2024 chemical industry outlook

The chemical industry should balance short- and long-term goals to weather the uncertainty in the current landscape and position itself for the future.

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After a challenging end to 2022, many in the chemical industry anticipated a modest rebound in production in 2023. But, by mid-2023, several chemical companies significantly revised down their expectations.[1] Multiple factors contributed to sluggish demand for chemicals globally, including a recession in Europe, inflation in the United States, and a smaller-than-expected rebound in demand from China. In addition, over-ordering in 2021 and 2022 resulted in high inventory levels, leading to months of destocking. Consequently, chemical output grew less than 1% year over year in the first eight months of 2023, with many segments experiencing lower output.[2] Many companies have turned their focus to reducing costs and improving efficiencies to help offset this reduction in output.

In the United States, fears of an economic downturn have faded with increased signs of a "soft landing," but economic growth is still expected to slow down,[3] leading many analysts to forecast only a modest rebound in chemical production.[4] Destocking will likely transition to restocking for many chemicals, but the underlying weakness in demand and overcapacity for some products will likely continue. Under these market conditions, chemical companies should balance their short- and long-term goals. The American Chemistry Council expects that capital spending for the US chemical

industry will remain mostly unchanged year over year in 2024 before ramping up to a growth rate of 3%–4% annually in 2025–2026.[5] But, *where* chemical companies deploy this capital could be critical in determining their competitive position in the coming years.

That is in part because the competitive landscape is changing. These changes can present new opportunities for chemical companies but, at the same time, expose the industry to new vulnerabilities. Over the last three years, stakeholder pressure and government policies have incentivized investment in the energy transition. As a result, there appears to be an acceleration in the convergence of sectors related to the energy transition. For instance, some oil and gas companies are moving into critical minerals mining and processing,[6] agriculture,[7] and chemicals[8] to secure clean energy supply chains. Meanwhile, some chemical companies are moving into lithium processing, battery manufacturing,[9] and clean ammonia[10] for similar reasons. Therefore, while there are new opportunities for chemical companies, the industry is also competing with other industries that often have stronger cash flows, such as large oil and gas companies.

To help companies begin to strategize about addressing these issues, the following trends have been investigated in the 2024 chemical industry outlook:

- Demand drivers
- Regional dynamics
- Digital and artificial intelligence
- Circular economy
- Sustainability and trust

Key trends

01
The energy transition is generating a **wave of manufacturing activity that depends on chemicals** and materials for support.

02
The **regional competitive landscape has changed significantly** over the last three years, leading many in the chemical industry to rethink their long-term strategies.

03
Digital and artificial intelligence (AI) technologies are important to the future of many industries, but in the chemical industry, **data is becoming an important feedstock for innovation and operational excellence.**

04
Chemical leaders seeking a competitive edge often realize the **vast possibilities of a circular economy.**

05
Increased transparency and collaboration can go a long way in **helping chemical companies build trust and differentiate their brand.**

Source: Deloitte analysis.

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1. Demand drivers: Energy transition drives chemical demand

The energy transition is generating a wave of manufacturing activity that depends on chemicals and materials for support. New government policies and incentives have spurred investment in the energy transition over the last two years. The Infrastructure Investment and Jobs Act (IIJA) was signed into law in late 2021, and it infused more than US$70 billion to electric vehicle (EV) infrastructure and clean energy transmission.[11] Then, in the summer of 2022, Congress passed the Creating Helpful Incentives to Produce Semiconductors (CHIPS) and Science Act and the Inflation Reduction Act (IRA), infusing another US$469 billion in tax incentives and funding into sectors such as domestically manufactured semiconductors, lithium-ion batteries, solar panels, and other clean energy technologies,[12] as well as the components and material inputs for these products.

So, while total demand for chemicals was soft in 2023, demand for chemicals and materials that are needed to support the energy transition is expected to rise in 2024 and beyond as the impact of these policies reverberates through the economy.

Impact on demand

How might the energy transition impact overall demand in 2024? In 2023, an estimated US$2.8 trillion was invested globally in energy, with more than 60% invested in clean energy technology, such as renewables, EVs, and battery storage.[13] Part of this has been in response to the policy of the United States that is helping spur private-sector investment. For example, in the year after the CHIPS Act was signed into law, the private sector announced US$166 billion in investments in semiconductor plants,[14] and in the year since the IRA was signed into law, the private sector announced approximately US$88 billion in clean energy manufacturing.[15]

