Recycled Waste Carbon Market Assessment, By Source [Municipal Solid Waste, Biosolids, Plastics, Industrial Waste Gases, and Others], By Recycling Process [Pyrolysis, Advanced Thermochemical Process, and Others), By Application [Chemicals, Fuels, Thermal Energy, and Others], By Region, Opportunities, and Forecast, 2016-2030F

Market Report | 2024-04-19 | 355 pages | Market Xcel - Markets and Data

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Report description:

Recycled Waste Carbon Market size was valued at USD 176.31 million in 2022, which is expected to grow to USD 442.79 million in 2030 with a CAGR of 12.23% during the forecast period between 2023 and 2030. The increasing utilization of waste carbon in fuel production and the advancing chemical industry are the primary factors driving the growth of the recycled waste carbon market. The recycled waste carbon is processed from municipal solid waste, plastics, industrial waste gases, and others, which are treated as resources, to recycle and reuse. The various processes utilized in recycled waste carbon processing include pyrolysis, advanced thermochemical processes, and others. The vital applications of recycled waste carbon include fuel, thermal energy, and others. The increasing demand for carbon in methanol production, the rising deployment of recycled material in biofuel production, and others are several key trends accelerating the demand for recycled waste carbon in fuel production. Furthermore, the prominent determinants, including the development of new chemical manufacturing facilities, significant export demand, and others are spurring the demand for recycled waste carbon to ensure environmental sustainability. However, the availability of economical substitutes for recycled waste carbon is posing a bottleneck for market growth in the upcoming years.

Increasing Adoption of Recycled Waste Carbon in Fuel Manufacturing

The recycled waste carbon sourced from municipal solid waste, biosolids, and others is utilized as an efficient catalyst to convert carbon in fuel production. Recycled waste carbon is employed in fuel productions such as methanol, biodiesel, and others. The increasing research and development activities for the utilization of recycled carbon in fuel plants, rising sustainable measures, and others are boosting the development of new recycled carbon to fuel manufacturing plants. Recycled waste carbon is vital in

the fuel manufacturing process to minimize emissions, as the recycled CO2 to fuel projects, brings additional benefits through shared infrastructure and efficient energy utilization, thereby supporting industrial innovation and sustainable economic development.

For instance, in October 2022, a recycled CO2-to-methanol plant started its commercial operation in Anyang, China. The new facility can capture 160,000 tons of carbon from waste streams. The CO2-to-methanol plant in China has a production capacity of 110,000 tons of methanol per year. Hence, the recently developed CO2-to-methanol plant is fostering the demand for recycled waste carbon to ensure superior sustainability, thereby propelling market growth.

Europe: The largest Recycled Waste Carbon Market

In Europe, the recycled waste carbon market is booming and constantly registering impressive growth rates in the past years and the year-on-year growth rate from 2021 to 2022 is the highest among all the regions globally. Various macro factors drive the market in the European region such as increasing government investment in the manufacturing of biofuel, the prominent share of the chemical industry in the overall economic growth of Europe, and others, which are driving the growth of the market in the region. In Europe, joint partnerships between recycled waste carbon and methanol makers are encouraging the use of recycled waste carbon, moving the market forward. The high rate of garbage generation through municipal solid waste is causing this segment to dominate in Europe. For example, according to the most recent OECD statistics, municipal solid waste generation in Hungary in 2021 will be 38,013.0, representing a 4.5% increase over the previous year.

The fight against climate change is one of the major factors that puts Europe at the forefront of the recycled waste carbon market. Advanced thermochemical processes, the most used recycling process in Europe, heavily contribute to climate change mitigation by reducing greenhouse gas emissions and promoting sustainable waste management practices. The European Environment Agency (EEA) has assessed the likelihood of Italy achieving the target, of recycling about 55% of municipal solid waste (MSW) by the end of 2025, and the overall recycling of waste generated from packaging waste and specific packaging materials targets by 2025.

Advanced Thermochemical Recycling Process Dominating the Market

From many options through which waste carbon can be recycled, the advanced thermochemical recycling process is the most preferred recycling method for waste carbon because the process ensures highly advanced innovative and promising processes for transforming waste into valuable materials and chemicals. Because of the benefits of advanced thermochemical recycling, the utilization of advanced thermochemical processes is increasing for the manufacturing of recycled waste carbon. Globally, the advanced thermochemical process comprehensively led the market with a revenue value of more than USD 80 million in 2022 which accounts for about 50% of all the recycling processes utilized in the market. Furthermore, the advanced thermochemical process will register a significant double-digit CAGR during the forecast period of 2023-2030F. As of 2022, Asia-Pacific and Europe, both combined hold more than 60% of the share in the utilization of advanced thermochemical recycling processes for waste carbon recycling, while the Asia-Pacific region shows the highest compounded annual growth rate of 14.44%.

