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Global Modular Construction Growth Opportunities

End-to-end Services and Digital Technology to Boost Modular Construction’s Future Growth Potential

Global Energy & Environment Research Team at Frost & Sullivan

PDF0-19

The Growth Pipeline™ Company
Powering clients towards a future shaped by growth

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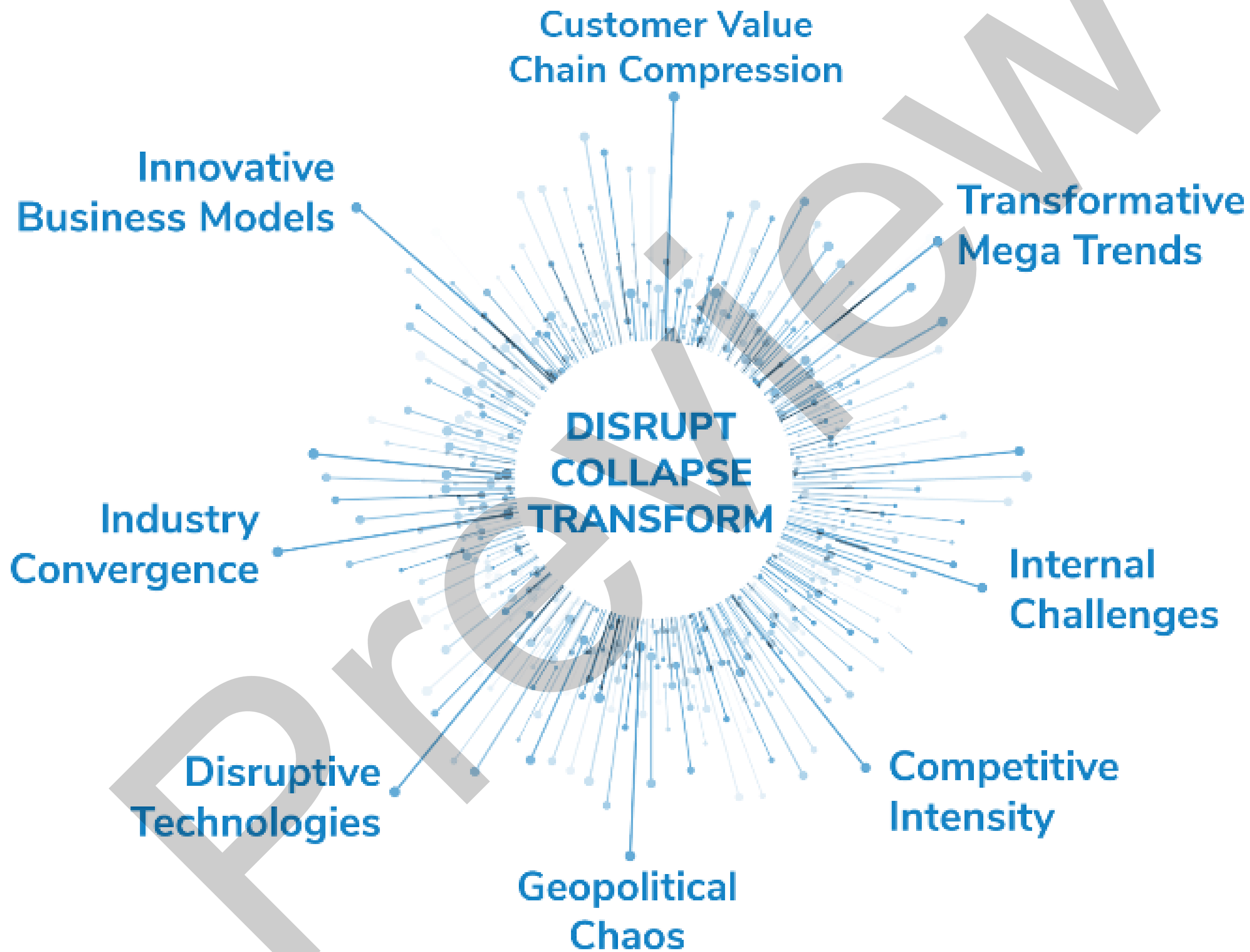
Strategic Imperatives

Why is it Increasingly Difficult to Grow?

The Strategic Imperative 8™: Factors Creating Pressure on Growth



Source: Frost & Sullivan

The Strategic Imperative 8™

Innovative Business Models	Customer Value Chain Compression	Transformative Mega Trends	Internal Challenges
A new revenue model that defines how a company creates and capitalizes economic value, typically impacting its value proposition, product offering, operational strategies, and brand positioning	Customer value chain compression as a result of advanced technologies, internet platforms, and other direct-to-consumer models that enables reduction in friction and the number of steps in customer journeys	Global forces that define the future world with their far-reaching impact on business, societies, economies, cultures, and personal lives	The internal organizational behaviors that prevent a company from making required changes

Competitive Intensity	Geopolitical Chaos	Disruptive Technologies	Industry Convergence
A new wave of competition from start-ups and digital business models that challenge the standing conventions of the past, compelling established industries to re-think their competitive stance	Chaos and disorder arising from political discord, natural calamities, pandemics, and social unrest that impact global trade, collaboration, and business security	New, disruptive technologies that are displacing the old, and significantly altering the way consumers, industries, or businesses operate	Collaboration between previously disparate industries to deliver on whitespace cross-industry growth opportunities

Source: Frost & Sullivan

The Impact of the Top 3 Strategic Imperatives on the Modular Construction (MC) Industry

SI8	Geopolitical Chaos	Transformative Mega Trends	Industry Convergence
Why	• COVID-19 lockdowns led to construction project closures in 2020 and 2021. • The ensuing lack of labor and building materials slowed down projects, created productivity challenges, and caused significant disruptions in the global construction industry.	• The COVID-19 pandemic has created a shift toward the use of modular buildings and construction. • The healthcare industry will remain a vital MC customer. • Since the pandemic, indoor air safety has become a concern for everyone.	• The post-pandemic era has called for more efficient construction methods in response to socio-economic trends, such as labor shortages, sustainability, and customer demand. • Intense collaboration between participants in the MC market, the construction value chain, and across industries will be essential.
Frost Perspective	• Over the next 3 years, market participants should broaden their manufacturing and assembly design capabilities. • This move will entail the use of digital solutions, such as building information modeling, to speed up modular building design and approval processes. • Market participants should develop sustainable manufacturing practices and establish relationships with eco-friendly material suppliers.	• Although the pandemic is in decline, market participants should continue to develop their manufacturing capabilities to rapidly provide modular buildings during crises and disasters. • The next 2 to 3 years will see the use of MC to build healthcare facilities and schools in rural areas and temporary housing for displaced populations because of political conflicts and natural disasters. • Market participants should work with engineers and architects to improve modular building design in response to changing demand regarding indoor air quality and energy consumption.	• Market participants must promote the use of MC to construction industry stakeholders to address labor shortages and the anticipated workforce challenges. Market participants should work with property developers in designing state-of-the-art sustainable buildings or properties that utilize MC. • Market participants need to learn about customer industries, such as healthcare and manufacturing, so they can provide highly customized modular buildings that meet building specifications.

