

# Circular Economy & Sustainability

*Workshop*

**Business Opportunities**

13th January 2025

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# iktva Program Overview (1/2)

The In-Kingdom Total Value Add (iktva) program is designed to drive increased investment, economic diversification, job creation, and workforce development within the Kingdom

Saudi Aramco aims to achieve 70% local content




**iktva in Procurement**

2000+ Service contracts	290+ Corporate purchase agreements
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**Business Opportunities**

12 Sectors	200+ Business Opportunities	\$28 bn Annual Market Size
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**Anchor Projects**

6 Anchor projects

IMI	SPARK	Tuwaiq
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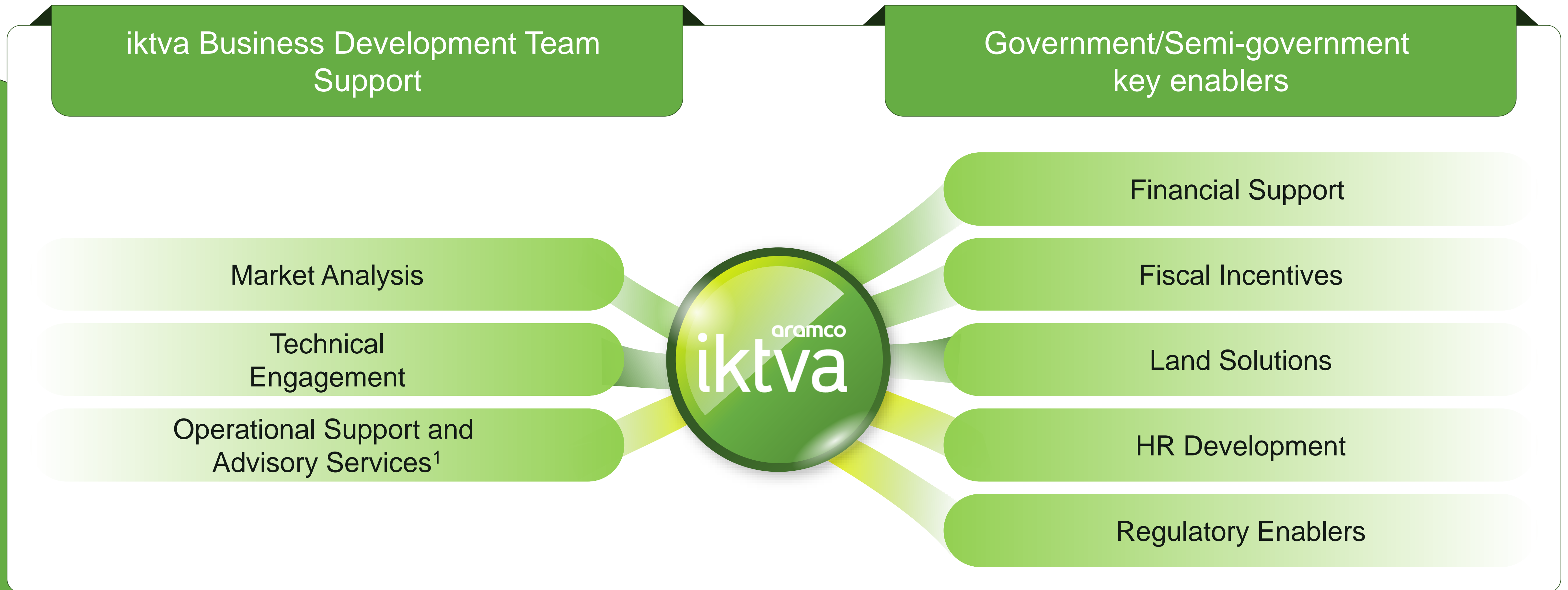


**Local Workforce Development**

16 National training centers	90+ Programs
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Driving Prosperity

Note: IMI = International Maritime Industries; SPARK = King Salman Energy Park











**Driving Prosperity**

1. Includes broad range of support services provided by the team: user requirements, advisory on available financial and fiscal incentives, guidance on localization process in line with local regulations and standards, action plan development etc.

# Why invest in KSA?

Non-exhaustive

 Strong GDP growth and healthy economy	 Big market and game-changing opportunities	 Government incentives and enablers	 Ease of doing business	 Strategic global location	 Favorable demographics
<b>Top 20</b> economies globally	<b>5</b> Special Economic Zones drive innovation	<b>\$1.3T+</b> invested in private sector by 2030	 one of world's most rewarding tax systems	<b>12-15%</b> of global trade passes via Red Sea	<b>17%</b> population growth from 2013-2023
<b>GDP growth</b> among highest projected in 2025 in top economies	<b>6</b> giga projects driving urbanization and industry	<b>5.7%</b> contribution of FDI to GDP by 2030	<b>Top 5</b> in the MENA region for ease of doing business	 KSA container ports are among the most efficient globally	<b>67%</b> of population below the age of 35

## Driving Prosperity

Note: FDI = Foreign Direct Investment  
 Source: IMF; MISA; Vision 2030 Key Performance Indicators; Shareek Program; World Bank

# How do we define what is an opportunity?



**Growing market**

*High growth high spend markets*



**Limited local players  
& import driven**

*Markets with few local contributors  
and high import resilience*



**Technological  
& labor feasibility**

*Markets with accessible or  
standardized technology and  
available skilled labor*

# Circular Economy & Sustainability Market Overview

KSA circular economy & sustainability

14 opportunities to be discussed today

**\$4.0 B**  
 7% CAGR<sup>1</sup>

2024 KSA market size for opportunities  
 in today's workshop

- 1 Oil Spill Detection, Identification, Clean-up, Remediation
- 2 Blocked Sulfur Handling
- 3 Asphalt Central Plant Recycling
- 4 Hot-in-place Asphalt Recycling (HIPR)
- 5 Waste-to-energy
- 6 Hydrocarbon Waste Circularity Solutions for Oil Sludge
- 7 Industrial Waste Management Services
- 8 On-site Industrial Waste Recycling – Drilling Operations
- 9 Carbon (CO<sub>2</sub>) Capture Membranes
- 10 Mineralization Equipment
- 11 Flare Recovery Systems
- 12 Ammonia (NH<sub>3</sub>) Crackers
- 13 Critical Membrane Commodities
- 14 Water Treatment Technologies

Driving Prosperity

1. 5-year forecasted KSA CAGR (2024-2029)

# Oil spill detection, identification, clean- up, remediation

*Business Opportunity*

# Opportunity profile – Oil spill detection, identification, clean-up, remediation

1

KSA requires advanced solutions for oil spill remediation to protect local ecosystems

## Types



Booms



Skimmers



Bioremediation agents

2

Oil spill remediation market in KSA is sizeable with stable growth

**\$2.8B**

Estimated 2029 KSA market size

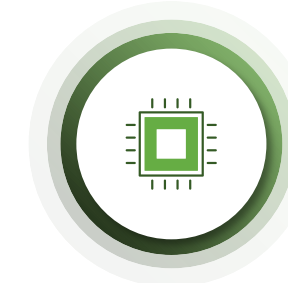
**4%**

Forecasted 5-year CAGR

3

Attractive investment opportunities across the value chain

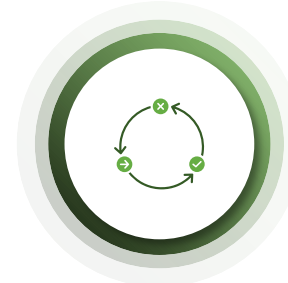
## KSA value chain opportunities



Equipment



Containment, collection & remediation



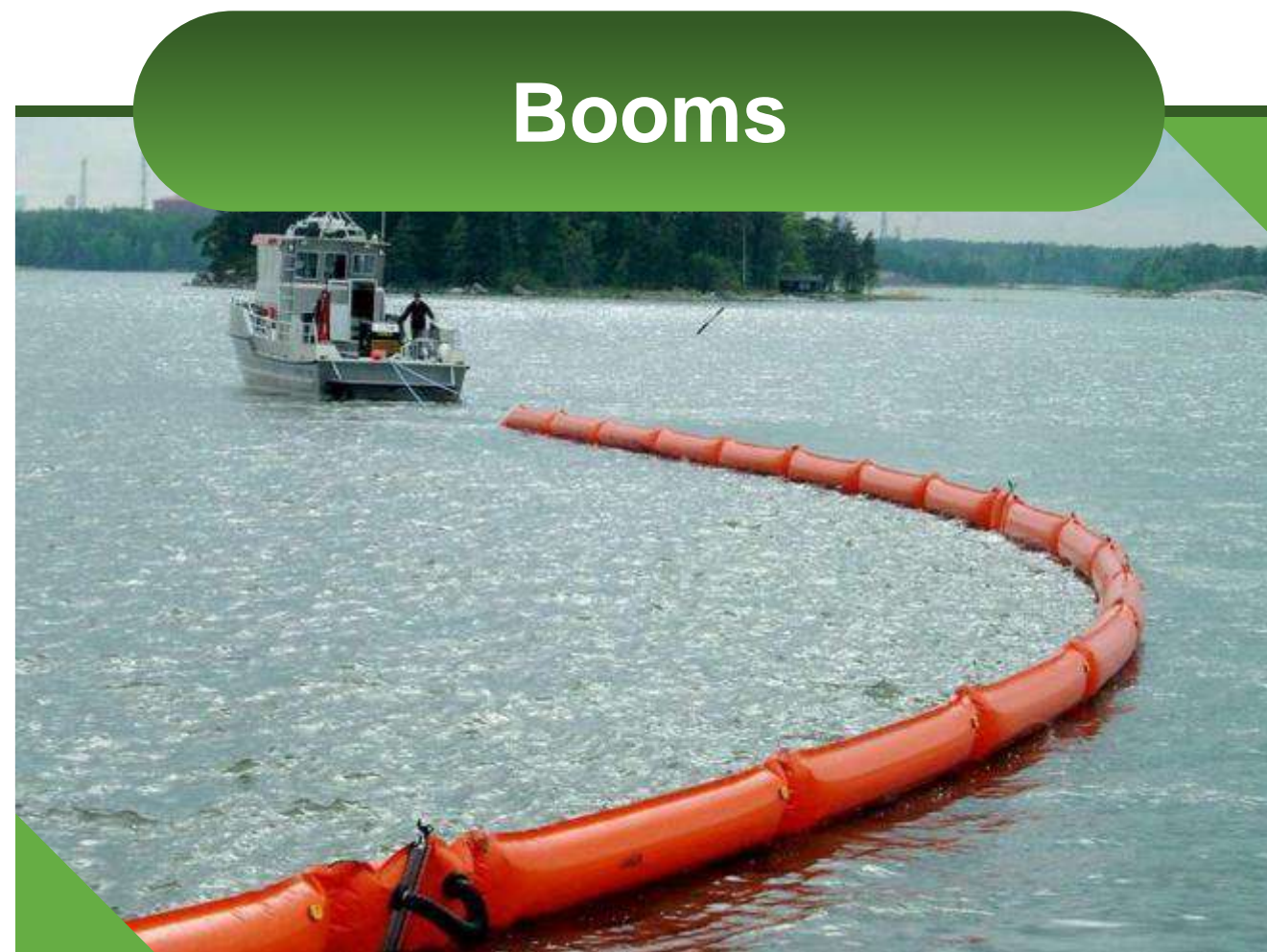
Waste Management

## KSA enablers

- Financial setup loans
- Corporate tax reduction
- KACST technical support

# Potential oil spill remediation technologies to be chosen and localized

Non-Exhaustive



**Booms**



**Skimmers**



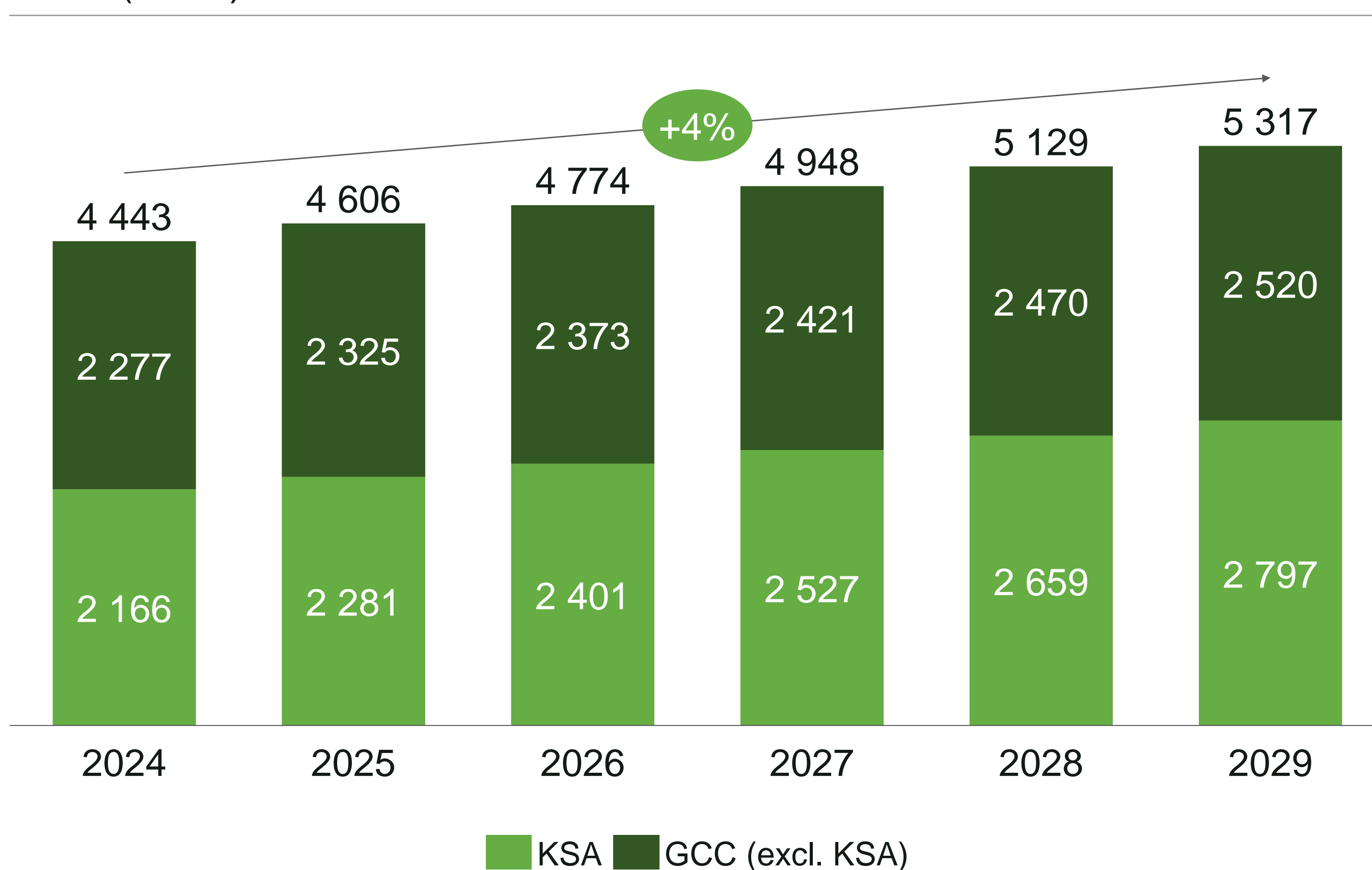
**Bioremediation agents**

## Applications

- Containing and preventing the spread of oil in water bodies
- Recovering spilled oil from the water surface for storage or disposal
- Breaking down and degrading oil using biological processes to restore ecosystems

# Oil spill remediation demand, customers, and drivers

Forecasted KSA and rest of GCC oil spill remediation market 2024-2029 (\$MM)



## Typical customers in KSA

- Oil & gas facilities

## Key KSA demand drivers

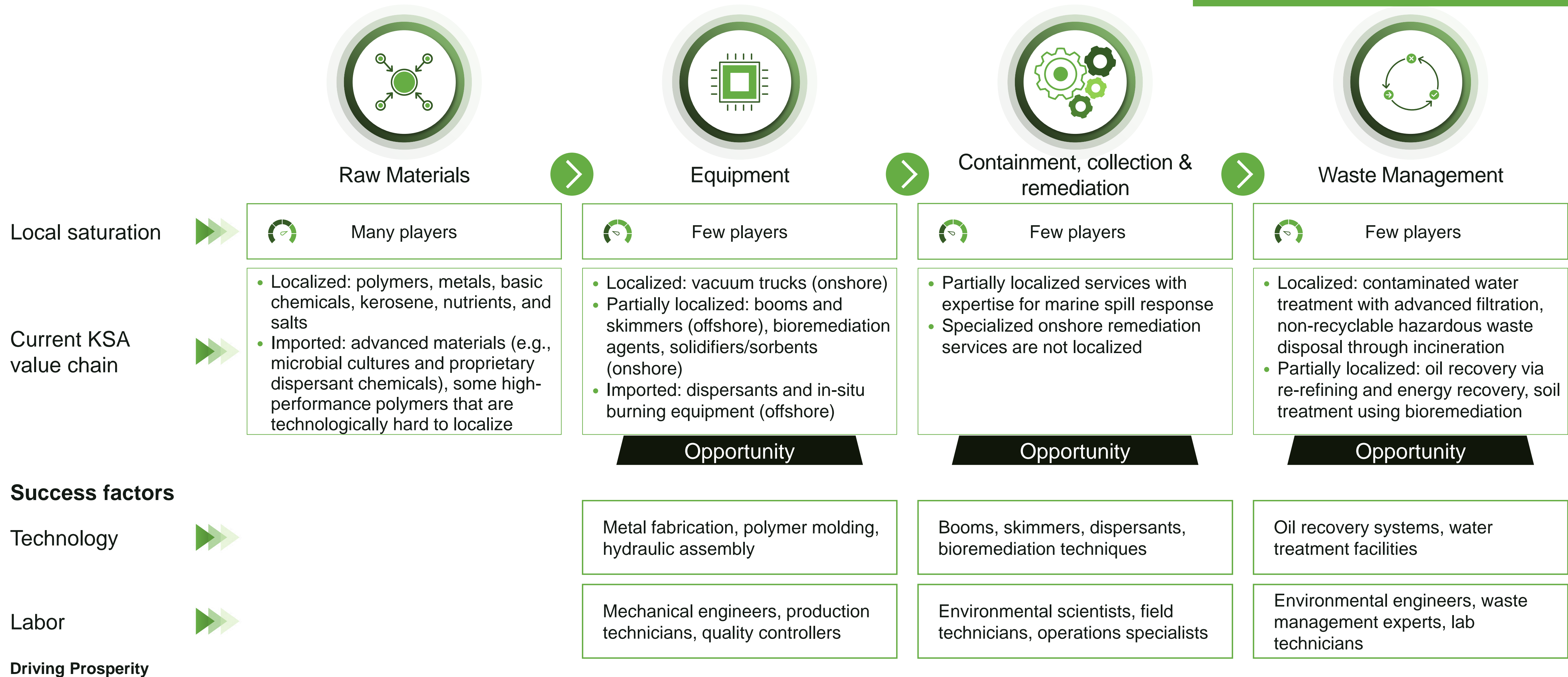
- Stricter environmental regulations drive demand for advanced spill management technologies
- O&G targeting emissions reduction on a company level

## KSA national targets

- KSA is targeting to recycle and treat 85% of the industrial hazardous waste from landfills by 2035

# Value chain and key localization opportunities

Oil spill remediation



# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Financial Support:** Loans and grants for procuring oil spill detection and remediation technologies



**Corporate Tax Reduction:** Credits on R&D for spill detection systems and bioremediation agents

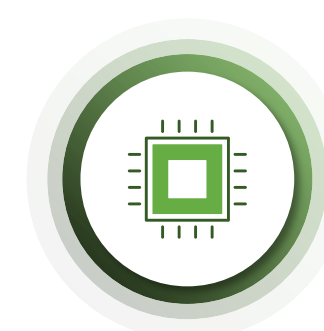


**Technical Enablers:** KACST support for localizing oil spill response equipment and training initiatives

Driving Prosperity

Note: KACST = King Abdulaziz City for Science and Technology  
 Source: Team analysis

## Where is the opportunity



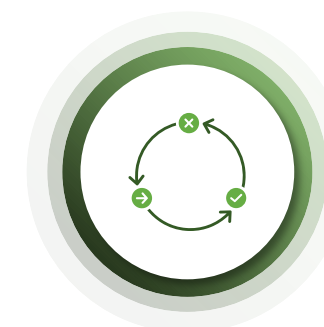
Equipment

Localize oil remediation equipment such as booms, skimmers, bioremediation agents, solidifiers/sorbents, dispersants and in-situ burning equipment



Containment,  
collection &  
remediation

Further localize offshore and onshore oil remediation services



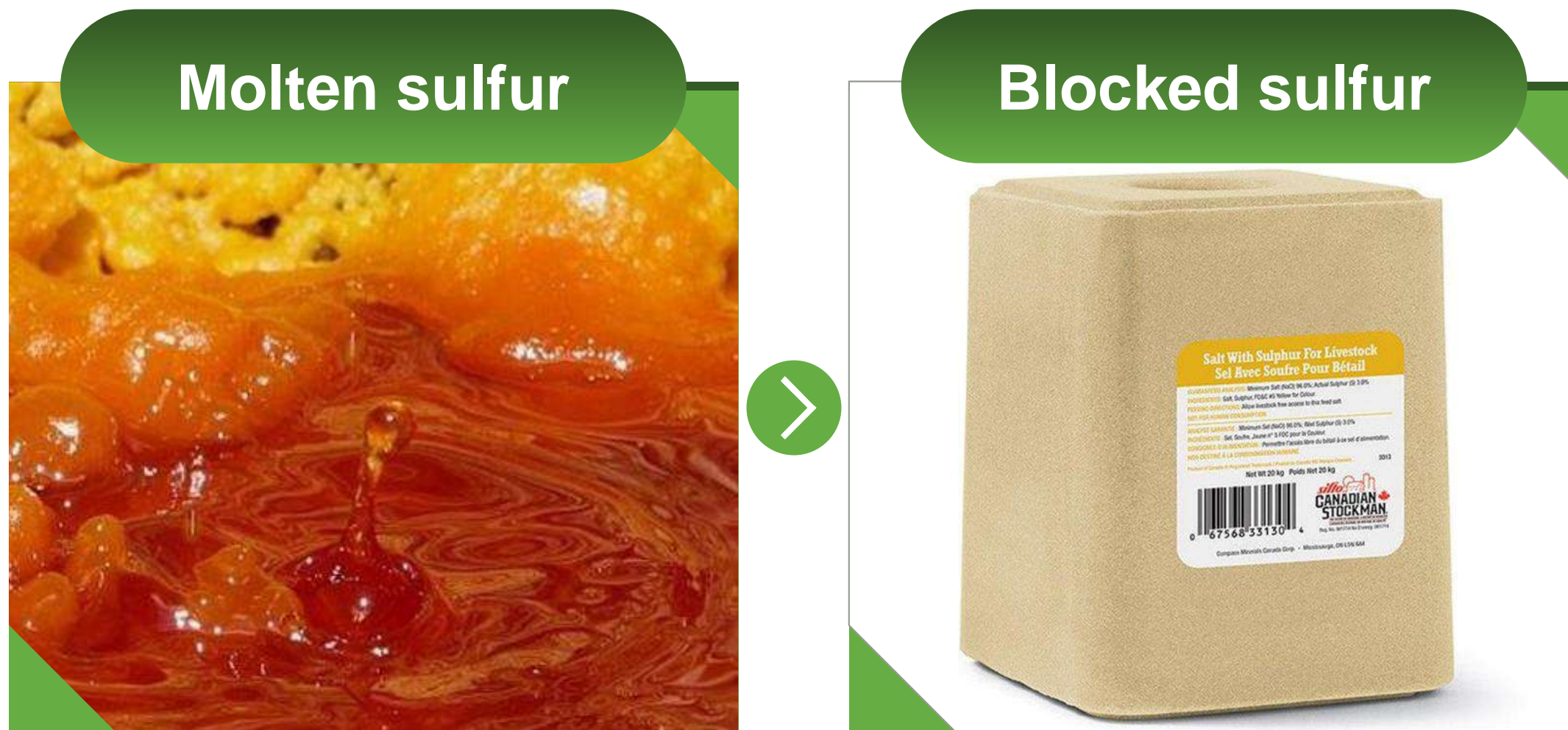
Waste  
management

Further localize oil recovery via re-refining and energy recovery, soil treatment using bioremediation

# Blocked sulfur handling

*Business Opportunity*

# Opportunity description – Blocked sulfur handling



## Blocked sulfur handling process **key steps**:

- **Molten Sulfur Transport:** Molten sulfur is pumped from storage tanks to blocking pits or molds using specialized transfer systems
- **Filtration and Purification:** Impurities and solid particles are removed through filtration systems to ensure quality sulfur
- **Cooling and Solidification:** Advanced cooling systems rapidly solidify sulfur into large, durable blocks, ready for handling
- **Storage and Logistics:** Solid blocks are safely stored and transported for industrial applications or further processing

- **Blocked sulfur handling** – process of cooling and solidifying molten sulfur, byproduct of O&G operations, into large blocks
- Blocked sulfur is **reused in industries like fertilizers, chemicals, and mining**, aligning with circular economy goals

# Opportunity profile – Blocked sulfur handling

1

KSA's environmental policies drive demand for efficient blocked sulfur handling systems

