From waste to returns: organic waste platforms are gaining traction with PE and strategic investors

Reddal - Organic waste management report

August 2025

Organic waste platforms offer 2-3x return potential, but scaling returns depends on navigating feedstock risk, mandate-led demand, and platform flexibility

Executive summary

Opportunity:
Organic waste is gaining traction as a scalable, cross-sector feedstock.

- Organic waste streams (food, livestock, agro-industrial, lipid-rich) are being processed into diverse outputs: biofuels, biogas, fertilizers, and renewable chemicals
- Organic waste is gaining traction as a scalable input, driven by climate policy, circular economy goals, and end-market demand across energy, mobility, and agriculture

Complication:
Despite strong policy signals, structural challenges still shape how scale can be achieved.

- Core feedstock like UCO are in shortage and heavily imported with fraud risks; others like manure or food waste are fragmented, under-collected, or logistics-intensive
- Capital-intensive infrastructure struggles to keep up with volatile mandates and limited low-cost green electricity
- Voluntary end-user demand remains slow, limiting commercial pull

Resolution:
Early movers with proven feedstock control and scalable processing capabilities are positioned to capture strong returns.

- Platforms that strategically secure feedstock, processing integration, and policy timing have demonstrated value; recent exits in organic waste processing validate short-to-mid term monetization potential
- Europe is seeing large-scale investment in circular waste platforms like Urbaser and Renewi, driven by infrastructure and PE funds
- Korea’s Daekyung O&T’s exit (2.75x return) with SK’s bolt-on SAF strategy show rising strategic value in biofuel plays

ILLUSTRATIVE

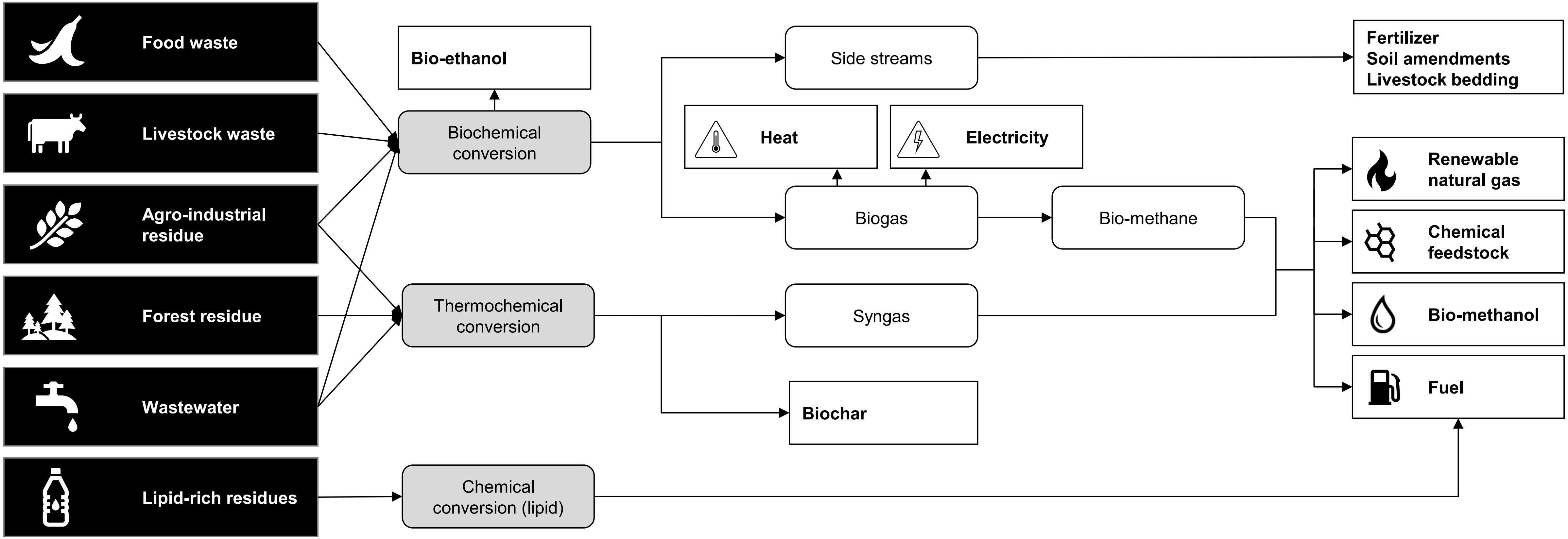
Organic waste is emerging as a modular platform for renewable fuels, energy, and circular materials

Overview of organic waste processing

Waste source | Main conversion process | Key outputs | **End products**

Organic waste

Process flow chart and end products



Food waste

Livestock waste

Agro-industrial residue

Forest residue

Wastewater

Lipid-rich residues

Biochemical conversion

Thermochemical conversion

Chemical conversion (lipid)

Bio-ethanol

Side streams

Heat

Electricity

Biogas

Bio-methane

Syngas

Biochar

Fertilizer
Soil amendments
Livestock bedding

Renewable natural gas

Chemical feedstock

Bio-methanol

Fuel

Source: EESI, Methanol Institute, Methanex investor presentation.

