacturing jobs, 90,000 chemical-supporting jobs, and up to 200,000 indirect jobs in 2035.[28] That's equivalent to half of the annual jobs created in Mexico in the past ten years on average.[29]

Exhibit 7 summarizes the economic impact of the four pathways on Mexico's chemical industry. We ordered the pathways based on the scale of investment required.

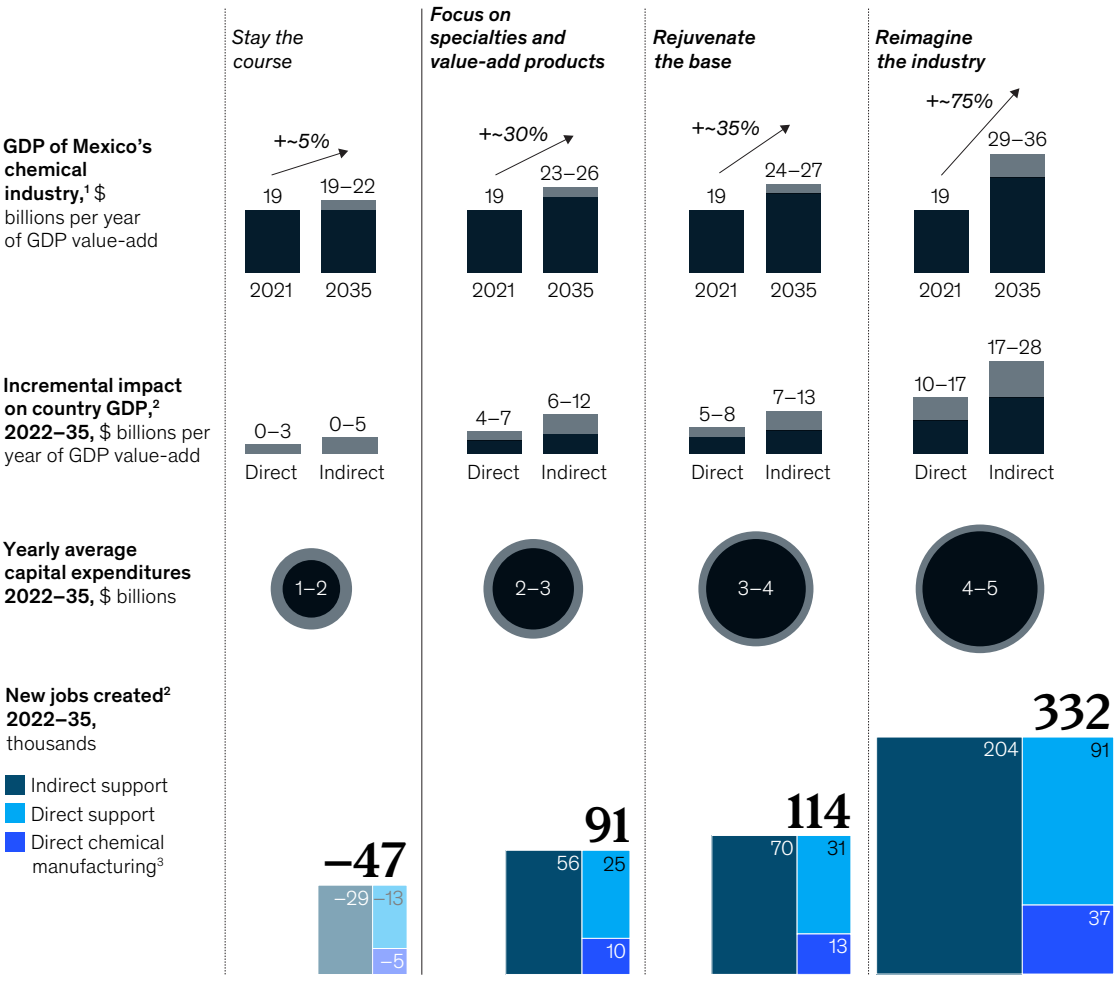
Stay the course

Under the current trajectory, growth in Mexico's chemical industry would remain almost flat. The