## Technologies



Cooling systems



Transfer pumps



Filtration systems



Blocking pits/molds

Driving Prosperity

2

Blocked sulfur handling market in KSA is sizeable with steady growth

**\$208MM**

Estimated 2029 KSA market size

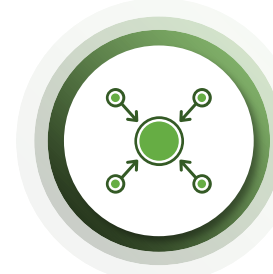
**4%**

Forecasted 5-year CAGR

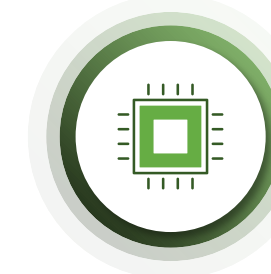
3

Attractive investment opportunities across the value chain

## KSA value chain opportunities



Raw Materials and Inputs



Equipment



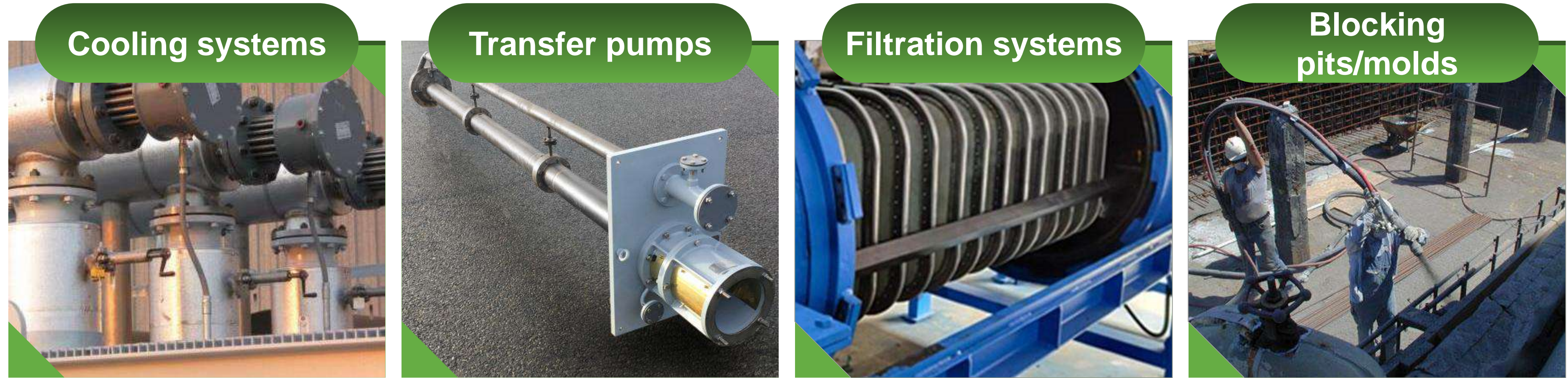
Processing

## KSA enablers

- Financial setup loans
- Corporate tax reduction
- KACST technical support

# Potential blocked sulfur handling technologies to be chosen and localized

Non-Exhaustive

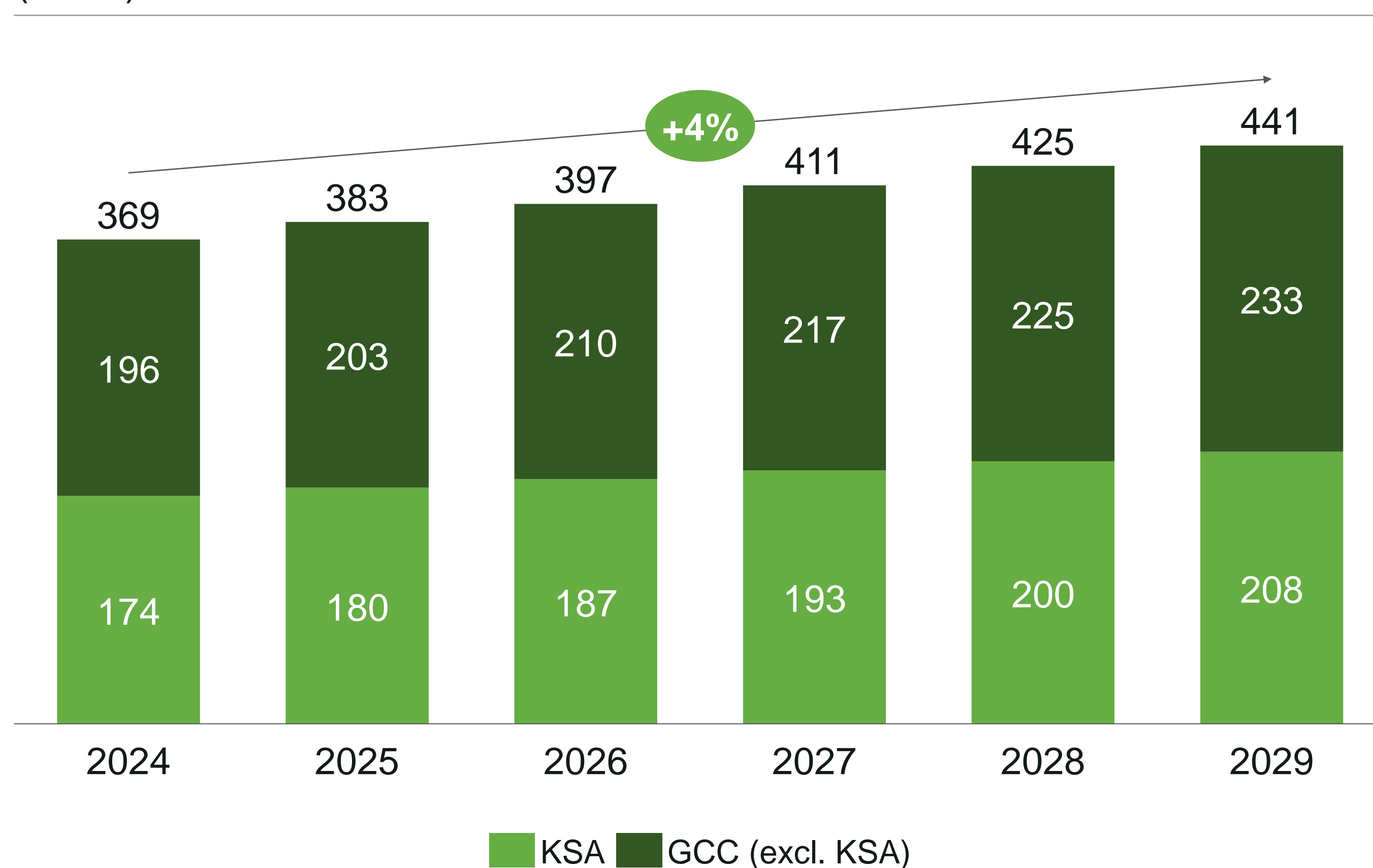


## Applications




- Accelerating the cooling and solidification of molten sulfur poured into blocking pits or molds
- Transporting molten sulfur from storage tanks to the blocking pits or molds
- Removing impurities and solid particles from molten sulfur
- Sulfur containment, cooling and solidifying into large, manageable blocks

# Blocked sulfur handling demand, customers, and drivers

Forecasted KSA and rest of GCC recovered<sup>1</sup> sulfur market 2024-2029 (\$MM)



## Typical customers in KSA

-  Chemicals plants
-  Fertilizers plants
-  Mining facilities

## Key KSA demand drivers

- Growth in chemical and fertilizer industries drives demand for sulfur logistics
- O&G targeting company-level emissions reduction, partially to be achieved through byproduct recovery

## KSA national targets

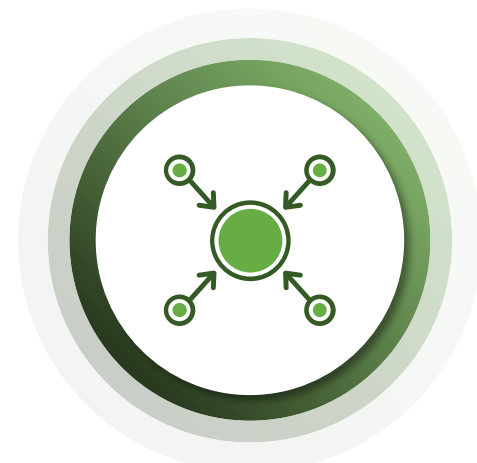
- KSA is targeting to recycle and treat 90% of the industrial hazardous waste from landfills by 2040

### Driving Prosperity

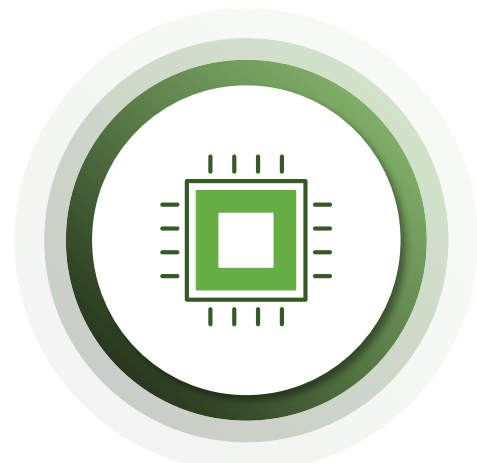
1. Market sizing data is on recovered (recycled) sulfur—including blocked, pastillated, granulated, and other solid forms—as it pertains to the circular economy, rather than the entire sulfur market  
Source: IEA, Grand View Research, Verified Market Research, Maximize Market Research

# Value chain and key localization opportunities

Blocker sulfur handling



## Raw Materials and Inputs



## Equipment



## Processing

Local saturation



Few players

Current KSA value chain



- Localized: steel, aluminum, concrete, cement, plastics, mineral wool
- Partially localized: coatings and linings (feasible loc.)
- Not localized: specialty alloys (challenging - high tech, nickel dependency), copper, ceramic fiber, basic sensors (feasible loc.)

Success factors

Opportunity



Few players

- Localized: storage tanks, cranes, material handling equipment, conveyors, transportation systems
- Partially localized: cooling systems (feasible loc.)
- Not localized: transfer pumps, filtration systems, blocking pits or molds (feasible loc.)

Opportunity



Few players

- Partially localized with 1-2 players offering processing sulfur into blocked format (feasible localization)

Opportunity

Technology



Metallurgy, coatings, insulation, sensor tech, heat treatment, machining

Heat exchange, fluid dynamics, filtration, materials science, casting/molding

Heat-resistant molds and cooling systems, automated handling and solidification monitoring systems

Labor



Engineers, technicians, scientists

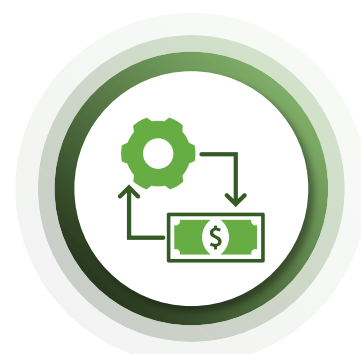
Mechanical engineers, process engineers, metallurgist

Operators, process engineers

Driving Prosperity

# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Technical Enablers:** Technical guidance and subsidized access to innovation hubs like KACST for developing blocked sulfur handling equipment



**Export Potential:** Strategic location of KSA allows the export of blocked sulfur to neighboring MENA countries with growing sustainability needs

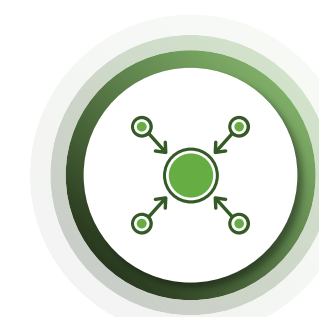


**Growing Demand:** Growing demand for blocked sulfur handling in KSA driven by expanding fertilizer, chemical, and construction industries

### Driving Prosperity

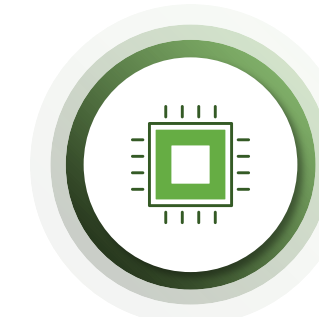
Note: KACST = King Abdulaziz City for Science and Technology  
 Source: Team analysis

## Where is the opportunity



Raw Materials  
and Inputs

Further localize coatings and lining production  
 Localize copper, ceramic fiber, basic sensors  
 manufacturing



Equipment

Further localize cooling systems  
 Localize transfer pumps, filtration systems,  
 blocking pits or molds



Processing

Further localize sulfur blocking

# Asphalt Central Plant Recycling

*Business Opportunity*

# Opportunity profile – Asphalt Central Plant Recycling

1

KSA infrastructure projects driving demand for sustainable CPR solutions

## Types



Warm Mix Central Plant Recycling



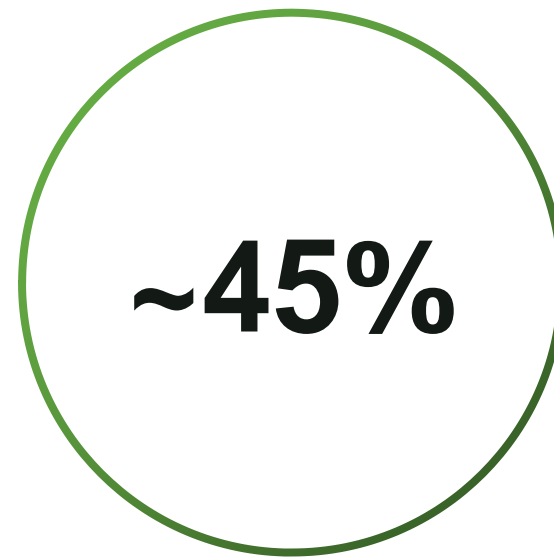
Hot Mix Central Plant Recycling

2

CPR market is nascent but expected to grow rapidly in coming years



Estimated 2029 KSA market size



Forecasted 5-year CAGR

3

Attractive investment opportunities across the CPR value chain

## KSA value chain opportunities



Equipment & technology



Processing and production



Lifecycle management

## KSA enablers

- Financial setup loans
- Flexible labor law
- Advanced manufacturing support

Driving Prosperity

# Potential Asphalt Central Plant Recycling localized types of services

Non-Exhaustive

## Warm Mix Central Plant Recycling



## Hot Mix Central Plant Recycling



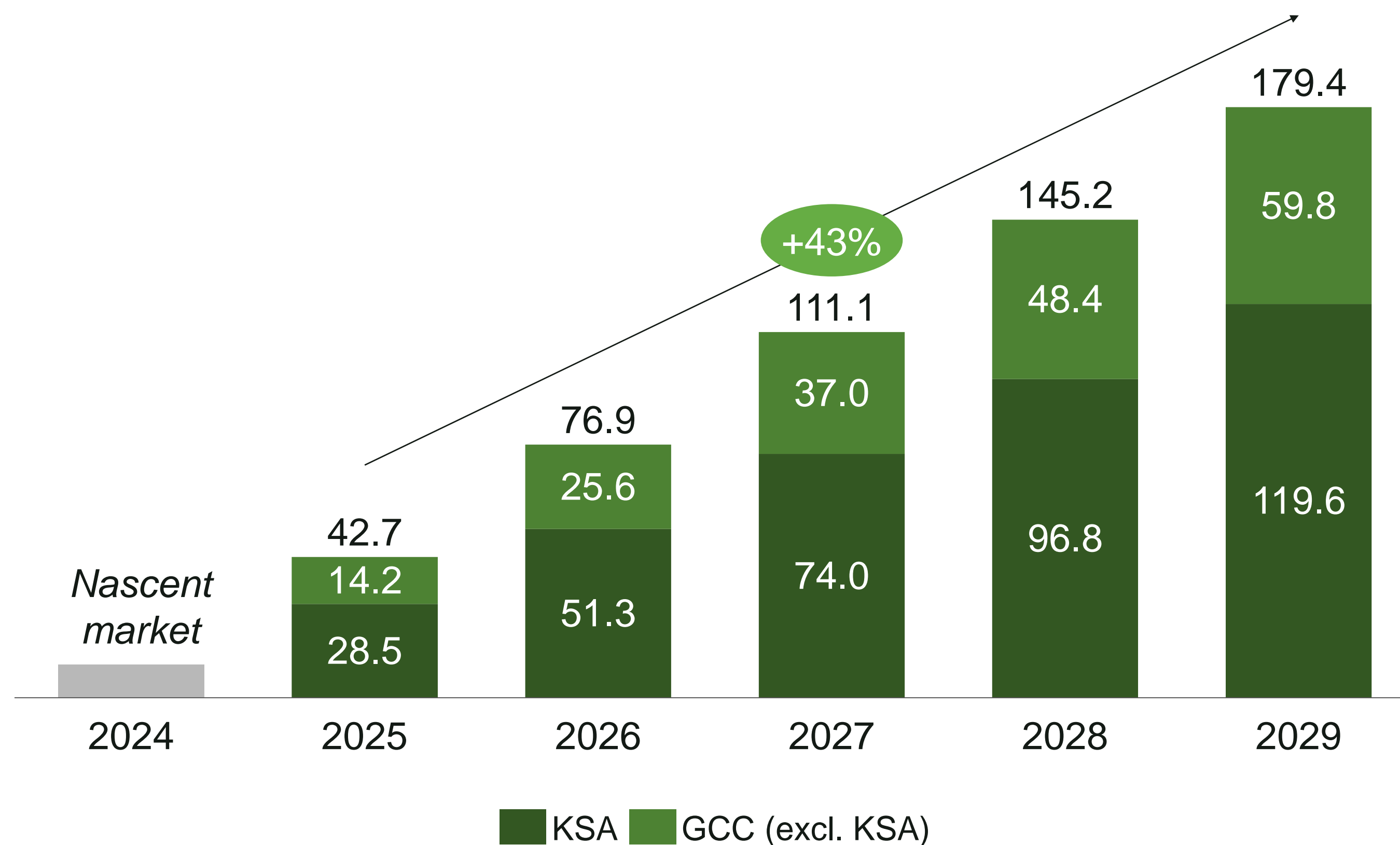
### Applications

- Projects emphasizing sustainability and lower environmental impact
- Low to medium traffic roads, urban streets, or maintenance layers

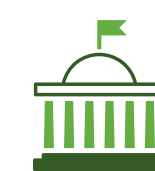
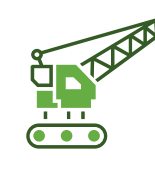

- High-performance roads (e.g., highways, urban networks)
- Surface and structural layers requiring durability and heavy traffic handling

# Asphalt Central Plant Recycling (CPR) demand, customers, and drivers

Forecasted KSA and rest of GCC Asphalt Central Plant Recycling (CPR) market 2024-2029 (\$MM)



## Typical customers in KSA

-  Government and public sector agencies
-  Industrial facilities
-  Real estate and property developers

## Key KSA demand drivers

- Large-scale infrastructure projects drive demand for sustainable asphalt recycling solutions
- Recycled asphalt offers cost savings compared to new materials

## KSA national targets

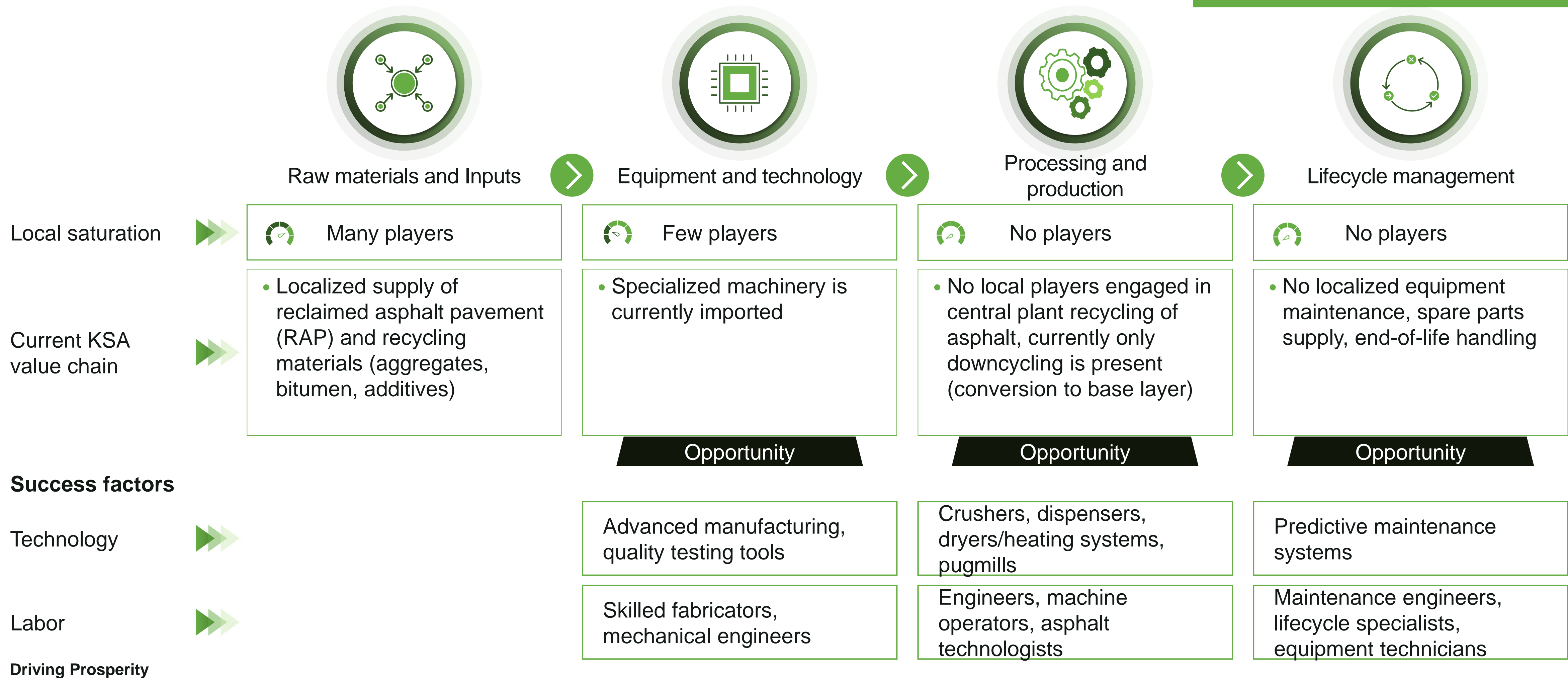
- KSA intending to divert 90% of all waste streams from landfills, recycling 40% by 2040

Driving Prosperity

Note: Nascent market as per 2024, as KSA has just started using asphalt recycling  
Source: Climate Action Tracker; Roland Berger; Grand View Research; Expert interviews; Team analysis

# Value chain and key localization opportunities

Asphalt Central Plant Recycling



Circular Economy & Sustainability Workshop

Note: Specialized machinery includes RAP crushers, screeners, recycling additive dispensers, modified dryers/heating systems, enhanced pugmills; CNC = Computer Numerical Control  
Source: Team analysis

# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Financial Support:** Access to subsidized loans from SABIC's NUSANED program for plant setup, equipment, and feedstock



**Corporate Tax Reduction:** Tax credits on R&D investments to encourage local innovation capabilities for specialized production



**Technical Enablers:** Advanced manufacturing support from KACST on technical guidance and infrastructure setup

### Driving Prosperity

## Where is the opportunity



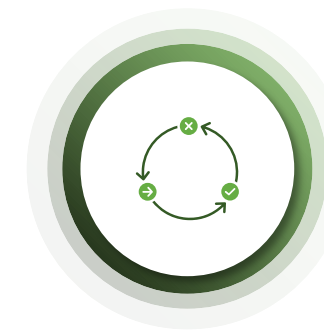
Equipment and technology

Localize specialized recycling machinery manufacturing



Processing and production

Localize Asphalt Central Plant Recycling services by upgrading the existing asphalt plants and building new



Lifecycle management

Establish equipment maintenance offering, spare parts supply, end-of-life handling

Note: Specialized machinery includes RAP crushers, screeners, recycling additive dispensers, modified dryers/heating systems, enhanced pugmills  
 Source: Team analysis

# Hot In-place Asphalt Recycling

*Business Opportunity*

# Opportunity profile – Hot In-place Asphalt Recycling

1

KSA exploring HIPR to address road maintenance needs

2

HIPR market is nascent, expected to grow rapidly with increased adoption

3

Attractive investment opportunities across the HIPR value chain

## Services types



Surface Recycling



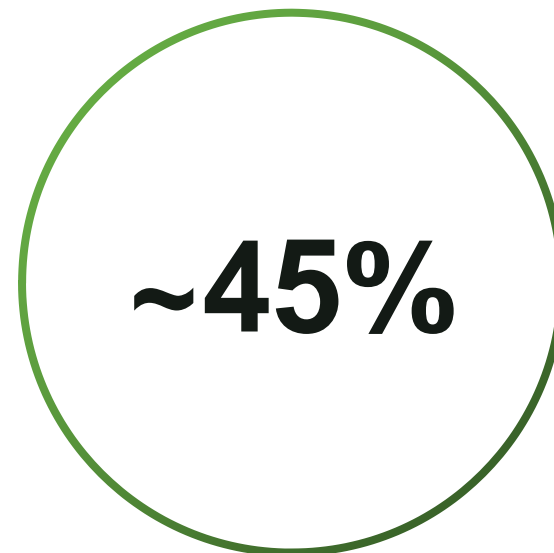
Remixing



Repaving



Estimated 2029 KSA market size



Forecasted 5-year CAGR

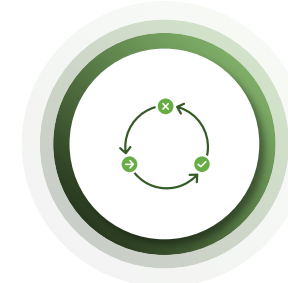
## KSA value chain opportunities



Equipment & technology



Processing and production



Lifecycle management

## KSA enablers

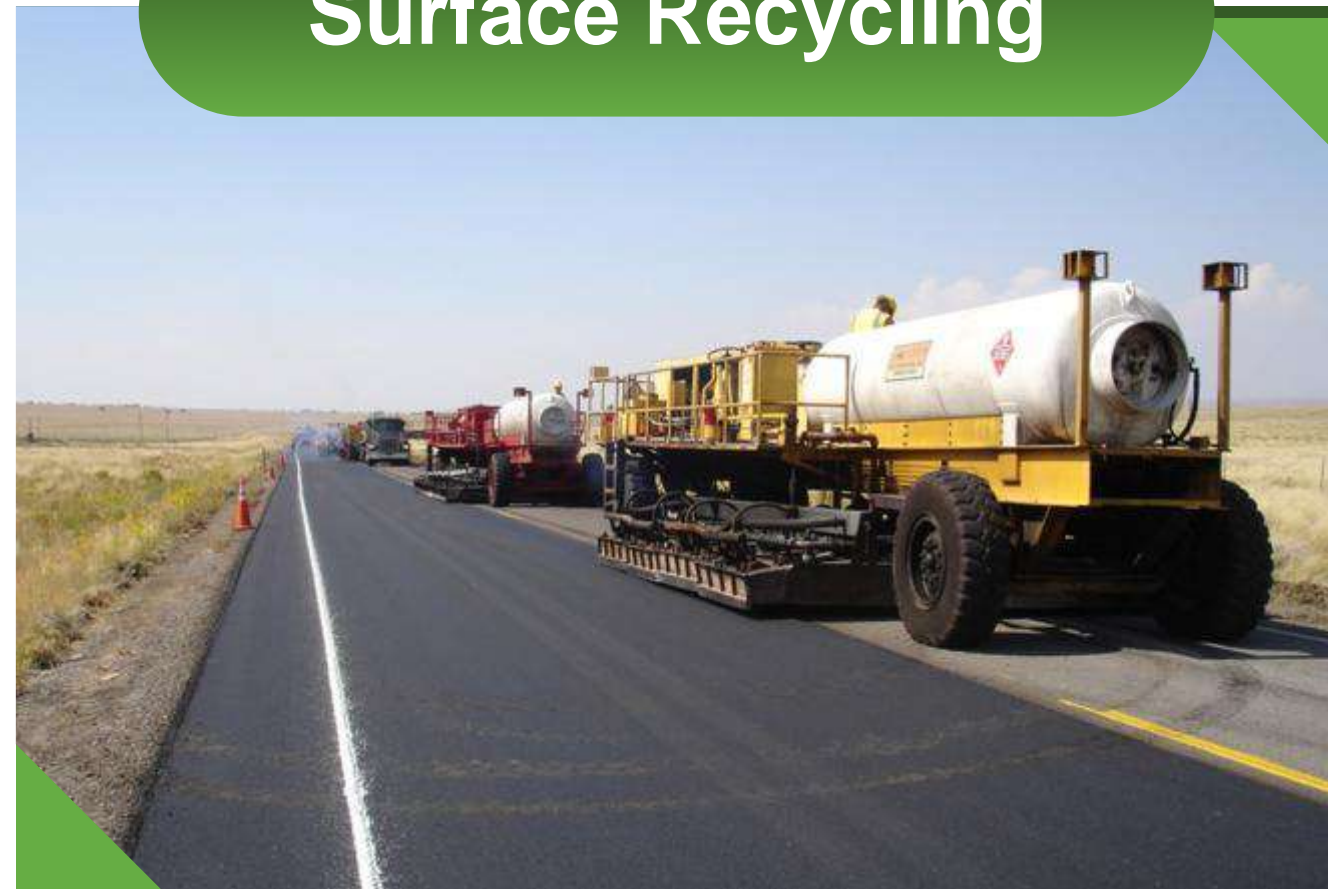
- Financial setup loans
- Flexible labor law
- Advanced manufacturing support