Source: Frost & Sullivan

Growth Opportunities Fuel the Growth Pipeline Engine™

The Innovation Generator™

Analytical Perspectives

The Growth Pipeline Engine™

Source: Frost & Sullivan

Growth Opportunity Analysis

Scope of Analysis

- **MC** involves **Off-site Prefabrication** of building units, such as walls, floors, rooms, and frames, for assembly on-site. Factories produce the building units following certain requirements, such as material standards, manufacturing processes and conditions, and product testing.
- **MC** differs from conventional construction, which involves building walls, flooring, and other building fittings on site. MC installation employs stringent methods that abide by construction codes and standards.
- The MC market has **2 Construction Types***, permanent MC (PMC) and relocatable MC (RMC). The 2 categories of MC **Materials*** are wood and non-wood.
- **The End-user*** market segments include commercial, institutional, public and infrastructure, and industrial.
- The study **Focuses on MC** that includes **Module Types,** such as rooms, roofs, walls, and windows. It **Excludes Certain Prefabricated Products,** such as kit sets, structures, scaffolding, frames, and formwork.
- This study excludes the following segmentations: **MC Material Sub-types, Module Types, Breakdown of End-user Sub-types,** and **a Breakdown of Regions**.

	Scope
Geographic Coverage	Global (Asia-Pacific [APAC], Europe, North America, Rest of the World [RoW])
Study Period	2020–2028
Base Year	2022
Forecast Period	2023–2028
Monetary Unit	US dollar ($)

Market Revenue

Market revenue refers to MC manufacturers' sales and excludes design, engineering, and installation costs. Market and growth estimates rely on secondary research and 2022 interview data.

Primary Research

Researchers conducted interviews with major participants in the construction value chain and MC manufacturers, following a structured discussion guide.

Secondary Research

Frost & Sullivan's internal database, industry reports, market databases, trade journals, industry literature, web-based materials, annual reports, and other sources form the basis of the secondary research.

*Key: Segment definitions are in the following slides.

Source: Frost & Sullivan

Segmentation by Construction Type and Material

MC

Construction Type[1]

PMC

PMC refers to a building or facility that will last for an indefinite period, and its permanence is similar to any other conventionally constructed or non-MC building's life cycle. PMC design and construction must meet the durability and reliability requirements of building operations, such as mechanical, electrical, and plumbing fittings; elevators and escalators; facility functions; and occupancy rates. Office, hospital, and school builders use PMC.

RMC

RMC is suitable for a facility's temporary function and can be a partially or fully assembled building that users can relocate and reuse, either by reconfiguring it or repurposing it for other building functions. Some examples of RMC use are construction site offices and worker accommodation, storage rooms, medical clinics, and retail pop-up stores. RMCs are not fixed properties and do not possess the permanence or life cycle of PMC buildings and conventionally built facilities.

Material[2]

Wood

Any form of lumber and timber

Non-wood

Any form of concrete, steel, plastic or composite, and other materials, such as fiberglass and drywall

Key:
1. Segmentation only for PMC and RMC; no split into module types
2. Segmentation only for wood and non-wood; no split into material subtypes

Source: Frost & Sullivan

Segmentation by End User

End User

Commercial

- This segment includes corporate office buildings that business service providers
(for example, manufacturers, communication and IT, finance and insurance, and property specialists) occupy. It includes single- and multi-tenant office buildings.
- Commercial includes retail, such as shopping centers, shops, malls, supermarkets, restaurants, cafes, factory outlets, wholesale stores, warehouses, and distribution centers.
- The commercial segment includes hospitality and leisure facilities, such as hotels, sports venues, and entertainment centers.

Institutional

- This segment covers education and healthcare facilities.
- Education facilities include public and private universities, higher education colleges, primary and secondary schools, and other small- and medium-sized education facilities (for example, kindergarten, preschool, and daycare facilities).
- Healthcare facilities cover public and private hospitals and senior care facilities and small- and medium-sized health facilities, such as medical and mobile clinics.

Public and Infrastructure

- This segment covers government administrative office buildings at central and local government levels. It may include defense facilities,
social housing facilities, prisons, and other public properties and facilities that government departments administer.
- Public and infrastructure facilities cover land and water transportation, such as ports, airports, railway stations, and transportation hubs.

Industrial

- The industrial segment covers small, medium, and large manufacturing businesses (for example, industrial, food and beverage, metal, automotive, and chemical). The segment includes equipment and parts manufacturers, paint producers, sales showrooms, laboratories, storage areas, and warehouses.
- This segment includes the primary energy and resources sector (for example, coal, iron ore, other metal ore, or mineral mining, and oil and gas exploration) and operations in remote mining campsites and mining villages, including the use of MC to accommodate the workforce.

Residential

- This segment includes residential buildings, such as landed housing properties and high-rise residences.
- The residential segment includes refugee camps.

Key: Segmentation only for the 5 main end-user types; no split into end-user subtypes

Source: Frost & Sullivan

Segmentation by Region

North America

- United States
- Canada

Europe

- Germany
- United Kingdom
- France
- Italy
- Spain
- Benelux (Belgium, the Netherlands, Luxembourg) *
- The Nordics (Denmark, Finland, Norway, and Sweden) *
- Rest of Europe (Austria, Portugal, Czech Republic, Switzerland, and Eastern Europe) *

APAC

- China
- India
- Japan and South Korea *
- Australia and New Zealand *
- Southeast Asia (Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam) *

RoW

- Gulf Corporation Council (GCC) (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates [UAE]) *
- Latin America (Argentina, Brazil, Chile, and Mexico) *
- Russia and Turkey *

*Key: No split into individual countries

Source: Frost & Sullivan

Growth Drivers

Modular Construction: Growth Drivers, Global, 2023–2028

Driver	1–2 Years	3–4 Years	5–6 Years
The Desire for Mass Housing and Sustainability-driven Home Construction will drive the demand for MC. Both developing and developed markets are looking into MC as a method to solve the housing crisis and promote sustainability in building construction. For instance, India, China, and countries in the Middle East and Africa are opting for MC to address urban slum housing challenges. In Singapore, the government has piloted MC-based public housing projects to support its population growth and drive sustainability efforts in the building industry. Canada and the United States are looking into MC to adapt to extreme weather conditions.	High	High	High
The Development and Construction of Infrastructure, Such as Healthcare and Education Facilities, will spur MC advancement. The COVID-19 pandemic in 2020 created opportunities for MC market participants to provide RMC or temporary structures for healthcare operations. This trend has accelerated MC adoption and raised awareness of its benefits among end-user sectors.	High	High	High
Digital Solutions and Manufacturing Advancement and their Associated Benefits in Reducing Construction Labor Costs and Lead Times will continue to stimulate MC revenue growth. The use of building information modeling (BIM), 3D printing, standardized project management, and lean manufacturing techniques in MC has progressively transformed construction project efficiency. As these supporting tools continue to evolve, MC participants will leverage these technologies and techniques to gain market competitiveness.	Medium	Medium	High