[23] "2022 revision of world population prospects," United Nations, accessed October 20, 2022.
[24] *Global land outlook, second edition: Land restoration for recovery and resilience*, United Nations Convention to Combat Desertification, April 27, 2022.
[25] Based on gross food production value in 2019; see "Value of agricultural production," FAOSTAT, Food and Agriculture Organization of the United Nations, accessed October 20, 2022.
[26] $30 billion to $50 billion a year compared with total Mexican GDP of about $1.2 trillion.
[27] A total of GDP increases of $60 billion to $75 billion in capital spending over 14 years.
[28] Chemical-supporting jobs are nonmanufacturing roles in chemical companies, such as human resources; indirect jobs are jobs created by suppliers.
[29] According to the Instituto Mexicano del Seguro Social (IMSS), 526,000 jobs have been created per year (on average) in Mexico from 2012 to 2021.

Exhibit 7

There are three growth pathways for capturing the industry's full potential.



Note: Additional impact on GDP and jobs might come from the spending of employees in the supply chain and short-term capital expenditures.
[1]Includes petrochemicals, specialties, fertilizers and agrochemicals, industrial gases, paint and inks, soap and detergents, rubber, and converters of plastics products (categories in Nomenclature of Economic Activities [NACE] codes 20 and 22; basic pharma products excluded).
[2]Direct includes impact coming from the sector's own economic activities, and indirect includes impact on sector's first level of suppliers and sector's subsequent level of suppliers (suppliers of suppliers). Excludes compounder, formulator, and converter jobs.
[3]Considers chemical manufacturing jobs as indicated in INEGI's Monthly Survey of Manufacturing Industry (EMIM).
Source: McKinsey Chemical Insights

petrochemical sector is expected to contract by 20 to 30 percent from 2021 to 2035, challenging the industry's utilization and competitiveness; petrochemical and resin import volume could grow from about 50 percent today[30] to roughly 55 to 60 percent in the same period.

On the other hand, underpinned by the growing demand of the manufacturing sector, Mexico's specialty-chemical, downstream-formulation, and conversion segments are expected to continue to expand at 1 to 2 percent a year. In this pathway, total investment would be kept at a minimum level

[30]Total net import of petrochemicals by volume.

of about $20 billion[31] over the next 15 years for industry maintenance. Mexico's chemical industry would experience minimal growth, from about $19 billion GDP value-add in 2021 to only $19 billion to $22 billion by 2035.

Focus on specialties and value-added products

In this growth pathway, the industry could develop capabilities to supply downstream specialty chemicals, formulations, and tailored applications to support domestic manufacturing and export-oriented nearshoring industries, while importing most petrochemicals and intermediates. Building innovation ecosystems, adapting new operating models, and upgrading chemical logistics infrastructure could be the key to success.

In this pathway, instead of investing in domestic feedstocks or petrochemical production, Mexico's industry could produce selective specialty chemicals and agrochemicals to serve local and export markets using imported intermediates. Industries with nearshoring potential (such as the automotive, electrical-manufacturing, pharmaceutical and healthcare, and transport industries) would drive local demand for and investment in specialty chemicals, including pigments and colorants, electronic chemicals, active ingredients, and carbon fiber.

In addition, Mexico could further expand its chemical formulations and compounding services for the region and be a launchpad for low-carbon chemical-formulation solutions. Mexico could partner with customers to help meet their sustainability-related targets; this could be done by increasing output of recycled content via mechanical- and advanced-recycling pathways and promoting the use of low-carbon-produced chemicals in the manufacturing of consumer products.

This pathway would require a total investment of $30 billion to $40 billion over the next 15 years ($2 billion to $3 billion per year on average). Building a competitive specialty-chemical sector would require business models different from those employed by commodity chemical companies. Also, the sector would have to reinvigorate its innovation capabilities. Public and private stakeholders could consider establishing public research institutions to improve research and development capabilities and encourage broader collaboration with universities. One example is the US National Science Foundation's funding for the Centers for Chemical Innovation.