Driving Prosperity

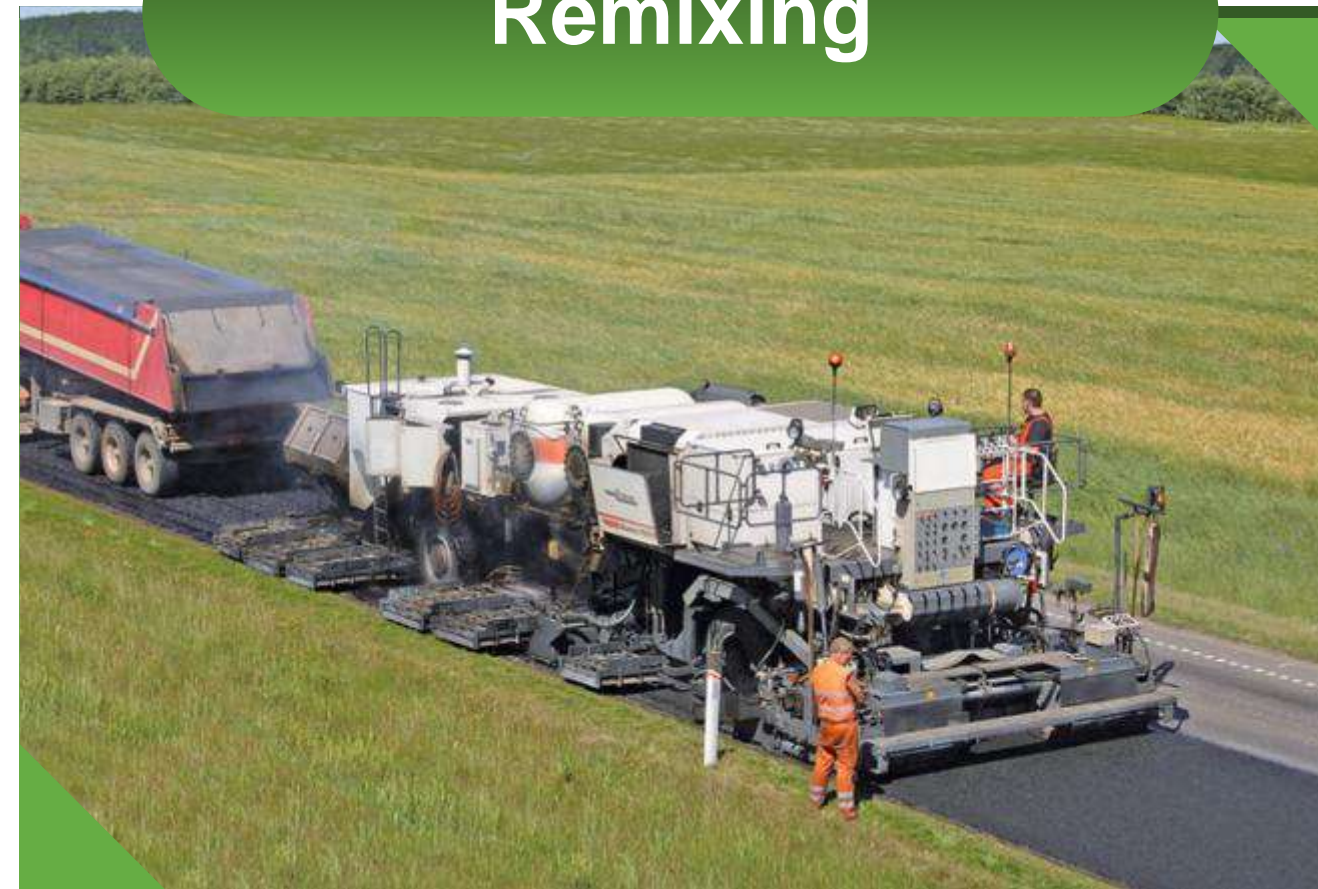
# Potential Hot In-place Asphalt Recycling localized types of services

Non-Exhaustive

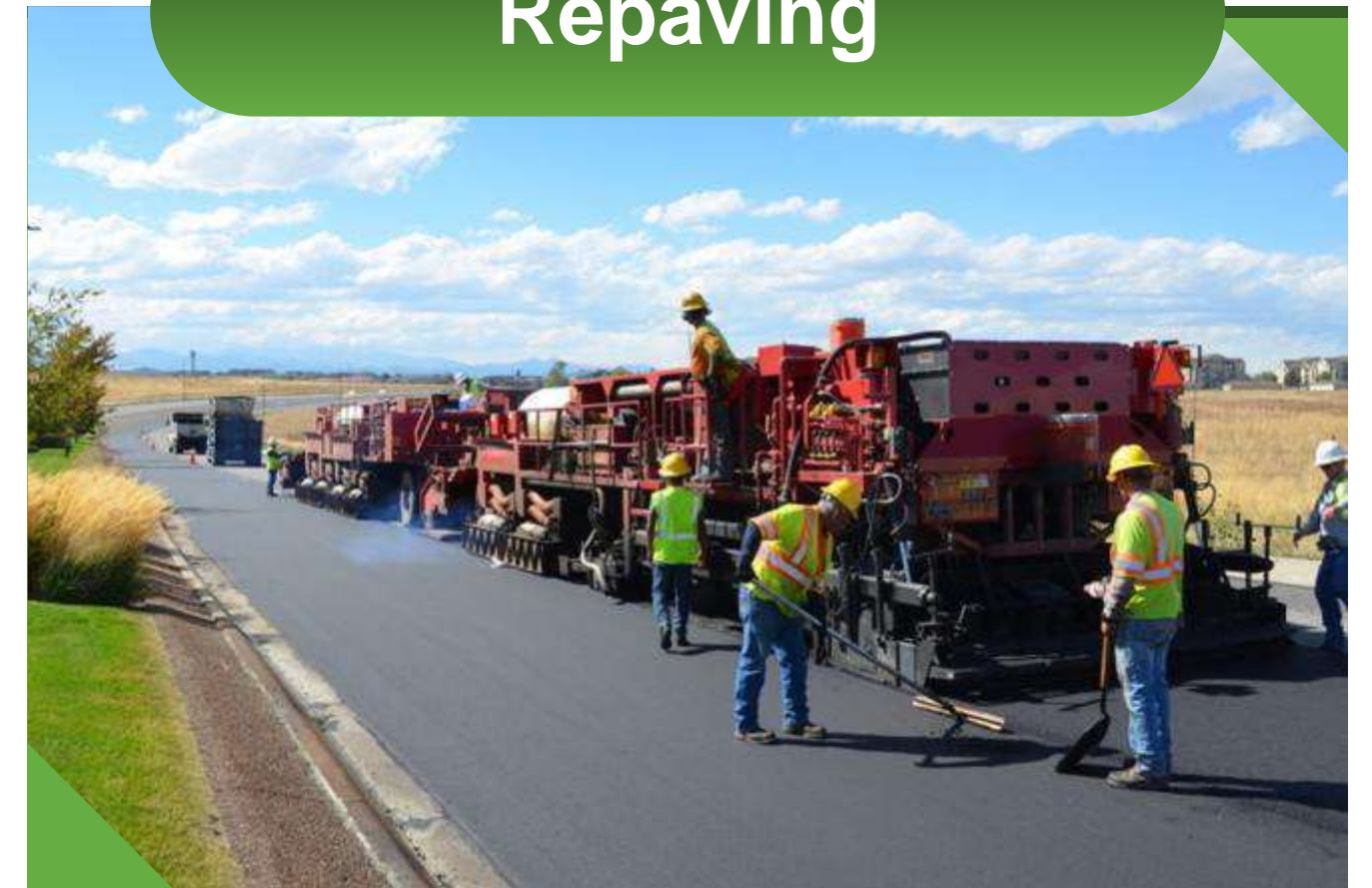
## Surface Recycling



## Remixing



## Repaving



### Applications

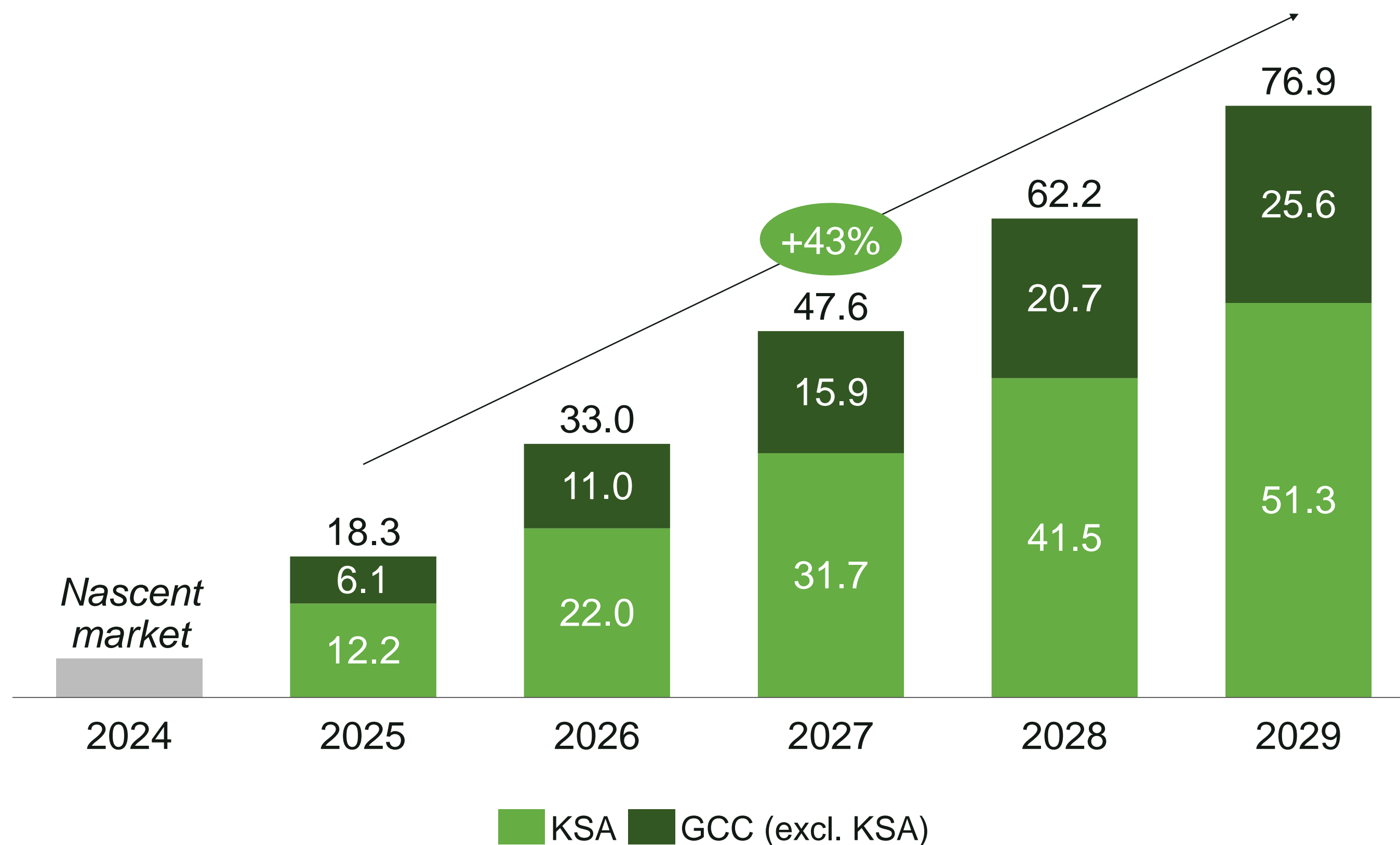
- Minor surface aging repair
- Low-traffic road maintenance
- Cosmetic pavement texture renewal

- Shallow structural improvements
- Medium-traffic road resurfacing
- Cracks and rutting repairs

- High-traffic road upgrades
- Surface and structural improvements
- Durable overlays with repair

# Hot In-place Asphalt Recycling demand, customers, and drivers

Forecasted KSA and rest of Hot In-place Asphalt Recycling market 2024-2029 (\$MM)



## Typical customers in KSA

- Government and public sector agencies
- Industrial facilities
- Real estate and property developers

## Key KSA demand drivers

- KSA's aging road infrastructure drives high maintenance demand and modern recycling solutions

## KSA national targets

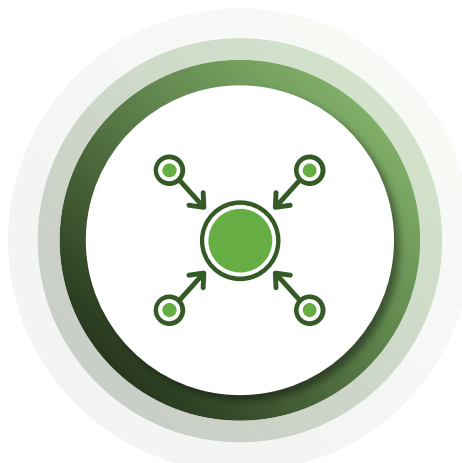
- KSA intending to divert 90% of all waste streams from landfills, recycling 40% by 2040

Driving Prosperity

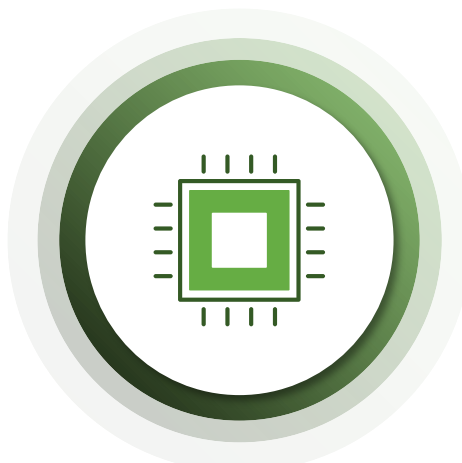
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# Value chain and key localization opportunities

Hot In-place Asphalt Recycling



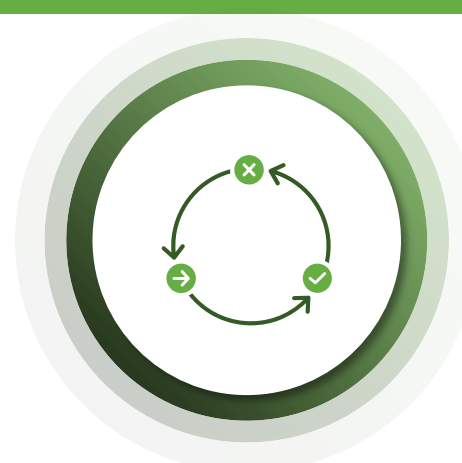
Raw materials and Inputs



Equipment and technology



Processing and production



Lifecycle Management

Local saturation

Many players

Few players

No players

No players

Current KSA value chain

- Localized supply of reclaimed asphalt pavement (RAP) and recycling materials (aggregates, bitumen, additives)

- Localized relaying/compacting equipment; imported heating, milling and scarifying equipment, mixing/blending units, rejuvenator dispensers

- On-site asphalt recycling started in 2024 with pilot projects; no local players specializing in HIPR, and all equipment and expertise are imported

- No localized equipment maintenance, spare parts supply, end-of-life handling

Opportunity

Opportunity

Opportunity

Success factors

Technology

Technology required: advanced manufacturing, quality testing tools

Heating units, milling machines, rejuvenator dispensers

Predictive maintenance systems

Labor

Labor required: skilled fabricators, mechanical engineers

Engineers, machine operators, asphalt technologists

Maintenance engineers, lifecycle specialists, equipment technicians

Driving Prosperity

Note: HIPR = Hot In-Place Asphalt Recycling, CNC = Computer Numerical Control  
Source: Team analysis

# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Financial Support:** Access to subsidized loans from SABIC's NUSANED program for plant setup, equipment, and feedstock



**Corporate Tax Reduction:** Tax credits on R&D investments to encourage local innovation capabilities for specialized production



**Technical Enablers:** Advanced manufacturing support from KACST on technical guidance and infrastructure setup

Driving Prosperity

## Where is the opportunity



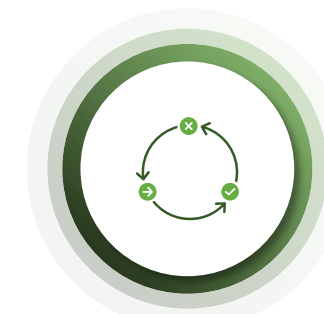
Equipment and technology

Localize specialized equipment such as heating, milling and scarifying equipment, mixing/blending units, rejuvenator dispensers



Processing and production

Establish local Hot In-place Asphalt Recycling services



Lifecycle management

Establish equipment maintenance offering, spare parts supply, end-of-life handling

# Waste-to-Energy

*Business Opportunity*

# Opportunity profile – Waste-to-Energy

1

KSA exploring WTE to address waste management challenges

2

WTE for O&G is nascent but poised for growth with sustainability goals

3

Attractive investment opportunities across the O&G WTE value chain

## Technologies



Incineration



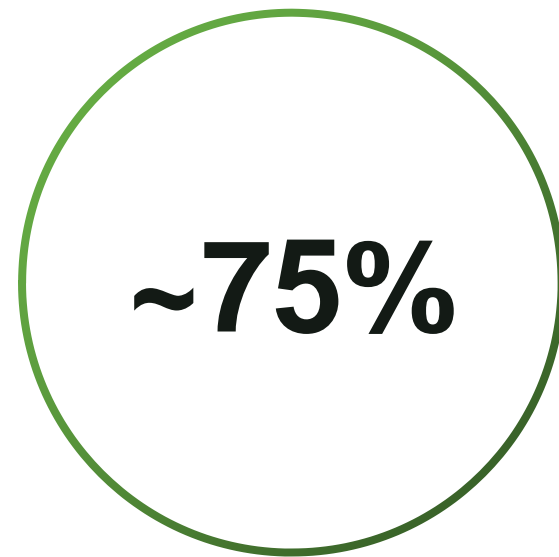
Gasification



Plasma Gasification



Estimated 2029 KSA market size



Forecasted 5-year CAGR

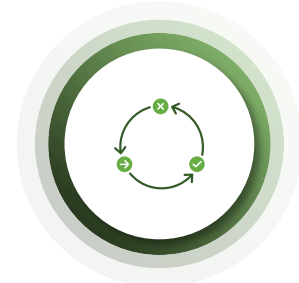
## KSA value chain opportunities



Pre-Service Sourcing



Service Delivery



Lifecycle mgmt

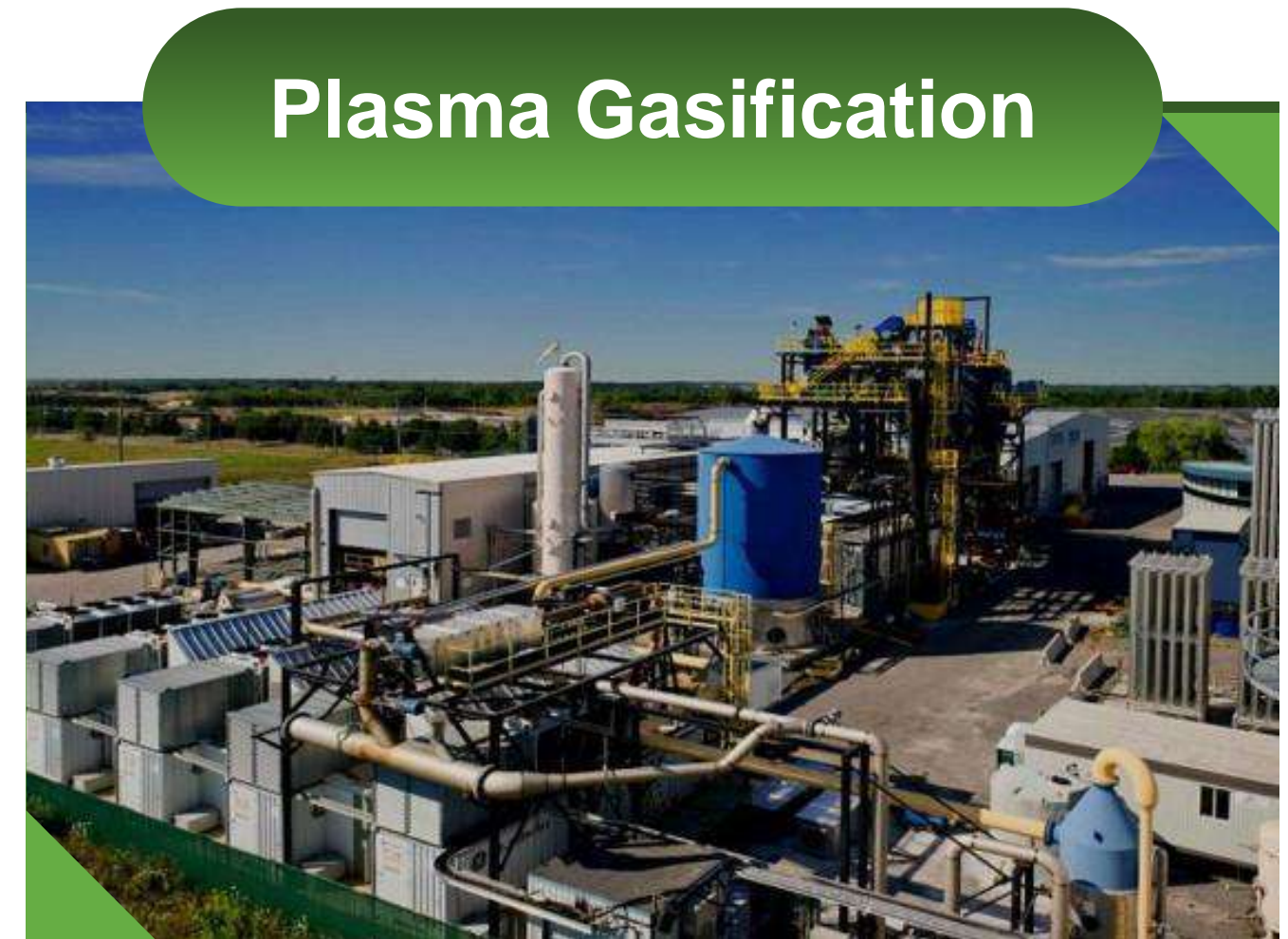
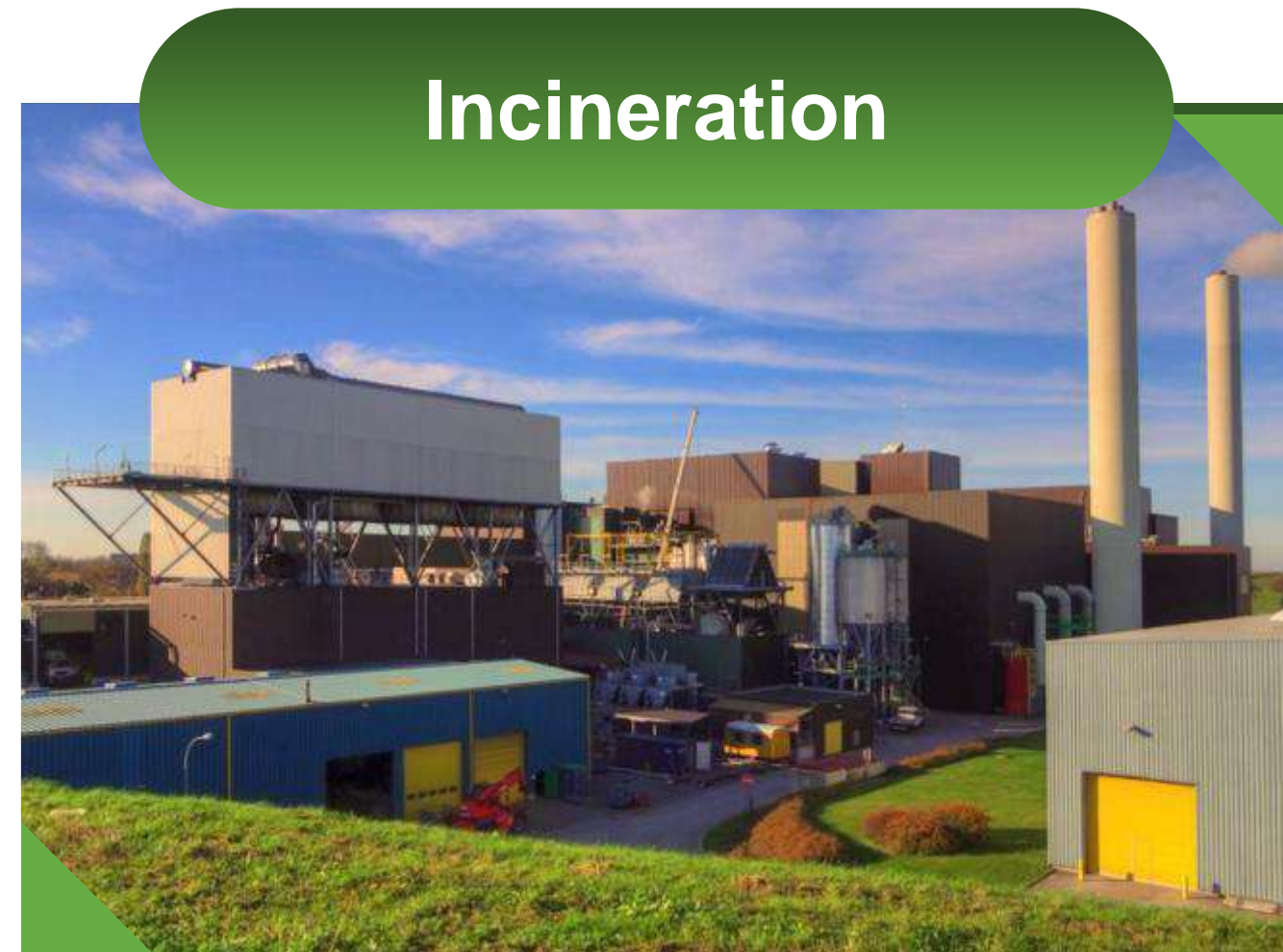
## KSA enablers

- Financial setup loans
- Corporate tax reduction
- Advanced manufacturing support

