

Robeco Trends & Thematic Investing

The Right Stuff: How innovative materials and processes are transforming industry supply chains for a low-carbon future

Sustainable Investing Expertise by
ROBECOSAM

Investment opportunity

For professional investors

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RobecoSAM Smart Materials Equities



- Materials are the building blocks for industrial development, economic growth, and societal progress
- Rising wages and increased consumption threaten resource security and remaining carbon budget
- Innovative materials and technologies offer solutions to resource scarcity and high carbon emissions

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Executive summary

The Smart Materials Equities strategy invests in companies developing innovative materials and processes so industries can continue to meet the demands of modern society without exhausting natural resources.

Throughout history, raw materials have been civilization's building blocks. From the Stone, Bronze and Iron Ages to the Industrial Revolution and the present, each era has witnessed material discoveries which gave society the tools and means to become more efficient and productive, opening new channels for growth and expansion.

The learning curve continues its forward path into the 21st century, as science and technology, markets and business, governments, consumers and civil society work to find solutions to meet the accelerating demands and looming challenges of an ever-expanding global society.

Today, population growth and excess consumption, digitalization and electrification, climate change and decarbonization are powerful forces impacting demand for raw materials. More people with more income translate into more consumption of everything. The rise in consumption and production are dramatically increasing the extraction of natural resources, thrusting the world into an unsustainable trajectory.

'The rise in consumption and production are dramatically increasing the extraction of natural resources, thrusting the world into an unsustainable trajectory'

Overconsumption in the present, risks exhausting resources for future generations. But not all risks lie in the future. Over reliance on fossil fuels across the extraction, production and use phases of the manufacturing supply chain means industry is contributing to carbon emissions that are already heating the Earth to crisis levels today. Moreover, excess waste on the ground and in ocean waters, is damaging ecosystems, reducing biodiversity and jeopardizing the economic security of many regions.

As a result, countries and companies worldwide are taking unprecedented action to reduce environmental pollution in all its forms and put us on a net-zero trajectory.

What's more, Covid-induced shocks have rippled across supply chains, creating production delays and stoking inflation across manufacturing sectors globally. To reduce future risks and build manufacturing resilience, governments and industry leaders are redirecting their focus inwards, re-shoring production to domestic fronts to reduce exposure to the vagaries and volatilities of off-shore supplies.

The Smart Materials Equities strategy (the Strategy) is now well into its second decade of giving investors a smarter way to invest in resources.

The Strategy invests in solutions across the entire industrial supply chain, from innovative materials producers who supply raw inputs to producers of cutting-edge manufacturing technologies that increase operational efficiency and reduce supply chain disruptions to end-of-life and recycling solutions that continue to recover economic value from waste streams.

This unique approach of investing in material supply, production and consumption phases of the manufacturing supply chain increases the available opportunities and provides greater risk protection compared to traditional investments in commodity and industrial sectors.

Moreover, the Strategy takes a long-term view and uses future sustainability risks and opportunities to help evaluate a company's value proposition for society and investors.

'The RobecoSAM Smart Materials Equities strategy gives investors a smarter way to invest in resources'

Why materials?

In the 21st century, as populations boom, consumption mushrooms, and global temperatures rise, innovations in materials and processing will be key in balancing unlimited demands with limited resource supplies and decarbonization goals.

From ancient empires to modern society, technological innovations in materials have provided the building blocks that enabled economic growth and development. The Neolithic (“new stone age”) was the first technology age, when humans, mastered the art of sculpting stone tools for use for hunting, agriculture, and shelters and settlements.

The Bronze and Iron ages witnessed the first elements of industrial processing with the mining of mineral ores like copper, zinc, tin, lead iron from the Earth’s crust to extract, melt and mix to create even stronger metallic alloys. Stronger, lighter and more abundant, the discovery of alloys stoked advances across the economy, from weaponry and agriculture to international trade.

Metals remain a critical material for industry and society. Thanks to 19th century processing innovations, steel – a mix of iron and carbon – has been mass-produced, making it one of the most important engineering and construction materials on the planet.