The Booming Chemicals Industry

Recycled waste carbon has various beneficial properties, such as reduced carbon dioxide (CO2) emissions, lower energy use, minimized water deployment, and others. As a result, recycled waste carbon is utilized as a raw material in the manufacturing of chemicals. The increasing procurement of sustainable materials, investment in chemical facility expansion, and others are leading to the rising production of chemicals.

For instance, according to the India Brand Equity Foundation (IBEF), in 2021, the chemical industry in India was valued at USD 212.8 billion, and in 2022, it was USD 232.6 billion, a year-on-year growth rate of 9.3%. Therefore, the growth of the chemical sector is fueling the demand for sustainable and recycled carbon procured from sources such as biocides, industrial waste gases, and others. This, in turn, is driving the recycled waste carbon market growth.

Impact of COVID-19

The imposition of rigorous COVID-19 measures in 2020 significantly impacted the production of non-essential products, including chemicals, fuels, and others. The challenges faced by the recycled carbon waste market during the COVID-19 pandemic, are marked by disruptions in supply chains and economic uncertainties. For instance, according to the European Chemical Industry Council (CEFIC), in 2020, the Europe chemical industry registered a decline of 10.9% as compared to 2019. Thus, the decline in the chemical industry impeded the market in 2020. Despite setbacks, the sector found growth opportunities, driven by increased

awareness of sustainability and a renewed emphasis on environmental practices along with substantial R&D.
In October 2020, the United States and Japan signed a deal to accelerate the R&D on the process of recycling CO2 and converting it into useful fuel and chemicals. Through this new partnership and era of advanced technological development, Japan aspires to capture, store, utilize, and recycle carbon dioxide solutions more feasible. The aim is to reduce hazardous greenhouse gas (GHG) emissions and establish stable energy sources.
However, the ease of COVID-19-related regulation significantly enhanced the recycled waste carbon market growth by the end of 2020. Likewise, in the coming years, the impact of the COVID-19 pandemic will be eradicated, which will boost the recycled waste carbon industry outlook during the projected forecast period.
Impact of Russia-Ukraine War
The Russia and Ukraine war resulted in trends such as supply chain disruption, higher oil prices, and others. As a result, the manufacturing activities of industrial products in Russia, Ukraine, and several European countries were halted in the first half of 2022. The conflict has obstructed the market's growth, affecting recycling operations and investment dynamics Therefore, the demand for recycled waste carbon declined in the first half of 2022 in countries such as Russia, Ukraine, Poland, and others. The war has resulted in challenges related to resource allocation, as companies need to reassess their respective priorities and strategies in response to geopolitical developments.
For instance, according to the World Bank (WB), in 2022, due to the Russia-Ukraine war, the price of crude oil soared by USD 100 per barrel, reaching its highest level since 2013. Thus, the higher oil prices due to Russia's invasion of Ukraine impacted the pricing, which created a roadblock for recycled waste carbon in the first half of 2022.
Key Players Landscape and Outlook
The recycled waste carbon market has the presence of various players such as Carbon Recycling International, Fairmat, Enerkem, and HORIBA, among others. The above-listed players are equipped with state-of-the-art manufacturing facilities to ensure bulk product requirements as per the end-use industries' demand. The major players dealing in the manufacturing of recycled waste carbon are investing in strategies such as new product innovation, acquisitions, partnerships, mergers, and others to increase their market share in the recycled waste carbon industry.
For instance, in July 2023, GAIL Limited, a leading natural gas manufacturer in India formed a strategic collaboration with LanzaTech, a manufacturer of recycled waste carbon. The prime aim of the partnership is to bio-recycled waste carbon adoption in the production of fuels and chemicals. Thus, the increasing partnerships in the market will boost the revenue growth of the industry in the upcoming years.
Enerkem: The Big Market Giant
Enerkem is one the biggest market players in the global carbon recycled waste carbon market. Enerkem Inc. is dedicated to advancing sustainable solutions by converting waste into low-carbon fuels and circular chemicals. Through its patented gasification technology, the company has successfully processed over 359,697 tons of diverse waste and residues, significantly reducing the reliance on landfills and lowering emissions. The company's innovative approach provides feedstock flexibility, enabling the processing of various waste materials and product diversity with multiple pathways to low-carbon molecules.
Enerkem's dedication to sustainability is reflected in its product diversity. The company offers various low-carbon intensity (CI) end-product pathways through its waste-to-syngas, waste-to-methanol, and waste-to-ethanol platforms. These platforms, complemented by commercially available add-ons, facilitate the production of a broad spectrum of fuels and chemicals with some of the industry's lowest carbon intensities.
In July 2023, Enerkem and Dimeta joined forces for significant waste-to-DME projects in Europe and the United States, focusing on producing renewable and recycled carbon dimethyl ether. The initiatives, targeting Northwest Europe and the Gulf Coast, aim to decarbonize off-grid sectors, with feasibility studies in progress.

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*Companies mentioned above DO NOT hold any order as per market share and can be changed as per information available during research work.

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