Source: Frost & Sullivan

Growth Restraints

Modular Construction: Growth Restraints, Global, 2023–2028

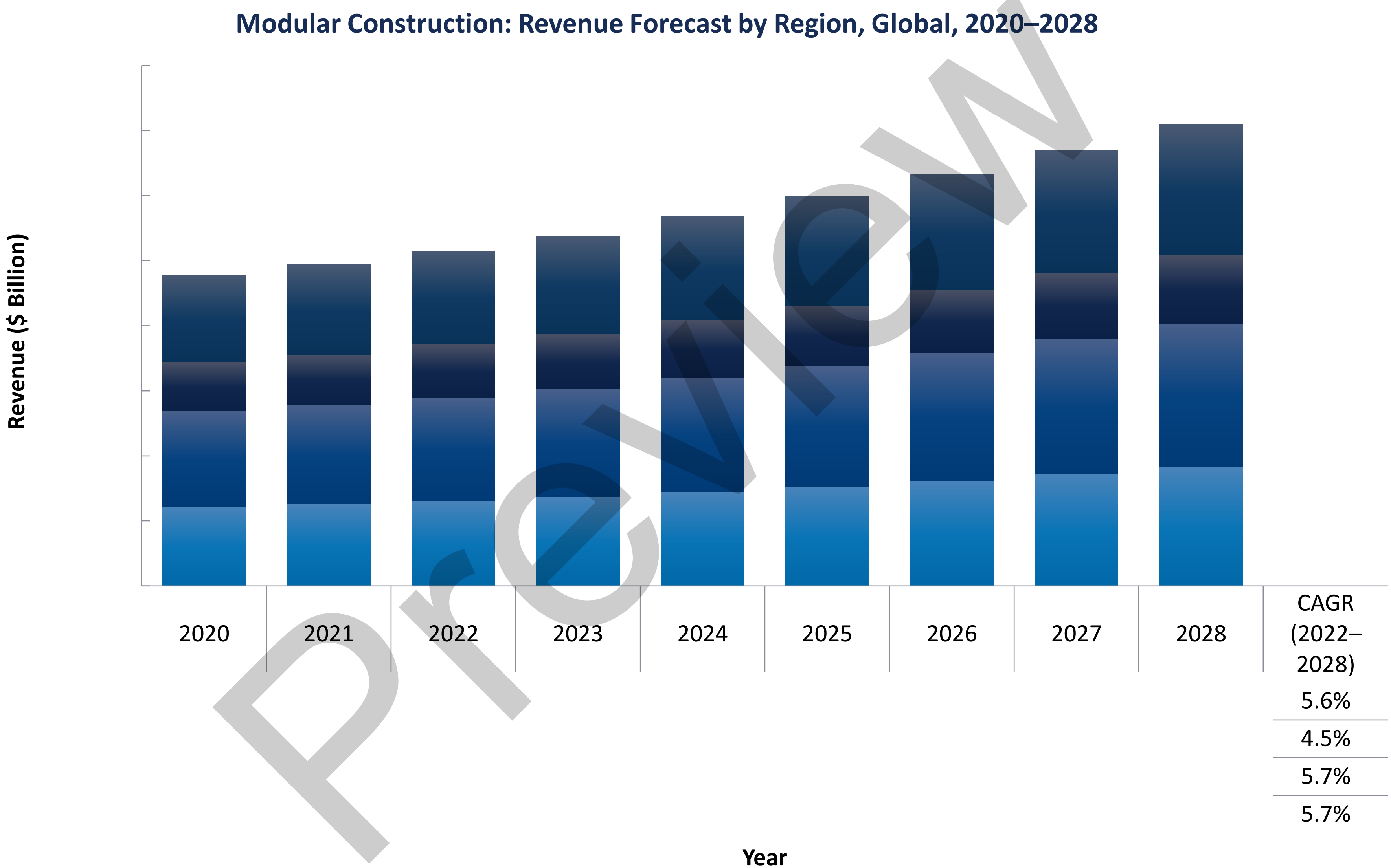
Restraint	1–2 Years	3–4 Years	5–6 Years
Rising Material Costs have Strained MC Sale Prices and affected conventional construction competitiveness. For instance, the price index of fabricated structural steel in the United Kingdom rose from 173 in 2021 to 262.1 in June 2022, and the price of lumber per 1,000 board feet in the United States fluctuated from a high of $1,500.60 in April 2021 to $663.30 in June 2022. The average price of aluminum per metric ton increased from $1,704 in 2021 to $3,496 in March 2022. As price sensitivity becomes more prevalent in the post-COVID-19 world, market participants will have to stay competitively innovative.	**High**	**Medium**	**Medium**
Economic Uncertainty Because of the Ongoing Pandemic and Subsequent Restrictions on Travel and Logistics have interrupted the supply chain of MC materials and components. While economies are reopening, some countries are still in lockdown or imposing restrictions on social and economic activities. For instance, the 2022 lockdowns in China, which is a major trading economy, created tensions in the supply chain ecosystem.	**High**	**Medium**	**Low**
MC's Limitations in Withstanding Natural Disasters, such as earthquakes and floods, are preventing its full adoption and acceptance as the go-to method in building construction. This restraint will have less impact on the market as participants develop the MC strengths of resilience and durability.	**Medium**	**Medium**	**Low**