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Demand for organic waste-derived products is accelerating across sectors – from agriculture to energy to industrials

Overview of organic waste potential use cases

Key outputs from organic waste processing	Drivers for increasing demand	Key applications and potential user examples
Biogas	Renewable energy targets Cost efficient electricity and heating Feedstock availability	**Electricity generation**: KEPCO **District gas / heating**: 서울도시가스(주), 삼천리, SK E&S
Bio-methane and methanol	Green fuel (EU regulation) Renewable chemical feedstock Green fuel (EU regulation)	**Marine fuel**: MAERSK, HMM **Plastics**: amcor, SEE **Silicone (medical)**: CardinalHealth, novo nordisk
Side streams	Reduction of waste Increasing food demand Regulation	**Fertilizer**: EuroChem, KG Chemical **Soil amendments**: syngenta, novozymes **Livestock bedding**: PLATTS Agriculture, American Excelsior Company
Biofuel (SAF, HVO, biodiesel)	SAF and biodiesel blending mandates Net-zero targets in hard-to-abate sectors Fuel security/diversification	**Aviation fuel (SAF)**: KOREAN AIR, Lufthansa **Marine fuel**: MAERSK, HMM **Ground transport (HVO, biodiesel)**: DHL, ups

Source: Company websites, Methanol institute, Methanex investor presentation, IEA.

Policy is driving momentum in organic waste processing, but fragmented feedstock and weak voluntary uptake remain strategic risks for scaling and investment

Structural challenges in organic waste processing

Key challenges in organic waste processing

Feedstock availability remains fragmented or limited.

- Despite the theoretical abundance of organic waste, practical constraints significantly limit its availability for bioproduct conversion
- Biofuel feedstock like UCO and animal fats face supply shortages and heavily rely on imports
  - UCO demand far exceeds domestic collection; EU collects around 1M tons while 7M tons used in biofuels in 2023; over 85% of UCO is imported
  - Korea recycles nearly 100% of its industrial/commercial UCO (~200k tons); however, current volume covers only 20% of biodiesel feedstock needs
- Rapid growth in biodiesel, HVO, and SAF demand is fueling cross-sector competition for the same limited feedstock
- Traceability and fraud risks (especially for imported feedstocks) add operational uncertainty
- Others (like food waste, manure, forest residue) are scattered, under-collected, or logistics-intensive
- The variability in organic waste feedstocks can lead to inconsistent processing outcomes, affecting the efficiency and reliability of bioproduct production

Demand is real, but largely driven by mandates, not markets.

- Current demand is compliance-driven (SAF blending, biofuel quotas, landfill bans)
- Both the EU and Korea have strong long-term policy support for biofuels, SAF, and organic waste valorization, with ambitious targets for 2030 and beyond
- However, supply is slow to respond; production infrastructure is capital-intensive and takes years to build
- The business case is weaker for next-gen bioproducts like synthetic fuels by limited access to abundant, low-cost renewable electricity needed for production at scale
- Voluntary pull from end-users is not yet mature, leading to slow offtake in bioproducts and temporary overcapacity risks in early-mover projects
- While long-term policy tailwinds are strong, policy uncertainty and volatility – short-term shifts in mandates or subsidies can drive rapid demand swings, which the supply side cannot easily adjust to
- The mismatch increases investment risk and hinders scalable, flexible production

Consideration

Secure, scalable feedstock access is a strategic differentiator

- Scalable returns hinge on securing reliable, traceable feedstock through vertical integration or local sourcing partnerships
- Diversified, logistics-ready feedstock reduce exposure to single-stream volatility
- Platforms with secure, scalable upstream control or differentiated sourcing is gaining competitiveness with margin protection and long-term viability

Flexibility protects against policy and timing risk

- Project pipelines built solely on compliance-driven demand face policy and timing risks – market pull strengthens the business case
- Models that are modular, co-located, support multiple feedstocks or output types can offer resilience amid market volatility

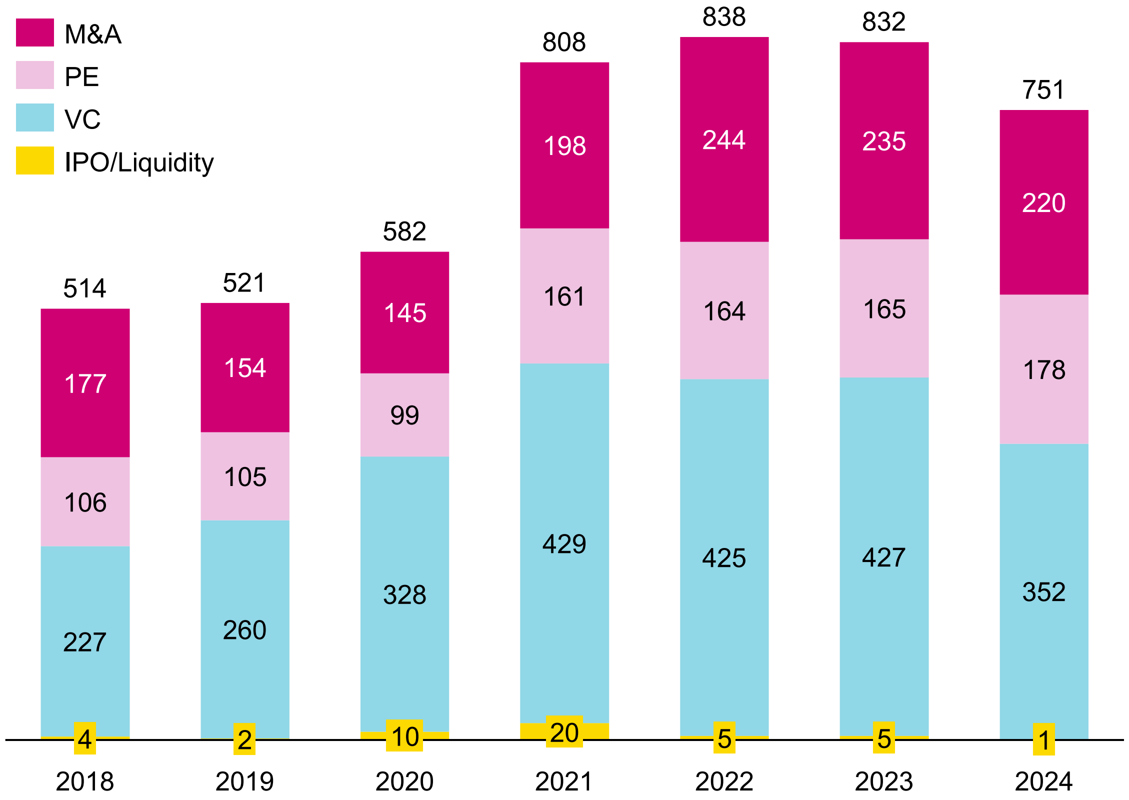
Source: ACI, IEEFA, Sustainability (2024), European Biogas, KEITI, E-platform, T&E 1 2 , expert interviews, Reddal analysis.