Rejuvenate the base

In this pathway, Mexico would address challenges within existing infrastructure, maximize utilization, and further strengthen chemical value chains. Feedstock plays a vital role in petrochemicals' day-to-day operation and production. Securing feedstocks would be a prerequisite to improving existing assets' utilization rates and rejuvenating petrochemical assets. Mexico would need to invest significantly in upstream and midstream infrastructure to secure enough feedstock (such as ethane, propane, and naphtha) for the chemical industry. This includes increasing upstream gas field production, upgrading fractionation facilities for ethane extraction, modernizing existing refineries to improve utilization, and producing more propylene, naphtha, and aromatics.

Feedstock availability would help rejuvenate Mexico's existing ethane crackers in Coatzacoalcos to maximize asset utilization. The announced Tuxpan–Coatzacoalcos gas pipeline would support existing ammonia plants in Coatzacoalcos and potentially revive fertilizer production. In addition, multiple petrochemical value chains (for example, ethylene oxide and vinyl chloride) currently waiting for ethylene availability could restart production and supply further downstream chains. The increase in domestic chemical production would also enable Mexican companies to further invest in specialties production and reduce imports.

The rejuvenation pathway would require $45 billion to $55 billion of investments over the next 15 years ($3 billion to $4 billion per year on average). The public and private sectors would need to collaborate

[31] Based on historical maintenance capital expenditures reported from "Anuario Estadístico de la Industria Química Edición 2022," 2022.

closely to help encourage production growth. Mexican regional chemical leaders would also need to invest capital and resources to revive their derivative assets and maximize integration with upstream feedstocks. The scale and extent of rejuvenation investment would also depend on existing asset conditions and future sustainability requirements; inefficient legacy assets may not be able to compete with sustainable, energy-efficient assets in the future (Exhibit 8).

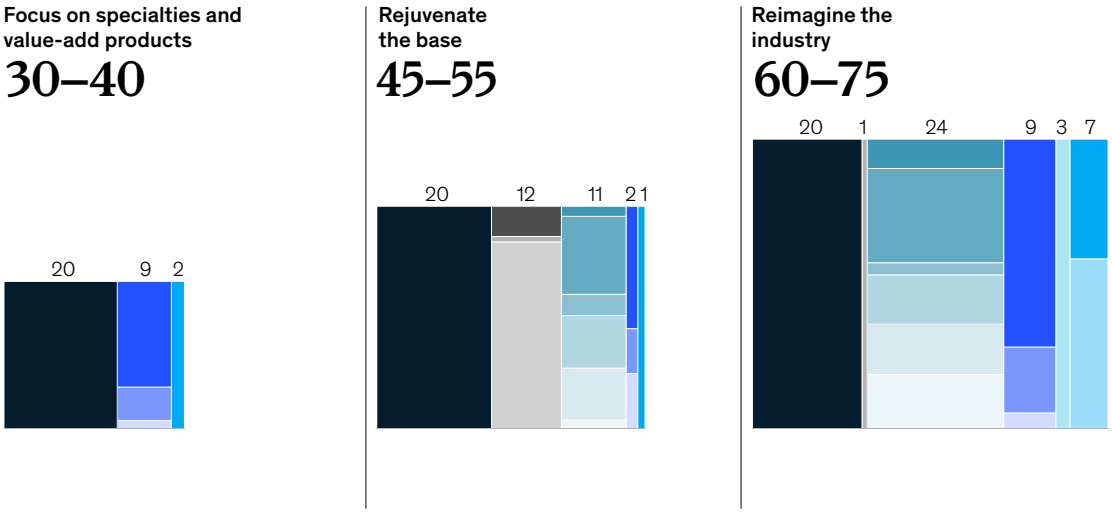
Reimagine the industry

In this pathway, Mexico's chemical industry could maximize its potential through investments in decarbonization and circularity to expand its chemical base; infrastructure to enable ample and economical transport of feedstocks from international markets; and new chemical assets to capture opportunities from future domestic hydrocarbon imbalances.

Exhibit 8

The scale and focus of the investment required will vary by scenario.