Source: Frost & Sullivan

Revenue Forecast

Note: All figures are rounded. The base year is 2022. Source: Frost & Sullivan

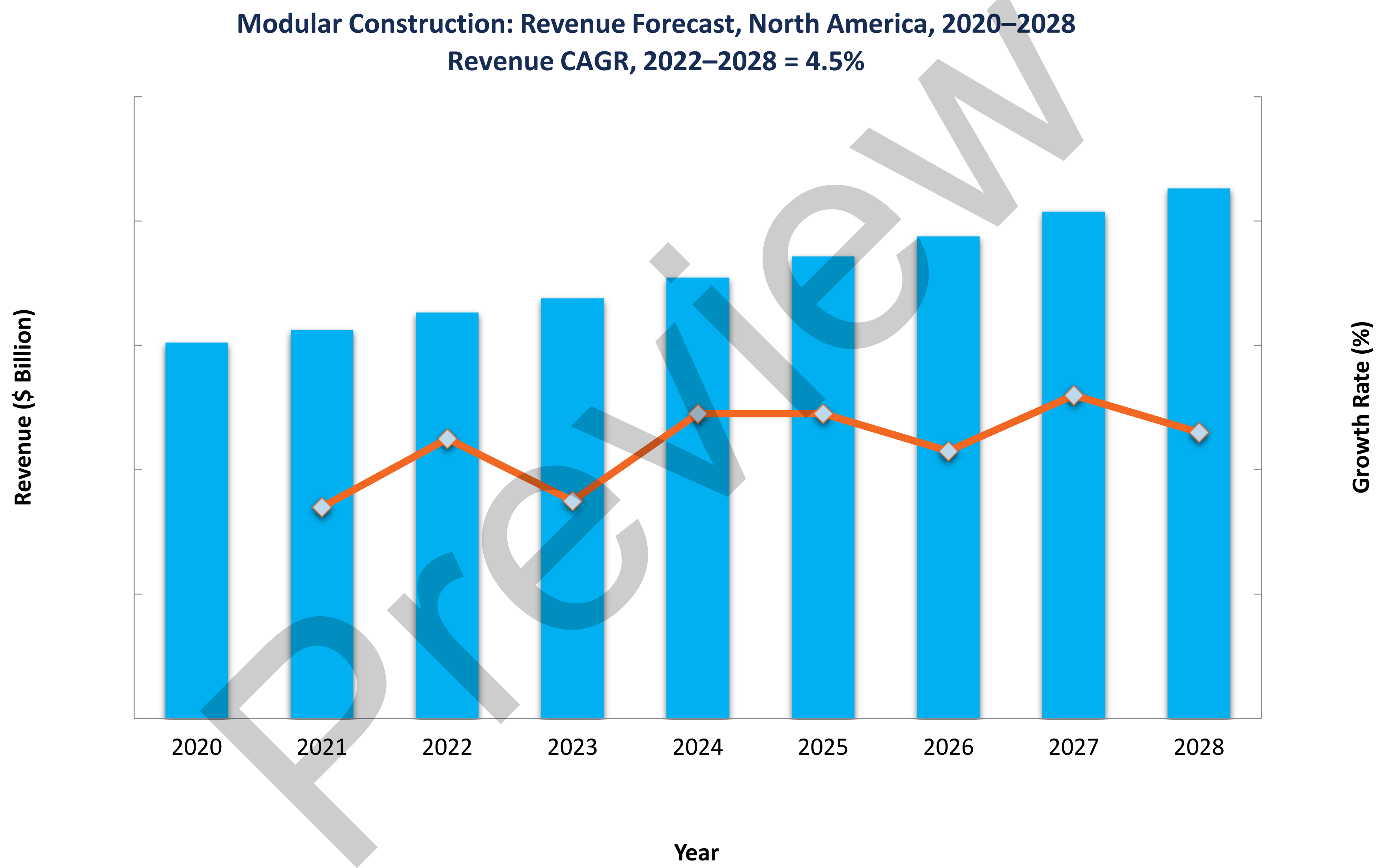
Revenue Forecast by Region



Note: All figures are rounded. The base year is 2022. Source: Frost & Sullivan

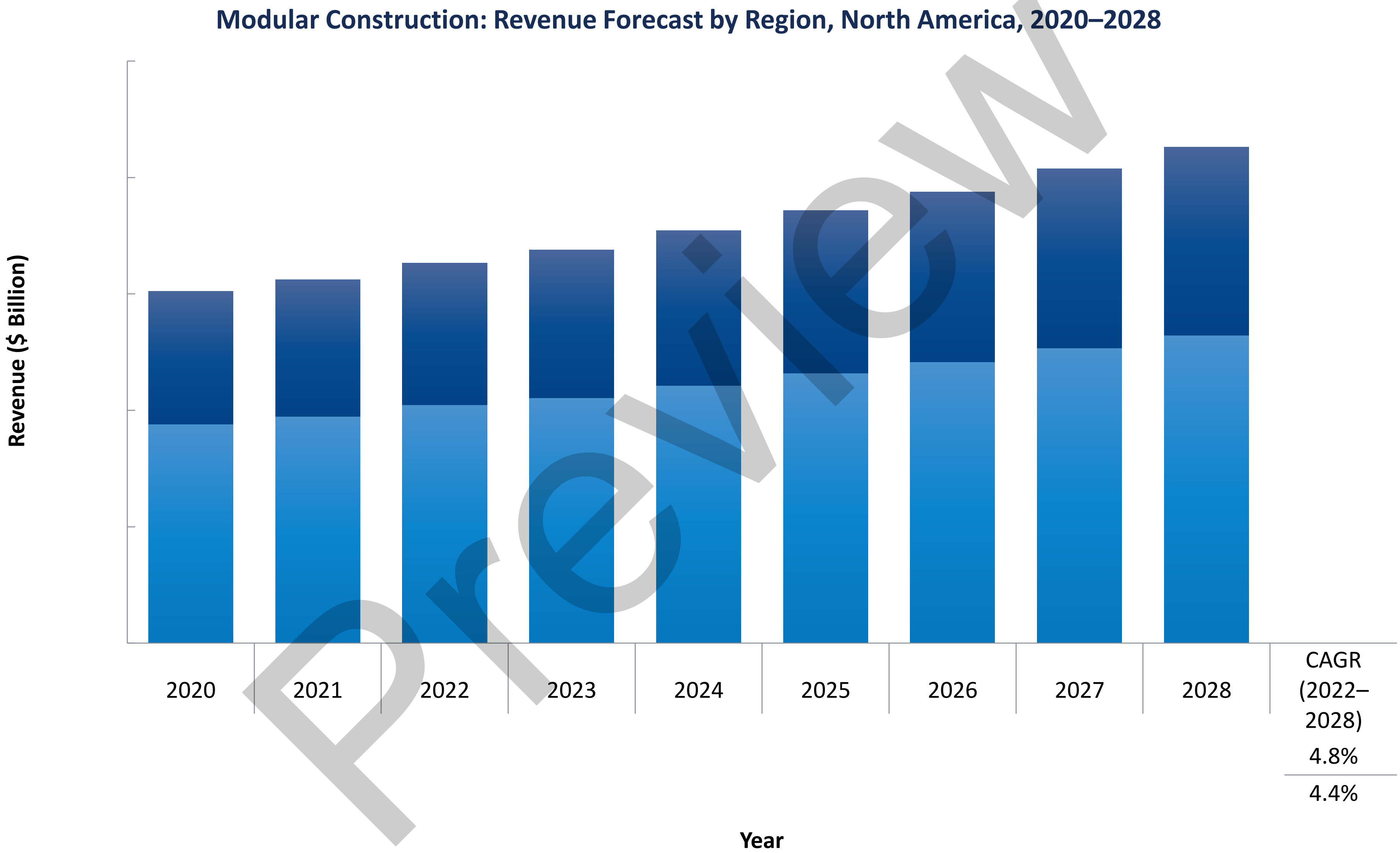
Growth Opportunity Analysis: North America

