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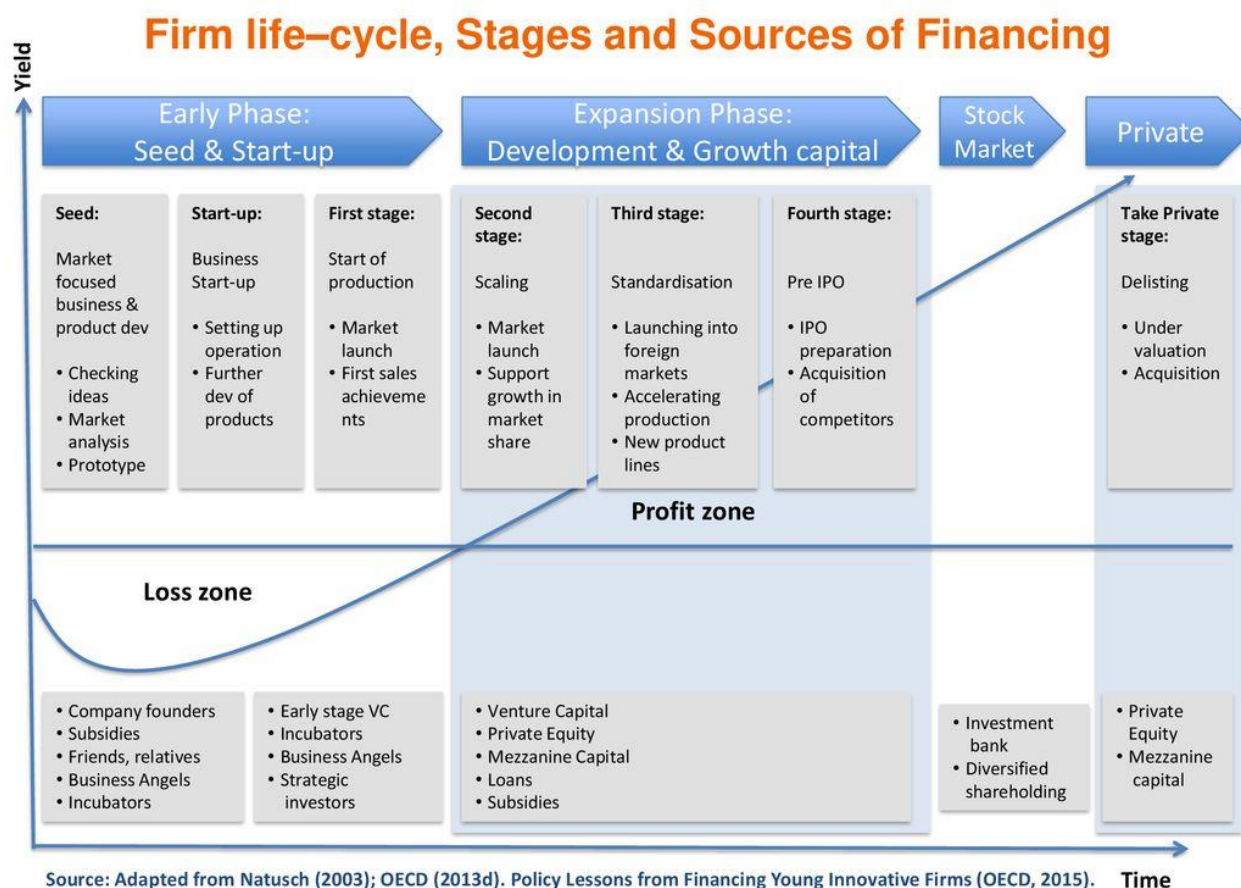


# Overview: Key Actors Influencing Investments in Sustainable Chemistry

V.1, 2023

Sustainable chemistry plays a critical role in the ESG framework, as it addresses some of the most pressing environmental and social issues facing the world today. Developing and implementing greener chemical processes and products can help reduce greenhouse gas emissions and waste, conserve resources, and minimize the use of hazardous substances. This, in turn, is essential for promoting health and safety while protecting communities that may be affected by chemical production and use. Due to the lack of industry-wide metrics for sustainable chemistry, this landscape analysis will use ESG as a proxy for sustainable chemistry efforts.