Innovations in glass processing took it from a decorative jewelry in Egypt to a critical feature on medieval building façades. Modern day applications have expanded as well. Glass is critical for industrial machinery and scientific instrumentation, energy-saving lighting and electronics, as well as fibre-optic cables that form the backbone of global telecommunication networks. Ceramics have also been transformed from an input for pottery, cooking and storage to a critical material used in modern smelting furnaces and gas pipes as well as in anti-corrosive coatings and enamels used across consumer goods and the industrial landscape.

Sociodemographic trends

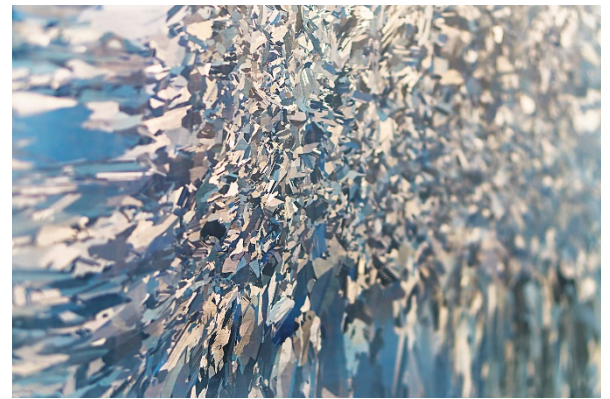
Growing populations, rising incomes and expanding urbanization are leading to massive increases in demand and consumption across retail and industrial goods. The world population is expected to reach 10 billion by 2060. The OECD projects global GDP and per capita incomes will triple by 2060 with the majority of the growth focused in emerging economies like China, India and Southeast Asia. Economic growth and rising incomes will mean further investments in urban and industrial infrastructure. Moreover, individual and household consumption will increase as middle classes around the world catch up to western standards of living. Global materials use is projected to reach 167 Gt in 2060, almost double present levels (OECD baseline 2017).

Digitalization and electrification

Structural trends like digitalization and big data are also dramatically impacting material use. On the one hand, digitalization is enabling an expansion of service sector activities in the economy, which are less material intensive compared to agriculture and industry. However, it is also increasing the need for both traditional and non-traditional materials to be extracted, refined and/or synthesized to support the expansion of the digital economy.

Conventional materials like copper will still be vital for electrical wiring and circuit boards. However, advanced ceramics, glass, and silicon compounds are increasingly needed to produce energy-efficient lighting, high-performance touchscreen displays, semiconductor wafers, as well as for connectivity technologies like embedded sensors, 5G antennas and next-generation fibre-optic networks.

Figure 1 | Silicon crystals



Polysilicon is the foundational material for the silicon crystals needed for the production of semiconductor wafers and microchips.

Source: Getty images

Moreover, electrification trends are charging demand for lithium, nickel, graphite and other battery electrode metals. Advances in battery storage capacity have been key catalysts in enabling transportation’s switch to electric vehicles. Hydrogen gas and stationary electric storage technologies like solid-state batteries will also be critical for helping utilities and other industrial players to transition to renewable energy sources.

Decarbonization

The climate crisis has catapulted decarbonization strategies to the top of national and international agendas and sharpened the focus on transportation, the built environment and industrial manufacturing, which collectively account for over 85% of global annual emissions. Given it takes energy to extract, refine, manufacture, distribute and even consume materials, solutions aimed at promoting resource efficiency will in parallel promote energy efficiency across these sectors.

Resource-efficient manufacturing technologies are helping to create more output with less input. Computer-aided design and 3D printing are helping design products in the lab before resources are wasted on the factory floor; robotics and automation are increasing productivity and improving throughput efficiency in the manufacturing process.

‘Given it takes energy to extract, refine, manufacture, distribute and even consume materials, solutions aimed at promoting resource efficiency will in parallel promote energy efficiency across these sectors’

Nano-engineered material composites can be substituted for traditional feedstock materials, reducing the strain on virgin resources as well as the energy needed to extract and process them. Examples include carbon fibres and metallic alloys to replace iron, brass, copper and lead as well as bio-based materials like bio-concrete, bio-plastics, and reinforced wood, that combine organically-engineered compounds with traditional industrial materials to create products that are less energy and resource intensive.