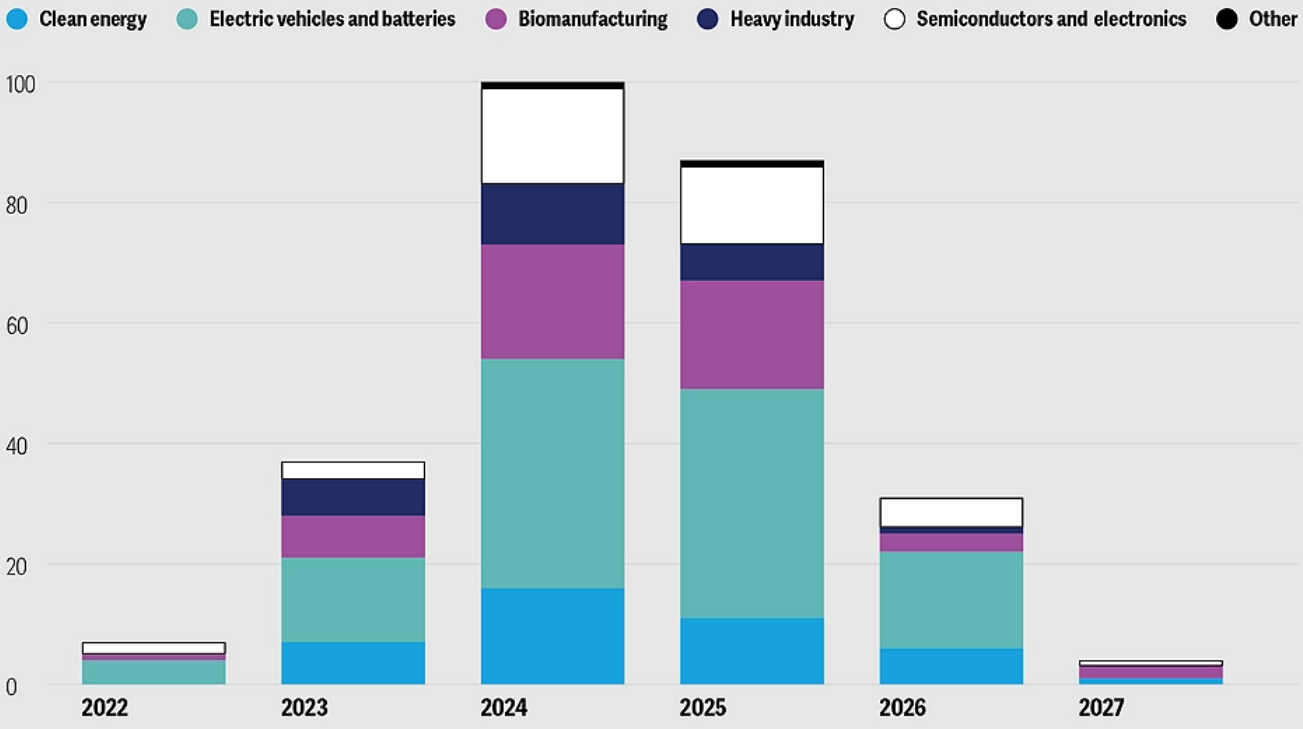
As this private sector investment rolls out, not only will new plants be built and production rise, but due to content requirements, demand for US-sourced inputs will also likely rise. And while total US manufacturing output remained mostly flat quarter-on-quarter in Q2 2023, output in motor vehicles and semiconductor manufacturing (sectors impacted by the IRA, IIJA, and CHIPS) increased 11.3% and 6.7%, respectively.[16] Due to prior inventory builds and destocking, the chemical industry may not have had its production impacted significantly by these recent increases in output—but that is expected to change in 2024.

The chemical industry supports more than 75% of all emissions reduction technologies needed to meet net-zero goals by 2050.[17] For instance, the industry manufactures battery materials for EVs; refrigerants for heat pumps; epoxy, polyurethane, and lubricants for wind turbines; and solvents for semiconductors. These sources of demand will likely drive increased production in the chemical industry in 2024, as more than 100 projects are expected to come online in the coming year (figure 1).

Figure 1

Several manufacturing projects have been announced since 2021 that could increase demand for some chemicals

Number of projects



Source: Deloitte analysis of the White House's Investing in America website (accessed September 26, 2023), press releases, and news articles.