NON-EXHAUSTIVE

Europe's waste sector is attracting infrastructure-scale capital, with growing interest in traditional players evolving into integrated circular platforms

Investment activity in the waste management sector in the Europe

European investment deal counts in waste management sector[1]



[1] As of February 13, 2025.
Source: Pitchbook.

Largest deals done in European waste management sector since Jan 2024

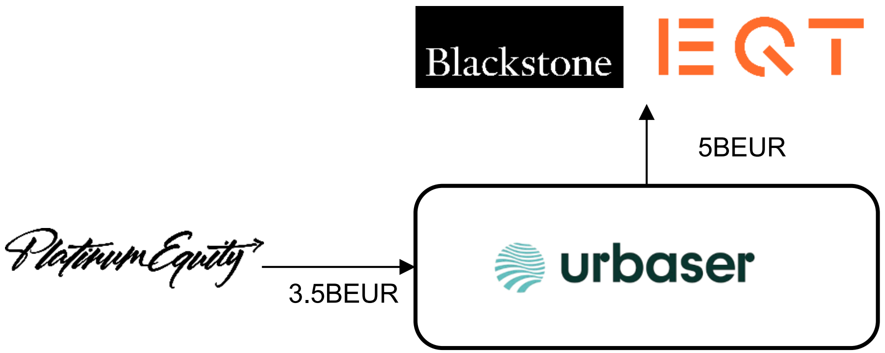
Company	Description	Deal type	Timeline	Deal size
Viridor Waste Management	Waste management services	M&A	Jan 2025	6 705MEUR
Urbaser	Environmental management service provider	Buyout	Apr 2024	5 000MEUR
Solor Bioenergi Group	Sustainable data centre operator	Debt Refinancing	Feb 2024	1 955MEUR
GreenScale	Waste-to-product	VC	Nov 2024	1 198MEUR
SLR Consulting	Environmental consulting services	Debt Refinancing	Aug 2024	882MEUR
Renewi	Waste-to-product	Buyout	Nov 2024	840MEUR
Fortum (Recycling and Waste Business)	Recycling and waste business across Finland, Sweden, Denmark, and Norway	Buyout	Nov 2024	800MEUR

Platinum Equity’s potential exit from Urbaser proves that modernizing waste operations around circularity can unlock both growth and exit value within a relatively short horizon

Urbaser

General information

Entities involved	Platinum Equity, Blackstone, EQT
Entry	2021
Exit (expected closing)	Q2 2025, with final bids due by late February 2025
Estimated valuation	5BEUR
Estimated return	~1.4x



Key development areas

Company description

- Spanish integrated waste management provider; originally part of the Spanish construction group ACS, Urbaser was acquired by China Tianying in 2016 before Platinum Equity’s acquisition in 2021
- Global presence across Europe (mainly Spain, Frand, the UK), Latin America, Asia, and Africa, supported by various specialized subsidiaries

Technological capabilities

- Waste-to-energy
- Waste recovery
- Municipal, construction and demolition, industrial waste treatment
- Advanced urban cleaning and waste collection

Learnings

- Under Platinum Equity, Urbaser revamped its identity to offer an integrated circular solutions model, linking urban cleaning, waste collection, and treatment in a single, cohesive value proposition
- Increased R&D spending has enabled service expansions (e.g., biorefinery, hydrogen projects), while a new operational management system drives efficiency and performance while a new operational management system drives efficiency and performance
- Urbaser streamlined its footprint, channeling resources into higher-potential regions, selling the Nordic business and reinforcing its presence in core markets like Spain through M&A
- These shifts reflect a strategic response to rising EU standards and demands for circular economy
- Multi-year contracts in both municipal and industrial segments provide predictable revenue streams, appealing to investors seeking resilience in uncertain markets
- With private equity’s typical 3–7-year horizon, Urbaser’s strategic realignment, and the ongoing momentum in green infrastructure investment, the potential sale could yield strong returns