Not only do these materials reduce the energy and resources used in upstream production phases, they also reduce the environmental footprint across a product’s useful life. Lightweight metals reduce the weight and therefore the fuel efficiency of transportation vehicles; better insulative materials help reduce energy consumption in buildings and construction; and bio-based materials are biodegradable, reducing emissions generated from landfill disposal and waste incineration.

Waste as resource

Thanks to advances in recycling, waste’s potential as a valuable resource and input material is increasing substantially. The world generates more than 2 billion metric tons of municipal solid waste annually, yet only a small fraction (13.5%) is recycled and reused. Moreover, accelerating living standards and consumption patterns mean the waste problem will continue, unsustainably.

When properly disposed, waste is either incinerated or dumped in landfills, meaning it contributes directly to greenhouse gas emissions. When improperly disposed, it leaks into ecosystems, upsetting and destroying natural habitats and biodiversity. Plastic is a major contributor to the waste problem. Studies estimate that of the 6.3 billion metric tons of plastic waste that have been produced, only 9% has been recycled. A UNEP life cycle analysis showed GHG emissions from plastics are projected to increase to 15% of the global carbon budget by 2050.

Moreover, plastic waste accounts for 50-80% of the debris accumulating in the ocean, leading to a decimation of marine life through entanglement and ingestion. Given it takes some types of plastics 500 years to decompose, the damage will persist over centuries. Furthermore, it’s not just about wildlife and ecosystems, it adversely impacts the health and economic well-being of millions of communities who derive their income from indigenous species (both marine and land-based) within their regions.

Recovery, recycling, and reuse of discarded waste reduces demand for fossil fuel feedstock and other virgin resources and also reduces the negative environmental and social impacts caused by their extraction and processing.

Recycling technologies are expected to advance and costs to fall in the coming decade, making it a cost-effective and resource-efficient alternative to mining virgin materials.

Figure 2 | Next generation and nature-based



Biopolymer blends are creating bioplastics that are as durable as traditional plastics but made from renewable sources or are biodegradable.

Source: Wacker Chemie

Why now?

Countries and companies worldwide are taking unprecedented action to reduce environmental pollution in all its forms and put us on a net zero trajectory. Moreover, rising commodity prices and supply chain disruptions are pushing a renewed focus on substitute materials and innovative process solutions.

Government action

Worldwide, regulations aimed at reducing carbon and other greenhouse gas emissions are tightening as countries seek to combat climate change. At Glasgow's COP26, nations including the US and the EU-bloc renewed their net zero pledges. By 2030, the US aims to reduce carbon emissions by at least 50% via strategies like decarbonizing the energy grid and mandating EV sales.

The EU stretches even farther, aiming to reduce emissions by 55%, taking aim specifically at heavy industrial emitters such as utilities, factories, cars, planes, shipping and building heating systems. The EU's net zero strategy also includes strengthening and extending its emissions trading system (ETS) that requires industrial polluters to buy carbon credits to cover the cost of their emissions. China has committed to phasing out coal and increasing the share of renewables in its energy mix to 25% by 2030. In 2021, it also launched a national emissions trading system for the power sector (coal and gas plants) and related companies.

In addition to the regulatory stick, the EU, US and China are also sweetening the financial carrots. All have announced plans to invest heavily in low and zero carbon technologies and infrastructure in order to realize their net zero ambitions.

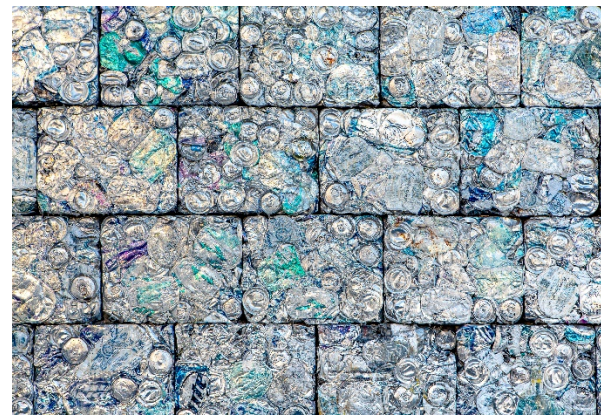
Overflowing waste streams

Reducing carbon emissions is not the only environmental problem facing Earth. Tons of plastic and other material waste are also imperiling our planet's wildlife, biodiversity and ecosystems. As a result, governments globally have stepped up actions and investments aimed at strengthening domestic waste collection and recycling.