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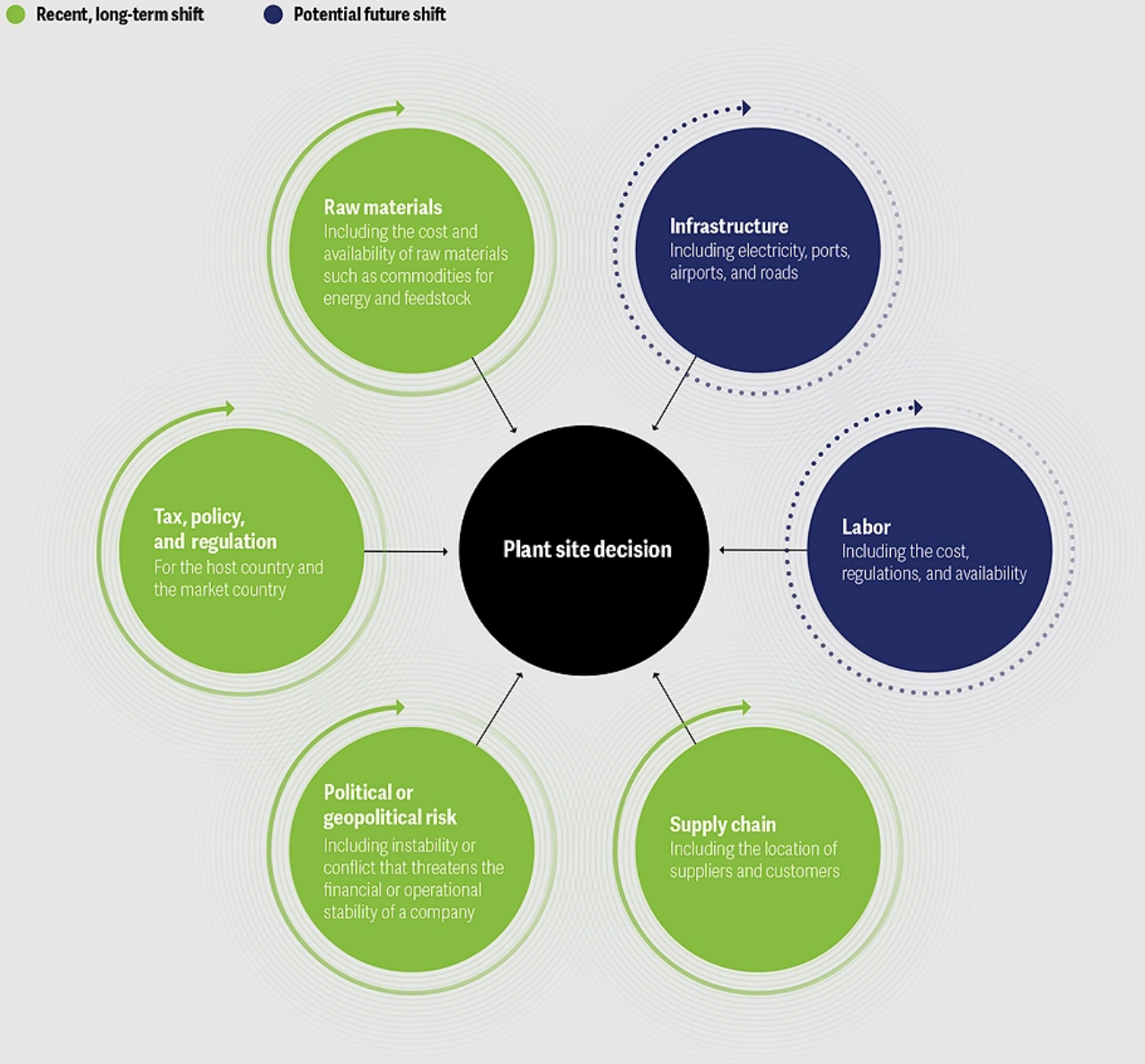
2. Regional dynamics: Regional competition heats up, driven by commodity prices, policies, and supply chain concerns

The regional competitive landscape has changed significantly over the last three years, leading many in the chemical industry to rethink their long-term strategies. Energy market volatility, evolving regional policy, and supply chain disruptions have sparked concerns about the deindustrialization of Europe and led some chemical companies to re-examine their assets and supply chains. And additional shifts in talent requirements and clean electricity availability are expected to arise as technology evolves and decarbonization efforts increase (figure 2). Chemical companies are expected to

continue shifting their portfolios in 2024 as they make strategic decisions about the future of their business in this new landscape.

Figure 2

Many of the factors considered for plant site selection have recently shifted or are expected to shift in the near future



Source: Deloitte analysis.

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Impact of commodity prices

Historically, the relative cost of energy and feedstock has regularly impacted the regional competitiveness of chemical production for short periods. However, recent geopolitical events have altered this competitiveness for the foreseeable future; this has

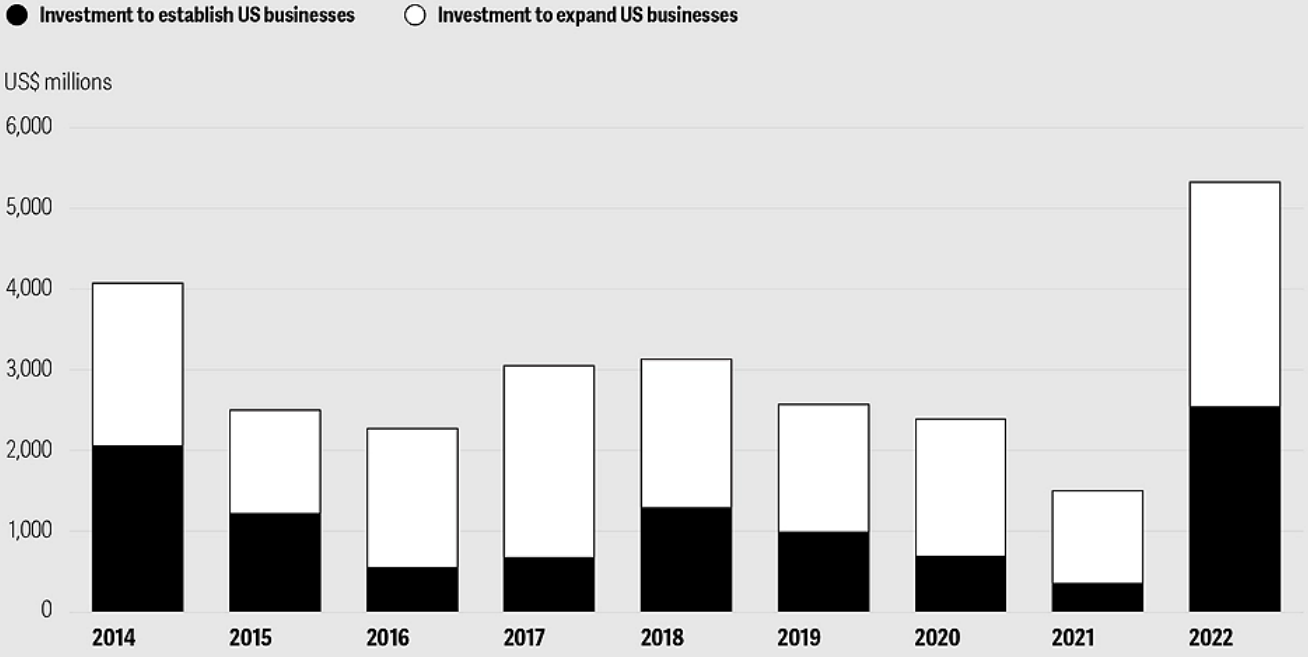
led some companies to rethink the viability of their assets. Global liquefied natural gas (LNG) prices moderated in 2023 following record highs in summer 2022.[18] Still, LNG spot markets will likely remain volatile as the market balances new export and import capacity, likely leaving much of European demand exposed to global prices until it switches to cleaner alternatives or secures more volume under long-term contracts. Meanwhile, the United States and the Middle East are expected to benefit from relatively cheap domestic sources of natural gas and liquefied petroleum gas (LPG), while China may benefit from oil and gas trade with Russia and larger volumes of LNG under long-term contracts.