Driving Prosperity

# Potential Waste-to-Energy technologies to be chosen and localized

Non-Exhaustive

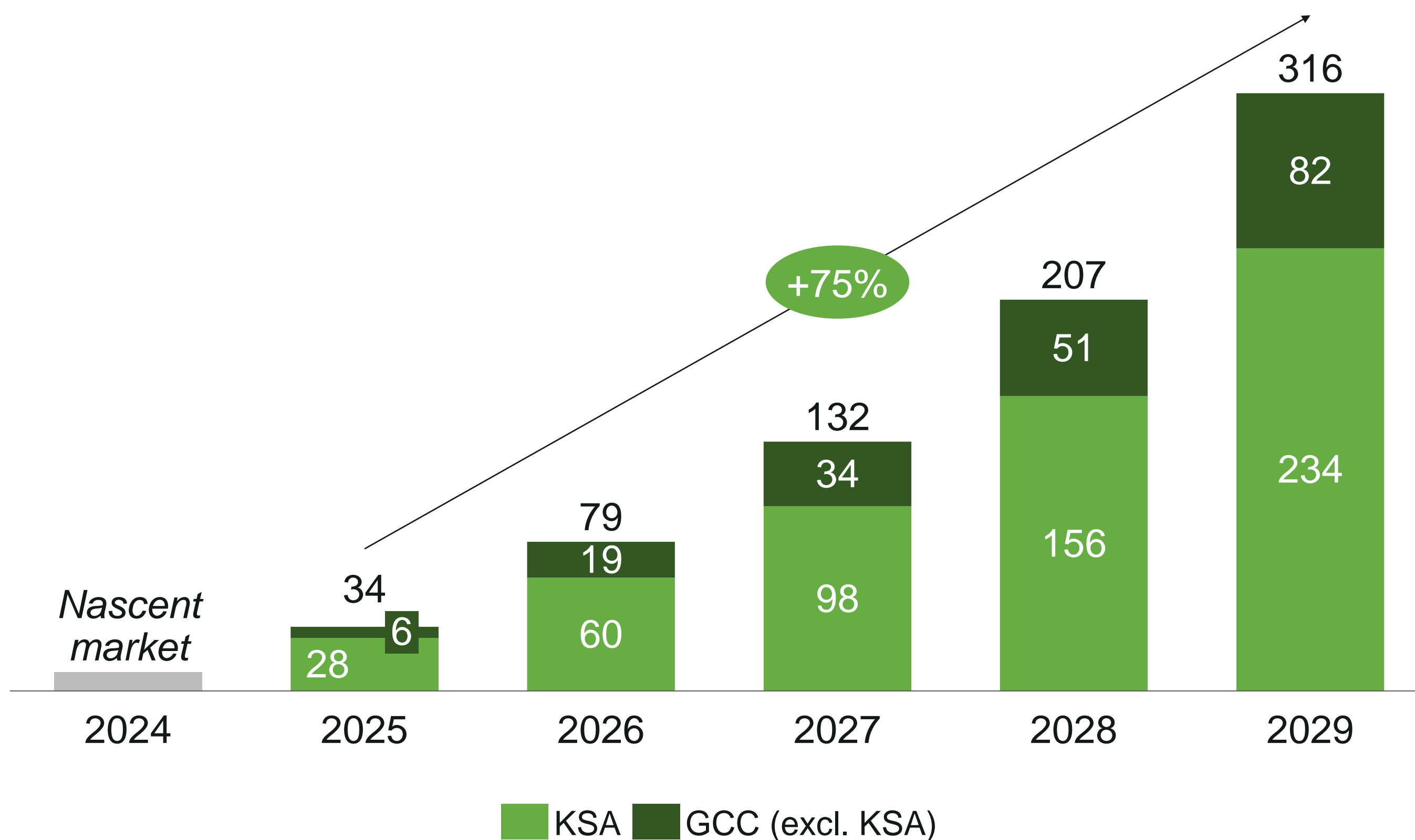


## Applications

- Solid or liquid hazardous waste with low energy content (e.g., sludge, contaminated soil, spent caustic)
- Hydrocarbon-based waste with higher organic content (e.g., tar, oily sludges)
- Highly toxic or hazardous waste that is difficult to treat conventionally (e.g., heavy metals, brine residues, tar with high toxicity)

# Waste-to-energy demand, customers, and drivers

Forecasted KSA and rest of GCC Waste-to-Energy for O&G market 2024-2029 (\$MM)<sup>1</sup>



## Typical customers in KSA

- Oil & gas facilities

## Key KSA demand drivers

- O&G targeting company-level emissions reduction, partially to be achieved through waste-to-energy

## KSA national targets

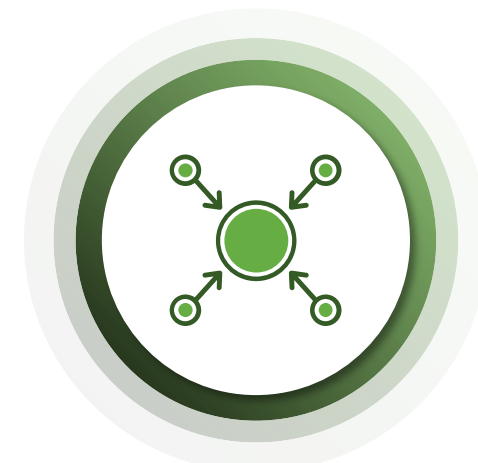
- KSA intending to divert 90% of all waste streams from landfills, incinerating 16% by 2040

Driving Prosperity

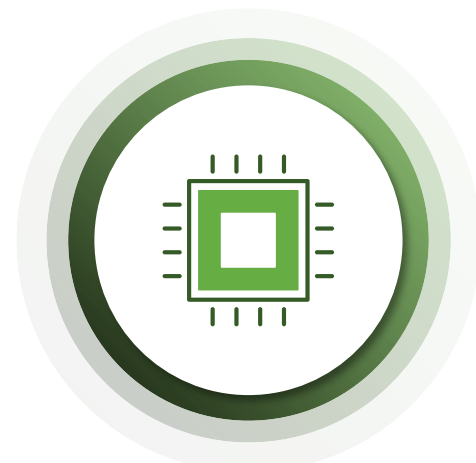
Note: 1. Market data is for O&G waste-to-energy  
Source: Climate Action Tracker; Roland Berger; Grand View Research; Expert interviews; Team analysis

# Value chain and key localization opportunities

Waste-to-Energy



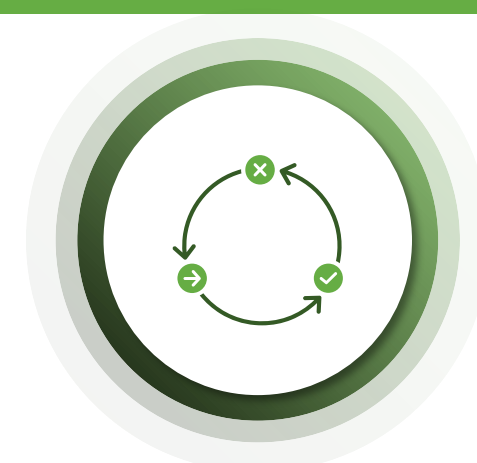
Raw Material Sourcing



Equipment & technology



Processing and conversion



By-product management

Local saturation

Few Players

Few players

No players

Few players

Current KSA value chain

- No local players specialized in unrecyclable O&G waste collection and transportation
- Some agents are already produced locally; specialized catalysts, activated carbon, and SCR agents are imported

- Partial localization for basic equipment, advanced systems are imported (difficult to localize)
- No localized players producing energy distribution infrastructure

- No localization in waste-to-energy (few local players for recyclable and other hazardous O&G waste), some byproducts of recycling are shipped out

- Partially localized treatment of liquid by-products, no localization of solid, gaseous by-products and hazardous residuals

Opportunity

Opportunity

Opportunity

Opportunity

Success factors

Technology

Modular containers, hazardous waste vehicles, IoT systems

Automated segregation systems, advanced shredders, heat recovery systems

High-temp incinerators, heat recovery systems

Flue gas scrubbers, ash recycling systems, brine treatment units

Labor

Logistics specialists

Thermal and robotics engineers, mechanical designers

Process engineers, equipment operators, technicians

Environmental engineers, recycling specialists, plant technicians

Driving Prosperity

Note: SCR = Selective catalytic reduction  
Source: Team analysis

# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Financial Support:** Subsidized loans from SABIC's NUSANED program for WTE plant setup and technology integration



**Corporate tax reduction:** Credits on R&D investments for WTE technologies and sustainable energy solutions



**Technical Enablers:** Advanced manufacturing support from KACST on technical guidance and infrastructure setup

Driving Prosperity

Note: WTE = Waste-to-Energy  
 Source: Team analysis

## Where is the opportunity



Raw Material Sourcing

Localize specialized unrecyclable O&G waste collection and transportation  
 Localize specialized catalysts, activated carbon, and SCR agents



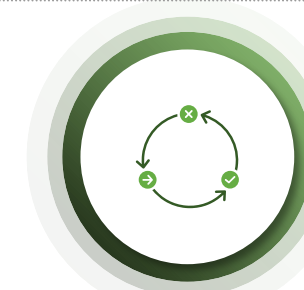
Equipment & technology

Localize basic equipment and energy distribution infrastructure



Processing and conversion

Establish Waste-to-Energy services for O&G unrecyclable waste



Lifecycle management

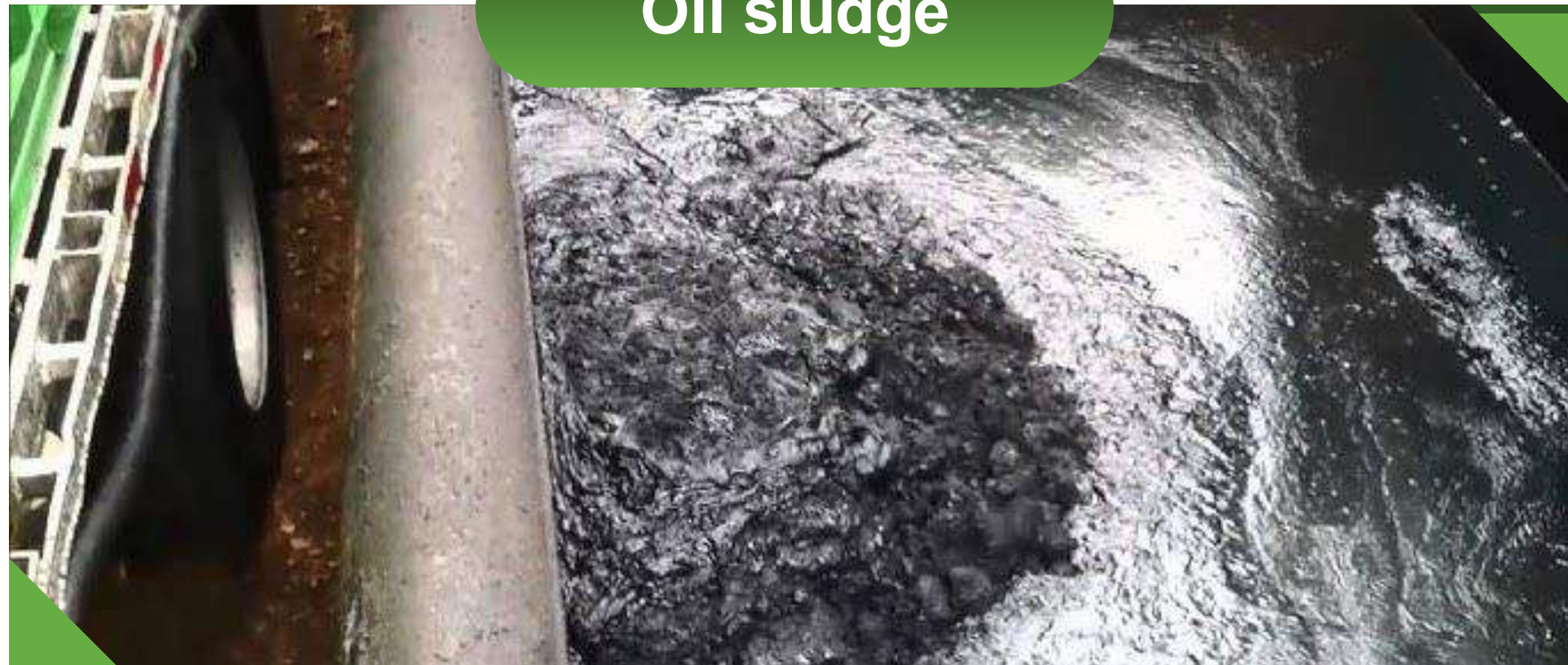
Establish Waste-to-Energy services for O&G unrecyclable waste

# Hydrocarbon Waste Circularity Solutions for Oil Sludge

*Business Opportunity*

# Opportunity description – Hydrocarbon Waste Circularity Solutions for Oil Sludge

Oil sludge



- **Oil sludge is a hazardous waste** generated from O&G operations, consisting of hydrocarbons, water, and solids
- **Circularity solutions involve treating and recycling** this waste to recover hydrocarbons, clean water, and solids

Oil sludge treatment process key steps:

- **Collection and Storage:** Oil sludge is collected from storage tanks, separators, or refining byproducts
- **Separation and Dewatering:** Mechanical separation (e.g., centrifuges, hydrocyclones) divides oil, water, and solids
- **Hydrocarbon Recovery:** Recovered hydrocarbons are filtered and returned to refining or energy production
- **Water Treatment:** Water is purified through filtration or chemical processes for reuse or safe disposal
- **Solid Residue Management:** Solids are treated to remove contaminants and repurposed

# Opportunity profile – Hydrocarbon Waste Circularity Solutions for Oil Sludge

1

KSA's O&G operations drive demand for oil sludge waste treatment

## Technologies



Centrifuges



Shale shakers



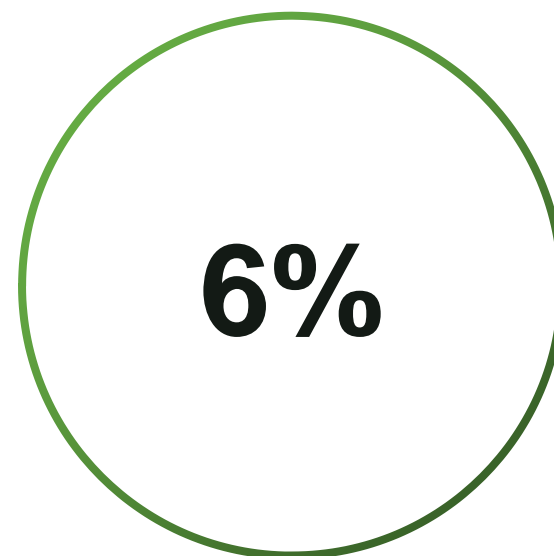
Hydrocyclones

2

Oil sludge waste treatment market is moderately scaled with stable growth



Estimated 2029 KSA market size

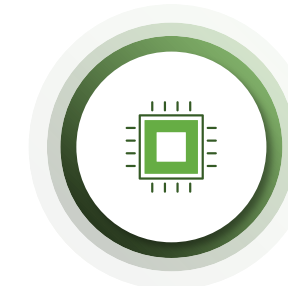


Forecasted 5-year CAGR

3

Attractive investment opportunities across the value chain

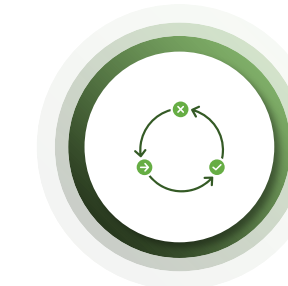
## KSA value chain opportunities



Equipment



Processing



By-product Management

## KSA enablers

- Financial setup loans
- Corporate tax reduction
- KACST technical support

### Driving Prosperity

Note: KACST = King Abdulaziz City for Science and Technology  
Source: Team analysis

# Potential Hydrocarbon Waste Circularity Solutions for Oil Sludge technologies to be chosen and localized

Non-Exhaustive



Centrifuges



Shale shakers



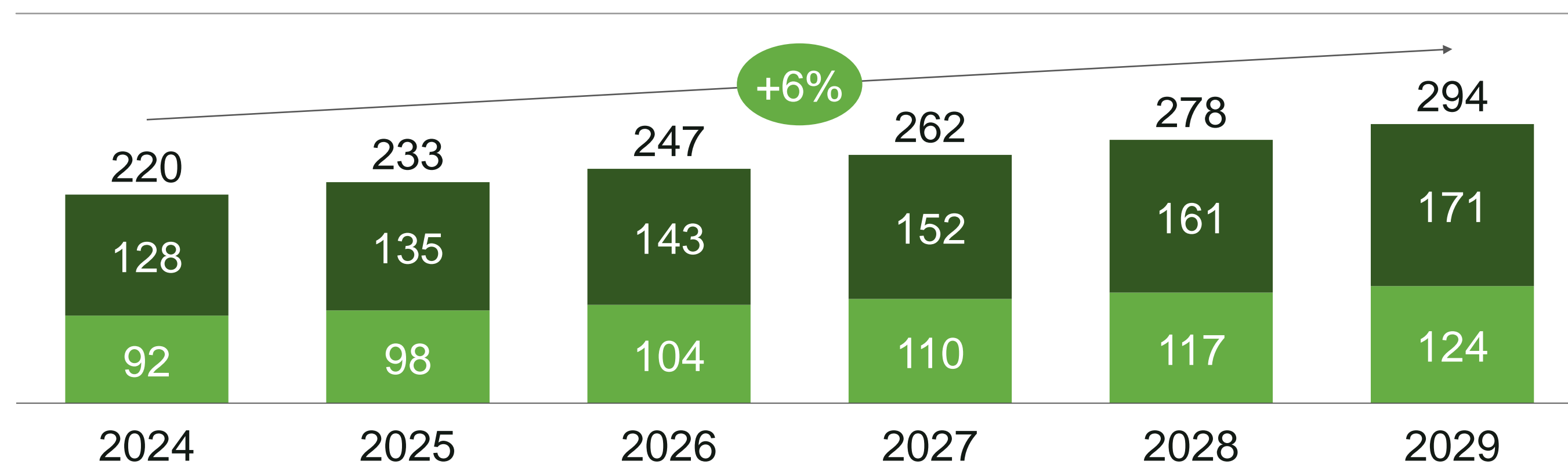
Hydrocyclones

## Applications

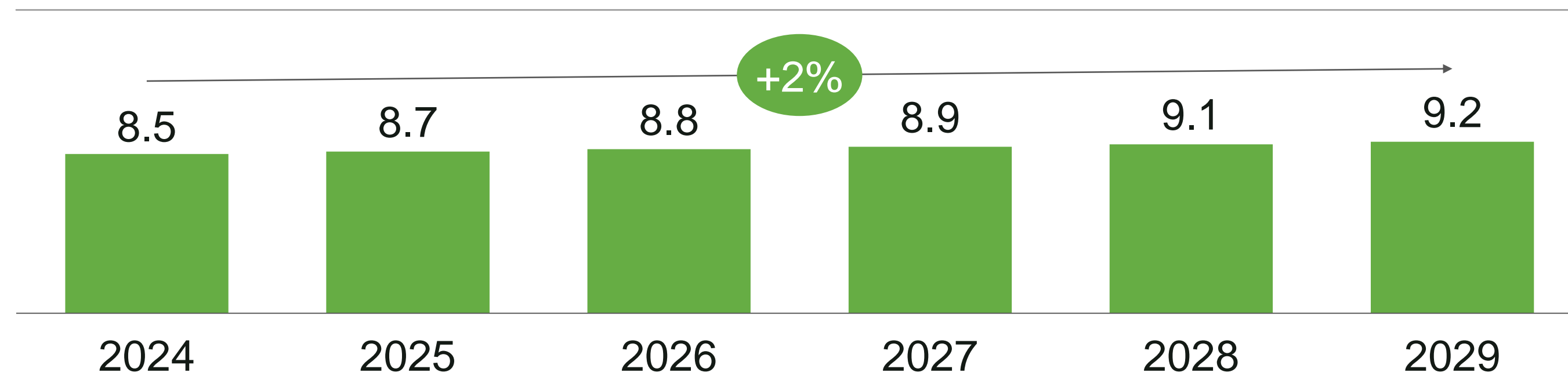
- Separate solids and liquids using high-speed rotation for efficient waste dewatering and recovery
- Remove large solids from drilling fluid through vibrating screens, preventing contamination in recycling
- Separate fine particles from liquids using centrifugal force, enhancing waste slurry purification

# Hydrocarbon Waste Circularity Solutions for Oil Sludge demand, customers, and drivers

Forecasted KSA and rest of GCC industrial and marine waste oils<sup>1</sup> market 2024-2029 (\$MM)



Forecasted KSA oil sludge waste generation 2024-2029 (Mt)



Driving Prosperity

■ KSA ■ GCC (excl. KSA)

## Typical customers in KSA

- Oil & gas facilities

## Key KSA demand drivers

- Stricter environmental regulations require effective hazardous waste management solutions

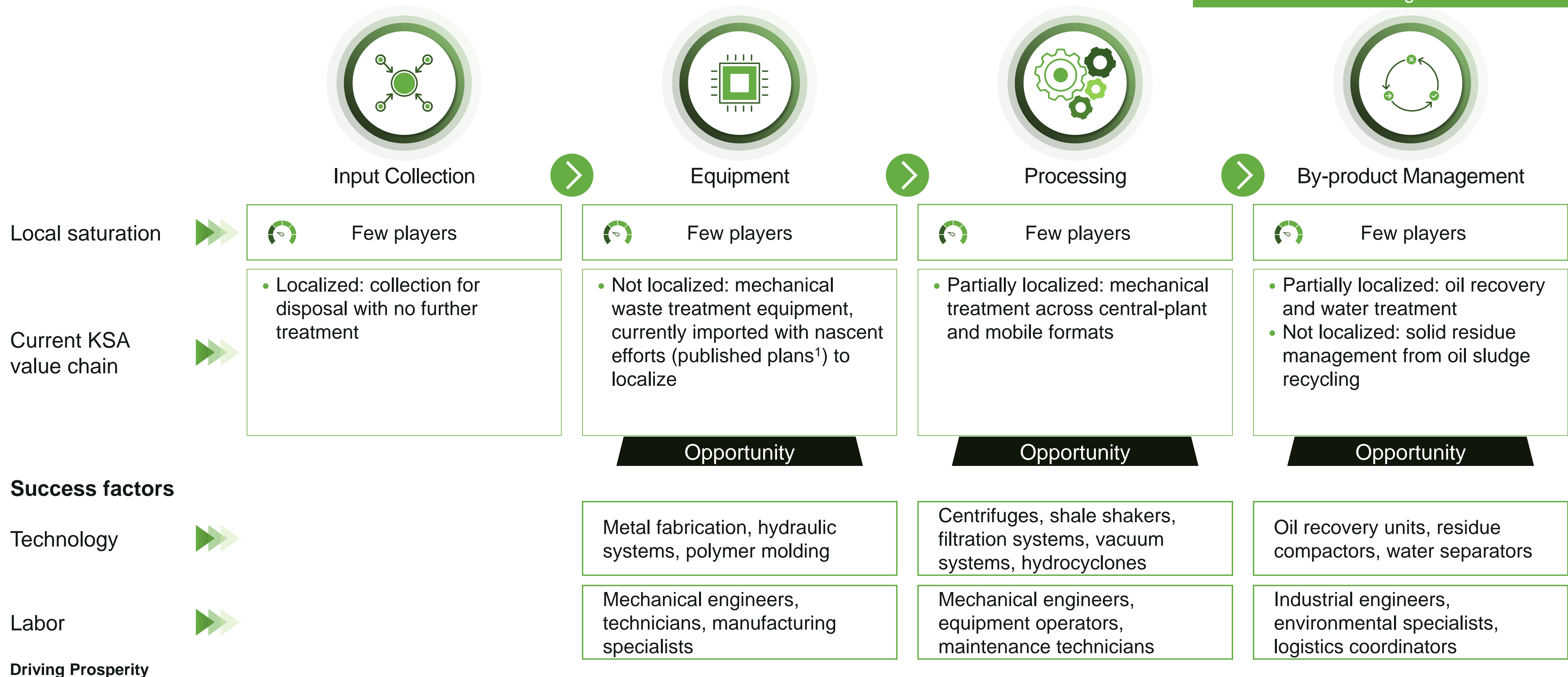
## KSA national targets

- KSA is targeting to recycle and treat 85% of the industrial hazardous waste from landfills by 2035

1. The processes used to recycle oil sludge is largely similar to recycling other industrial and marine waste oils  
Source: IEA, Adroit Market Research, Precedence Research, Climate Action Tracker

# Value chain and key localization opportunities

## Hydrocarbon Waste Circularity Solutions – Oil Sludge



1. Flottweg and Estedama partnership on oil sludge treatment stations  
Source: Team analysis

# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Technical Enablers:** Technical guidance and subsidized access to innovation hubs like KACST for developing waste treatment technologies



**Regulatory Enablers:** Strict enforcement of environmental compliance through penalties of up for violations



**Export Potential:** Strategic location of KSA allows the export of industrial waste recycling equipment to neighboring MENA countries with growing sustainability needs

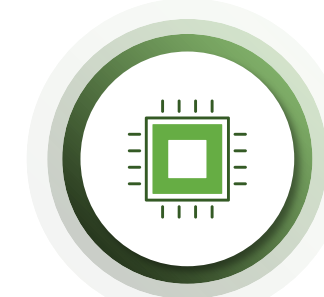


**Growing Demand:** Industries producing high volumes of hazardous and non-hazardous waste require advanced treatment technologies

### Driving Prosperity

Note: KACST = King Abdulaziz City for Science and Technology  
 Source: Team analysis

## Where is the opportunity



Equipment

Localize manufacturing of equipment for mechanical oil sludge waste treatment such as centrifuges, shale shakers, hydrocyclones



Processing

Further localize oil sludge mechanical treatment



By-product  
Management

Establish solid residue management from oil sludge recycling

# Industrial waste management services

*Business Opportunity*

# Opportunity description – Industrial waste management services

## Industrial waste



- **Industrial waste management** includes process of treating and repurposing waste focusing on recovery of valuable materials to support the circular economy
- Industrial waste can be **categorized by physical state** into solid (metals, ash), liquid (effluents, sludge), gaseous (emissions)

## Key industries contributing to industrial waste:

- **Oil & Gas:** Hydrocarbon residues, drilling muds, oil sludge, spent catalysts, contaminated water
- **Petrochemicals:** Process effluents, plastic scrap, solvents, chemical byproducts
- **Manufacturing:** Scrap metals, plastics, chemicals, used lubricants, rejected components
- **Mining:** Tailings, mineral slurry, overburden materials, process water
- **Power Generation:** Fly ash, bottom ash, contaminated cooling water, spent filters
- **Construction & Demolition:** Concrete debris, bricks, metals, asphalt materials

# Opportunity profile – Industrial waste management services

1

KSA's expanding industries drive demand for effective industrial waste management

## Technologies



Sludge dewatering systems



Centrifuges



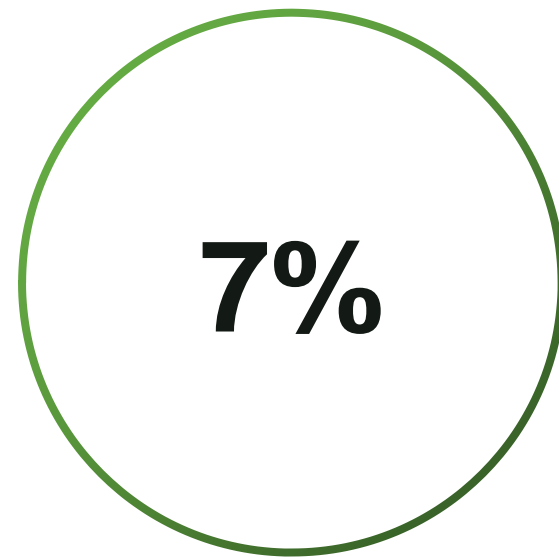
Spent catalyst processing units

2

Industrial waste management is a specialized market with stable growth



Estimated 2029 KSA market size

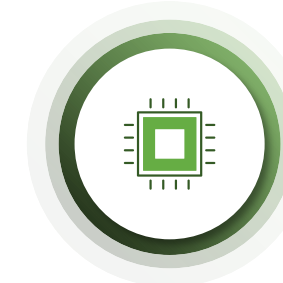


Forecasted 5-year CAGR

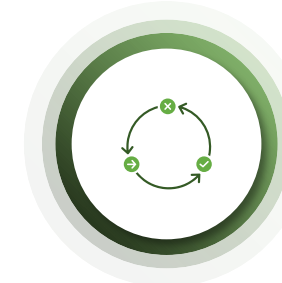
3

Attractive investment opportunities across the value chain

## KSA value chain opportunities



Equipment



By-product Management

## KSA enablers

- Financial setup loans
- Corporate tax reduction
- KACST technical support

### Driving Prosperity

Note: KACST = King Abdulaziz City for Science and Technology  
 Source: Team analysis