There are many ways in which financing can positively or adversely influence companies in the transition to safer, more sustainable chemistries. The investment and banking communities are diverse and fund projects from early stage to capitalization in various forms. The investment communities' actions for advancing sustainable chemistry are either focused on decreasing chemical risk through reduction of chemicals of concern in value chains or on growing sustainable chemistry solutions (i.e., chemical opportunity).



In the following discussion, we analyze key players affecting investments in sustainable chemistry for the chemicals sector and downstream users. The chemicals sector is the focus of this analysis due to its fundamental role in the transition to sustainable chemistry. The sector develops sustainable chemistry solutions to meet the demands of other sectors such as personal care, cleaning, and packaging. Our analysis found that the financial community is critical to advancing investment in sustainable chemistry (including public sector investors) but can in some cases inadvertently impede progress.

## Investors in the Public Markets

Growing attention to ESG issues is reshaping expectations of disclosure and performance at public companies. ESG is increasingly embedded into due diligence protocols at institutional investors, particularly as controversies like PFAS<sup>1</sup> contamination impact financial performance. Between January 2018 and Sept 2020, major PFAS producers' shares fell:

<sup>1</sup> PFAS: Per-and polyfluoroalkyl substances

Dupont's by 45%, 3M's by 31% and Chemours' plummeted 59%. That's a combined decline in value of about \$80 billion<sup>2</sup>.

The impact of this shift in focus by investors can be seen in both the bond as well as equity markets.

### Developments in Bond Markets

The bond market has demonstrated some advancements in ESG investing with the issuance of Green Bonds. The first green bonds were issued in November 2008. While the chemical industry got a late start, there have been some notable developments:

- BASF placed the first green bond for the chemical industry in June 2020 to raise \$1.08 billion - it serves to finance sustainable products and projects.
- Clariant placed a green bond in the amount of CHF 175 million in August 2022 to be invested in sustainable product development.
- POSCO Chemical is raising \$244 million in green bonds to be used for the expansion of China-based battery material production and the construction of a new plant in South Korea.
- Arkema placed its first-ever green bond in October 2020—a loan earmarked to raise money for climate and environmental projects—and will use the proceeds to finance a new plant in Singapore that will manufacture 100% biobased nylon.

In October 2022, the Climate Bonds Initiative announced the expansion of the Climate Bonds Standards into the basic chemicals industry by making the Basic Chemicals Criteria available for certification. While the initiative is focused on reducing greenhouse gas emissions, the certification will not be given to entities engaged in manufacturing, placing on the market, or the use of Persistent Organic Pollutants (POPs), Mercury and mercury compounds, their mixtures, and mercury-added products, substances that deplete the ozone layer, certain hazardous substances in electrical and electronic equipment<sup>3</sup>.

### Developments in Equity Markets

The increase in ESG considerations among key players in the public market is an immense opportunity for financing sustainable chemistry.

#### *Mutual Funds*

Almost all mutual funds either have dedicated funds for investing in ESG assets or incorporate ESG principles in their general investment criteria. Certain funds, such as Parnassus Endeavor, Boston Trust Walden, and Domini, have been very effective in keeping up with or even beating S&P 500 returns on average while being entirely committed to

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<sup>2</sup> Zainzinger, V. (2020, November 15). *Is green investing influencing the value of chemical companies?* Chemical and Engineering News. <https://cen.acs.org/business/finance/green-investing-influencing-value-chemical/98/i44>

<sup>3</sup> *Basic Chemicals Criteria*. (2022, October 11). Climate Bonds Initiative. <https://www.climatebonds.net/files/files/criteria-document-basic-chemicals-final-oct-2022-06102022.pdf>

sustainable investing<sup>4</sup>. While a majority are focused on clean energy and technology, green chemistry has also captured the interest of some of these funds.