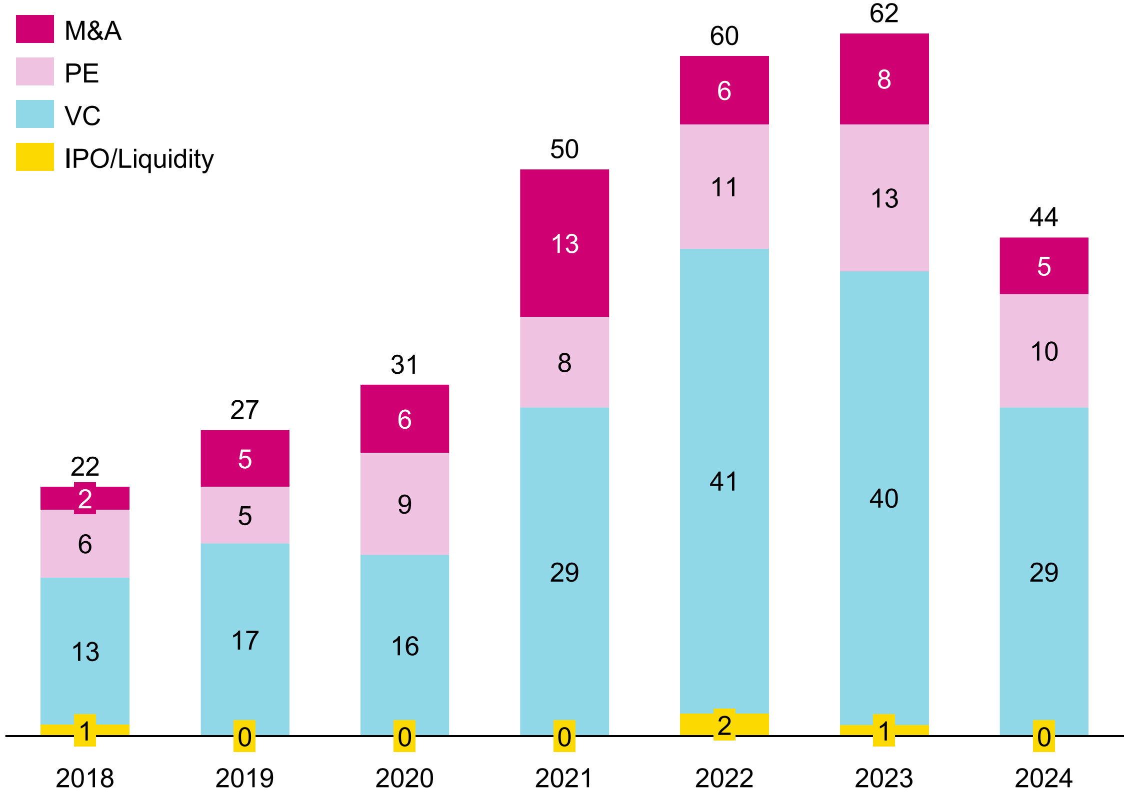
Source: Urbaser company websites, Platinum Equity (2021), BloombergNEF (2023), PR News (2021), Reuters (2024).

NON-EXHAUSTIVE

Korea's waste sector has seen a wave of sizable buyouts across traditional and energy-focused platforms, including biofuel, WtE, and integrated waste services

Investment activity in the waste management sector in South Korea

Korean investment deal counts in waste management sector[1]



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[1] As of February 13, 2025.

Source: Pitchbook.

Largest deals done in Korean waste management sector since Jan 2022

Company	Description	Deal type	Timeline	Deal size
Ssangyong C&E	Sustainable cement	Buyout	Jul 2022	1 462MEUR
Ecorbit	Waste management services	Buyout	Dec 2024	1 394MEUR
KJ Environment	Waste management services	Buyout	Aug 2024	666MEUR
Eco Management Korea	Waste-to-energy	Buyout	Oct 2022	449MEUR
SK Eco Prime	Biofuel	Buyout	Dec 2023	385MEUR
Daekyung O&T	Biofuel	M&A	Oct 2023	351MEUR
SK Ecoplant	Waste management services	PE Growth	Feb 2022	287MEUR
Kwangjin Chemical	Chemical waste management	Buyout	May 2023	171MEUR

REDDAL

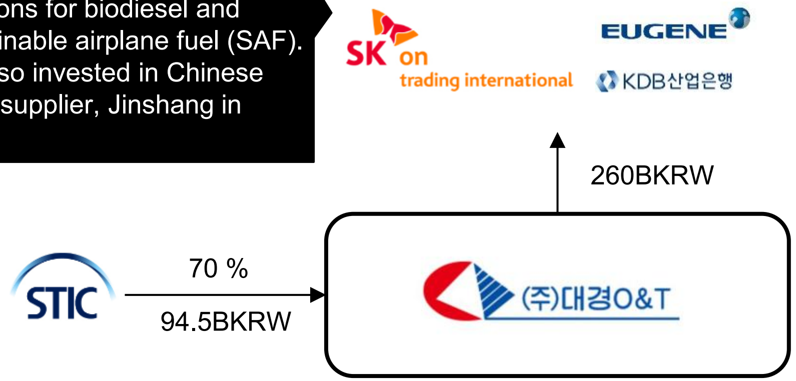
STIC's exit from Daekyung O&T shows how organic waste-derived fuels are becoming high-value strategic assets – with SK's bolt-on strategy reinforcing Korea's push into SAF

Daekyung O&T

General information

Entities involved	STIC, SK Trading International, KDB, Eugene PE
Entry	2017
Exit	Q4 2023
Final valuation (offered)	370BKRW (of which 70% equity sold)
Estimated return	2.75x

SK is looking for drop-in solutions for biodiesel and sustainable airplane fuel (SAF). SK also invested in Chinese UCO supplier, Jinshang in 2023.