Impact of policies

New climate-related policies are also impacting regional competitiveness. In February 2023, Europe announced the Green Deal Industrial Plan to counter US subsidies and prevent an exodus of industrial activity from Europe.[19] In addition, the Cross Border Adjustment Mechanism (CBAM) was adopted in May 2023 to help level the playing field between European Union and foreign producers by putting a carbon price on certain carbon-intensive products.[20] The implications of the CBAM are not expected to be fully realized until 2026 at the earliest, but it could bifurcate global markets into more carbon-intensive and less carbon-intensive product markets, which would likely have implications for chemical producers globally. Meanwhile, after the passage of the IRA and CHIPS Act, US domestic manufacturing has grown, and foreign investment in manufacturing businesses has risen to its highest level in over eight years in 2022 (figure 3).[21]

Figure 3

Real new foreign direct investment in US manufacturing rose to the highest level in more than eight years in 2022



Note: Data deflated using Producer Price Index (2022=100).

Source: Deloitte analysis of US Bureau of Economic Analysis' New Foreign Direct Investment in the United States and US Bureau of Labor Statistics' Producer Price Index.

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Impact on supply chains

Onshoring, nearshoring, and friendshoring are gaining momentum. Supply chain disruptions became pervasive during the COVID-19 pandemic and were exacerbated by the Russia-Ukraine war.[22] In addition, pressure to decarbonize is incentivizing the localization of supply chains. Not only does localization improve the economics of bio-based and recycled feedstocks, but the reduction in long-haul transport also reduces supply chain emissions. Meanwhile, friendshoring aims to help mitigate geopolitical risks and was visible in a recent deal between Australian and US companies, where the companies merged to secure a lithium supply chain.[23]

Market share battle for olefins and polyolefins

One aspect in which regional dynamics are changing the landscape is olefins and polyolefins. In 2023, China completed more than 20 petrochemical projects, pushing its global share of petrochemical capacity up to 25%.[24] Refiners in China have moved away from fuels toward petrochemicals in anticipation of declining demand for fossil-based transport fuels. China expanded capacity down the supply chain as it moved toward self-sufficiency, adding ethylene, propylene, polyethylene, and polypropylene capacity. At the same time, plants in the United States and the Middle East have benefited from more competitively priced feedstocks. With ethane production growing in the United States, companies are building out ethylene and polyethylene capacity to absorb the feedstock, even as ethane exports continue to rise.[25] But, global utilization rates at polyethylene and polypropylene plants have declined as supply outpaced demand.[26] So, one question in 2024 will be whether low utilization rates could lead to permanent plant closures in China and Europe or could these plants weather the challenging market environment until the market balances.

3. Digital and artificial intelligence: Data is becoming an important feedstock for chemicals excellence

Digital and artificial intelligence (AI) technologies are important to the future of many industries, but in the chemical industry, data is becoming an important feedstock for innovation and operational excellence. The chemical industry has been digitalizing its operations for decades, but it is only recently that digitalization has accelerated to a point where companies should *be digital* to help retain a competitive advantage. Companies seem to be moving past the stage of addressing specific use cases in silos and moving toward a broad approach to digitalization that integrates systems across operations and businesses. With digital integration, companies are benefitting from increased productivity, accelerated innovation, improved decision-making, and stronger customer relations.