# Potential industrial waste management technologies to be chosen and localized

Non-Exhaustive



## Applications

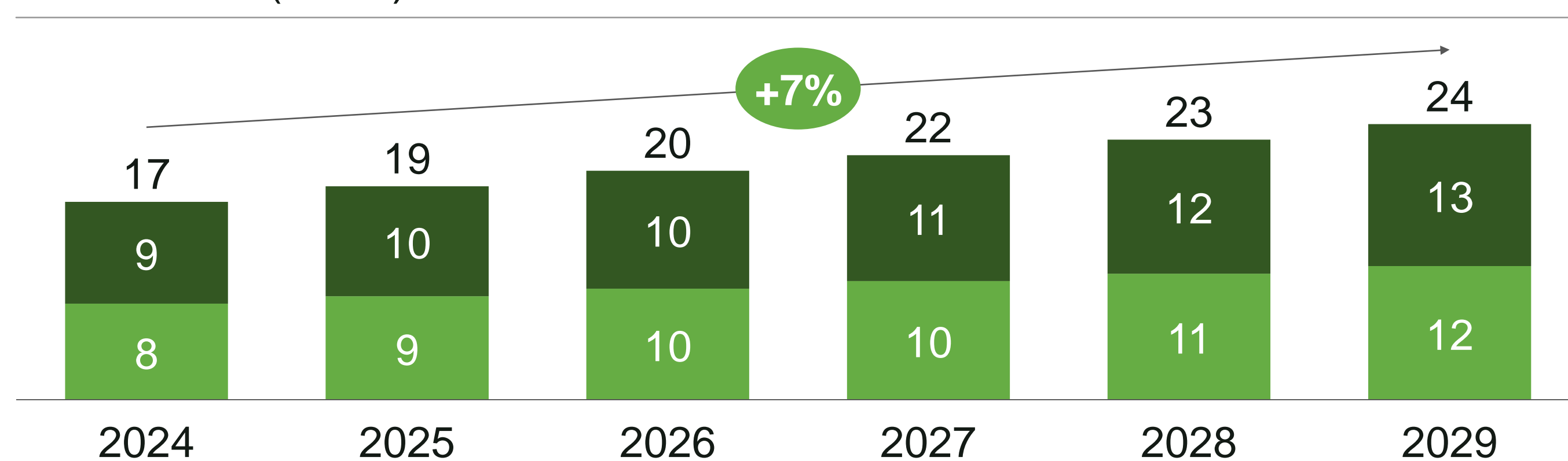
- Removing water from sludge to reduce volume and prepare for recycling

- Separating solids and liquids to recover valuable materials and clarify wastewater

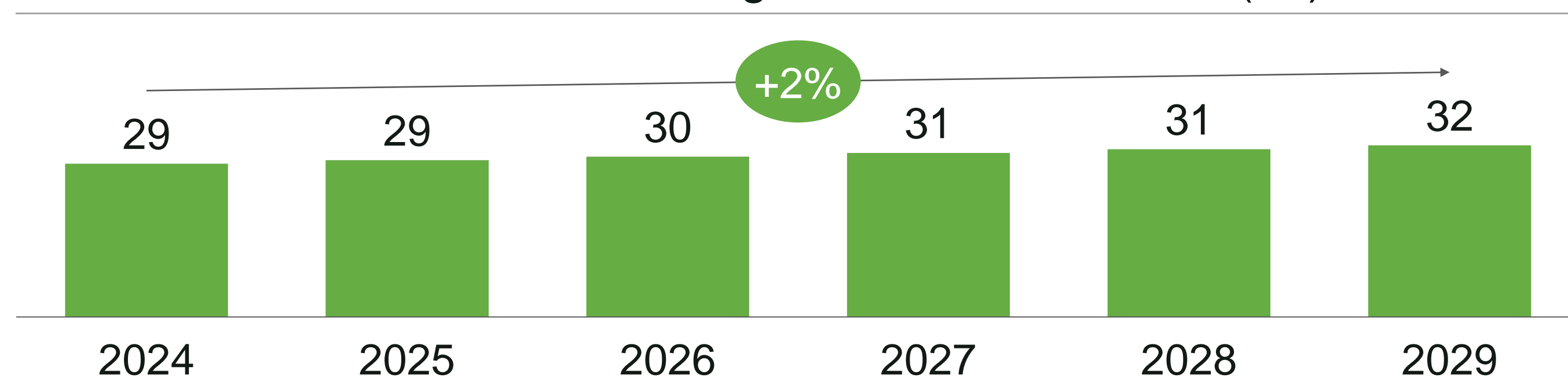
- Regenerating valuable metals and active compounds from used industrial catalysts

# Industrial waste management services demand, customers, and drivers

Forecasted KSA and rest of GCC industrial waste recycling<sup>1</sup> market 2024-2029 (\$MM)



Forecasted KSA industrial waste generation 2024-2029 (Mt)



■ KSA ■ GCC (excl. KSA)

## Typical customers in KSA

- Oil & gas facilities
- Other industrial plants (petrochemicals, power, mining, manufacturing, desalination)

## Key KSA demand drivers

- Industrial growth generates rising volumes of hazardous and non-hazardous waste

## KSA national targets

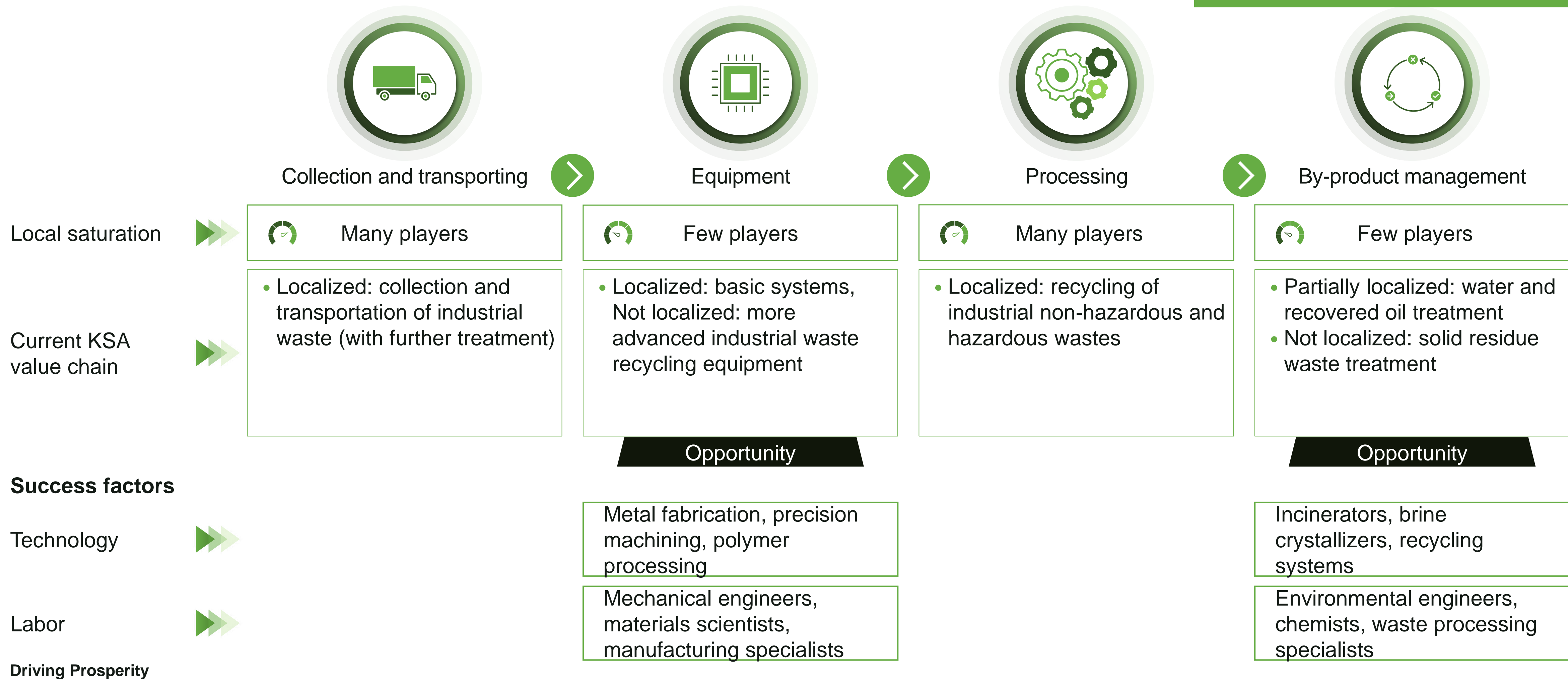
- KSA is targeting to recycle and treat 85% of the industrial hazardous waste from landfills by 2035

Driving Prosperity

1. Due to waste recycling processes for O&G and other industries having significant synergies, figures represent market size for all industries  
Source: Trading Economics, Fortune Business Insights, Market Research Future, Research Nester

# Value chain and key localization opportunities

Industrial waste management services



# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Technical Enablers:** Technical guidance and subsidized access to innovation hubs like KACST for developing localized waste recycling technologies



**Regulatory Enablers:** Strict enforcement of environmental compliance through penalties of up to 10 years for violations



**Export Potential:** Strategic location of KSA supports the export of localized industrial waste recycling equipment and recycled materials to MENA and global markets

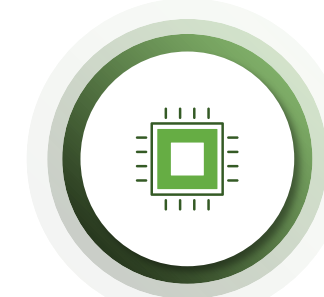


**Growing Demand:** Rising industrial activity in petrochemicals, mining, manufacturing creates high demand for localized waste solutions

### Driving Prosperity

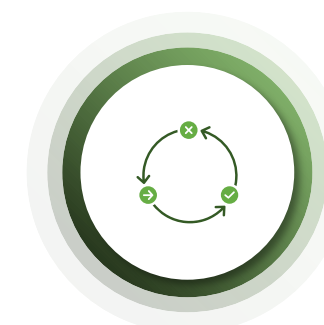
Note: KACST = King Abdulaziz City for Science and Technology  
 Source: Team analysis

## Where is the opportunity



Equipment

Localize advanced equipment such as sludge dewatering systems, centrifuges, spent catalyst processing units, tank cleaning systems, desorption units, chemical neutralization systems

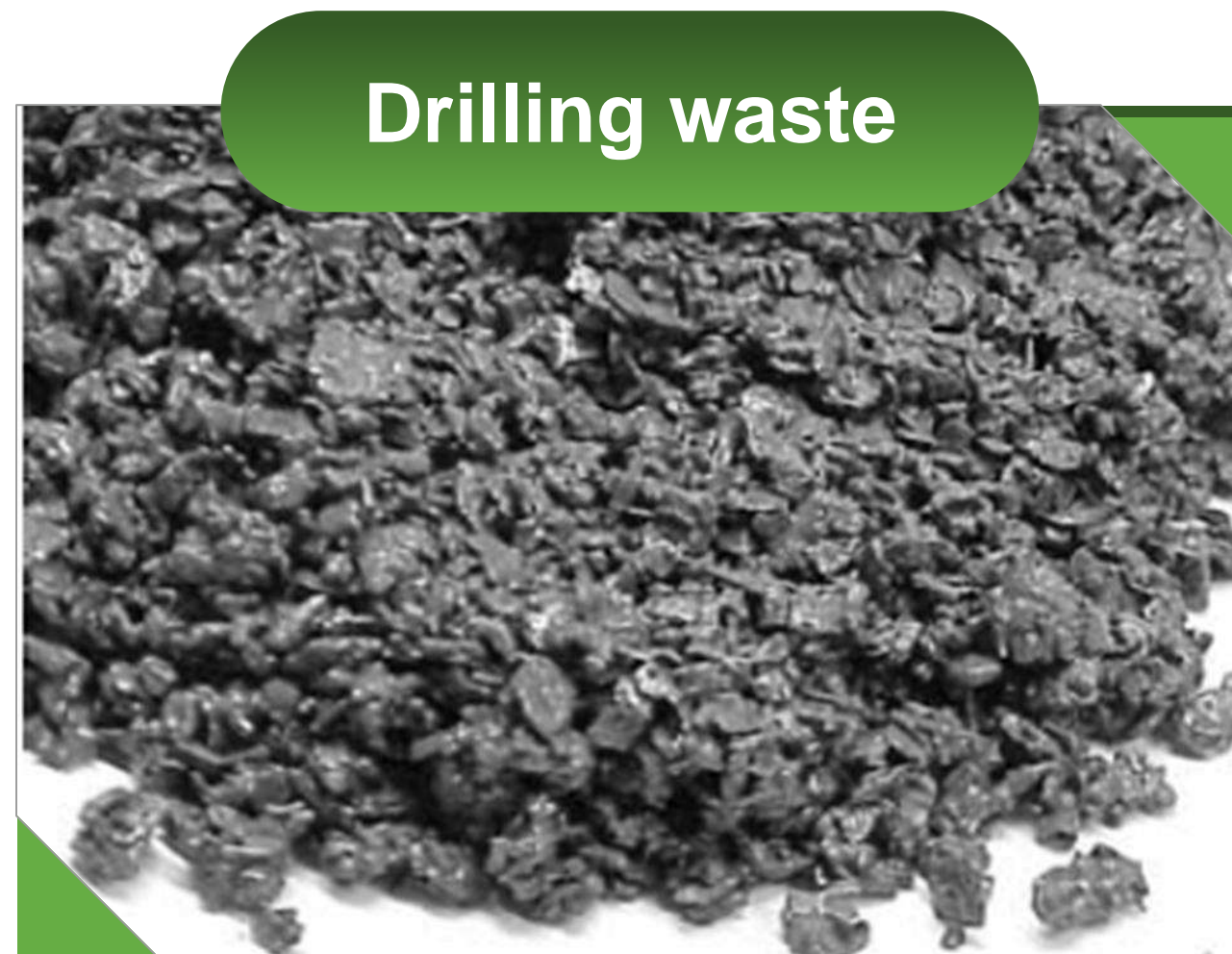


By-product Management

Establish solid residue waste treatment

**On-site industrial  
waste recycling –  
drilling operations**  
*Business Opportunity*

# Opportunity description – On-site industrial waste recycling – drilling operations



## Key waste types in drilling operations:

- **Drilling Mud:** Used to lubricate drill bits, containing hydrocarbons, water, and solids.
- **Cuttings:** Rock fragments mixed with drilling fluids, often contaminated with hydrocarbons.
- **Oil Sludge:** Hydrocarbon-rich waste generated during drilling and maintenance activities.
- **Produced Water:** Water mixed with oil and chemicals extracted during drilling.

- **On-site recycling of drilling waste** involves treating and repurposing waste directly at drilling locations, minimizing environmental impact and reducing logistical costs

# Opportunity profile – On-site industrial waste recycling for drilling operations

1

KSA's drilling operations create strong demand for industrial waste recycling

## Technologies



Centrifuges



Shale shakers



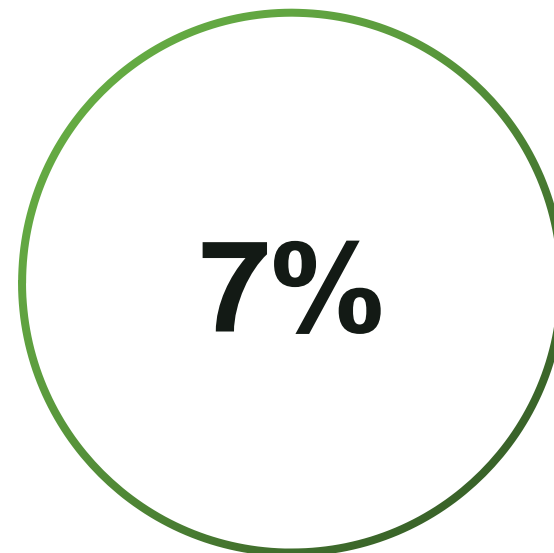
Hydrocyclones

2

Market is moderately scaled with stable growth



Estimated 2029 KSA market size

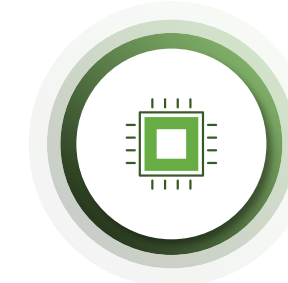


Forecasted 5-year CAGR

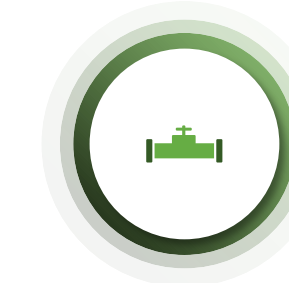
3

Attractive investment opportunities across the value chain

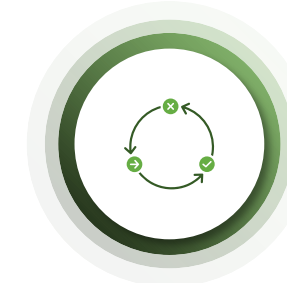
## KSA value chain opportunities



Equipment



Treatment



Lifecycle mgmt

## KSA enablers

- Financial setup loans
- Corporate tax reduction
- KACST technical support

### Driving Prosperity

Note: KACST = King Abdulaziz City for Science and Technology  
Source: Team analysis

# Potential on-site industrial waste recycling technologies to be chosen and localized

Non-Exhaustive



Centrifuges



Shale shakers



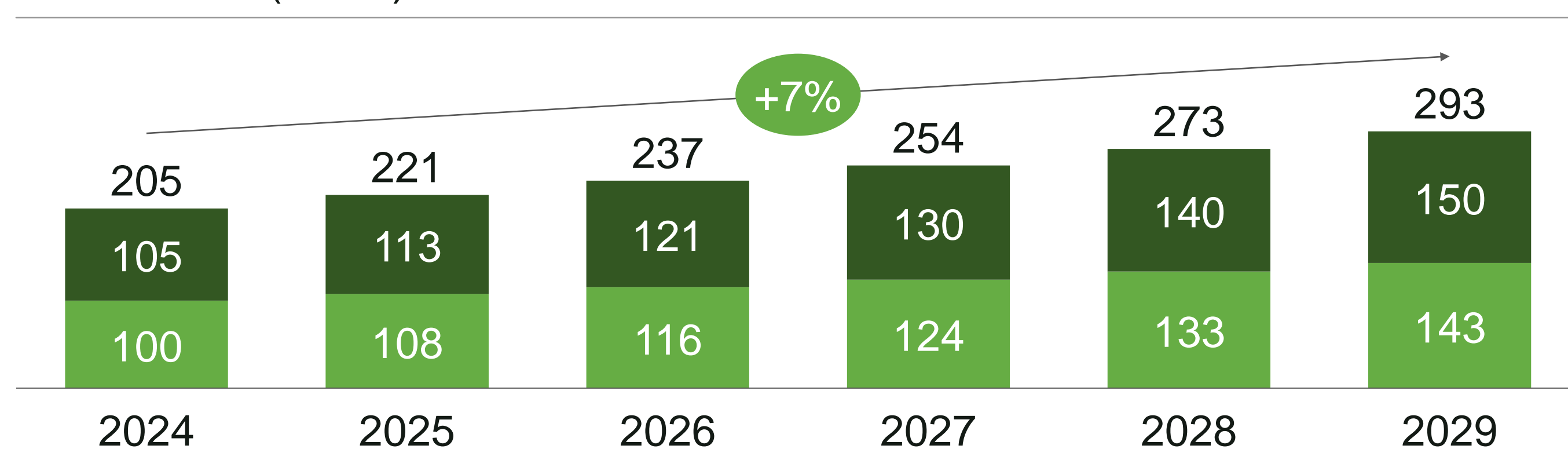
Hydrocyclones

## Applications

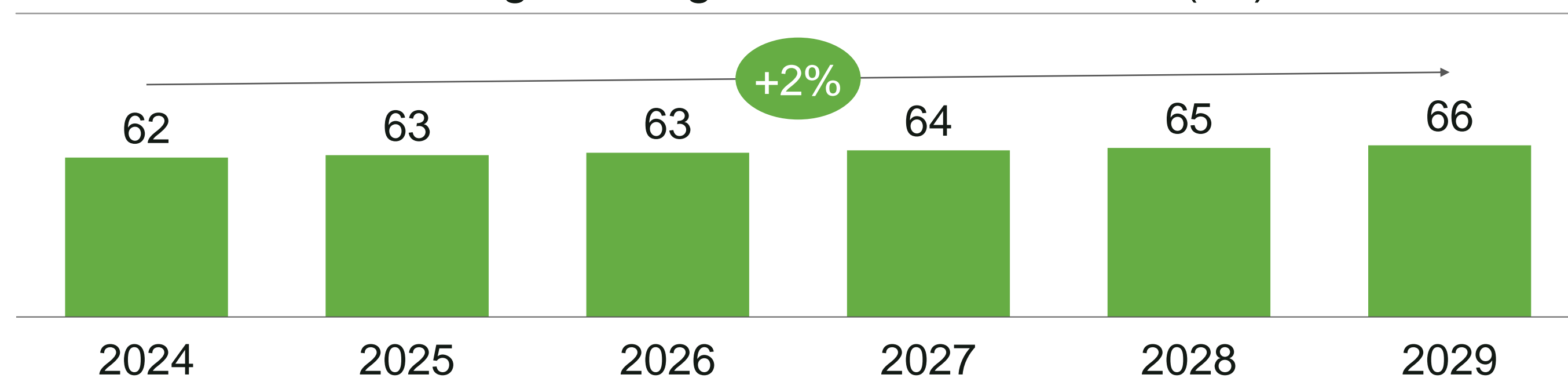
- Separate solids and liquids using high-speed rotation for efficient waste dewatering and recovery
- Remove large solids from drilling fluid through vibrating screens, preventing contamination in recycling
- Separate fine particles from liquids using centrifugal force, enhancing waste slurry purification

# Industrial waste recycling – drilling operations demand, customers, and drivers

Forecasted KSA and rest of GCC drilling waste management market 2024-2029 (\$MM)



Forecasted KSA drilling waste generation 2024-2029 (Mt)



■ KSA ■ GCC (excl. KSA)

## Typical customers in KSA

- Oil & gas facilities

## Key KSA demand drivers

- Ongoing oil and gas exploration creates high volumes of drilling waste requiring recycling
- Company-level sustainability goals push for on-site recycling to minimize environmental impact

## KSA national targets

- KSA is targeting to recycle and treat 85% of the industrial hazardous waste from landfills by 2035

# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Technical Enablers:** Technical guidance and subsidized access to innovation hubs like KACST for developing drilling waste technologies



**Regulatory Enablers:** Strict enforcement of environmental compliance through penalties of up to 10% for violations



**Export Potential:** Strategic location of KSA allows the export of industrial waste recycling equipment to neighboring MENA countries with growing sustainability needs

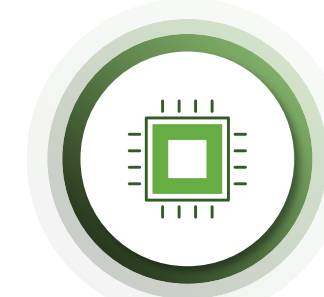


**Growing Demand:** Industries producing high volumes of hazardous and non-hazardous waste require advanced treatment technologies

### Driving Prosperity

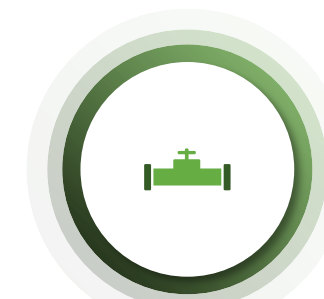
Note: KACST = King Abdulaziz City for Science and Technology  
 Source: Team analysis