Key development areas

Company description

- Producer of biodiesel derived from used cooking oil (UCO) and abattoir byproducts
- STIC transformed the company from an animal feed supplier to a sustainable energy products supplier
- Expanding the supply of used cooking oil is needed for scaling SAF raw material production capacity
- SK's Chinese supply network, Jinshang, may provide a viable solution to secure the necessary UCO supply; however, China is expected to limit or ban its UCO exports, posing a significant risk

Technological capabilities

- Raw materials for SAF
- Refining and rendering oils
- Trading and storage tanks
- Inland transport

Learnings

- Domestic conglomerates' demand for sustainable fuel products has been identified, and major petrochemical players like SK, GS Caltex, HD Hyundai, and S-Oil are aiming to scale SAF production in anticipation of stricter regulations
- SAF market is mandate driven – EU has set an SAF mandate of 2% by 2025, increasing to 6% by 2030 and 70% by 2050; in Korea, a 1% SAF mix mandate is expected to be introduced by 2027, driving further demand for the product
- Despite rising demand, Korea's SAF supply lags behind global competitors such as the US, EU, and China; while there are over 320 SAF production facilities globally, Korea currently has none
- Various governments (including the US) are incentivizing SAF production, which poses potential competition for Korean petrochemical players in these markets
- Significant challenges remain with SAF feedstock (such as UCO) procurement, as tough competition, high price volatility, and domestic protectionism exist

Source: Yonhap (2023), Seoul Daily (2023), Chosun Biz (2023), Financial News (2024), SK Innovation (2024), Kiwoom (2024), Greenium (2024).

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Transforming industrial waste into global green construction through scaling green cement and cement-free solutions

Industrial waste in green construction report

August 2025

REDDAL

For improved global commercialization, green cement and cement-free materials' providers need to trade waste sidestreams, enhance data sharing, and increase product awareness

Executive summary

Construction's carbon footprint and contribution of cement production

- The buildings and construction sector accounts for ~37% of global CO2 emissions
- Cement production is responsible for ~7-8% of global CO2 emissions

Green cement blends and cement-free solutions

- Established green cement blends: Fly-ash and slag-based cement
- Emerging green cement blends: LC3, blended with natural pozzolans
- Cement-free materials (geopolymer)

State incentives and accelerating adoption of green materials

- US and Canada enacted regulations incentivizing low-carbon materials
- Asian governments introduced green construction materials' procurement laws and SCMs-related standards

Key use cases of green cement and cement-free materials

- Infrastructure: Precast applications, pavements, load-bearing structures
- Residential and commercial buildings
- Specialized applications requiring temperature and chemical resistance

Commercialization challenges of green cement and cement-free materials

- Industrial waste sidestreams are likely facing scarcity, threatening commercial scaling, so for instance many waste streams (such as, fly ash) are already utilized in other sectors (for instance in road construction), creating competition; besides, mining and metal industries generate ~500 million tons of unused slag annually – insufficient for scaling green cement production
- Construction players are still lagging in terms of digitalization and data sharing, whereby data silos and inconsistent protocols prevent efficient collaboration and only 35% of firms share data willingly, with larger companies more likely to do so
- Sustainable cement-free materials are not yet widely known or adopted with construction companies prioritizing proven materials to avoid perceived risks, even when alternatives offer environmental benefits

Solutions for better commercialization of green cement and cement-free materials

- Trading waste sidestreams by expanding digital ecosystems into marketplaces for side-stream trading could address raw material volatility, as well as establishing regional hubs for side-stream collection, processing, and distribution of alternative raw materials such as vanadium, phosphate, and titanium
- Enhancing data sharing to overcome data sparsity by prioritizing the development of comprehensive, standardized data repositories specifically for cement alternatives (geopolymer formulations, processing parameters, and performance characteristics)
- Increasing product awareness of green materials though demonstration projects that would serve as powerful tools for building construction industry confidence and providing real-world performance data

Source: Company websites, PBCToday (2024), World Cement (2025), Reddal analysis.

NON-EXHAUSTIVE

Asian and North American governments have been introducing green construction procurement incentives in the form of regulations and emission accounting standards

Overview of key governmental incentives for green construction in North America and Asia Pacific

Regulatory incentives for green construction in Asia Pacific and North America

Asian governments have introduced green construction materials' procurement laws, but also some states have specifically targeted cement and concrete industry with SCMs-related standards

Public green construction materials' procurement regulations:

- In China, the government enacted the revised General Rules for Grading and Certification of Green Construction Materials (effective January 1st, 2024)
- In India, the government has implemented green building criteria for public housing projects; for example, the Lucknow Development Authority mandatorily adopted Green Building Criteria for all its residential and commercial buildings focusing on among other things the use of low-carbon materials
- Thailand has implemented policies supporting low-carbon public procurement, including the use of eco-labeling and specific product categories
- South Korea's government has introduced the Zero Energy Building (ZEB) Certification mandate

Targeted cement and SCMs-related standards and rules:

- Indian IS 456 standard provides guidelines for replacing cement with SCMs, specifically mentioning ground granulated blast-furnace slag and fly ash
- Singapore has adopted a modified version of EN 206, which includes provisions for using SCMs in concrete
- Indonesian SNI 03-4433 standard allows for flexible use of SCMs in concrete mix designs
- In Indonesia, Industry Minister regulation of 2012 requires cement producers to decarbonize their products by 2–3 percent per ton every four years

Both US and Canada have implemented federal regulations incentivizing low-carbon materials, but also individual states can have additional tighter rules, such as emissions accounting requirements

Federal legislations:

- The U.S. Inflation Reduction Act (IRA) includes 2.15BUSD for the General Services Administration and 2BUSD for the Federal Highway Administration to spend on materials with substantially lower embodied greenhouse gas emissions
- The Canadian federal government introduced a Carbon Capture, Utilization and Storage (CCUS) tax credit to support the cement industry's decarbonization

State legislations:

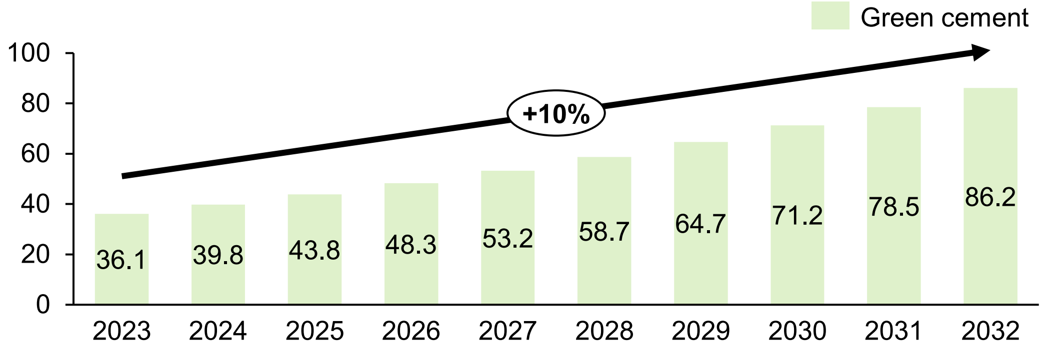
- California's climate legislation requires the cement industry to reach net-zero carbon by 2045
- New York State has implemented rules regulating CO2 limits on concrete used in state-funded public construction projects, so starting 2025, environmental product declarations must be submitted for all concrete mixes
- New Jersey's Bill S-287 of 2023 provides tax credits of up to 3% to concrete producers that supply low-carbon concrete for state-funded construction projects
- Maryland has introduced legislation (HB261) that would require the Department of General Services to establish maximum acceptable global warming potential for concrete or cement mixture materials used in eligible public construction projects by January 1st, 2026

Source: Area Development (2024), WRI (2023), State Capital Lobbyist (2023), Global Cement (2023), Global Efficiency Intelligence, JCI (2015), Enviliance Asia (2024), UNEP (2023), US Dept. of Commerce, Antara News (2024).

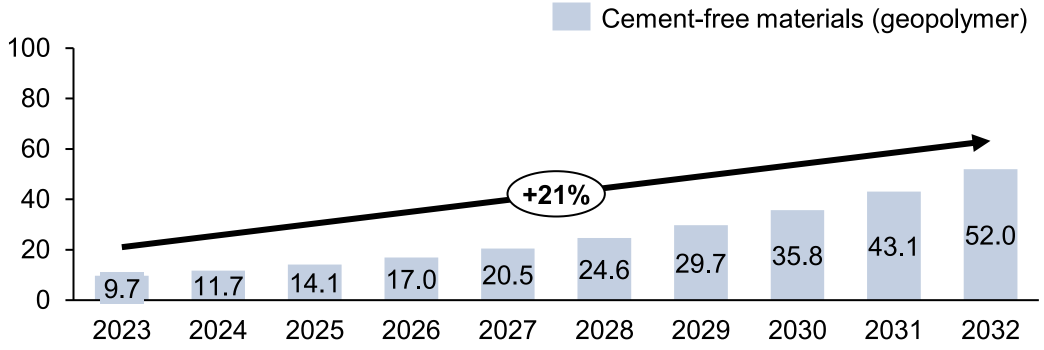
Green cement market will grow at 10% CAGR to reach 86BUSD by 2032, but cement free materials will show staggering 21% growth in the same period

Overview of cement market

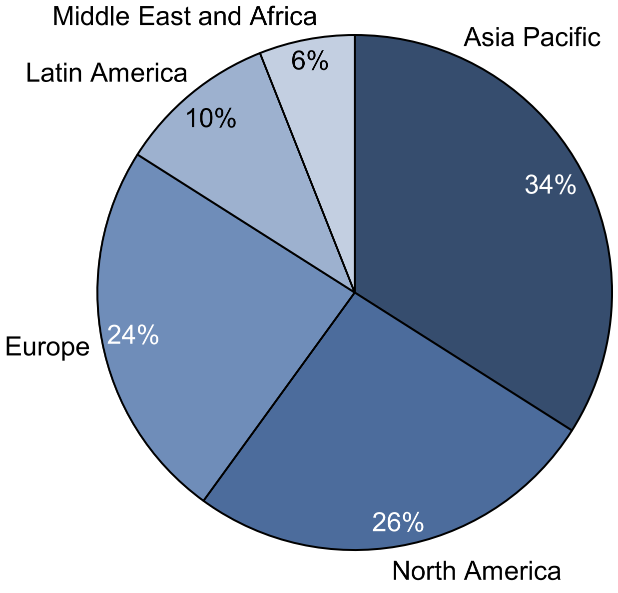
Green cement market size, 2023-2032, BUSD



Cement-free materials (geopolymer) market size, 2023-2032, BUSD



Green cement market size by region, 2023



Selected key industry trends

Green cement and decarbonization

- Major industry players are setting ambitious targets to reduce carbon emissions; for instance, Holcim has pledged to achieve net-zero CO_2 emissions by 2030
- Green cement products are advancing through the development of low-carbon cement alternatives
- Cement producers are increasingly adopting alternative fuels and moving away from coal