The EU packaging directive targets a 70% recycling rate of all packaging by 2030. For individual waste streams, rates can go even higher: 75% of glass, 80% of metals like iron and steel and 85% of paper and cardboard are expected to be recycled.¹

Since 2019, the EU has banned single-use plastics and in 2020, China introduced bans on plastic bags in all major cities. Other regional and national economies have followed suit, including Canada, Thailand, Indonesia, Costa Rica, and California and New York in the US.

Figure 3 | Recycling returns



Recycling recaptures the material and economic value of wasted materials and reinserts them back into the manufacturing loop.

Source: iStock by Getty

Inflationary surges

The uptick in commodity prices in 2021 resulted from material, labor, logistics and even geopolitical constraints, each of which demonstrate the strong need for “smart” solutions across the industrial supply chain. Even prior to the pandemic, the cost of mining raw materials was projected to increase relative to other prices, all but guaranteeing price increases for select commodities.

Moreover, resource-rich nations like China have limited exports of raw materials, further fanning inflation and crippling production delays for manufacturers globally.

Due to online orders and economic re-openings, demand is outpacing supplies, leading to product shortages and rising prices for material inputs and finished products. Rising prices coupled with supply chain disruptions will leave stakeholders searching for cheaper and more accessible alternatives to reduce their consumption of and dependence on traditional raw materials and the countries that supply them.

‘The uptick in commodity prices demonstrate the strong need for “smart” solutions across the industrial supply chain’

Labor shortages have also stoked inflation. Government-imposed shutdowns in foreign labor markets confined workers home and deprived manufacturers and port authorities with labor to produce and move critical goods in both foreign and domestic markets. Moreover, low wages, difficult working conditions as well as Covid contagion fears have kept many workers home voluntarily, leaving employers with no alternative but to raise wages to entice them back to the job.

To reduce future risks and build manufacturing resilience, governments and industry leaders are redirecting their focus inwards and re-shoring means of production. Robots and automation help shield manufacturers from labor shortages and wage inflation, while decentralized production (which capitalizes on 3D and cloud-based technologies) increases manufacturing flexibility by re-directing resources to other production facilities when disruptive events emerge along the supply chain.

Figure 4 | Robots drive resilience



Robotic manufacturing is helping increase manufacturing’s resilience to disruptive forces.

Source: iStock by Getty

Why Smart Materials?

A unique approach, a successful track record, and a commitment to sustainability make the RobecoSAM Smart Materials Equities strategy a compelling investment.

Smart Materials is the smart and sustainable way to invest in resources. The Strategy focuses on addressing the critical challenge of resource scarcity through investments in sustainable solutions across the industrial manufacturing and materials sectors.

By assessing which critical trends, scalable technologies, and geographic regions are reaching an inflection point, the investment team identifies sectors and companies that are best positioned for sustainable, long-term growth.

Unique approach

The Strategy invests in solutions across the entire industrial supply chain, from innovative materials producers who supply raw inputs to producers of cutting-edge manufacturing technologies that increase operational efficiency. Moreover, the Strategy also invests in end-of-life and recycling solutions that continue to recover economic value from waste streams.

This unique approach of investing in the materials, production and consumption phases of the manufacturing supply chain increases the available opportunities and provides greater risk protection compared to traditional investments in commodity and industrial sectors.

Actively managed, sustainably driven

Now in its second decade, the Smart Materials strategy has benefited from consistent and steady leadership at the top, supported by an investment team with deep knowledge and diverse experience across materials, industrials and manufacturing, transportation and mobility, semiconductors and technology, in addition to finance, economics and investments.