For example, Ginkgo Bioworks Holdings Inc (NYS: DNA) received \$775 million of development capital from General Atlantic, Berkshire Partners, Bellco Capital, Morgan Stanley Investment Management, Putnam Investments, Baillie Gifford, Casdin Capital, Viking Global Investors, Senator Investment Group, Cascade Investment, ARK Invest, T. Rowe Price, ArrowMark Partners, Bain Capital Public Equity, Franklin Mutual Advisers and Flying Eagle Acquisition on September 17, 2021, through a private placement. The company is building a platform to enable customers to program cells as easily as computers. The company's platform is market agnostic and enables biotechnology applications across diverse markets, from food and agriculture to industrial chemicals to pharmaceuticals. Concurrently, the company acquired Soaring Eagle Acquisition through a reverse merger, resulting in the combined entity trading on the New York Stock Exchange under the ticker symbol DNA and DNA.WS on September 17, 2021, putting the company's pre-money valuation at \$13.27 billion<sup>5</sup>.

In December 2022, investors managing \$8 trillion in assets urged the world's biggest chemicals companies to phase out the production of persistent chemicals known as PFASs<sup>6</sup>. These 47 mutual funds, including Aviva Investors and Storebrand, holding equity investments in companies such as 3M and DuPont, took this action as regulators toughen rules around the use of hazardous chemicals and as analysts warn some companies could face billions of dollars in associated clean-up and compensation costs. Signatories did not include major asset managers like Vanguard and Blackrock, which have significant exposure to the chemical industry due to their domination of the passive (index-tracking) fund space. For the past six years, investor signatories representing \$3 trillion in assets have asked companies to assess and reduce their chemical footprint through the annual survey released by the Chemical Footprint Project.

In an October 2020 report from the investment firm Jefferies, analysts noted that shares of chemical companies that ranked highly in ESG indexes outperformed those with low rankings by 4.8% per year<sup>7</sup>. An estimated \$35 trillion is now invested in funds with sustainability considerations of some kind. There is increasing scrutiny from the Securities and Exchange Commission regarding requiring more disclosure from firms claiming to invest according to ESG principles<sup>8</sup>. Some noteworthy funds that have been investing in sustainable chemistry include the Invesco MSCI Sustainable Future ETF and the VanEck Vectors Environmental Services ETF.

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<sup>4</sup> Foster, L. (2022, January 23). *Here Are Barron's Top-Performing Sustainable Funds*. Barron's. <https://www.barrons.com/articles/top-sustainable-investment-funds-ranking-51642723579>

<sup>5</sup> *Ginkgo Bioworks to Go Public with Over \$1.6 Billion in Proceeds*. (2021, September 14). businesswire. <https://www.businesswire.com/news/home/20210914005748/en/Ginkgo-Bioworks-to-Go-Public-with-Over-1.6-Billion-in-Proceeds>

<sup>6</sup> Christiansen, S. (2022, December 1). *€7.7tn investment coalition call for phase-out of 'forever chemicals'*. Citywire. <https://citywire.com/selector/news/7-7tn-investment-coalition-call-for-phase-out-of-forever-chemicals/a2403661>

<sup>7</sup> Zainzinger, V. (2020, November 15). *Is green investing influencing the value of chemical companies?* Chemical and Engineering News. <https://cen.acs.org/business/finance/green-investing-influencing-value-chemical/98/i44>

<sup>8</sup> *Press Release: SEC Proposes to Enhance Disclosures by Certain Investment Advisers and Investment Companies About ESG Investment Practices*. (2022, May 25). U.S. Securities and Exchange Commission. <https://www.sec.gov/news/press-release/2022-92>

## *Pension Funds*

As intergenerational stewards of capital, some pension funds have embraced ESG considerations in their investment practices. A main driver of this move is the inherent need for managers to incorporate long-term views of corporate risks and opportunities. Several global pension funds have excluded a company's securities due to business activities that are deemed unethical or harmful to the environment<sup>9</sup>. For example, Norway Government Pension Fund Global excluded AES, a Virginia-based utility company, due to coal-based activities and Honeywell for its participation in the nuclear weapons industry.