## Where is the opportunity



Equipment

Localize specialized equipment such as centrifuges, shale shakers, hydrocyclones



Treatment

Localize on-site pre-treatment solutions



Lifecycle Management

Establish solid waste recycling and advanced disposal systems

# Carbon (CO<sub>2</sub>) Capture Membranes

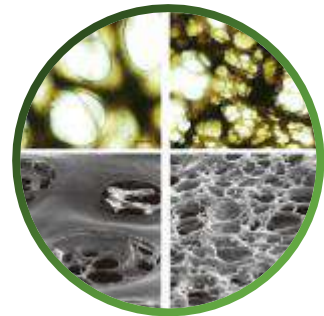
*Business Opportunity*

# Opportunity profile – Carbon capture membranes

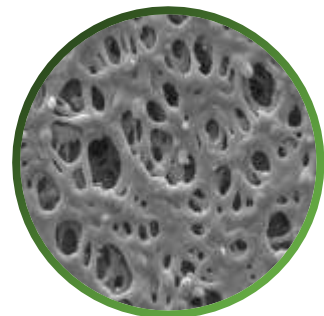
1

KSA's decarbonization goals boost demand for carbon capture membranes

## Types



Polyimide Membranes



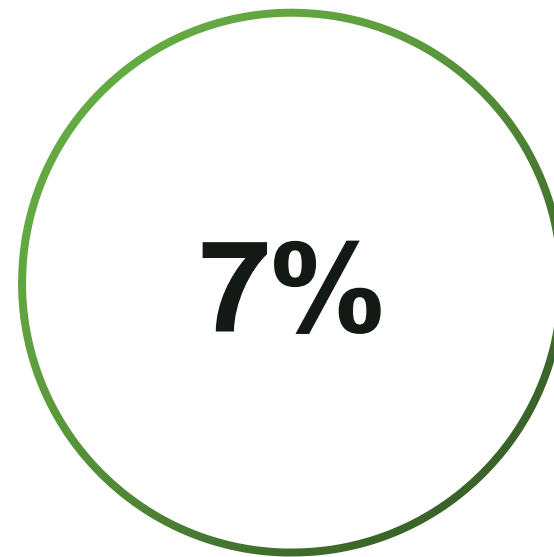
Polyethersulfone (PES) Membranes

2

Carbon capture membrane market is growing steadily



Estimated 2029 KSA market size



Forecasted 5-year CAGR

3

Attractive investment opportunities across the membrane value chain

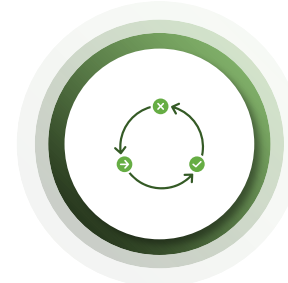
## KSA value chain opportunities



Raw materials



MFE



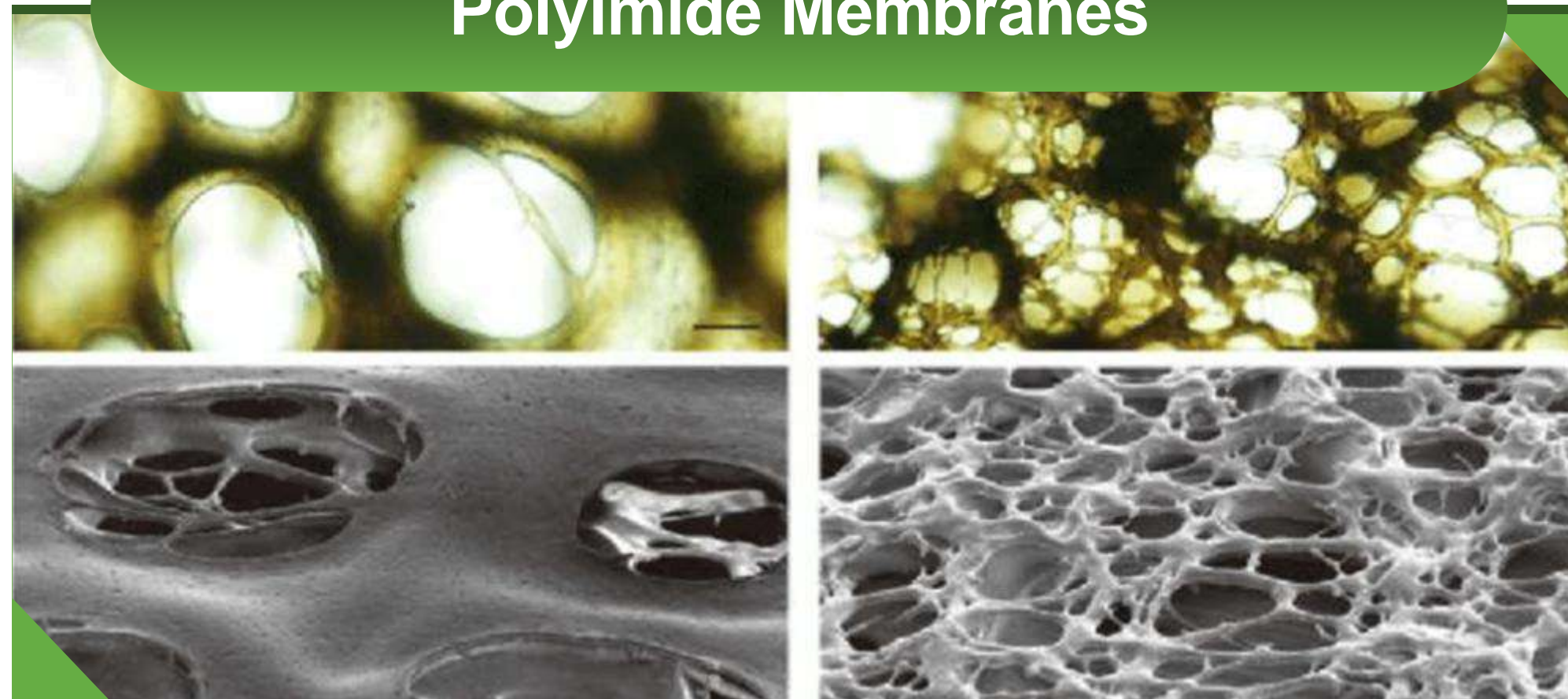
Lifecycle mgmt

## KSA enablers

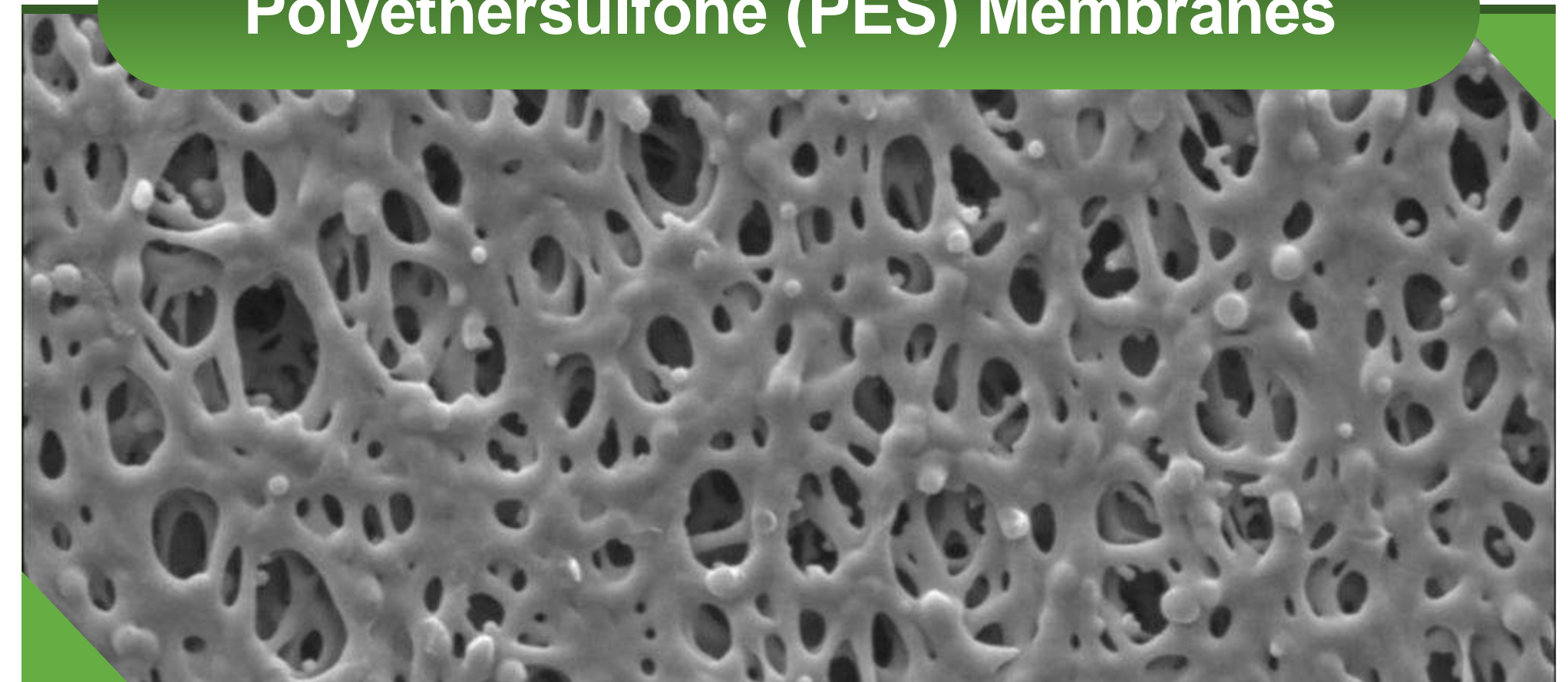
- Financial setup loans
- Flexible labor law
- Advanced manufacturing support

# Potential Carbon capture membranes localized categories

## Polyimide Membranes



## Polyethersulfone (PES) Membranes



### Applications

- **Natural Gas Sweetening:** Removing CO<sub>2</sub> and H<sub>2</sub>S from natural gas streams
- **Post-Combustion CO<sub>2</sub> Capture:** Capturing CO<sub>2</sub> from flue gas in power plants
- **Hydrogen Purification:** Separating hydrogen from gas mixtures in refineries

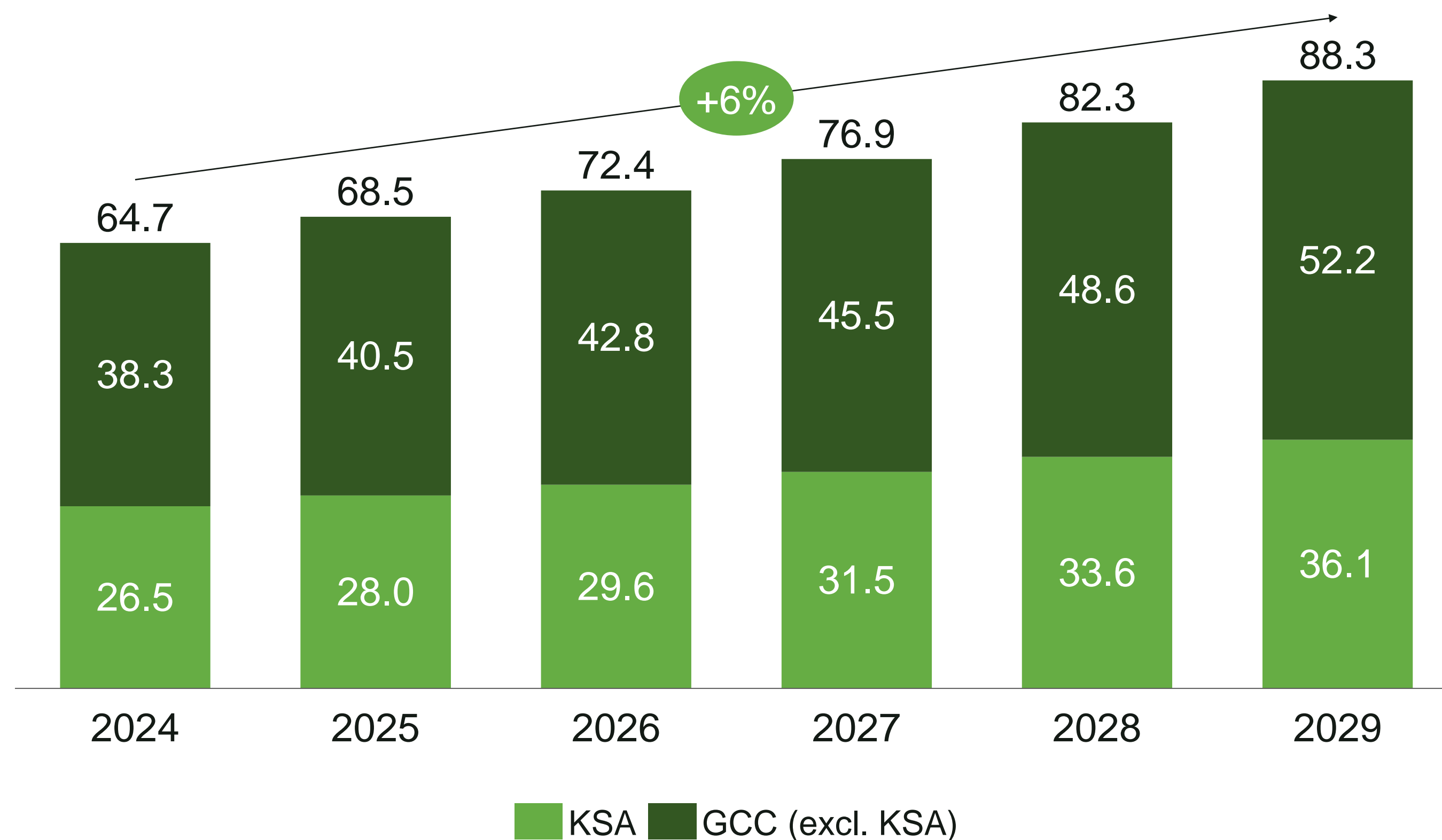
- **High-Pressure CO<sub>2</sub> Capture:** Removing CO<sub>2</sub> from natural gas under high pressure
- **Air Separation:** Enriching oxygen or nitrogen concentrations in industrial processes
- **Industrial Gas Purification:** Removing impurities from hydrogen or ammonia streams

Driving Prosperity

Source: Team analysis

# Polymeric gas separation membrane demand, customers, and drivers

Forecasted KSA and rest of GCC membranes market 2024-2029 (\$MM)



## Typical customers in KSA

- Oil & gas facilities
- Power producers
- Industrial and petrochemical plants

## Key KSA demand drivers

- Technological advances are making CO<sub>2</sub> capture easier and cheaper

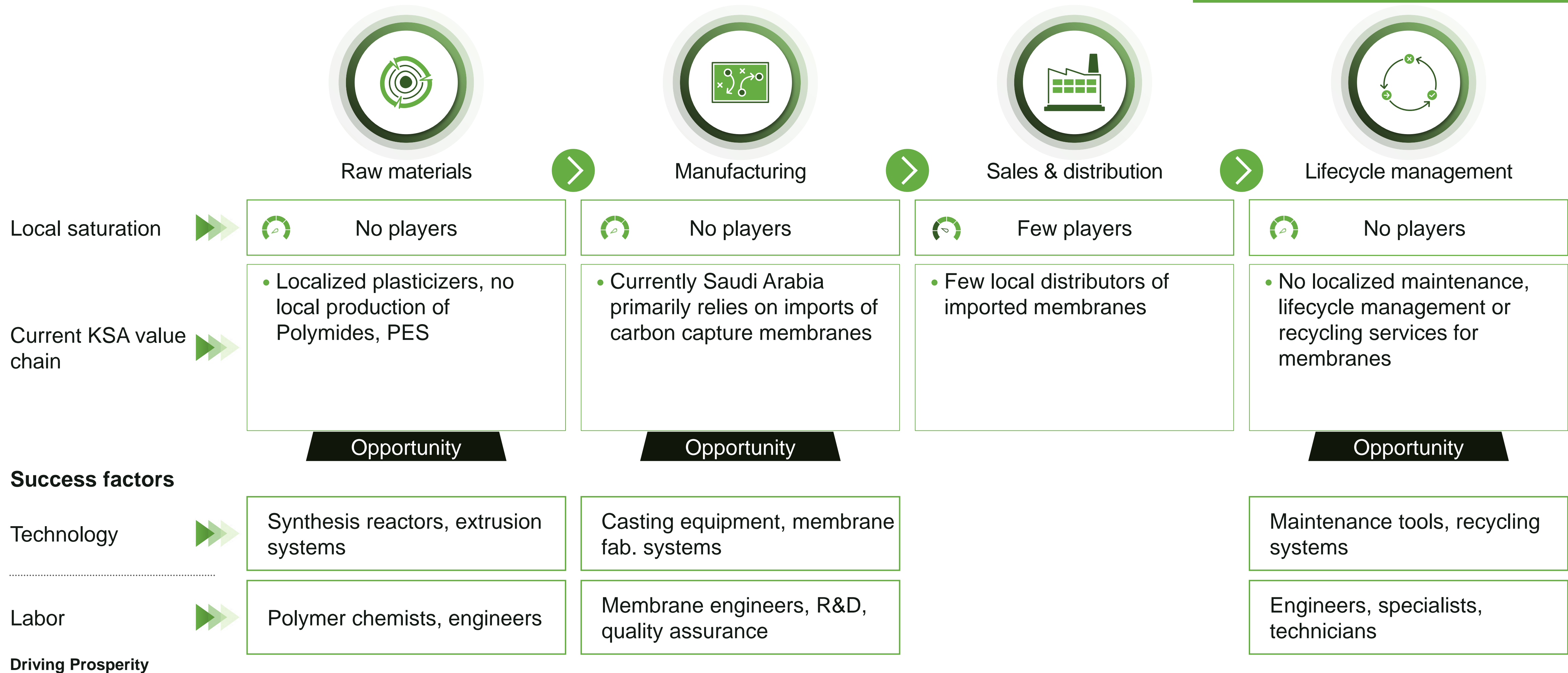
## KSA national targets

- KSA aiming for carbon capture targets of 44 million tons annually by 2035 to achieve net-zero emissions by 2060

Driving Prosperity

# Value chain and key localization opportunities

Polymeric gas separation membranes  
(incl. CO<sub>2</sub> capture membranes)



Note: PES = Polyether Sulfone; CO<sub>2</sub> Capture membranes can be used outside of O&G e.g., in power generation, cement, steel  
Source: Team analysis

# Investment opportunity and enablers

Non-exhaustive

## Key enablers in KSA to drive success



**Financial Support:** Access to subsidized loans from SABIC's NUSANED program for manufacturing setup



**Flexible Labour policies:** Saudization exemptions for specialized industries like CO<sub>2</sub> capture membrane production



**Technical Enablers:** Advanced manufacturing support from KACST on technical guidance and infrastructure setup



**Tax Credits:** Credits on R&D investments for CO<sub>2</sub> capture and gas separation membrane technologies

Driving Prosperity

## Where is the opportunity



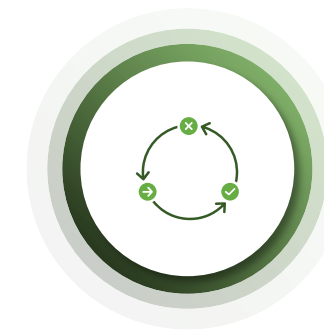
Raw materials

Localize production of advanced polymeric materials: Polyimides and polyethersulfones



Manufacturing

Establish manufacturing of polymeric membranes



Lifecycle management

Establish maintenance, lifecycle management and recycling services

# Mineralization equipment

*Business Opportunity*

# Opportunity profile – Mineralization equipment

1

Mineralization equipment needed for growing CCUS demand

## Types



CO<sub>2</sub> Reactors



Gas Handling Systems



Mixing & Blending Equipment



Modular Skid Systems

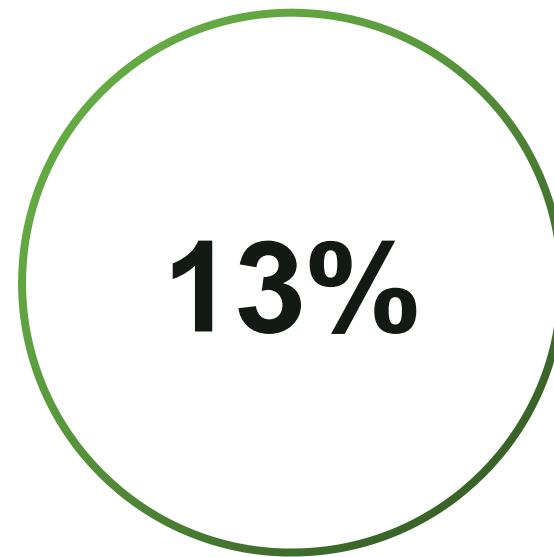
Driving Prosperity

2

Mineralization market projected to grow a double-digit rate for the next 5 years



Estimated 2029 KSA market size



Forecasted 5-year CAGR

3

Attractive investment opportunities in the min. equipment value chain

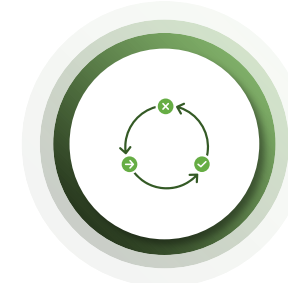
## KSA value chain opportunities



Raw & interm. materials



MFE



Lifecycle mgmt

## KSA enablers

- Financial setup loans
- Flexible labor law
- Advanced manufacturing support

# Potential mineralization equipment localized categories

## CO<sub>2</sub> Reactors



## Gas Handling Systems



## Mixing & Blending Equipment



## Modular Skid Systems



### Applications

- Subsurface CO<sub>2</sub> mineralization (O&G)
- Carbonates for cement production
- Aggregates from industrial byproducts

- High-pressure CO<sub>2</sub> injection (O&G)
- Concrete curing with CO<sub>2</sub>
- Chemical CO<sub>2</sub> utilization processes

- Slurry preparation for injection
- Aggregate-carbonate blending processes
- Pre-blended cementitious materials

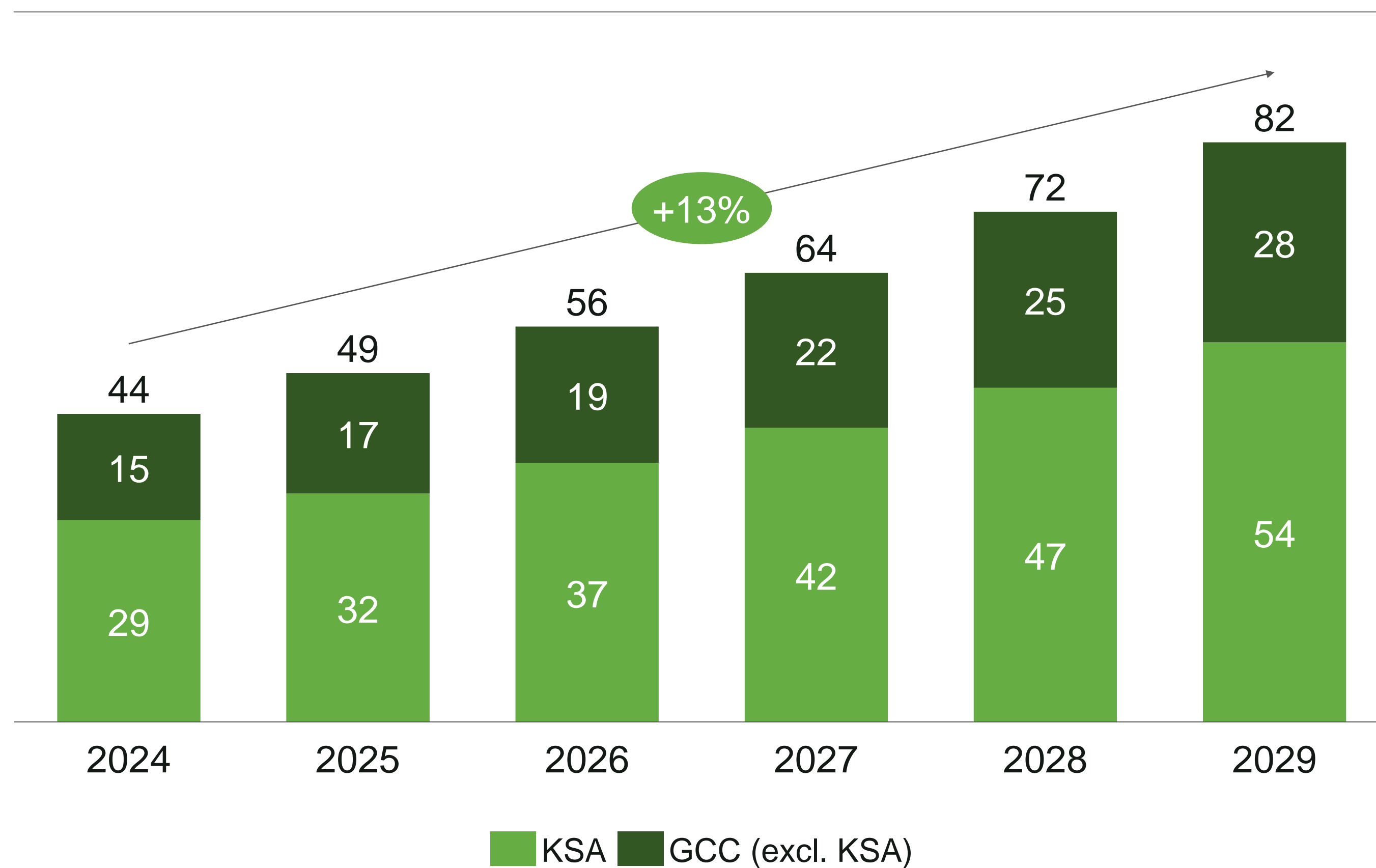
- Mobile field-based mineralization
- On-site concrete production units
- Portable aggregate curing solutions

Driving Prosperity

Source: Team analysis

# Mineralization equipment demand, customers, and drivers

Forecasted KSA and rest of GCC mineralization equipment market 2024-2029 (\$MM)



## Typical customers in KSA

- Oil & gas facilities
- Hard to abate industries (steel, cement, petrochemicals)

## Key KSA demand drivers

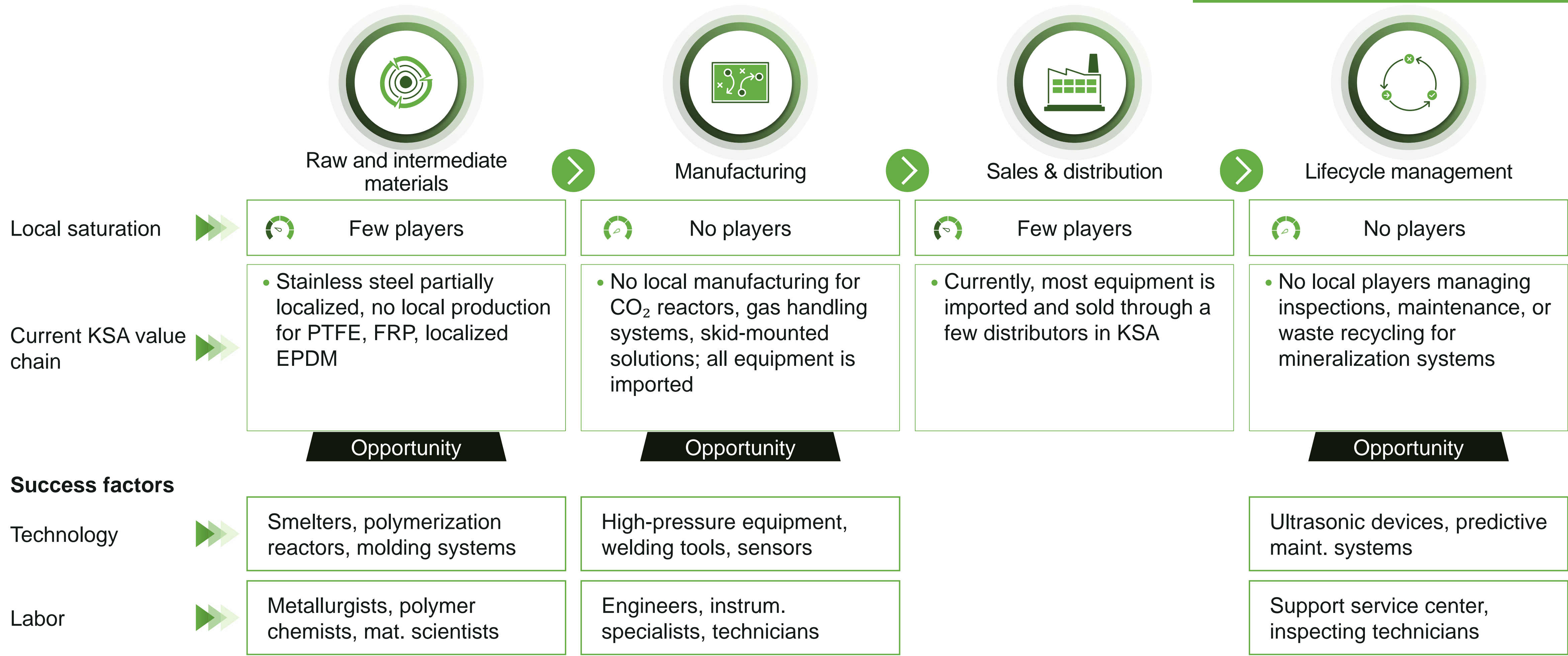
- Growing infrastructure projects increase demand for low-carbon cement and aggregates

## KSA national targets

- KSA aiming for carbon capture targets of 44 million tons annually by 2035 to achieve net-zero emissions by 2060

# Value chain and key localization opportunities

Mineralization equipment



Circular Economy & Sustainability Workshop

Note: PTFE = Polytetrafluoroethylene (Teflon); FRP = Fiber Reinforced Polymers, EPDM = Ethylene Propylene Diene Monomer  
Source: Team analysis

# Investment opportunity and enablers

Non-exhaustive

## Key enablers in KSA to drive success



**Financial Support:** Access to subsidized loans from SABIC's NUSANED program for manufacturing setup



**Flexible Labour policies:** Saudization exemptions for specialized industries like CO<sub>2</sub> capture membrane production



**Technical Enablers:** Advanced manufacturing support from KACST on technical guidance and infrastructure setup



**Tax Credits:** Credits on R&D investments for CO<sub>2</sub> capture and gas separation membrane technologies

Driving Prosperity

## Where is the opportunity



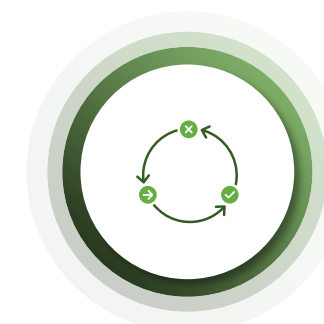
Raw materials

Localize production of advanced polymeric materials: Polyimides and polyethersulfones



Manufacturing

Establish production for CO<sub>2</sub> reactors, gas handling systems, mixers, skid-mounted systems