Rate of adoption

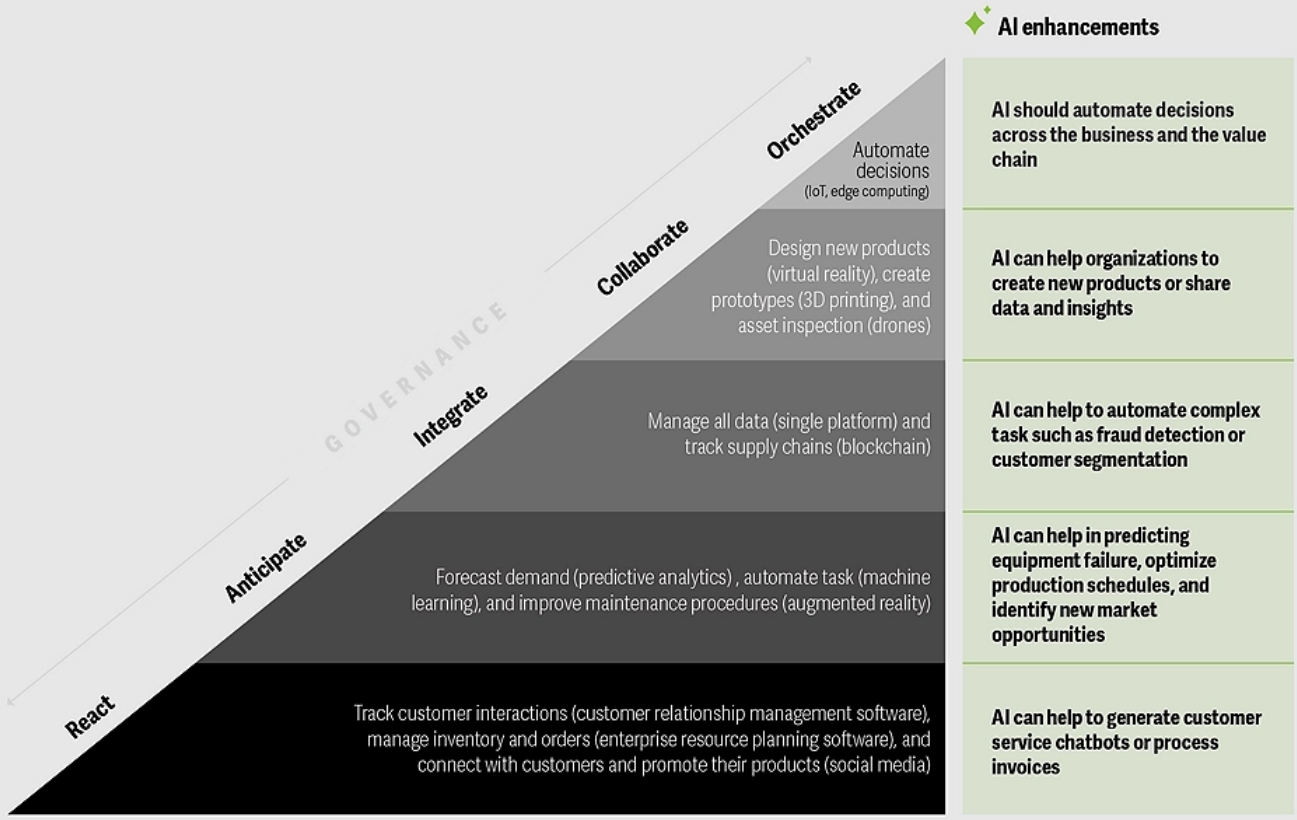
Digital investments dropped in 2023 in part due to a slower US economy and high interest rates. After a 6.6% rise in 2022, chemical industry spending on information technology is projected to fall 0.1% in 2023.[27] However, 94% of leaders surveyed by Deloitte say AI will be critical to the success of their organization over the next five years.[28] Therefore, this drop is expected to be short-lived. Several chemical companies have announced AI programs to accelerate research and development (R&D) for sustainable products,[29] predict the impact of changes in production of one product or other processes,[30] and gain insights by tracking data through the entire value chain.[31]

The rise of AI

The chemical industry is experiencing a rise in the adoption of AI technologies. Many chemical companies are using Industry 4.0 technologies such as Internet of Things, digital twin, and robotics to gather data and automate processes.[32] However, companies that have already advanced further up the digital maturity model[33] are beginning to use AI across business lines (figure 4). For instance, some companies are using AI and machine learning (ML) to build predictive models to help optimize operations or anticipate maintenance. But, the next step is implementing AI or ML along with other technologies to accelerate materials discovery, reduce time to market, and fully optimize operations. One chemical company recently worked with a technology company to use generative AI to identify new applications for existing products by analyzing data from patents, news, social networking services, and a dictionary of company products.[34]

Figure 4

AI is poised to play an important role across the digital maturity model for chemical companies



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Companies can realize the potential of digital technologies by collecting, storing, processing, and communicating massive volumes of data. Data can come from various technologies across various business activities, including sensors on machines, customer transactions, and R&D activities. The quality of this data is important to effectively using AI and other sophisticated analytics techniques to help uncover patterns and trends that can be utilized to improve decision-making.

Chemical and material companies are expected to continue digitalizing across business dimensions throughout 2024. However, there are several limitations and risks that chemical companies should consider when developing AI strategies, including the technology's cost, ethical use, potential bias, and intellectual property protection. But companies that are able to anticipate these challenges and develop digital strategies

that include governance may be able to better capitalize on the benefits of deployment.

4. Circular economy: Companies continue to develop supply chains to support circular investments

Chemical leaders seeking a competitive edge often realize the vast possibilities of a circular economy. It can offer a clear pathway toward sustainability goals by minimizing waste and reducing scope 3 emissions while retaining economic value. And momentum is expected to grow further in 2024 as new projects are announced or come online.