Some examples of Pension Funds with ESG mandates<sup>10</sup>:

- On November 23, 2020, CEOs of the eight largest Canadian pension funds made a public pledge about their commitment to creating more sustainable and inclusive growth by integrating ESG factors into their strategies and investment decisions.
- The California State Teachers' Retirement System (CalSTRS), the Japanese Government Pension Investment Fund (GPIF), and the largest UK pension fund, the Universities Superannuation Scheme (USS) issued an open letter in March 2020 making a similar commitment.

Despite the ESG pledges made by several pension funds, their potential in ESG investments has been only partially realized. Many obstacles remain to be overcome due to various structural, regulatory, and legal hurdles. In many cases, regulators can inhibit the integration of ESG by placing large reporting burdens on pension funds, therefore making ESG an expensive use of resources.

## *Hedge Funds*

Hedge Funds have acted as "activist" investors to both positively and negatively influence the transition to sustainable chemistry. Hedge fund Trian Fund Management pushed DuPont to reduce its operating division and reduce R&D expenses to generate short-term cash before merging the company with Dow<sup>11</sup>. These were considered short-term gains that were not aligned with the long-term interests of the company.

On the other hand, Belgian chemicals group Solvay (SOLB.BR) said it plans to cut industrial waste discharged into the sea from soda-ash production on a Tuscan beach in the wake of pressure from environmentalists and activist Bluebell Capital Partners. Solvay, which had previously pushed back on concerns that the waste may be harmful, now plans to invest around 15 million euros (\$14.96 million) in reducing the release of limestone residue into the sea at its facility in Rosignano, Italy. That will help cut the maximum it discharges into the sea by 20% compared to what regulators currently allow the company by 2030, it said. By

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<sup>9</sup> Ashworth, W. (2022, October 28). 9 "Dirty" Stocks That Pensions Are Shunning. Kiplinger. <https://www.kiplinger.com/investing/stocks/603266/dirty-stocks-that-pensions-are-shunning>

<sup>10</sup> Lachance, S., and Stroehle, J.C. (2021, August 5). *The Origins of ESG in Pensions: Strategies and Outcomes*. Wharton Pension Research Council Working Papers. [https://repository.upenn.edu/prc\\_papers/711](https://repository.upenn.edu/prc_papers/711)

<sup>11</sup> Lee, S. T. (2016, September 8). *Activist Investors and the Health of Companies*. The Lexington Review. <https://blogs.baruch.cuny.edu/lexingtonreview/journal/activist-investors-and-the-health-of-companies/>

2040, that volume will drop to 40% below what the authorities have said it can release into the sea<sup>12</sup>.

## Investors in the Private Markets

Private companies are generally smaller than public companies and do not have the same regulatory requirements when it comes to disclosure and their ESG practices. However, investors have a greater potential to impact ESG practices in private companies through direct engagement and influence on decision-making. Additionally, these investors play a critical role in financing startups working to develop innovative and sustainable chemical products and processes. Some of the major players in this space are commercial banks, angel investors, venture funds, and private equity funds. The following section discusses the current landscape of private investments in sustainable chemistry.

### Commercial Banks

Increasingly in regions like Europe, where regulatory risks are rising for the chemical industry, banks are developing “ecoloans” whereby companies with better sustainability performance can qualify for lower-interest loans. Ecoloans set performance expectations. For example, Finland-based Kemira received a loan from banks, including BNP Paribas, Danske Bank, and Swedbank, that was contingent on the company lowering its carbon footprint and increasing revenue dependent on more sustainable, resource-conscious products<sup>13</sup>.

### Angel Investors

Angel investors are critical players in financing the earliest stages of a start-up’s existence in the chemical sector. Still, financing new start-ups linked to sustainable chemistry is limited, though financing around decarbonization and circularity is more common. Networks are working to link new entrepreneurs to funding sources, but this happens for boutique investments that are not competing against incumbent chemistries.

The Chemical Angels Network has coordinated investments in ~40 start-ups with individual angel investors. Successes include the reflective display tech firm, Azumo and Connora Technologies, which sold its recyclable polyamine epoxy technology to Aditya Birla Chemicals in 2019<sup>14</sup>.