The investment team collaborates closely with Robeco’s SI Research team. The SI team are organized by sector and therefore able to offer specialized expertise on sustainability trends and issues affecting industries and their constituent companies. SI analysts also provide in-depth assessments on sector and company ESG performance as well as their impact on the UN SDGs. SI inputs are integrated into portfolio-specific investment decisions and help inform future investment strategies.

Since its inception in 2006, the Strategy’s assets have grown to nearly EUR 2 billion as of the end of October 2021.

Table 1 | Smart Materials Strategy track record¹

| | 1 year | 3 years | 5 years | Since Oct 2006 |
|------------------------------------|--------|---------|---------|----------------|
| RobecoSAM Smart Materials Equities | 44.83% | 17.17% | 15.53% | 9.59% |
| MSCI World Index TRN | 41.35% | 17.37% | 14.21% | 8.32% |
| Relative performance | 3.49% | -0.20% | 1.32% | 1.27% |

Annualized performance of the RobecoSAM Smart Materials Equities strategy. Gross of fees, EUR. Source: Robeco. Data as of 31 Oct 2021.

Moreover, the Strategy takes a long-term view and uses future sustainability risks and opportunities to help evaluate a company’s value proposition for society and investors. Companies whose dominant revenues stem from products that are questionable, controversial or incompatible with the Strategy’s sustainable principles are excluded.

Figure 5 | Investment clusters



Advanced materials - Includes functional materials as well as strategic and specialty metals for technological, industrial and manufacturing sectors that provide better performance and lower volatility compared to cyclical commodities.



Transformational materials - Includes bio-based, enhanced composites and nanostructures used for energy storage, efficient lighting and LED displays. These materials improve the performance specifications of a product and/or prolong product life.



Smart manufacturing - Includes automation and process control, robotics, laser and software companies that help make manufacturing processes and materials handling safe, secure, cost-efficient, resource-efficient and less polluting.



Process technologies - Includes companies focused on recycling and circular solutions, analytical instruments, and cleaner industrial processes that deliver efficiency gains in the extraction, processing, and usage of resources and materials.

Promoting SDGs

The Strategy invests in companies creating long-term value for stakeholders in society, not just shareholders of stock. These companies contributing directly to multiple SDGs, including affordable and clean energy, industry innovation and infrastructure, sustainable cities and communities, responsible consumption and production, decent work and economic growth, and climate action.

Article 9

The fund has been classified as an Article 9 investment under the EU's Sustainable Finance Disclosure Regulation (SFDR).

Figure 6 | Strategy-related SDGs ²



Source: Robeco, UN Sustainable Development Goals
Data as of September 2021.

In addition, Robeco has successfully developed a proprietary tool that scores companies in the thematic universe based on the strength of their contributions to theme-relevant SDGs. Companies which detract from SDG targets are excluded from the portfolio.

Finally, the Strategy benefits from the voting and engagement activities of Robeco's Active Ownership Team which drives awareness, education and action from companies on the risks and opportunities of addressing sustainability issues within their operations and markets.

For more information, please contact your Robeco Sales Manager or our Client Servicing team at rs-clientservicing@robeco.com.

¹ Performance since inception is as of the first full month. The currency in which the past performance is displayed may differ from the currency of your country of residence. Due to exchange rate fluctuations the performance shown may increase or decrease if converted into your local currency. Periods shorter than one year are not annualized. The value of your investments may fluctuate. Past performance is no guarantee of future results. Returns gross of fees, based on gross asset value. Values and returns indicated here are before cost; neither consider the management fee as well as other administration costs related to the fund nor the fees and costs which may be charged when subscribing, redeeming and/or switching units. These have a negative effect on the returns shown. First performance date: 31.10.2006. Effective October 29th, 2020, select RobecoSAM equity funds were merged onto the RCGF SICAV platform and received new inception dates, share classes, and ISIN codes. All performance prior to the RCGF SICAV merger on October 29th, 2020, has been calculated based on the investment policies, fees, and share classes of the respective sub-fund under the previous SICAV.

² The SDGs listed are not exhaustive, have been prioritized based on strength of impact and the overarching goals of the Smart Materials Equities strategy over the long term. A complete reporting of SDGs associated with the Strategy can be obtained upon request.

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