Revenue Forecast



Note: All figures are rounded. The base year is 2022. Source: Frost & Sullivan

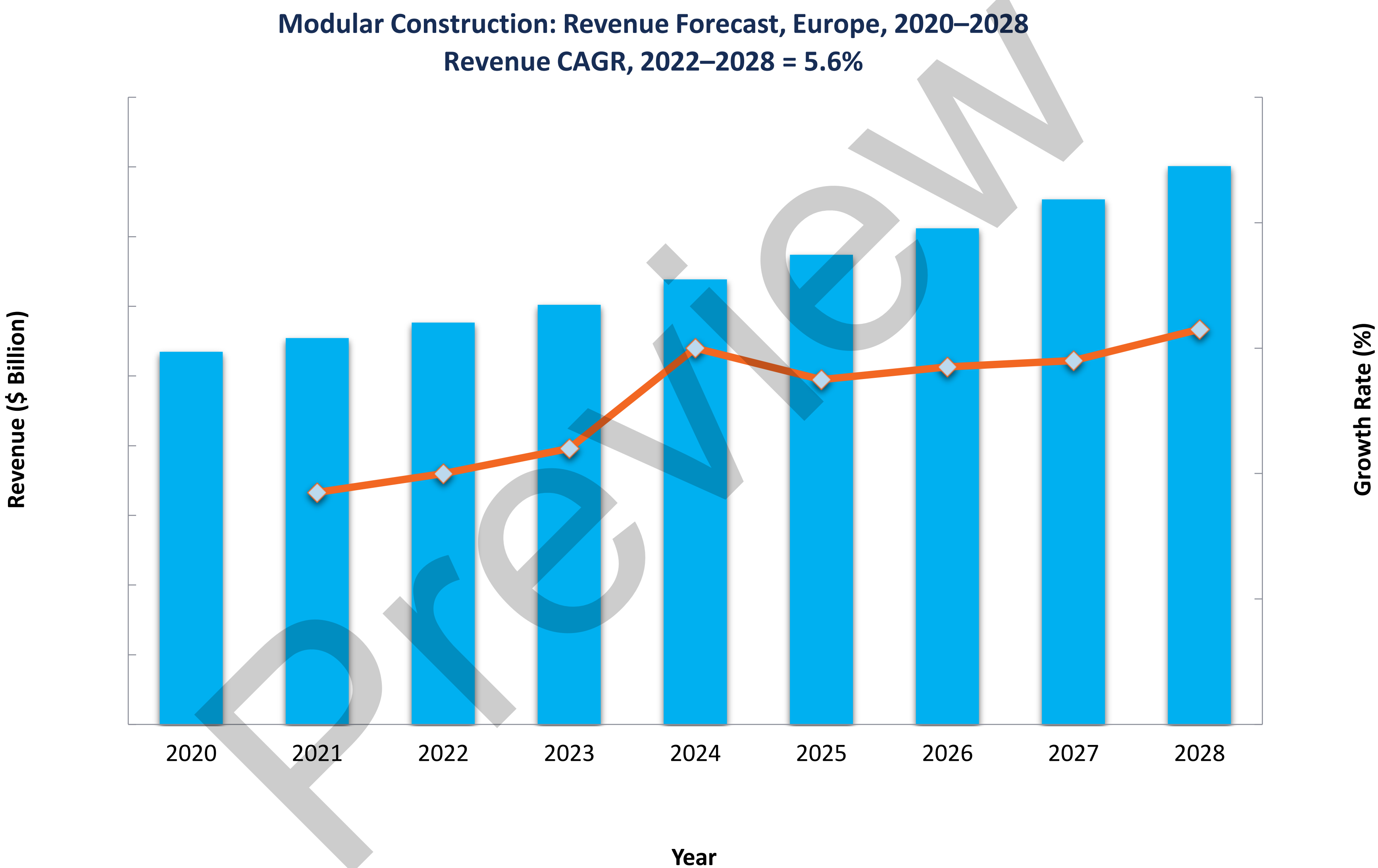
Revenue Forecast by Region



Note: All figures are rounded. The base year is 2022. Source: Frost & Sullivan

Growth Opportunity Analysis: Europe

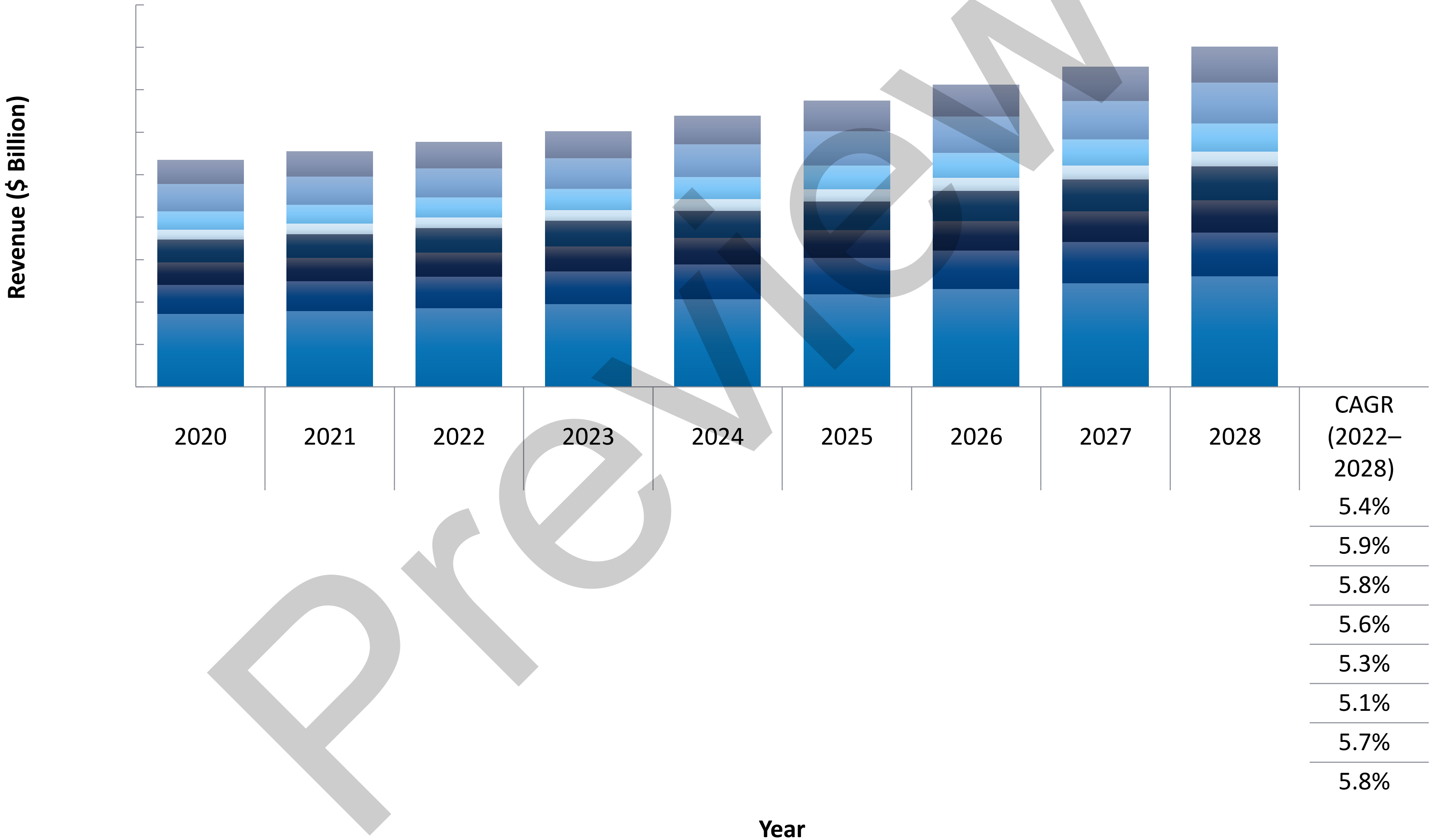
Revenue Forecast



Note: All figures are rounded. The base year is 2022. Source: Frost & Sullivan

Revenue Forecast by Region

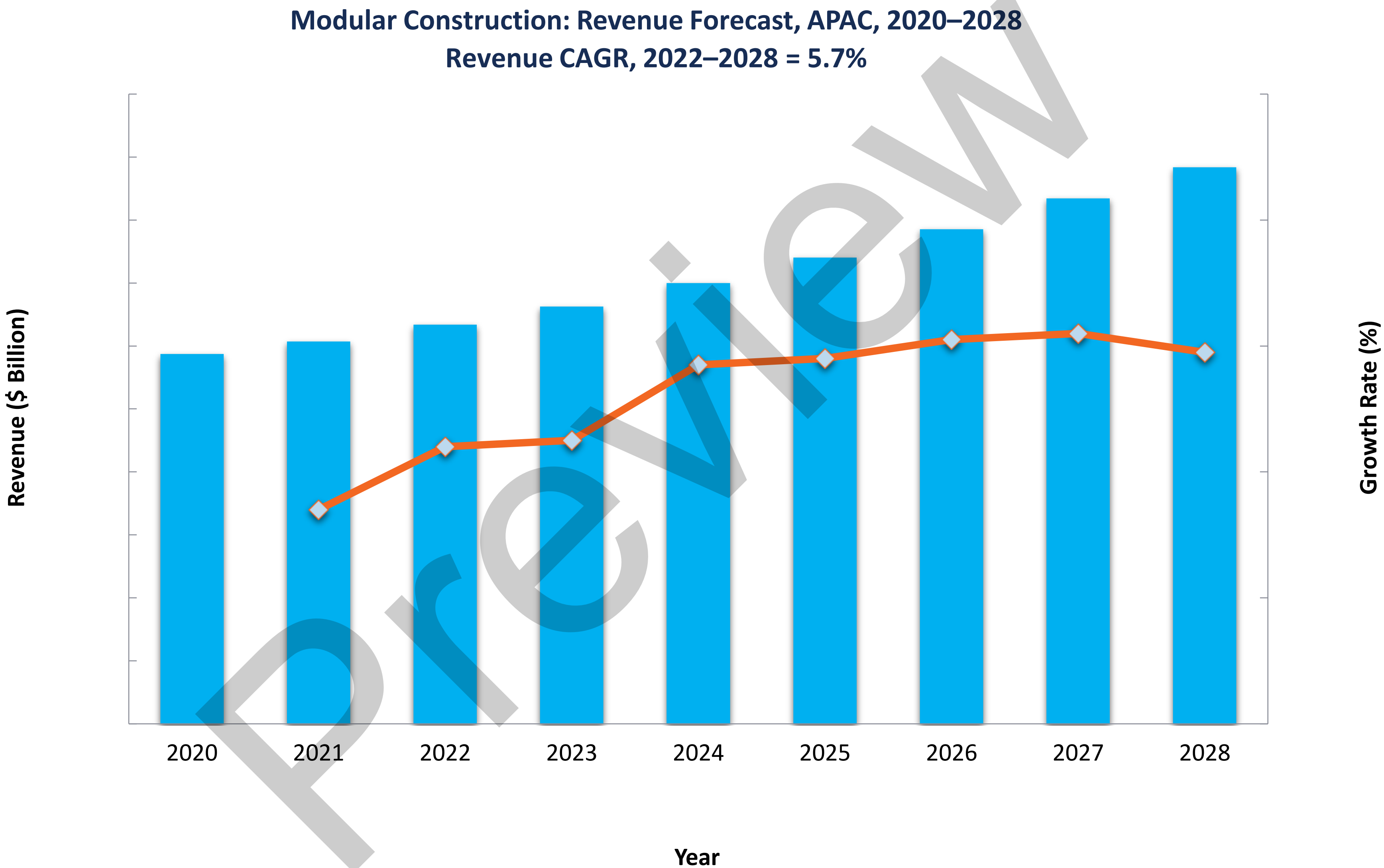
Modular Construction: Revenue Forecast by Region, Europe, 2020–2028