### Venture Capital Funds

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<sup>12</sup> Meijer, B. H., Martinuzzi, E., and Jessop, S. (2022, September 6). *Solvay to cut waste discharged off Italy, ending tussle with activist*. Reuters. <https://www.reuters.com/business/sustainable-business/solvay-ends-dispute-with-activist-bluebell-over-italy-sea-waste-2022-09-06/>

<sup>13</sup> Scott, A. (2019, June 23). *Chemical makers sign up for sustainability-linked loans*. Chemical and Engineering News. <https://cen.acs.org/environment/sustainability/Chemical-makers-sign-sustainability-linked/97/i25>

<sup>14</sup> Bettenhausen, C. (2022, May 11). *Chemical Angel Network launches first investment fund*. Chemical and Engineering News. <https://cen.acs.org/business/investment/Chemical-Angels-Network-launches-first/100/i17>



A decade ago, there were very few VC firms dedicated to financing green and sustainable chemistry ventures. This is slowly starting to change:

- VC firms like Safer Made<sup>15</sup> are leveraging private equity financing for startups, early-stage, and emerging companies that demonstrate high growth potential in the green chemistry space.
- Capricorn<sup>16</sup> is another example of venture capital firm financing companies that have a positive environmental impact and disrupt the status quo.
- BFY Capital invests in the “better-for-you” consumer retail space by providing debt finance to early-stage companies<sup>17</sup>.

The increasing focus by VC firms on sustainable chemistry has led to significant advances in capital raising by early-stage companies in the green chemicals space. Some examples:

- Good Chemistry Company, a spinout of Vancouver-based 1QBit, secured seed funding of \$6.7 million to expedite the discovery and design of new materials across many industries. Green Sands Equity led the funding with participation from WorldQuant Ventures and Accenture<sup>18</sup>.
- Evolved By Nature produces skincare products made from liquid silk technology that offers effective stabilization and delivery of real silk molecules to the skin with advanced anti-aging benefits, enabling consumers to use skincare products with no synthetic fillers and eliminating harsh preservatives. The company raised \$120 million of Series C venture funding in a deal led by Teachers' Venture Growth and Senator Investment Group on May 6, 2022, putting the company's pre-money valuation at \$350 million. Chanel, Emerald Development Managers, The Kraft Group, Jeff Vinik, Mousse Partners, and other undisclosed investors also participated in the round. The funds will be used to accelerate the commercialization of the Activated Silk technology platform, which will move global markets away from dependence on synthetics and fossil fuel derivatives and expand the boundaries of regenerative medicine<sup>19</sup>.
- Solugen is a developer of specialty chemicals platform called Bioforge, designed to replace petroleum-based products with plant-derived substitutes. The company's products use enzymatic technology to convert plant sugars into hydrogen peroxide. They are followed by the manufacturing of a comprehensive line of environmentally friendly chemicals, enabling businesses and corporate clients to decrease costs, reduce carbon dioxide emissions and minimize their carbon footprint. The company raised \$200 million of Series D venture funding in a deal led by Refactor Capital, Kinnevik, and Lowercarbon Capital on October 28, 2022, putting the company's pre-money

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<sup>15</sup> Company Website. <https://www.safermade.net/>

<sup>16</sup> Company Website. <https://capricorn.be/en/channels/capricorn-cleantech/approach-2>

<sup>17</sup> Company Website. <https://www.bfycap.com/about-us>

<sup>18</sup> *Good Chemistry Company secures seed funding to accelerate the discovery and design of new materials across a vast number of industries.* (2022, April 5). Company Website. <https://goodchemistry.com/good-chemistry-company-secures-seed-funding/>

<sup>19</sup> *Chanel-backed 'activated silk' firm adds new investors.* (2022, June 30). Reuters. <https://www.reuters.com/article/fashion-evolved-funding-idAFL1N2YG2WV>

valuation at \$1.8 billion. Fifty Years, Baillie Gifford, Temasek Holdings, and other undisclosed investors also participated in the round. The funds will be used to break ground on the next Bioforge and to advance the company's new molecule pipeline to enable an even wider range of carbon-negative and low-carbon solutions for customers and end consumers. Previously, the company raised \$357 million through a combination of Series C1 and Series C2 venture funding in a deal led by GIC and Baillie Gifford on September 9, 2021, putting the company's pre-money valuation at \$1.5 billion. Carbon Direct Capital Management, Spur Capital Partners, Valor Equity Partners, and 16 other investors also participated in the round<sup>20</sup>.