Lifecycle management

Localize maintenance, equipment recycling, and inspections

Note: PTFE = Polytetrafluoroethylene (Teflon)

Source: Expert interviews; Government websites; Team Analysis

# Flare recovery systems

*Business Opportunity*

# Opportunity profile – Flare recovery systems



KSA's sustainability goals drive demand for flare gas recovery systems in O&G

## Technologies



Knockout drums



Flare gas recovery compressors



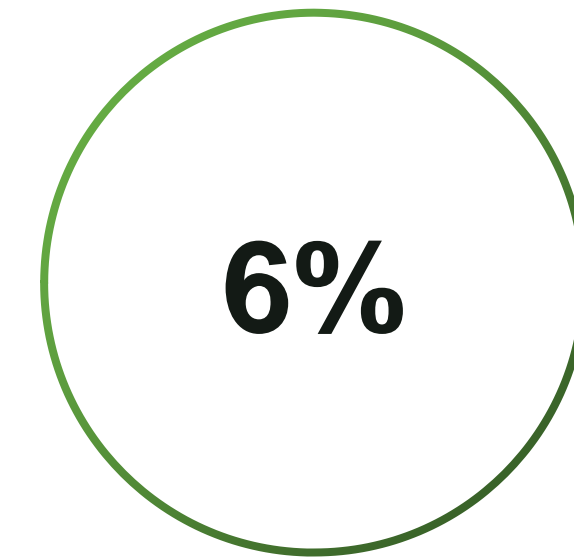
Separation units



The flare gas recovery market is niche with steady growth



Estimated 2029 KSA market size

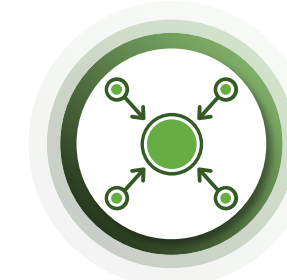


Forecasted 5-year CAGR

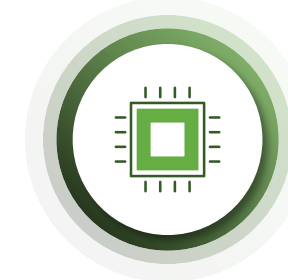


Attractive investment opportunities across the value chain

## KSA value chain opportunities



Raw materials & Inputs



Manufacturing

## KSA enablers

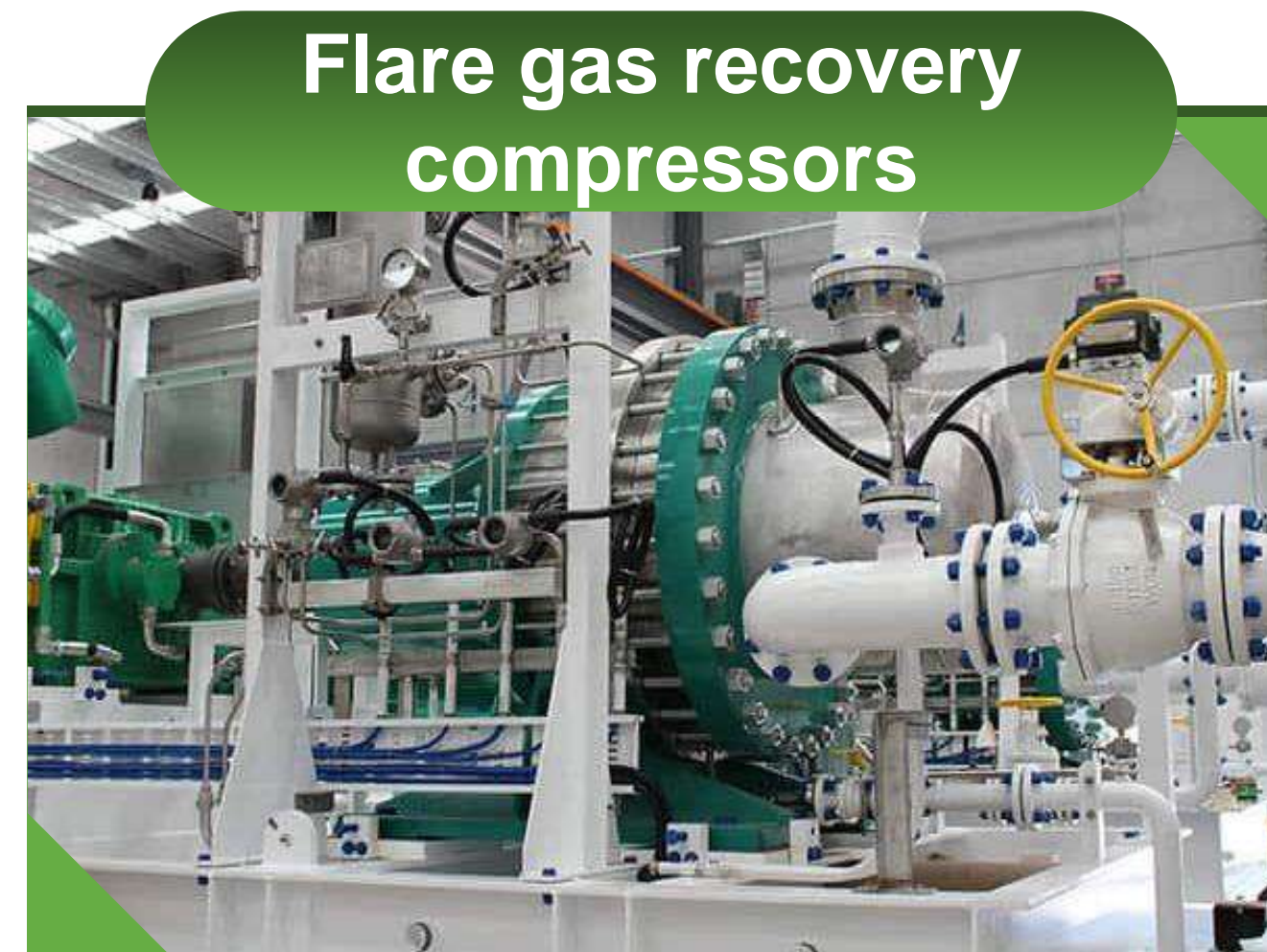
- Financial setup loans
- Corporate tax reduction
- KACST technical support

# Flare recovery systems technologies to be chosen and localized

Non-Exhaustive



Knockout drums



Flare gas recovery compressors



Separation units

## Applications

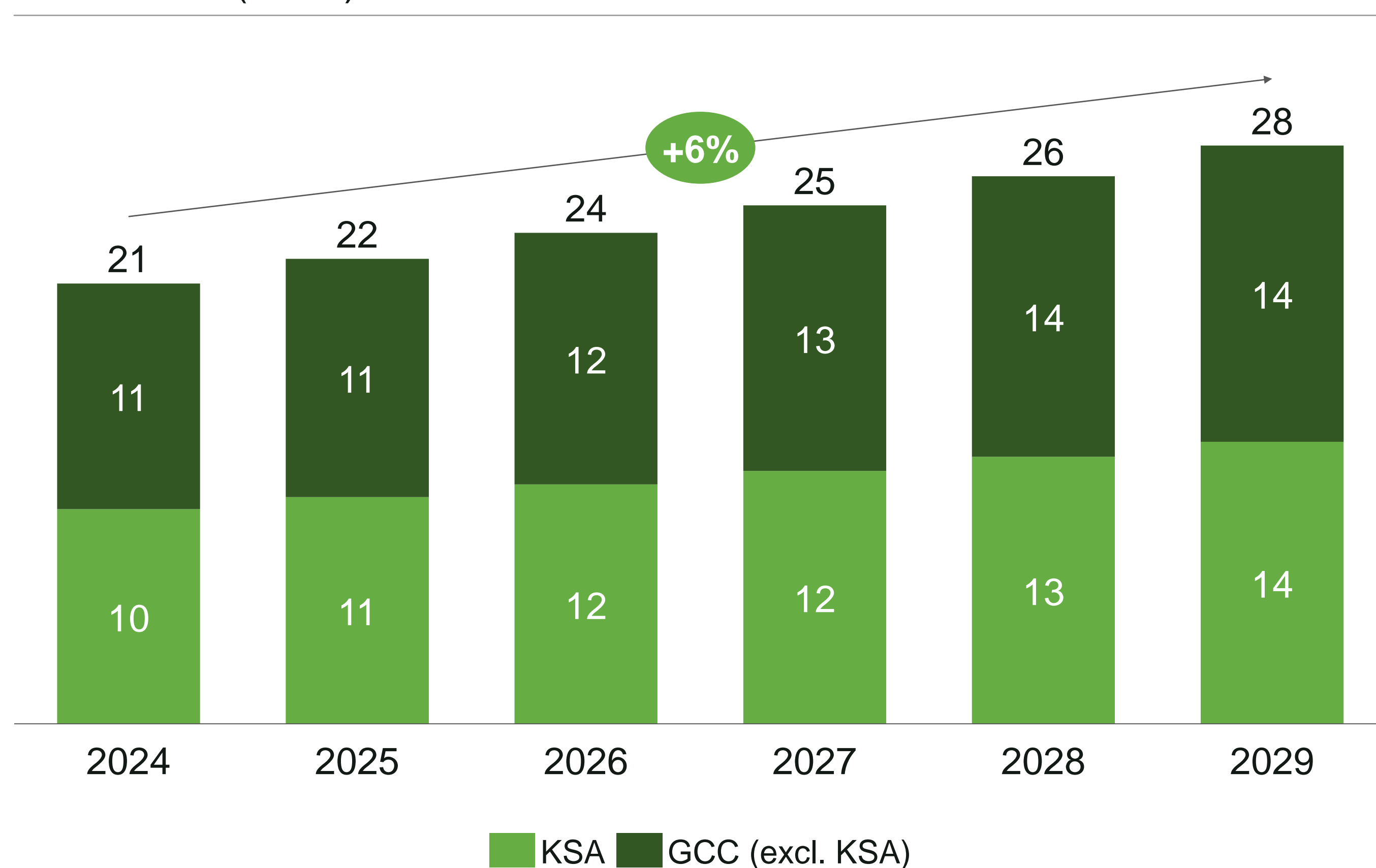
- Prevents carryover of hydrocarbons and water into compressors
- Compresses flare gas for reinjection into the process
- Removes particulates and condensates from recovered gas streams
- Removes H<sub>2</sub>S and CO<sub>2</sub> from sour gas streams

Driving Prosperity

Note: H<sub>2</sub>S = Hydrogen sulfide

# Flare recovery systems demand, customers, and drivers

Forecasted KSA and rest of GCC O&G flare recovery systems market 2024-2029 (\$MM)



## Typical customers in KSA

- Oil & gas facilities

## Key KSA demand drivers

- O&G targeting company-level emissions reduction, partially to be achieved through flare gas recovery

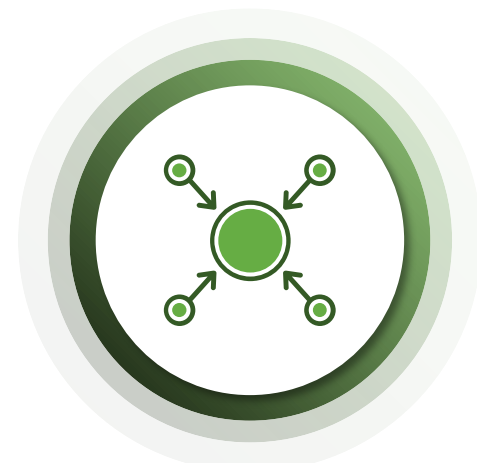
## KSA national targets

- The Saudi Green Initiative targeting to reduce carbon emissions by 278 MM tons/year by 2030

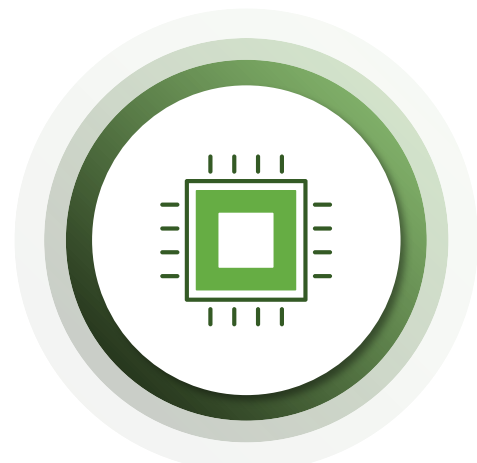
Driving Prosperity

# Value chain and key localization opportunities

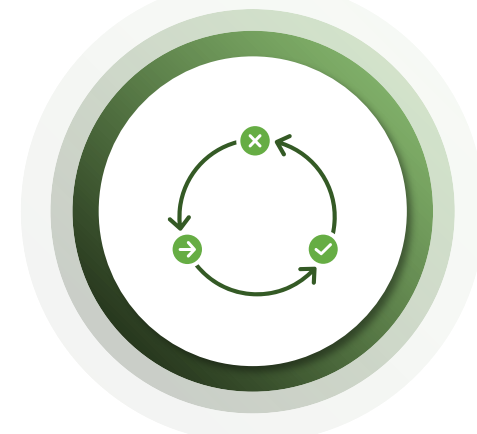
Flare recovery systems



Raw Materials and Inputs




Manufacturing




Lifecycle Management

Local saturation



 Few players

 No players

 Few players

Current KSA value chain



- Localized steel production
- Partially localized: amines
- Not localized: piping and valves (feasible loc.), high-strength specialty alloys (challenging to loc.: capex-intensive, nickel import dependency), sensor (not feasible: high tech)

- Equipment is currently imported with no local manufacturing of systems components or full systems

- Partial localization for sulfur recovery from acid gases, byproduct hydrocarbons, CO<sub>2</sub>, water vapor, oil sludge and other solid and liquid residues

Success factors

**Opportunity**

**Opportunity**

Technology



Advanced alloying, chemical synthesis, and testing

Precision machining, automation, and system integration

Labor



Material scientists, metallurgists, chemical engineers

Mechanical engineers, system designers, production specialists

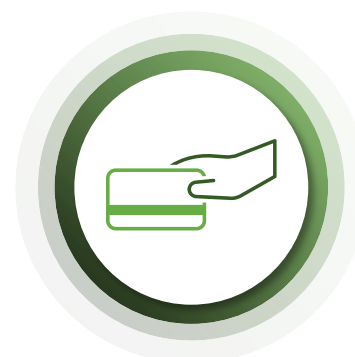
Driving Prosperity

# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Financial Support:** Loans and grants for procuring flare gas recovery technologies and infrastructure



**Corporate Tax Reduction:** Credits on R&D for flare gas capture systems and emission reduction technologies

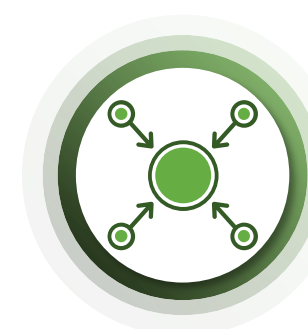


**Technical Enablers:** KACST support for localizing flare recovery equipment and workforce training programs

### Driving Prosperity

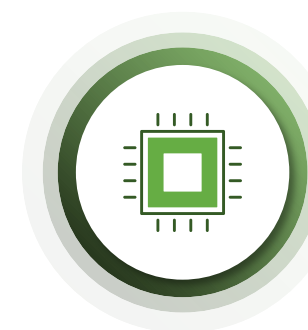
Note: KACST = King Abdulaziz City for Science and Technology  
 Source: Team analysis

## Where is the opportunity



Raw Materials  
and Inputs

Localize production of piping and valves



Manufacturing

Localize manufacturing of flare recovery systems including knockout drums, compressors, separation units

# Ammonia (NH<sub>3</sub>) crackers

*Business Opportunity*

# Opportunity profile – Ammonia (NH<sub>3</sub>) Crackers

1

KSA's hydrogen export strategy driving demand for Ammonia crackers

## Types



Large-Scale Centralized Catalytic Reactors



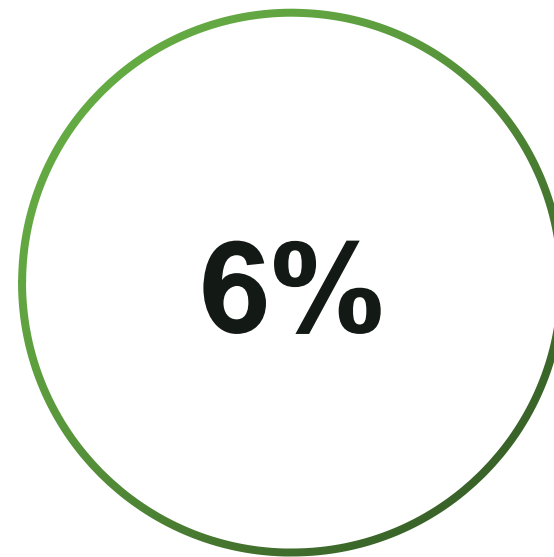
Modular/Skid-Mounted Catalytic Systems

2

Ammonia cracker market is sizeable with steady forecasted growth



Estimated 2029 KSA market size



Forecasted 5-year CAGR

3

Attractive investment opportunities across the Ammonia cracker value chain

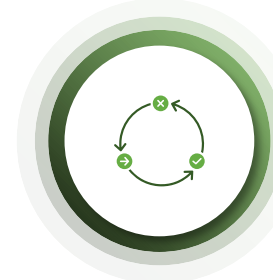
## KSA value chain opportunities



Raw materials



MFE



Lifecycle mgmt

## KSA enablers

- Financial setup loans
- Flexible labor law
- Advanced manufacturing support

# Potential Ammonia crackers equipment localized categories

Non-Exhaustive

## Large-Scale Centralized Catalytic Reactors



### Applications

- Ammonia producers and hard-to-abate sectors (e.g., steel, petrochemicals) where hydrogen is required at scale

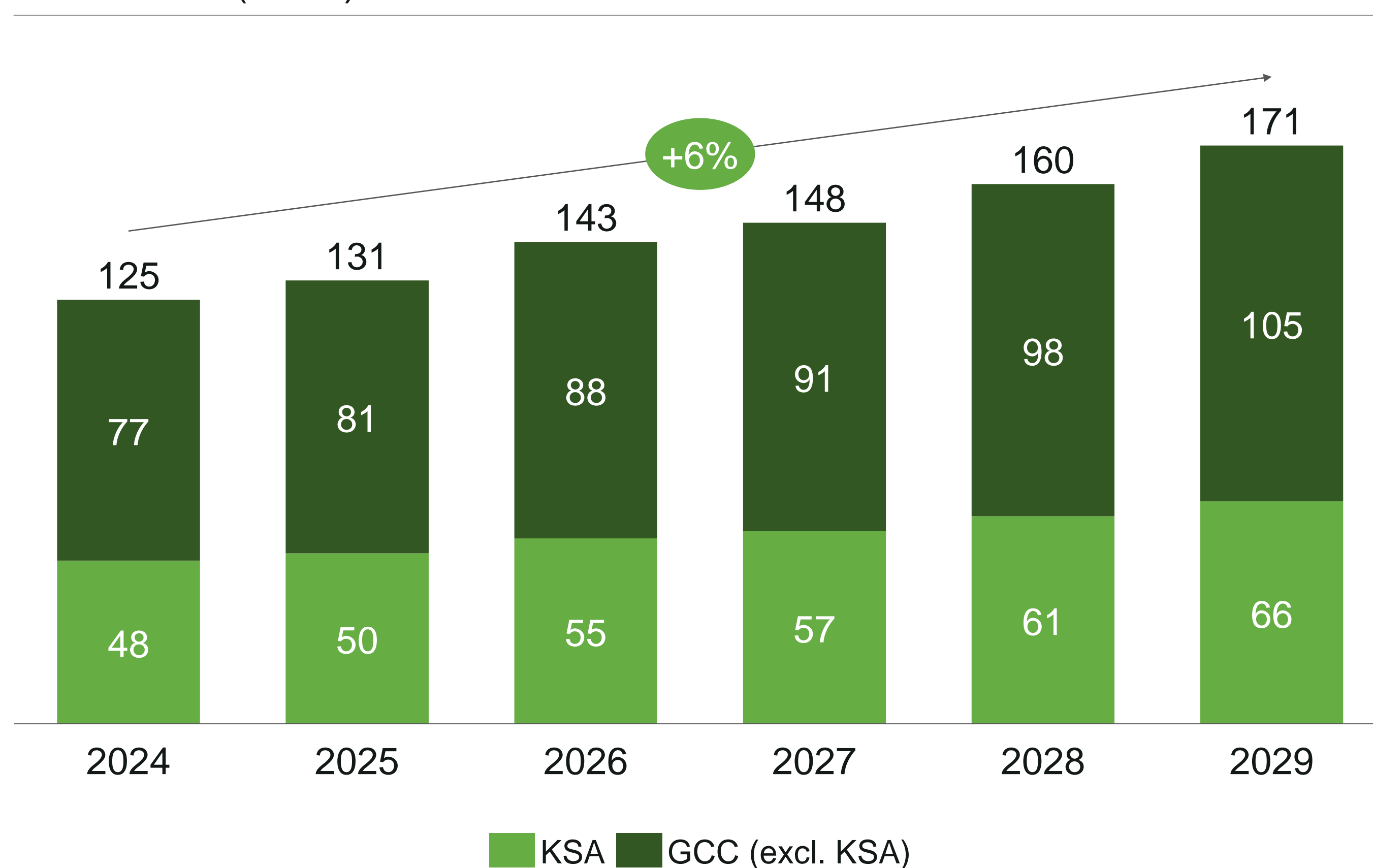
## Modular/Skid-Mounted Catalytic Systems



- Decentralized hydrogen production at hydrogen fueling stations and remote industrial sites

# Ammonia crackers demand, customers, and drivers

Forecasted KSA and rest of GCC Ammonia crackers market 2024-2029 (\$MM)



## Typical customers in KSA

- Hard-to-abate sectors
- Ammonia producers
- Hydrogen fueling stations, logistics center

## Key KSA demand drivers

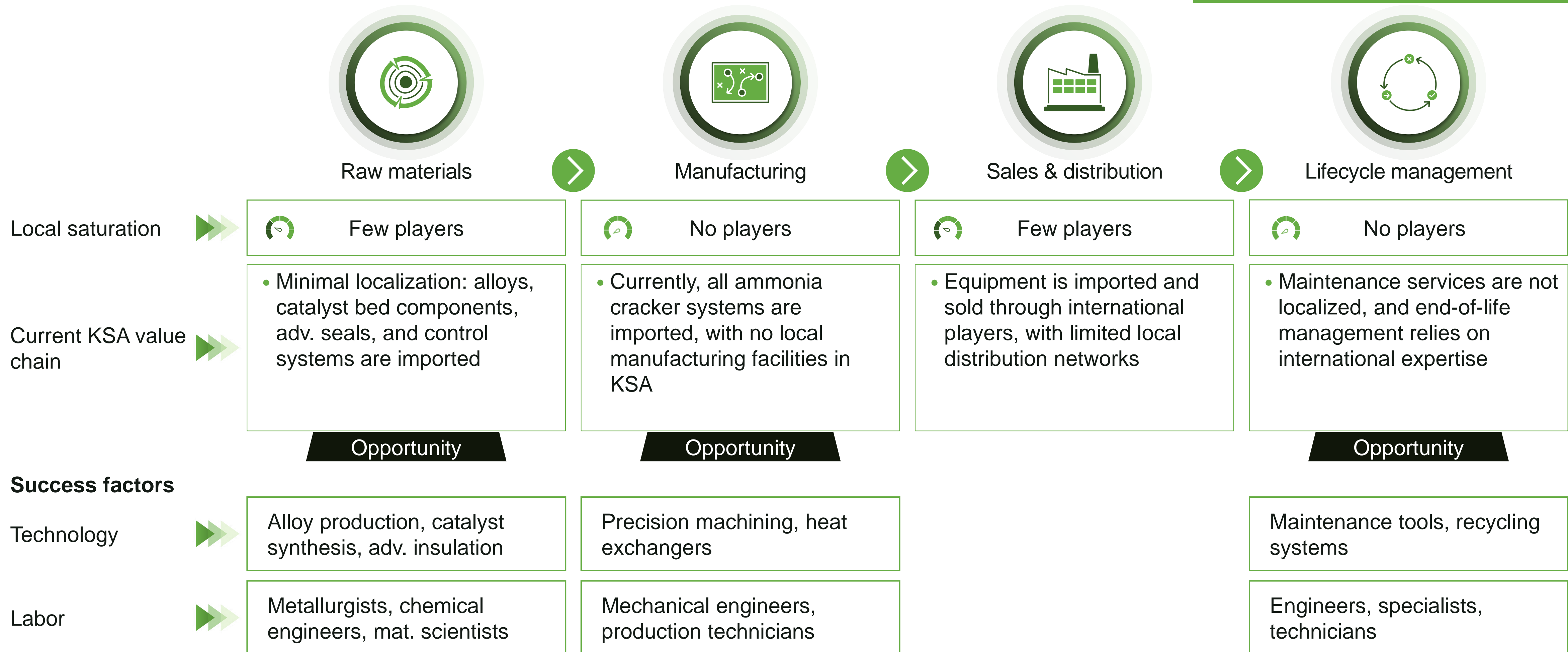
- KSA's hydrogen export strategy boosts ammonia cracker potential
- Growing domestic hydrogen use drives cracker demand for industry and fuel cells

## KSA national targets

- KSA aims to become the world's leading hydrogen exporter, targeting 2.9 million tons annually by 2030

# Value chain and key localization opportunities

NH<sub>3</sub> crackers



Note: PES = Polyether Sulfone; CO<sub>2</sub> Capture membranes can be used outside of O&G e.g., in power generation, cement, steel  
Source: Team analysis

# Investment opportunity and enablers

Non-exhaustive

## Key enablers in KSA to drive success



**Flexible Labour Policies:** Saudization exemptions for emerging sectors like NH<sub>3</sub> cracker technology manufacturing



**Tax Credits:** Credits on R&D investments for ammonia cracking technologies and hydrogen infrastructure



**Technical Enablers:** Advanced manufacturing support from KACST on technical guidance and infrastructure for NH<sub>3</sub> cracker systems



**Financial Support:** Access to subsidized loans from SABIC's NUSANED program for manufacturing NH<sub>3</sub> crackers and components

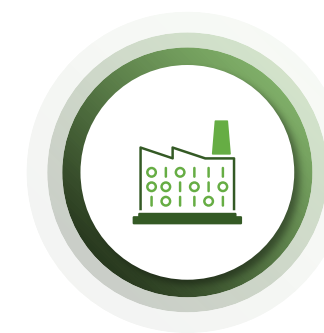
Driving Prosperity

## Where is the opportunity



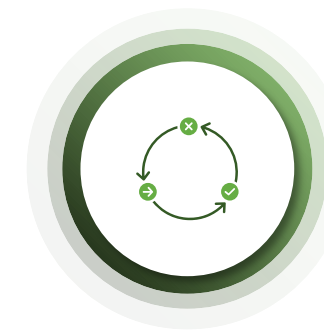
Raw materials

Localize production of alloys, catalyst bed components, adv. seals, and control systems



Manufacturing

Establish manufacturing of Ammonia (NH<sub>3</sub>) crackers



Lifecycle management

Expand maintenance, lifecycle management and recycling services

# Critical membranes commodities

*Business Opportunity*

# Opportunity profile – Critical membrane commodities

1

KSA's industrial expansion increases reliance on raw materials, which are required for membrane manufacturing

## Types



Polyethylene Glycol (PEG)



Polyamide (PA)