Note: All figures are rounded. The base year is 2022. Source: Frost & Sullivan

Growth Opportunity Analysis: APAC

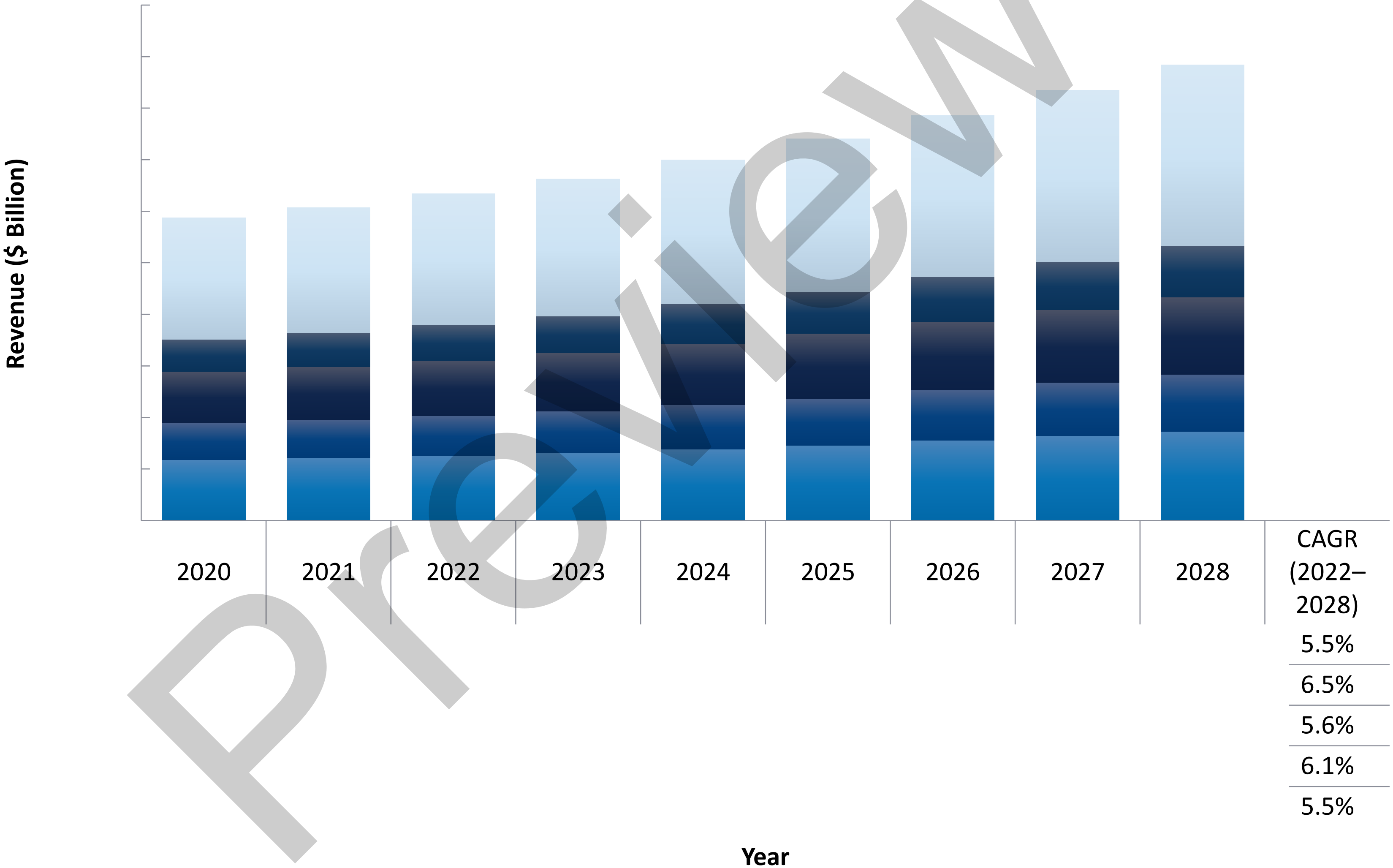
Revenue Forecast



Note: All figures are rounded. The base year is 2022. Source: Frost & Sullivan

Revenue Forecast by Region

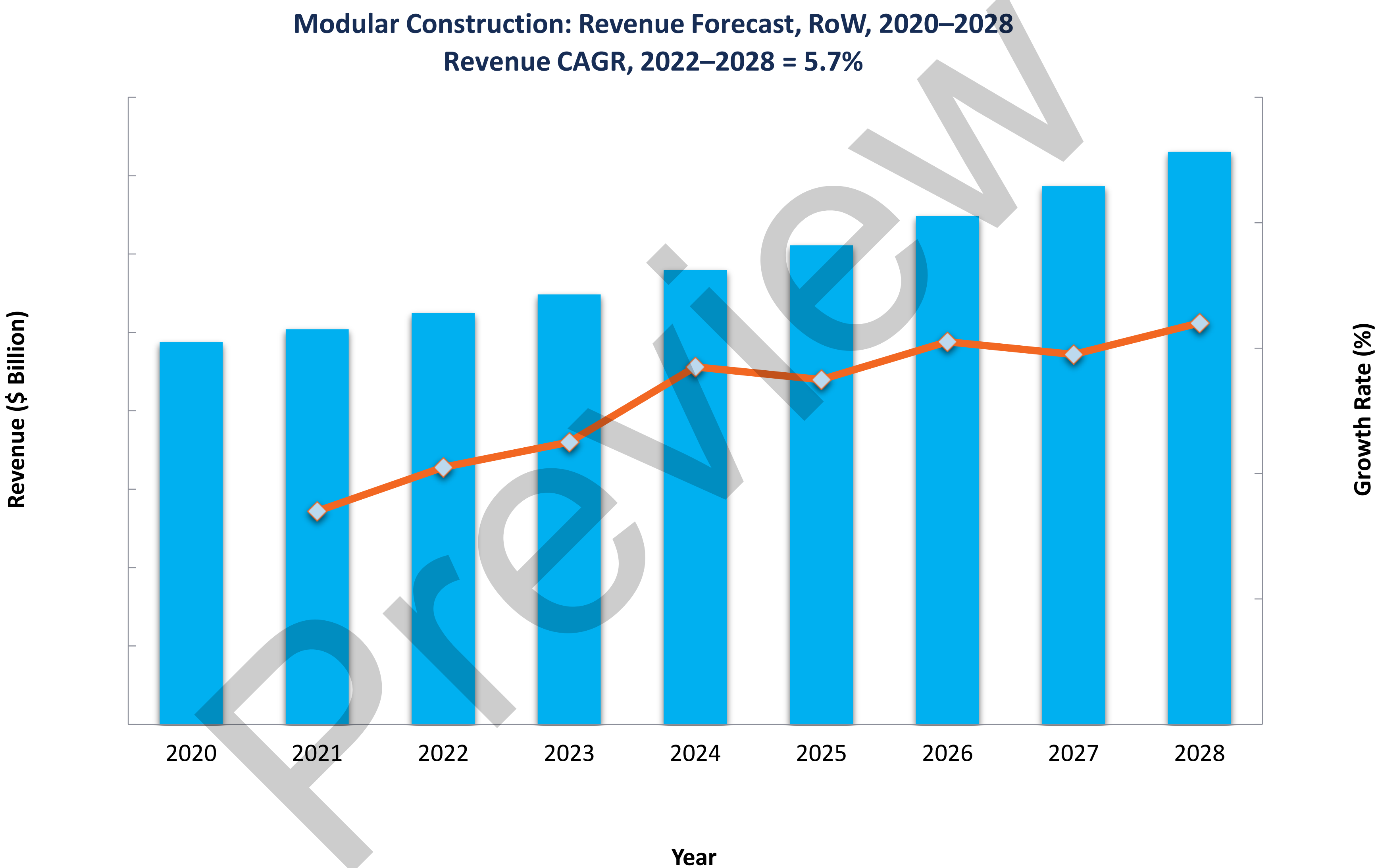
Modular Construction: Revenue Forecast by Region, APAC, 2020–2028



Note: All figures are rounded. The base year is 2022. Source: Frost & Sullivan

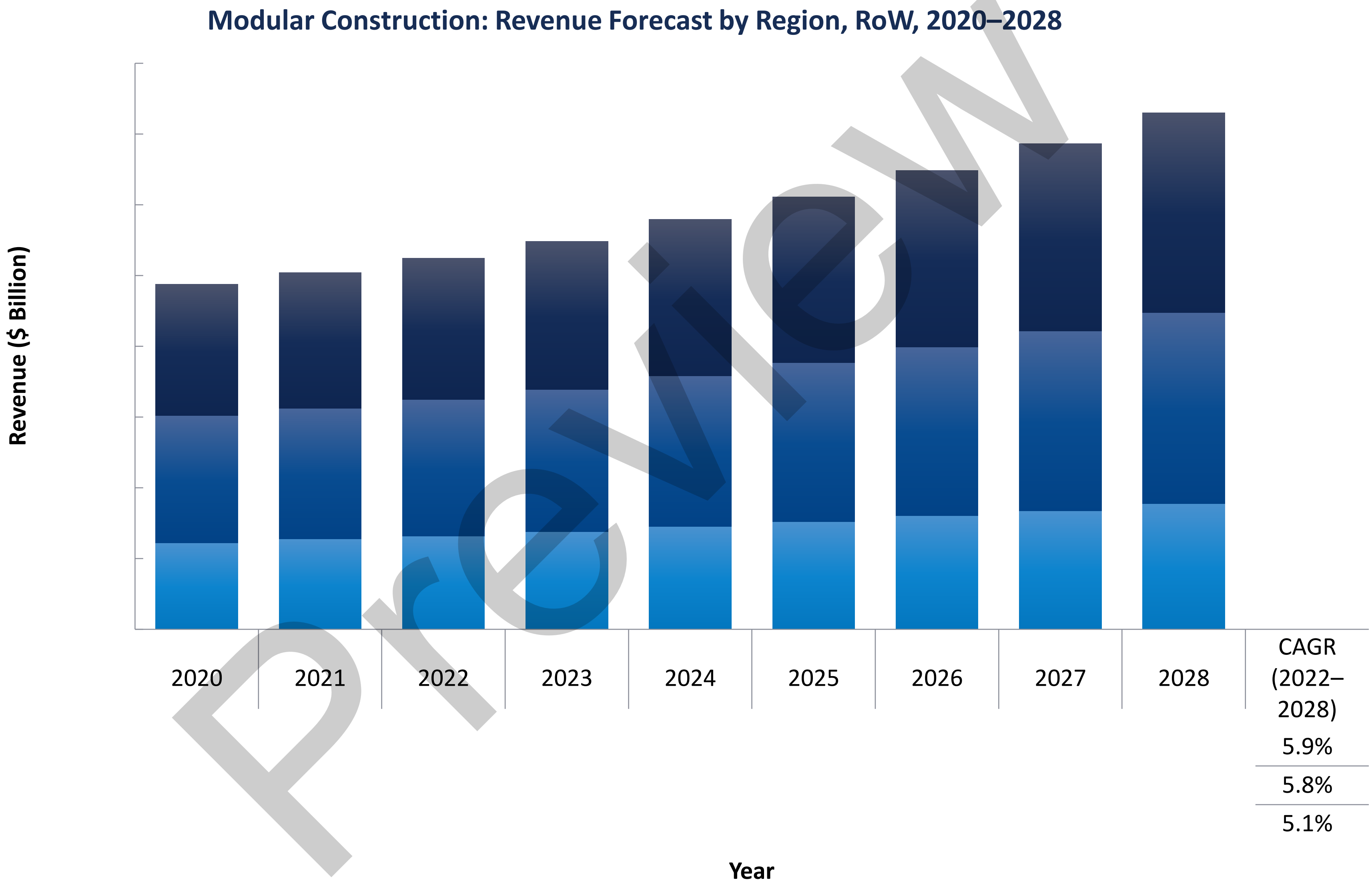
Growth Opportunity Analysis: RoW

Revenue Forecast



Note: All figures are rounded. The base year is 2022. Source: Frost & Sullivan

Revenue Forecast by Region



Note: All figures are rounded. The base year is 2022. Source: Frost & Sullivan

Growth Opportunity Universe

Growth Opportunity 1: End-to-end Services to Improve MC Reliability

Opp. Size in 5 Years	$500 M–$1 B
Timeline for Action	2 Years
Base Year	2022

Relevant End-user Industries for this Growth Opportunity

Manufacturing	Mobility	Metal & Mining
Energy & Environment	Chemicals & Materials	Information & Communications Technologies
Electronics & Semiconductors	Agriculture, Food & Nutrition	Govt and Public Sector
Construction	Education	Healthcare & Lifesciences
Consumer	Aerospace	Hospitality
Retail	Defense	Banking & Financial Services

Applicable Regions

North America	Western Europe
Latin America	Africa
Central/ Eastern Europe	Asia-Pacific

Frost & Sullivan has identified 10 Growth Processes that serve as levers for determining and evaluating new Growth Opportunities.