Technological advancements

- Cement producers are increasingly integrating automation technologies, robotics, and predictive maintenance; for instance, both Lafarge and Holcim are adopting “Plants of Tomorrow” programs

Regulatory and policy developments

- Programs like the U.S. Federal Buy Clean Initiative (2021) and California's Cement Decarbonization Legislation (2021) are promoting the use of lower-carbon materials
- In Asia Pacific, several regulations have been introduced, such as Singapore's Green Mark Scheme (2005), Australia’s Environmentally Sustainable Procurement Policy (2024), China’s Action Plan for Energy Saving and Carbon Reduction in the Cement Industry (2022), and others

Source: Precedence Research, Allied Market Research 1 2, The Times, Holcim 1, 2, Lafarge, Time, BCA, OneClickLCA (2024), China Climate Cooperation (2024).

ILLUSTRATIVE

Several types of industrial waste are used to produce SCMs that allow to make low-carbon cement blends containing less of clinker

Overview of cement production

⬜ Non-green cement blends
🟩 Established green cement blends
🟩 Emerging green blends

🟦 Clinker
🟦 SCM
⬜ Limestone
🟦 Gypsum
🟪 Chemicals
🟨 Aggregates

Process flow chart and end products

Raw materials

- **Limestone, clay, and marl**
- **Additional components**
  - **Silica sand**
  - **Iron ore**
- **Supplementary Cementitious Materials (SCMs)**
  - **Fly ash waste**
  - **Slag waste**
  - **Demolition waste**

Processing plant

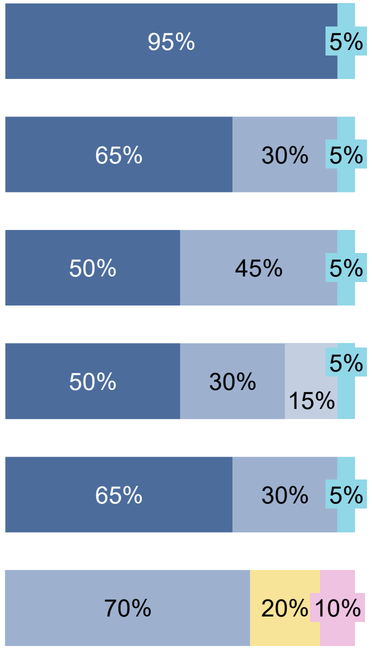
Up to 85% of emissions in cement production come from traditional clinker that can be partially replaced by SCMs.

1. **Crushing and grinding the raw materials**
2. **Blending the materials in the correct proportions**
3. **Burning the prepared mix in a kiln**
4. **Grinding the clinker with some gypsum**

Gypsum and other additives

End products and their compositions (in %)

- **Ordinary Portland Cement (OPC)**
- **Fly-ash based cement**
- **Slag-based cement**
- **LC3 (Limestone calcinated clay cement)**
- **Blended cement with natural pozzolans**
- **Cement-free materials (geopolymer)**



Source: US Department of Energy (2023), McKinsey (2024), Brittanica,Heidelberg Materials, Geopolymer 1, 2.

NON-EXHAUSTIVE

Fly-ash, slag, and natural pozzolans’-based blends show high performance; however, geopolymer blends lead in terms of performance and carbon reduction potential

Overview of green cement blends’ potential use cases

🟩 Established green cement blends
🟩 Emerging green blends

Green cement blends	Availability considerations	Performance characteristics	Key applications	Selected key suppliers
Fly-ash based cement	• Available near coal plants	• Enhances workability, durability, and sulfate resistance	• Roads and pavements • Marine and hydraulic structures • Mass concrete works (dams)	UltraTech Cement The Engineer's Choice LafargeHolcim
Slag-based cement	• Available near steel plants utilizing the Blast Furnace (BF) or Basic Oxygen Furnace (BOF)	• Excellent durability and resistance to chloride and sulfate attack	• Coastal and marine structures • Underground structures (tunnels, basements) • Bridges and roads	Heidelberg Materials JSW Cement The Leaders' Choice
LC3 (Limestone calcinated clay cement)	• Clay is a typical raw material for a cement plant; however, at a smaller share compared to limestone	• Comparable performance to OPC	• General construction (residential, infrastructure) • Precast concrete elements	LafargeHolcim
Blended cement with natural pozzolans	• Available in dry or volcanic regions	• Enhances long-term strength and resistance to chemical attack	• Marine and sulfate-rich environments • Mass concreting and hydraulic structures • Restoration of heritage structures	CEMEX
Cement-free materials (geopolymer)	• Requires not only the availability of SCMs, but also availability of activation chemicals	• Contains no clinker, offering very low carbon emissions • Excellent chemical resistance and high durability	• Infrastructure exposed to aggressive chemicals (wastewater treatment plants) • Fire-resistant concrete applications • Precast parts and high-performance cases	BETOLAR oxara slb CarbiCrete Cemfree Rieder WAGNERS

Source: US Department of Energy, Polymers 1, 2, Eco Material Technology, Kirkland Mining, JACS (2024), Materials (2023), ACEEE, ENR, LC3, SCA, Pro Road Global.