## Private Equity Funds

Private equity funds investing directly into privately held industrial and chemical companies broke records in 2021, and there was a major focus on ESG trends to shape those investments<sup>21</sup>. For example, The Carlyle Group acquired a major stake in Beautycounter, a cosmetics company committed to safer products through ingredient innovation and transparency<sup>22</sup>. This will help create a fast-growth track for Beautycounter, a major leader in clean beauty, that might not have happened otherwise.

In another such transaction, Advent International (“Advent”), one of the largest and most experienced global private equity investors with a well-established track record in chemicals investing, and specialty chemicals company Lanxess established a joint venture for engineering and high-performance polymers. The two companies acquired the DSM Engineering Materials business (DEM) from Dutch group Royal DSM in May 2022, which will become part of the new joint venture. Lanxess is combining its High-Performance Materials (HPM) business unit with DEM. Both DEM and HPM are pioneers in sustainability, offering bio- and recycled-based alternatives across their product portfolios. This JV will focus on investing in developing further sustainable products for the automotive industry<sup>23</sup>.

## Facilitators and External Actors

While investment banks and government agencies are not traditional investors, their actions heavily influence the flow of funds to corporations and government funding may be critical

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<sup>20</sup> Solugen raises over \$200 million Series D to reimagine the chemistry of everyday life. (2022, November 2). PR Newswire. <https://www.prnewswire.com/news-releases/solugen-raises-over-200-million-series-d-to-reimagine-the-chemistry-of-everyday-life-301666772.html>

<sup>21</sup> Private Equity Investors Are Paying Attention to Industrials & Chemicals. (2022, March 11). Intralinks. <https://www.intralinks.com/insights/podcast/private-equity-investors-are-paying-attention-industrials-chemicals>

<sup>22</sup> Beautycounter, the Industry Leading Clean Beauty Brand, Partners with The Carlyle Group to Fast-Track Growth. (2021, April 13). Investor Website. <https://www.carlyle.com/media-room/news-release-archive/beautycounter-industry-leading-clean-beauty-brand-partners-carlyle#:~:text=New%20York%2C%20NEW%20YORK%2C%20April,a%20majority%20stake%20in%20Beautycounter>

<sup>23</sup> Advent International and LANXESS establish a leading global joint venture for high-performance engineering polymers with combined sales of around EUR 3 billion. (2022, May 31). Investor Website. <https://www.adventinternational.com/advent-international-and-lanxess-establish-a-leading-global-joint-venture-for-high-performance-engineering-polymers-with-combined-sales-of-around-eur-3-billion/>



to driving the necessary capital investment for sustainable chemistry. While investments in sustainable chemistry have gained some momentum over the past few years, the policies adopted by investment banks and the federal government can accelerate or inhibit this shift.

### Role of Investment Banks

A report by Toxic Bonds and Bank on our Future noted that banks had underwritten \$2.7 trillion of fossil fuel bonds since the 2015 Paris Climate Agreement, revealing that underwriting bonds for fossil fuel companies is a loophole in banks' net-zero targets and needs greater scrutiny<sup>24</sup>. Conversely, "Green bonds" set clear ESG performance expectations and can be an effective financial tool in driving capital into environmental innovations.

The chemical industry is capital-intensive, so there's always a need for capital raising. It's also an industry that regularly undergoes consolidation. Consulting firm Accenture noted in a recent study that the number of chemical deals in which sustainability was stated as part of the rationale for the deal hit a record \$10 billion in 2021<sup>25</sup>. The top 7 banks servicing deals in the chemical and gas sectors are Morgan Stanley, Goldman Sachs, Deutsche Bank, Bank of America, Merrill Lynch, J.P. Morgan, Lazard, and Barclays<sup>26</sup>.