Growth Processes

Customer & Branding	Distribution Channel	Geographic Expansion	Vertical Market Expansion	Competitive Strategy
Strategic Partnering	Product Development	Merger & Acquisition	Product Launch	Technology & IP

Source: Frost & Sullivan

Growth Opportunity 2: Sustainability Practices to Promote MC Use

Opp. Size in 5 Years	>$1 B
Timeline for Action	3 Years
Base Year	2022

Relevant End-user Industries for this Growth Opportunity

Manufacturing	Mobility	Metal & Mining
Energy & Environment	Chemicals & Materials	Information & Communications Technologies
Electronics & Semiconductors	Agriculture, Food & Nutrition	Govt and Public Sector
Construction	Education	Healthcare & Lifesciences
Consumer	Aerospace	Hospitality
Retail	Defense	Banking & Financial Services

Applicable Regions

North America	Western Europe
Latin America	Africa
Central/ Eastern Europe	Asia-Pacific

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Growth Processes

Customer & Branding	Distribution Channel	Geographic Expansion	Vertical Market Expansion	Competitive Strategy
Strategic Partnering	Product Development	Merger & Acquisition	Product Launch	Technology & IP

Source: Frost & Sullivan

Growth Opportunity 3: Innovative Business Models to Bring Value to MC Customers

Opp. Size in 5 Years	$500 M–$1 B
Timeline for Action	3 Years
Base Year	2022

Relevant End-user Industries for this Growth Opportunity

Manufacturing	Mobility	Metal & Mining
Energy & Environment	Chemicals & Materials	Information & Communications Technologies
Electronics & Semiconductors	Agriculture, Food & Nutrition	Govt and Public Sector
Construction	Education	Healthcare & Lifesciences
Consumer	Aerospace	Hospitality
Retail	Defense	Banking & Financial Services

Applicable Regions

North America	Western Europe
Latin America	Africa
Central/ Eastern Europe	Asia-Pacific

Frost & Sullivan has identified 10 Growth Processes that serve as levers for determining and evaluating new Growth Opportunities.

Growth Processes

Customer & Branding	Distribution Channel	Geographic Expansion	Vertical Market Expansion	Competitive Strategy
Strategic Partnering	Product Development	Merger & Acquisition	Product Launch	Technology & IP

Source: Frost & Sullivan

Growth Opportunity 4: Partnerships to Boost MC Outreach

Opp. Size in 5 Years	>$1 B
Timeline for Action	4 to 5 Years
Base Year	2022

Relevant End-user Industries for this Growth Opportunity

Manufacturing	Mobility	Metal & Mining
Energy & Environment	Chemicals & Materials	Information & Communications Technologies
Electronics & Semiconductors	Agriculture, Food & Nutrition	Govt and Public Sector
Construction	Education	Healthcare & Lifesciences
Consumer	Aerospace	Hospitality
Retail	Defense	Banking & Financial Services

Applicable Regions

North America	Western Europe
Latin America	Africa
Central/ Eastern Europe	Asia-Pacific

Frost & Sullivan has identified 10 Growth Processes that serve as levers for determining and evaluating new Growth Opportunities.

Growth Processes

Customer & Branding	Distribution Channel	Geographic Expansion	Vertical Market Expansion	Competitive Strategy
Strategic Partnering	Product Development	Merger & Acquisition	Product Launch	Technology & IP

Source: Frost & Sullivan

Growth Opportunity 5: Technology Convergence to Advance MC

Opp. Size in 5 Years	$100 M–$500 M
Timeline for Action	3 Years
Base Year	2022

Relevant End-user Industries for this Growth Opportunity

Manufacturing	Mobility	Metal & Mining
Energy & Environment	Chemicals & Materials	Information & Communications Technologies
Electronics & Semiconductors	Agriculture, Food & Nutrition	Govt and Public Sector
Construction	Education	Healthcare & Lifesciences
Consumer	Aerospace	Hospitality
Retail	Defense	Banking & Financial Services

Applicable Regions

North America	Western Europe
Latin America	Africa
Central/ Eastern Europe	Asia-Pacific

Frost & Sullivan has identified 10 Growth Processes that serve as levers for determining and evaluating new Growth Opportunities.

Growth Processes

Customer & Branding	Distribution Channel	Geographic Expansion	Vertical Market Expansion	Competitive Strategy
Strategic Partnering	Product Development	Merger & Acquisition	Product Launch	Technology & IP

Source: Frost & Sullivan

Growth Opportunity 6: Customer's Industry Focus for Optimum MC Penetration

Opp. Size in 5 Years	>$1 B
Timeline for Action	5 Years
Base Year	2022

Relevant End-user Industries for this Growth Opportunity

Manufacturing	Mobility	Metal & Mining
Energy & Environment	Chemicals & Materials	Information & Communications Technologies
Electronics & Semiconductors	Agriculture, Food & Nutrition	Govt and Public Sector
Construction	Education	Healthcare & Lifesciences
Consumer	Aerospace	Hospitality
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Applicable Regions

North America	Western Europe
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Frost & Sullivan has identified 10 Growth Processes that serve as levers for determining and evaluating new Growth Opportunities.

Growth Processes

- Customer & Branding
- Distribution Channel
- Geographic Expansion
- Vertical Market Expansion
- Competitive Strategy
- Strategic Partnering
- Product Development
- Merger & Acquisition
- Product Launch
- Technology & IP

Source: Frost & Sullivan

Next Steps

Why Frost, Why Now?

Our Expertise	
EXPERIENCE	• 60 years of proven global experience • Trusted partner of investors, corporates, and governments
COVERAGE	• Industry convergence through comprehensive coverage • Global footprint to match client needs
ANALYTICS	• Innovation Generator™ driving 6 analytical perspectives • Proprietary growth tools and frameworks
BEST PRACTICES	• Growth Pipeline Engine™ and Companies to Action™ • 10 Growth Processes: Best practices foundation

Client Impact

- **FUTURE GROWTH POTENTIAL:** Maximized through collaboration
- **GROWTH PIPELINE™:** Continuous flow of growth opportunities
- **GROWTH STRATEGIES:** Proven best practices
- **INNOVATION CULTURE:** Optimized customer experience
- **ROI & MARGIN:** Implementation excellence
- **TRANSFORMATIONAL GROWTH:** Industry leadership

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Industry Convergence
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