Plastics recycling

Investments in plastics recycling continue to rise in response to brand targets and government policies. Many brands have announced targets to use more recycled content and design their packaging to be recyclable or reusable.[35] And companies upstream in the supply chain are striving toward similar goals as they work to reduce scope 3 emissions. At the same time, restrictions and bans on single-use plastic continue to be adopted across US states and Europe. The signing of the United Nations treaty to end plastic pollution is expected to happen by the end of 2024; the details of the treaty could either slow or accelerate activity in plastics circularity.[36] Despite this momentum, only about 9% of plastics are currently recycled.[37]

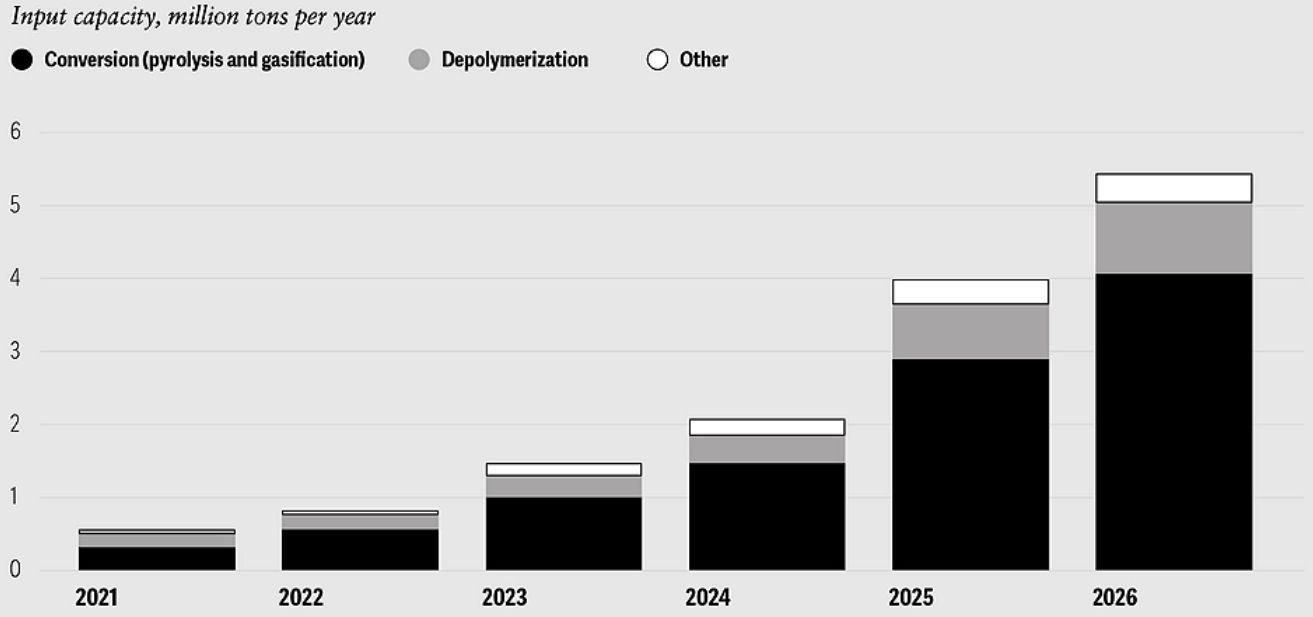
While it is accepted that mechanical recycling produces less greenhouse gas emissions than advanced recycling, the limitations of mechanical recycling—such as requiring limited types of plastics and low levels of contamination while producing lower-quality plastics—have led to an acceleration in advanced recycling announcements to reduce the amount of plastic that ends up in landfills.[38] So, while mechanical recycling currently accounts for about 96% of total plastics recycling capacity,[39] due to the feedstock limitations, advanced recycling capacity is scaling up in response to

demand.[40] If all announced projects are completed, advanced recycling capacity could more than triple between 2023 and 2026 (figure 5).[41]

Over the last few years, 24 states have passed legislation to classify advanced recycling as manufacturing rather than waste management, thereby shielding them against more stringent environmental regulations.[42] However, some states are still sorting through the market's wide range of advanced recycling technologies and their impact on the environment. Instead of federal action, more states may be likely to consider advanced recycling legislation in 2024, which could provide clarity for companies that are considering whether to expand capacity.

Figure 5

The number of advanced recycling projects is expected to grow significantly in the coming years



Source: Deloitte analysis of press releases and news articles.

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Battery recycling

Lithium-ion battery recycling has garnered attention in recent years and is poised to grow in 2024 and beyond. While China had nearly three times more recycling capacity, both existing and planned, compared to the United States in 2021,[43] the United States and Europe have accelerated development through their recent

initiatives. For instance, the IRA qualifies EV batteries recycled in the United States for the domestic manufacturing subsidy, stimulating innovation and investment in this space.[44] Furthermore, while battery scrap will likely be the feedstock for many of these battery recycling facilities initially, end-of-life EV battery volumes are expected to rise considerably in the 2030s.[45]

Bio-based feedstocks

The growth of bio-based feedstocks continues to show promise, and in March 2023, the Biden administration announced goals to displace 90% of plastics over the next two decades by harnessing biotechnology and biomanufacturing.[46] Although these are just goals, they demonstrate the direction toward which the administration is heading. Earlier in 2022, the US Department of Defense announced it would commit US$1 billion in bio-industrial domestic manufacturing infrastructure investment over the next five years to catalyze this industry.[47] These initiatives are still in their early stages but could accelerate over the coming years.