Cumulative capital expenditure required over the next 15 years, $ billions



Key changes required

Maintenance capital expenditures across the industry[1]

Secure feedstocks
- Increase upstream gas production
- Upgrade or expand fractionation and improve import infrastructure
- Modernize existing refineries

Replace imports of petrochemicals
- Upgrade or expand cracking capacity
- Improve polyolefin self-sufficiency
- Integrate polyester family value chain
- Grow inorganics value chain production
- Expand aromatics and derivative production
- New offerings in engineering plastics

Grow specialties and value-add services
- Grow presence serving regional nearshoring and manufacturing industries
- Develop offerings for other industries such as packaging and personal care
- Increase specialties services (eg, compounding and formulations)

Support agriculture resiliency
- Reduce fertilizer imports and grow crop protection

Develop sustainability presence
- Increase mechanical and develop advanced recycling capacity
- Develop green H_2 and ammonia

Note: Figures may not sum, because of rounding.
[1]Based on historical average maintenance capital expenditure spend, excluding new major project capital expenditures.
Source: McKinsey Chemical Insights

To address the feedstock issue, Mexico could consider importing low-cost feedstocks from the global market. Mexico is close to two of the world's lowest-cost oil and gas basins: the Permian Basin and Eagle Ford in the southwestern United States. And Mexico's proximity to the United States means Mexico would pay less for ethane imports to supply its ethane crackers than countries in Asia and elsewhere do. The naphtha and refinery-grade propylene from Mexico's refineries would provide feedstock options for the chemical industry.

Mexico could also invest in petrochemicals to integrate existing chemical chains and serve local demands. Value chain integration could allow the industry to continuously upgrade the value of hydrocarbons and maximize asset synergies. Mexico has multiple chemical chains with missing intermediates, such as polyester and polyvinyl chloride (PVC) chains. Investing in intermediates and expanding derivatives would help Mexico strengthen its petrochemical position.

In agrochemicals, Mexico could reduce its reliance on fertilizer imports by developing new capacity to serve its major agricultural states in the Pacific coast. For crop protection chemicals, Mexico could explore biological pesticides to reduce the load of synthetic chemicals and promote digital tools to empower farmers in making informed decisions.

Finally, developing sustainable products could be a significant differentiator for Mexico in places where sustainability markets are still nascent:

— *Expanding circularity capabilities.* Mexico is already a leader in plastics recycling. It could use its existing recycling ecosystems to enhance the collection of plastic waste necessary for use as feedstock. Incorporating chemical recycling into the mix of production methods to generate recycled material would be necessary to meet domestic brand-driven demand for recycled content. Expanding recycling production into non-PET plastics and hard-to-recycle applications of PET would also position Mexico's chemical industry to service strong demand in export markets.

— *Decarbonizing the industry with green hydrogen and green ammonia.* Mexico has abundant solar and wind resources (for example, solar in the north and wind in Oaxaca). Mexico could use these resources to become a leader in supplying green hydrogen and green ammonia to help decarbonize the refining and chemical industries.

In this pathway, Mexico would need to invest $60 billion to $75 billion in the chemical industry over the next 15 years ($4 billion to $5 billion per year on average). It would be an unprecedented level of investment for Mexico, but countries such as India and Brazil have achieved it in recent decades.[32] This investment would require concerted efforts across various stakeholders in the industry; a robust collaboration mechanism could strengthen long-term ties between industry players and national authorities and encourage investment. Both public and private R&D activities would need to be encouraged to promote investment in specialty chemicals, low-carbon chemicals, and green hydrogen–based products.

Assessing the industry's full potential

If Mexico pursued the full range of levers available, the chemical industry could almost double in size, adding another $7 billion to $17 billion per year to the industry's GDP by 2035 (Exhibit 9). Should Mexico achieve its full potential, it would become the world's tenth-largest chemical industry by 2035, on par with Brazil.