### Role of the Government

The federal government is a major investor in the R&D, piloting, demonstration, deployment, and scale of new chemical technologies that span a range of "technology readiness levels," or TRLs. Federal investments may be in the form of grants, loans (such as SBIR/STTR loans to innovative start-ups), loan guarantees, financing, R&D, deployment and open licensing support to tax incentives. The largest agencies involved include the Department of Energy, Department of Defense, and Department of Agriculture. The National Science Foundation and the National Institutes of Health represent critical research funders.

The 2022 Inflation Reduction Act created several new opportunities to advance sustainable chemistry. The 48C credit is a 30% investment tax credit for qualified advanced energy manufacturing properties, with \$10 billion in credits available for 2023-2032. At least \$4 billion is reserved for projects in communities most impacted by energy production. Critically, the new 48C expands eligibility to include projects that re-equip, expand, or establish an industrial or manufacturing facility to produce equipment designed to refine, electrolyze, or blend any fuel, chemical, or renewable product or low-carbon and low-emission. The IRA also provides an additional \$5.812 billion to DOE to provide financial assistance, on a competitive basis, to projects for installing and implementing advanced industrial technology at energy-intensive industrial and manufacturing facilities. Eligible facilities are non-Federal, nonpower industrial, or manufacturing facilities engaged in

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<sup>24</sup> *How banks are breaking their Net Zero pledges to finance climate chaos.* (July 2022). Toxic Bonds. [https://s3.amazonaws.com/s3.sumofus.org/images/Toxic-Bonds-Bank-Underwriting-Report\\_FINAL.pdf](https://s3.amazonaws.com/s3.sumofus.org/images/Toxic-Bonds-Bank-Underwriting-Report_FINAL.pdf)

<sup>25</sup> Tullo, A. H. (2022, June 26). *The chemical industry's new green deals.* Chemical and Engineering News. <https://cen.acs.org/environment/sustainability/chemical-industrys-new-green-deals/100/i23>

<sup>26</sup> *The top 7 investment banks servicing chemicals & gases deals.* (2017, May 30). PitchBook. <https://pitchbook.com/newsletter/the-top-7-investment-banks-servicing-chemicals-gases-deals>

energy-intensive industrial processes, including chemical production. The federal share of the project is capped at 50%<sup>27</sup>.

## Conclusions

The financial actors influencing investments in the chemicals industry play a pivotal role in transitioning to safer chemicals. To effectively engage these institutions, we need to understand the impact of these different actors in growing finance for sustainable chemistry along the project lifecycle of innovations from R&D to demonstration, deployment, and scale.

**Funding that advances sustainable chemistry** can be effectively accomplished through the financial community's advancement of ESG frameworks – as sustainable chemistry is critical to advancing a number of ESG goals. In addition, coalitions of investors have sent clear messages to companies to decrease their hazardous chemicals use. Sustainable chemistry innovations have mostly occurred to date at the early stage. Deployment and capitalization financing, including financing beyond first facilities has been more challenging. Smaller companies have generally been successful in accessing to various funding sources from government, angel investors, and VCs. Larger public companies source funding from bonds and various public funds.

**Activities that hinder growth of sustainable chemistry innovations are tied to finance strategies that consolidate capital that perpetuates dependency on petrochemicals to the detriment of growth of sustainable product innovations.** These include certain banks, hedge funds and private equity firms which invest in less risky investments in existing chemistries and materials which provide consistent returns, deprioritize or eliminate R&D or push for short-term returns. The trading of passive index funds that don't differentiate between sustainable and unsustainable chemistries can also perpetuate current systems.

There are other actions of investors that can advance and hinder sustainable chemistry that are outside of the scope of this current review. For example, investors that deal primarily with downstream sectors (e.g., personal care and cleaning) may also catalyze growth in sustainable chemistry but investing in firms that manufacture safer, more sustainable products. These sectors and their financial actors' roles in the growth of sustainable chemistry may be explored in future work.

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<sup>27</sup> *Industrial Demonstrations Program*. (n.d.). Office of Clean Energy Demonstrations. <https://www.energy.gov/oced/industrial-demonstrations-program>