Building localized supply chains

Building resilient supply chains may be key to the success of any of these circular solutions. So far, companies have demonstrated their ability to innovate through new business models and partnerships. Some companies have signed long-term contracts with feedstock suppliers and recycled content offtakers to help minimize risks. A few companies have expanded vertically to operate along a larger part of the supply chain. And others are working with companies to build a more extensive network for feedstock and processing. Increased collaboration across the supply chain will likely continue to be critical in 2024 to take steps toward ensuring sufficient feedstock for these recycling facilities.

5. Sustainability and trust: Data and digitalization can improve brand transparency and trust

Trust is important to brand competitiveness, but some events in 2023 impacted trust levels in the chemical industry. These concerns were exacerbated when a US Geological Survey study found that at least 45% of tap water in the United States could contain one or more per- and polyfluoroalkyl substances (PFAS).[48]

But, while PFAS are top of mind for many policymakers, the issue is emblematic of a larger shift toward increased scrutiny of products, operations, and supply chains as stakeholders increasingly demand that companies work to minimize the negative impacts on health, safety, environment, and society. Chemical companies have been taking steps to minimize these impacts for years. Still, even more now, companies are expected to differentiate their products and brands by increasing transparency and improving collaboration with stakeholders.

Response to PFAS

In response to the PFAS concerns, several brands announced intentions to eliminate PFAS from their product offerings.[49] Meanwhile, regulators in the United States and Europe have proposed new rules. As part of the Green Deal announced in 2020, the European Commission committed to ban thousands of "nonessential" hazardous chemicals by 2030, including PFAS.[50] That has not happened yet, but movement toward increased regulation is likely. In the United States, the Environmental Protection Agency has proposed to designate some PFAS as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act, which would increase transparency around releases of these chemicals.[51] And more than 20 US states have also announced bans or restrictions on certain PFAS uses, such as firefighting foam, cosmetics, and food packaging.[52]

However, not all PFAS have the same physical, chemical, environmental, or toxicological properties. For instance, the two most studied PFAS, perfluorooctanoic acid and perfluorooctanesulfonic acid, were mostly phased out by 2016 due to their toxicity, mobility, and bioaccumulation potential.[53] However, many in the industry consider fluoropolymers to be polymers of low concern under the Organization for Economic Cooperation and Development criteria.[54] To complicate matters, there are currently no alternatives for fluoropolymers in some uses, such as solar panels, green

hydrogen, and lithium-ion batteries.[55] As the industry waits to see whether regulators will differentiate between PFAS compounds in upcoming rules, some companies have announced they will phase out the manufacturing and use of PFAS, and some organizations are engaged in innovating for alternatives.[56]

Differentiating through transparency and collaboration

Increased transparency and collaboration can go a long way in helping chemical companies build trust and differentiate their brand. Stakeholders typically expect access to information about the products they use, the brands they buy from, and the assets that operate in their neighborhoods. As digitalization leads to the ability to collect data across R&D, operations, and supply chains, stakeholders are asking companies to be more transparent and make responsible decisions.

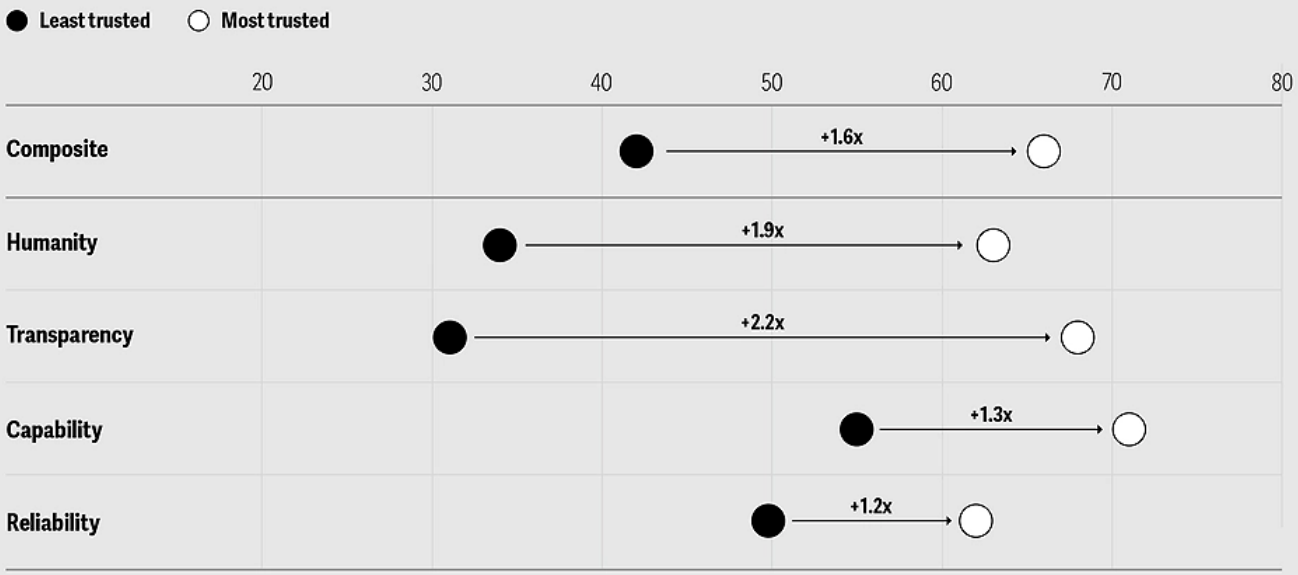
For instance, the ability of companies to trace the origin of inputs and track the emissions of products seems to be becoming more important for customers. Earlier this year, one chemical company introduced its end-to-end traceability technology that features blockchain-enabled services; this technology allows buyers to precisely trace the origin of ingredients in their products.[57] Another chemical company launched a pilot blockchain project for emissions tracking that signifies a critical step toward reducing emissions throughout value chains.[58]