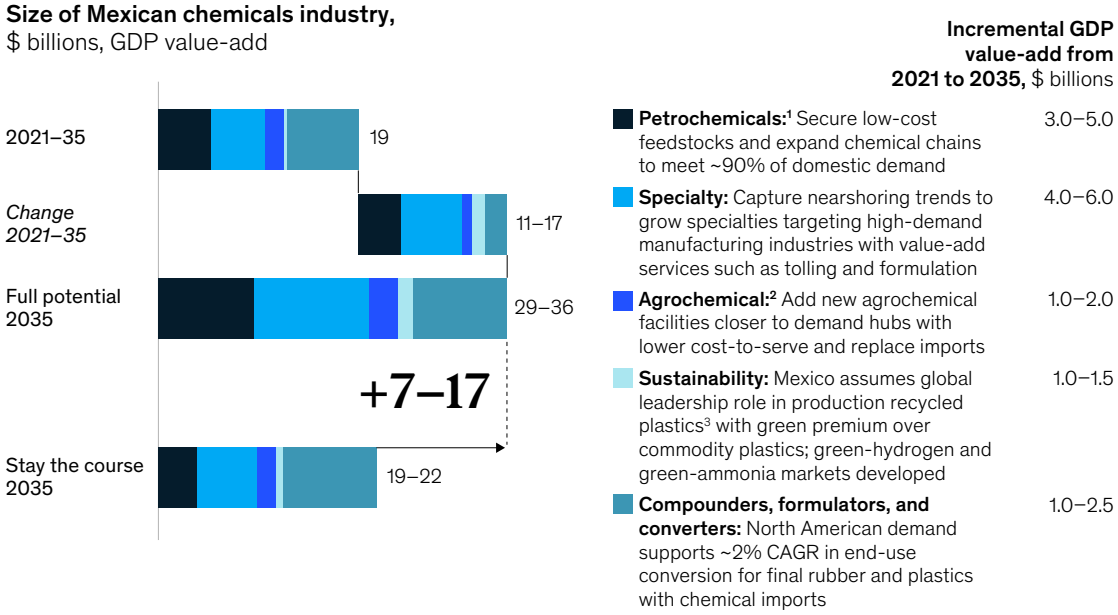
— For petrochemicals, the sector has the potential to grow $3 billion to $5 billion by serving local markets, reducing import dependence to about 10 percent, and increasing use of existing assets.

— For specialty chemicals, there is a $4 billion to $6 billion growth opportunity to capture nearshoring trends and target high-demand manufacturing industries.

[32] India and Brazil spent about $80 billion and $67 billion, respectively, in chemical industry capital expenditure in the past 15 years (2007–21 in 2015 real dollars); S&P Global Market Intelligence.

Exhibit 9

By pursuing the right investment, Mexico's chemicals industry can capture $7 billion to $17 billion in additional value by 2035.



[1]Includes petrochemicals, plastics and resin in its primary form, and inorganic chemicals.
[2]Includes fertilizers and crop protection chemicals.
[3]Polyethylene (PE), polypropylene (PP), polystyrene (PS), polyvinyl chloride (PVC), and polyethylene terephthalate (PET).
Source: McKinsey Chemical Insights

— For agrochemicals, Mexico could revamp its fertilizer production and strengthen crop protection solutions, creating a $1 billion to $2 billion value-add.

— For sustainability, Mexico could establish its leadership position in recycling to incorporate a wider variety of waste plastics into its recycling ecosystem and invest in green hydrogen, potentially adding another $1.0 billion to $1.5 billion to the chemical industry.

The chemical industry in Mexico is at a turning point. Global trends are opening new growth avenues, but much work remains for Mexico to be able to capture the opportunity.

Pablo Ordorica Lenero is a senior partner in McKinsey's Mexico City office, where **Rafael Scott** is a partner; **Manuel Prieto** is a partner in the Houston office, where **Yasmine Zhu** is a consultant; and **Theo Jan Simons** is a partner in the Cologne office.

The authors wish to thank Yuyang Du, Federico Gonzalez, Craig Poeppelman, Andrew Ryba, Sam Samdani, Alexandra Tennant, Matthew Veves, Jeremy Wallach, and Adam Youngman for their contributions to this article.

Designed by McKinsey Global Publishing