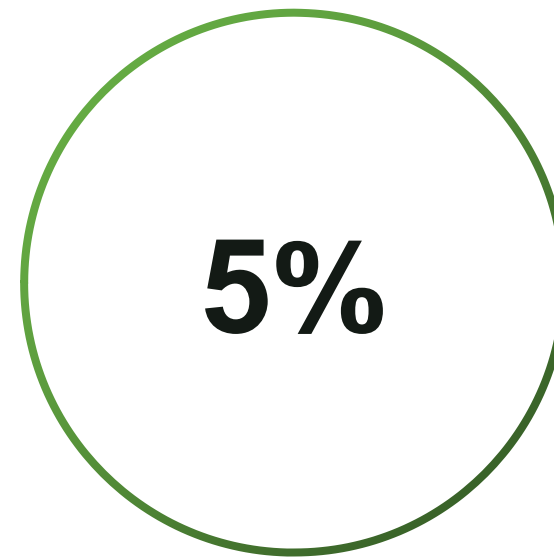
Polysulfone (PS)

2

Market for high-performing polymers<sup>1</sup> is sizeable with steady growth



Estimated 2029 KSA market size

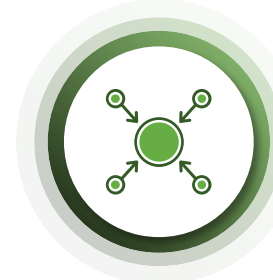


Forecasted 5-year CAGR

3

Attractive investment opportunities across the value chain

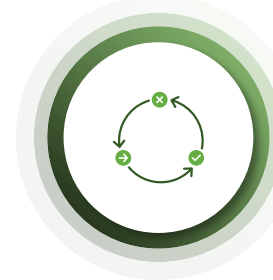
## KSA value chain opportunities



Raw Materials and Inputs



MFE



Lifecycle Management

## KSA enablers

- Financial setup loans
- Corporate tax reduction
- KACST technical support

### Driving Prosperity

1. High-performing (specialty) polymers are part of the critical membrane commodities  
 Note: MFE = Manufacturing; KACST = King Abdulaziz City for Science and Technology

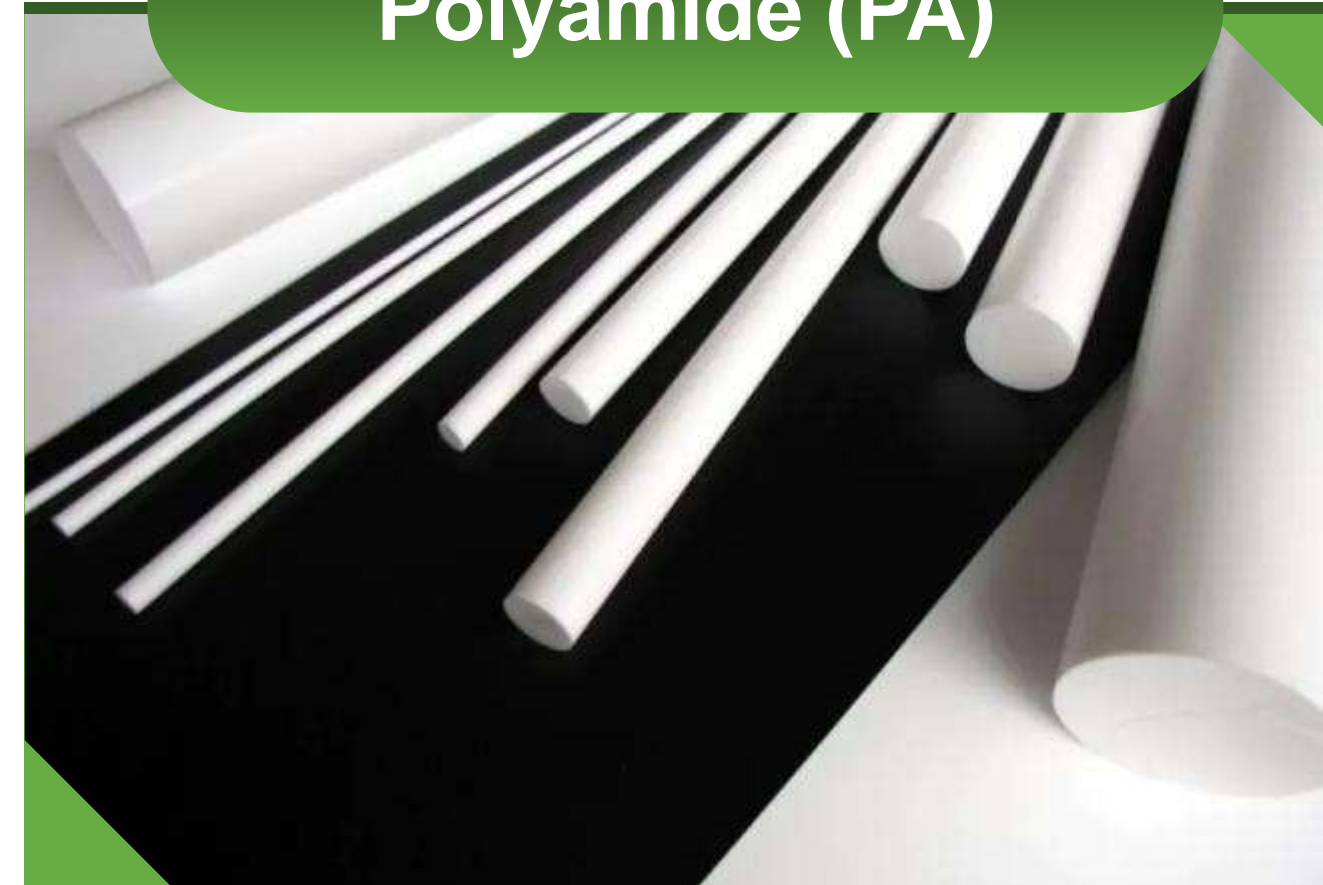
# Potential critical membrane commodities to be chosen and localized

Non-Exhaustive

## Polyethylene Glycol (PEG)



## Polyamide (PA)



## Polysulfone (PS)



### Applications

- Used in membrane manufacturing for wastewater/desalination systems
- Stabilizer in drug formulations and medical-grade products
- Processing aid and additive in food-grade applications

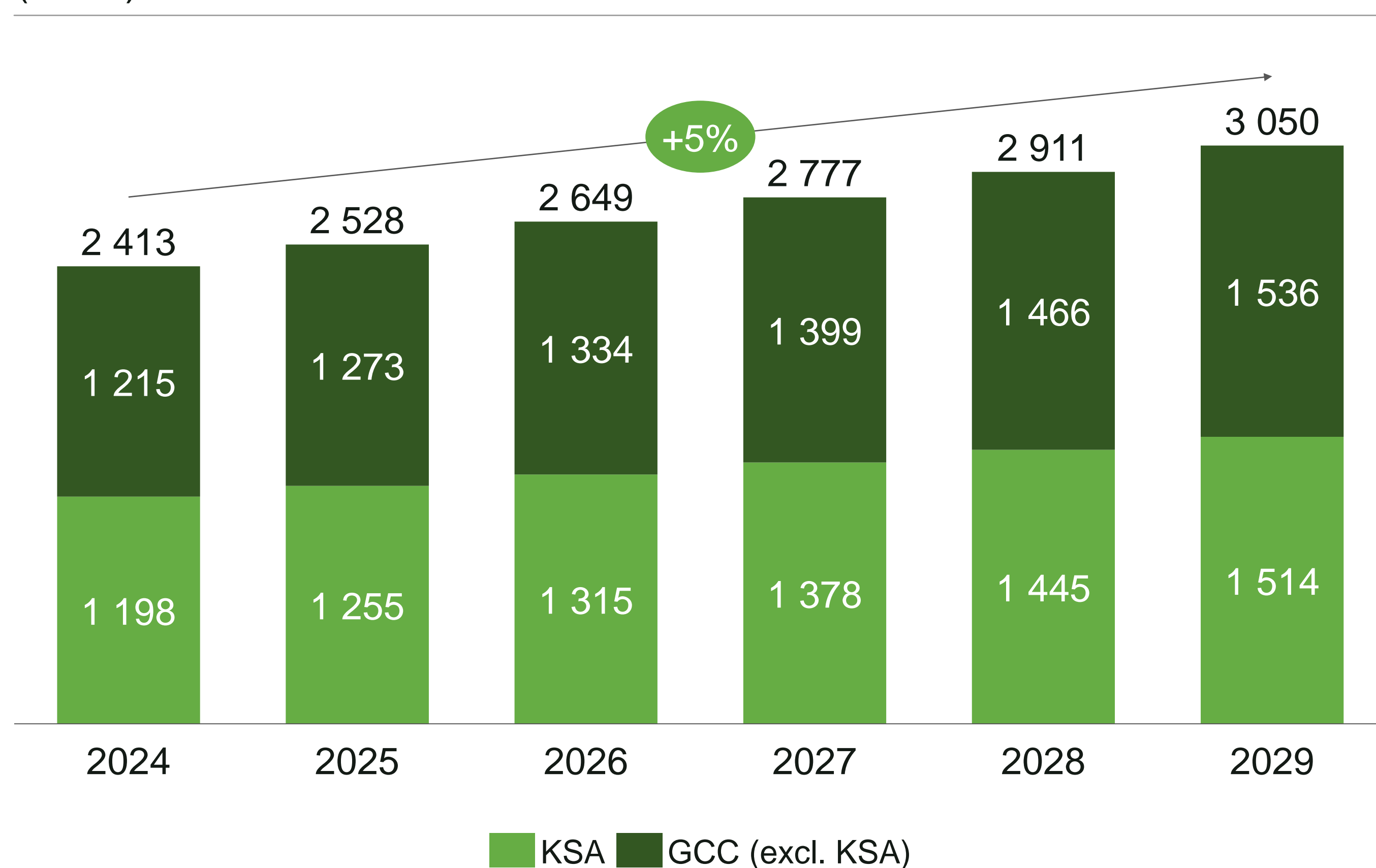
- Core material for ultrafiltration and reverse osmosis membranes
- Used in medical devices and sterile filtration systems for drug production
- Used in food-grade piping, filtration systems, and processing equipment

- Widely used in reverse osmosis membranes for desalination
- Utilized in drug delivery systems and sterile packaging
- Key material in durable and hygienic packaging and filtration components

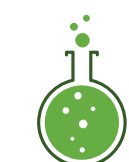


Driving Prosperity

# Critical membranes commodities demand, customers, and drivers

Forecasted KSA and rest of GCC PEG, PS and PA market 2024-2029 (\$MM)



## Typical customers in KSA

-  Water and wastewater treatment industry
-  Food & beverage industry
-  Pharmaceuticals

## Key KSA demand drivers

- Growing demand for desalination and wastewater treatment technologies
- Expansion of F&B and pharmaceutical industries requiring high-performance polymers for packaging and advanced processing solutions

## KSA national targets

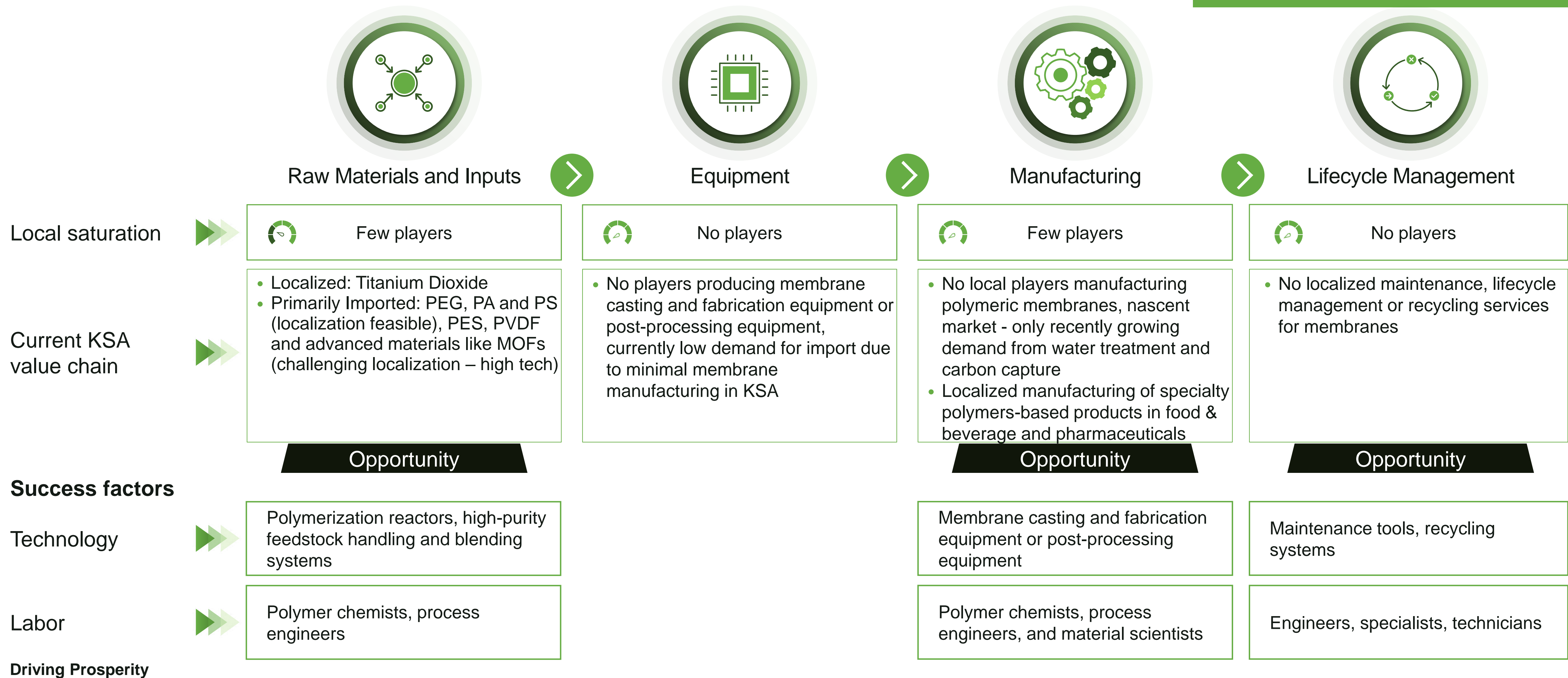
- KSA net-zero 2060 goal includes advancing carbon capture and wastewater treatment technologies

Driving Prosperity

Note: PEG = Polyethylene Glycol, PA = Polyamide, PS = Polysulfone  
Source: IEA, Grand View Research, Verified Market Research, Maximize Market Research

# Value chain and key localization opportunities

Critical membrane commodities



Circular Economy & Sustainability Workshop

Note: PEG = Polyethylene Glycol, PA = Polyamide, PES = Polyethersulfone, PVDF = Polyvinylidene Fluoride, PS = Polysulfone, MOFs = Metal-Organic Frameworks  
Source: Team analysis

# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Financial Support:** Loans and grants for local production of PEG, PSU, and PA



**Corporate Tax Reduction:** Credits on R&D for advanced membrane materials and polymer processing technologies

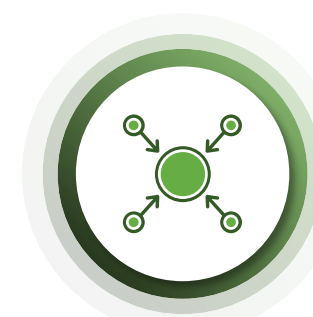


**Technical Enablers:** KACST support for localizing polymer manufacturing and skilled workforce training

### Driving Prosperity

Note: KACST = King Abdulaziz City for Science and Technology; PEG = Polyethylene Glycol, PA = Polyamide, PS = Polysulfone  
 Source: Team analysis

## Where is the opportunity



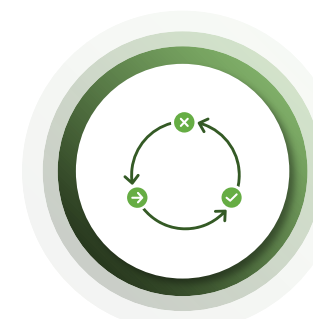
Raw Materials  
and Inputs

Localize manufacturing of PEG, PA, PS



Manufacturing

Localize polymeric membrane manufacturing



Lifecycle  
Management

Localize maintenance, lifecycle management or recycling services for membranes

# Water treatment technologies

*Business Opportunity*

# Opportunity profile – Water treatment technologies

1

KSA's growing industrial and municipal sectors drive demand for water treatment technologies

## Technologies



Reverse Osmosis (RO)  
 Membranes



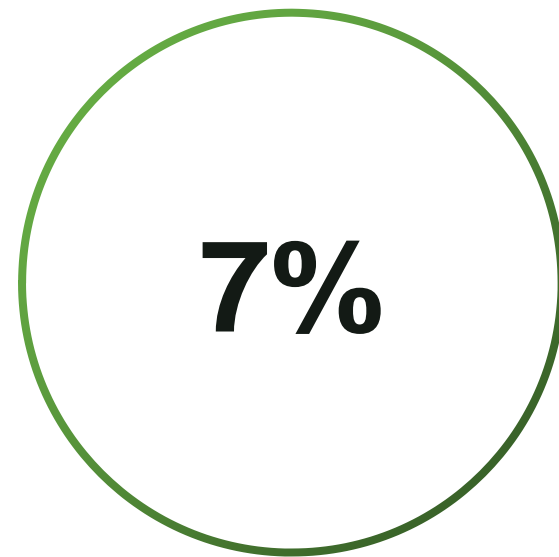
Ultrafiltration (UF)

2

Water treatment market is moderately scaled with stable growth



Estimated 2029 KSA market size

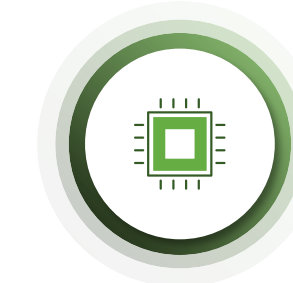


Forecasted 5-year CAGR

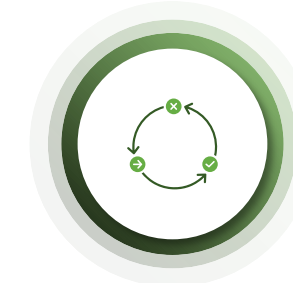
3

Attractive investment opportunities across the value chain

## KSA value chain opportunities



Equipment



Lifecycle Management

## KSA enablers

- Financial setup loans
- Corporate tax reduction
- KACST technical support

### Driving Prosperity

Note: KACST = King Abdulaziz City for Science and Technology  
 Source: Team analysis

# Potential water treatment technologies to be chosen and localized

Non-Exhaustive



Reverse Osmosis (RO)



Ultrafiltration (UF)

## Applications

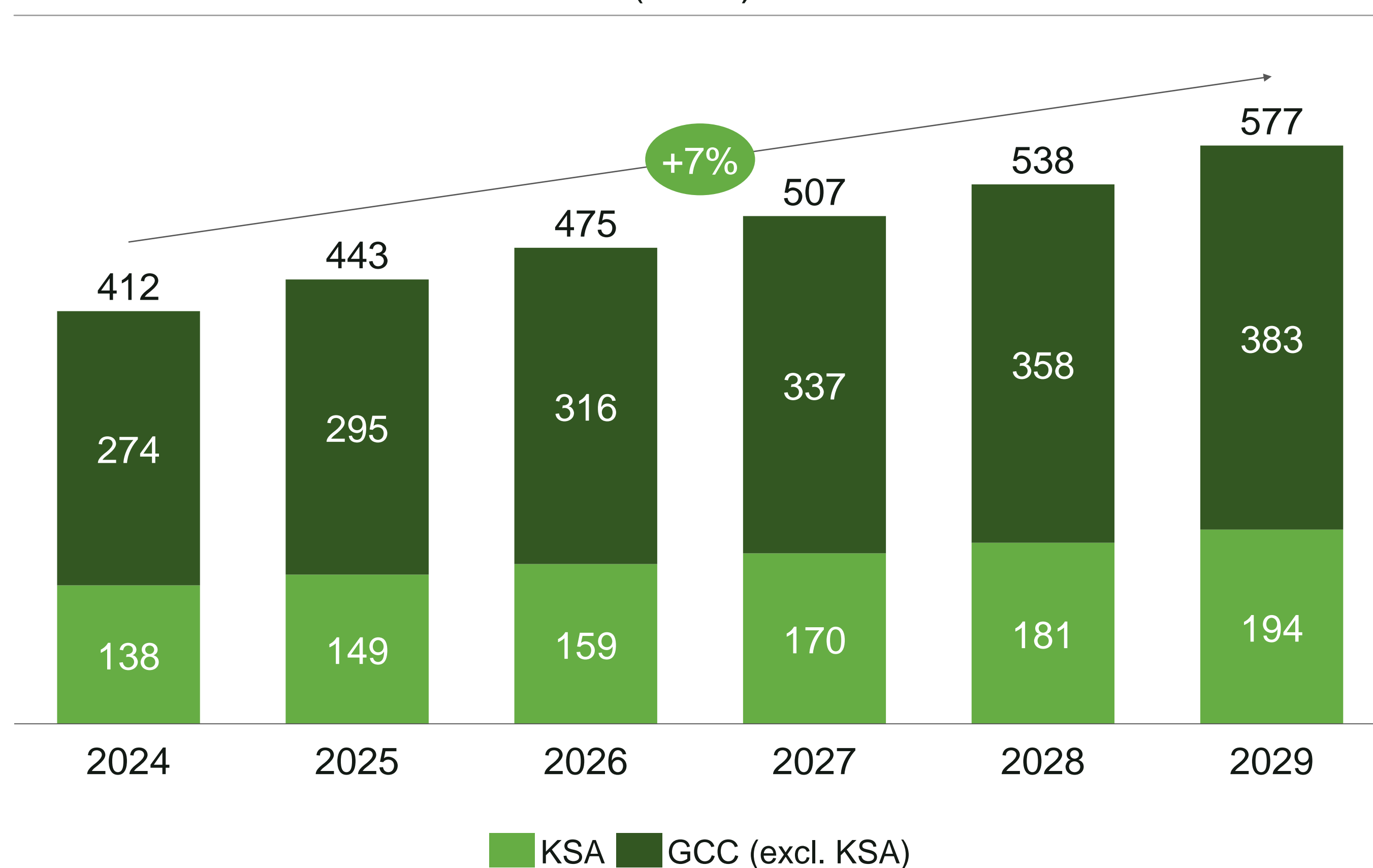
- Municipal water desalination
- Industrial water reuse and ultrapure water systems

- Pre-treatment for desalination
- Industrial water recycling and reuse




Driving Prosperity

# Water treatment technologies demand, customers, and drivers

Forecasted KSA and rest of GCC water and wastewater treatment membranes<sup>1</sup> market 2024-2029 (\$MM)



## Typical customers in KSA

-  Oil & gas facilities
-  Water treatment plants
-  Other industrial plants (petrochemicals, power, mining)

## Key KSA demand drivers

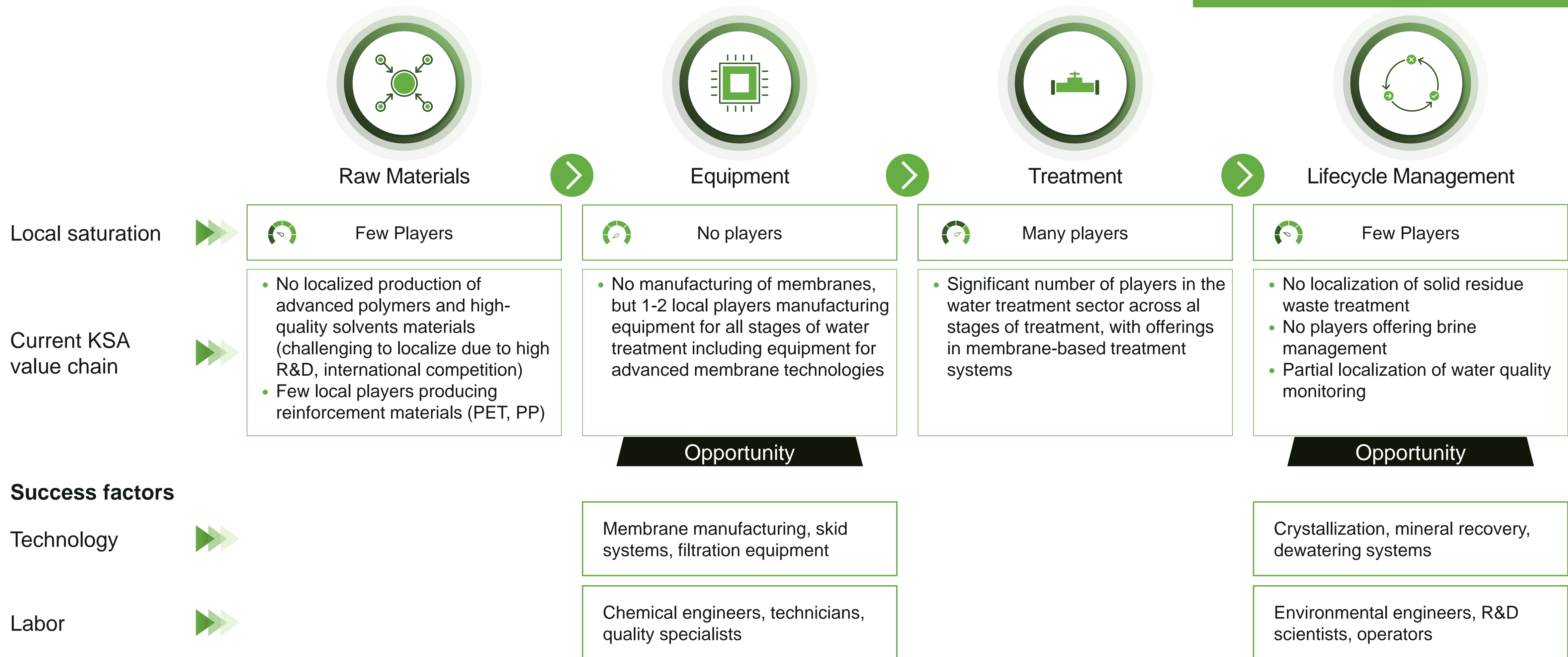
- Rising water scarcity drives demand for efficient water recycling and desalination solutions
- Stricter wastewater regulations push industries to adopt advanced treatment technologies

## KSA national targets

- KSA intending to recycle 40% of waste streams by 2040

# Value chain and key localization opportunities

Water treatment technologies



Notes: PET = Polyethylene terephthalate; PP = Polypropylene  
Source: Team analysis

# Investment opportunity and enablers

## Key enablers in KSA to drive success



**Financial Support:** Subsidized loans from NUSANED for manufacturing water treatment equipment and building plants



**Corporate Tax Reduction:** Credits on R&D investments for innovative water recycling and purification solutions

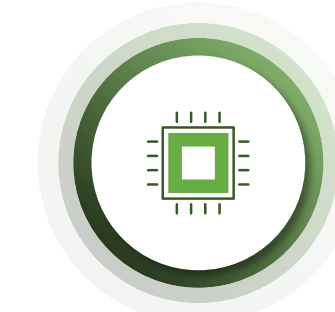


**Technical Enablers:** KACST guidance for setting up advanced water treatment systems and localizing technology

### Driving Prosperity

Note: KACST = King Abdulaziz City for Science and Technology  
 Source: Team analysis

## Where is the opportunity



Equipment

Localize manufacturing of advanced membrane technologies



Lifecycle Management

Establish solid residue waste treatment and brine management

**Thank  
You**