More companies are realizing transparency and collaboration are important to differentiating their brand. Highly trusted companies tend to outperform less-trusted companies by as much as four times in market value,[59] as highly trusted companies develop stronger brand loyalty with customers and employees. Deloitte's qualitative and quantitative TrustID™[60] research reveals that brand trust is dependent on four factors: reliability, capability, transparency, and humanity. Chemical companies score relatively highly in reliability and capability, with the gap between high and low performers being relatively small. However, the gap between high and low performers for humanity and transparency is considerably wide, which provides chemical companies with significant opportunities to differentiate themselves in the market (figure 6).

Figure 6

The gap between "most trusted" vs. "least trusted" companies in the Energy & Chemicals industries is widest when considering the humanity and transparency factors

Brand survey index



Source: Deloitte's TrustID Brand Index Study, January 2023. Deloitte conducted a brand index survey of more than 1,300 B2B energy and chemical customers to understand how much they trust suppliers—and what exactly drives or undermines their trust.

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Securing a place in the sustainable future

Strategic positioning can be crucial for helping companies maintain competitive advantage. Many companies get caught up with short-term uncertainties, but those who successfully position their business for the future can become leaders in their industry. During downcycles, smart businesses often innovate and find ways to become more relevant, effective, and productive. This can position them to take advantage during the upcycles.

With stakeholder pressure mounting, markets shifting, policy incentives stacking up, and technology advancing, chemical companies should position themselves for the high-tech, low-carbon future. The industry leaders will likely be the ones who make strategic decisions and secure clear pathways to strong and sustainable returns now, despite the current challenging market environment.

As chemical companies move into 2024, these are some of the signposts they need to watch out for:

- **The global economy**: Recession in any part of the global economy could keep chemical demand low, putting pressure on companies that are already struggling and reducing available capital. However, the converse is also true.

- **Policy and regulation**: Continued policy activity impacting the chemical industry is expected (e.g., permitting reform, PFAS regulations, the UN treaty to end plastic pollution). These policies could accelerate momentum toward sustainability and all the factors that support it (e.g., materials innovation, technology) or potentially present headwinds (e.g., unfavorable regulations for advanced recycling), depending on how they materialize. Further uncertainty could be expected as we move into an election year.

- **Digital rollout**: The applications for new technologies, including AI, are seemingly endless. Where companies choose to roll out programs could signal where they see their competitive edge.

- **Collaboration across the supply chain**: Whether it is building new supply chains for EV development, strengthening existing supply chains for recycling, or tracking emissions through supply chains to help minimize scope 3 emissions, collaboration throughout supply chains has become critical. More partnerships, joint ventures, or other collaborations will likely signal increased activity in securing resilient supply chains and innovating products and processes.

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Acknowledgments

The authors would like to thank **Ankhi Biswas** and **Vamshi Krishna** from Deloitte SVCS India Pvt. Ltd. for their roles as key contributors to this report, including research, analysis, and writing. The authors would also like to thank the following members from the Deloitte 2024 chemical industry outlook advisory board:

· **Ryan Bottoms**, **Philip Hueber**, and **Teresa Thomas** from Deloitte & Touche LLP;

· **Amy Chronis**, **Heather Ashton Manolian**, and **Jennifer McHugh** from Deloitte Services LP; and

· **Anshu Mittal** from Deloitte SVCS India Pvt Ltd.

Furthermore, the authors extend their thanks to **Greg Bausch**, **Kevin Gregory**, **Jake Riley**, and **Ryan Youra** from Deloitte Consulting LLP, and **Julia Tavlas** from Deloitte LLP for their subject matter inputs.

Finally, the authors would like to acknowledge the support of the following:

· **Clayton Wilkerson** from Deloitte Services LP for orchestrating resources related to the report;

· **Katrina Hudson**, **Dario Failla**, and **Tara Meyer** from Deloitte Services LP who drove the marketing strategy and related assets to bring the story to life;

· **Alyssa Weir** from Deloitte Services LP for her leadership in public relations;

· **Rithu Thomas**, **Pubali Dey**, and **Harry Wedel** from the Deloitte Insights team who supported the report's publication; and

· **Gail Borden** from Benchmark Communications for her editing contributions.

Cover image by: **Rahul B**