NON-EXHAUSTIVE

Most of the cement-free materials’ providers operate in Europe and North America due to sustainability requirements; with some attempting market entry into Asia and Africa

Geographical distribution of cement-free materials’ providers

Providers	Products	Geographic presence
BETOLAR	• Geoprime®	🇫🇮 🇪🇺 🇮🇳
WAGNERS	• Earth Friendly Concrete®	🇦🇺 🇲🇾
CarbiCrete	• Cement-free CMUs (Concrete Masonry Units)	🇨🇦
C-Crete Technologies	• Cement-free concrete	🇺🇸
Cemfree	• Cemfree Masonry Mortar	🇬🇧
CCP	• Greenbloc Technology	🇬🇧
oxara	• Oxacrete®, Oxabrick®	🇺🇸 🇪🇺 🇮🇳 🇨🇭
mace	• Prefabricated building 'cassettes’ from cement-free concrete	🇬🇧

Implications

North America, Oceania, and Europe:

- Cement-free materials’ providers should establish a solid ground in Europe, Oceania, and North American regions due to stricter government regulations and standards on sustainable construction materials’ procurement

Asia and Africa:

- Successful GTM-cases to Asia and Africa of European players show that market entry should be done through local partnerships and integrated solutions approach, so for instance:
  - In the West and South of India, Betolar has established strategic tie-ups to produce low-carbon, cement-free precast concrete products, for example with Vyara Tiles
  - In India, Betolar provides fully integrated end-to-end solutions, which include designing recipes, dosing of Geoprime, and post-production technical support

Source: Company websites, Inderes.

To effectively commercialize cement-free solutions globally the focus is to be put on trading waste sidestreams, enhancing data sharing, and increasing product awareness

Cement-free materials’ commercialization challenges and potential solutions

Industrial waste sidestreams are likely facing scarcity, threatening commercial scaling

- Expanding digital ecosystems (such as Betolar’s SidePrime platform) into marketplaces for side-stream trading could address raw material volatility
- Establishing regional hubs for side-stream collection, processing, and distribution would address scarcity challenges; for instance, by forming partnerships with mining companies that can provide alternative raw materials for geopolymer production, such as vanadium, phosphate, and titanium

Construction players are still lagging in terms of digitalization and data sharing

- To overcome data sparsity, the industry must prioritize the development of comprehensive, standardized data repositories specifically for cement alternatives (geopolymer formulations, processing parameters, and performance characteristics)
- Industry associations, academic institutions, and government agencies should collaborate to establish data standards that facilitate interoperability and knowledge sharing while respecting intellectual property concerns

Sustainable cement-free materials are not yet widely known or adopted

- Education and awareness programs play a crucial role in accelerating market adoption, whereby the construction industry's unfamiliarity with geopolymer technology contributes to resistance to change
- Demonstration projects would serve as powerful tools for building industry confidence and providing real-world performance data, whereby high-profile demonstration projects that showcase geopolymer concrete in various applications would provide tangible evidence of its viability and performance capabilities

Source: Company websites, Reddal analysis.

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Report 2 short description

- 200 characters
- To effectively commercialize cement-free solutions globally, focus must be on trading waste sidestreams, enhancing data sharing, and increasing awareness through successful demonstration projects

Summary

Report 2 text content on website

- The Reddal Sustainability Practice has conducted a study on challenges and opportunities in transforming industrial waste into green construction solutions. The construction sector has been reported by the UN Environment Programme to be responsible for over 37% of global greenhouse gases' emissions, thus addressing this issue would be of both high societal and economic values. Our material "Transforming industrial waste into green construction solutions" outlines the green cement and cement-free materials (geopolymer) market size opportunities, putting a special emphasis on the geographic differences in terms of regulatory and policy developments that incentivize the adoption of green construction solutions to various degrees. We then take a perspective on how green construction materials' providers can best address the current commercialization challenges and efficiently scale their solutions on the global level through a combined approach based on multiplying industrial waste side streams, promoting data sharing, and increasing the awareness of green construction solutions in the global markets.

- So far, both US and Canada have implemented federal regulations incentivizing low-carbon materials, but also individual states can have additional tighter rules, such as emissions accounting requirements. Moreover, some Asian governments are introducing green construction materials' procurement laws, but also some states have specifically targeted cement and concrete industry with SCMs-related standards. As of today, most of the cement-free materials' providers, such as Betolar, Wagners, and Oxara, operate in Europe, Oceania, and North America due to stricter sustainability requirements; with some attempting market entry into Asia and Africa. However, the commercialization of green cement and cement-free materials like geopolymers faces several key challenges. First, the availability of essential industrial waste streams—such as slag and fly ash—is limited and may not meet the demands of large-scale production, especially as these materials are also used in other industries. Second, the construction sector lags in digitalization and data sharing, making it difficult to track, compare, and optimize the use of sustainable materials across projects. Finally, there is a general lack of awareness and adoption of these innovative materials, as many industry professionals are unfamiliar with their benefits and the market tends to be risk-averse.

- Overcoming these barriers will require coordinated efforts in supply chain management to address waste side streams' scarcity, whereby trading waste side streams by expanding digital ecosystems into marketplaces, as well as establishing regional hubs for side-stream collection, processing, and distribution of alternative raw materials could address side streams' supply concerns. Furthermore, industry collaboration for increased data sharing will be key in order to overcome data sparsity by prioritizing the development of comprehensive, standardized data repositories specifically for cement alternatives (geopolymer formulations, processing parameters, and performance characteristics). Finally, spreading knowledge on the performance and reliability of green cement blends and cement-free materials though demonstration projects that would serve as powerful tools for building construction industry confidence. These measures in combination could significantly improve the global commercialization of green cement and cement-free materials by addressing current bottlenecks.

For @Triet: Include a screen shot of slide 16 at the end of the report.