The Outlook and Challenges facing the Chemical Industry – Implications for the Industry in Iran?

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Iran Petrochemical Forum

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The Petrochemical industry continues to change globally, creating challenges and opportunities

CHANGING STRUCTURE

- Downstream Shift
- Clusters/Mega Sites
  - Refinery – Petchem Integration

GEOGRAPHIC SHIFTS

- Population/Market Shift to Asia
- Geographic Shift of Investment
- Emergence of China
- Changing ME attractiveness

PETROCHEMICAL INDUSTRY

CHANGING BUSINESS

- M&A Activity Increase
- Emergence of New Global Majors

CHANGING FEEDSTOCKS

- Changes in Competitiveness
  - US/ME
- Coal/Shale Gas in Asia?
- Renewables
- Oil Price Influences

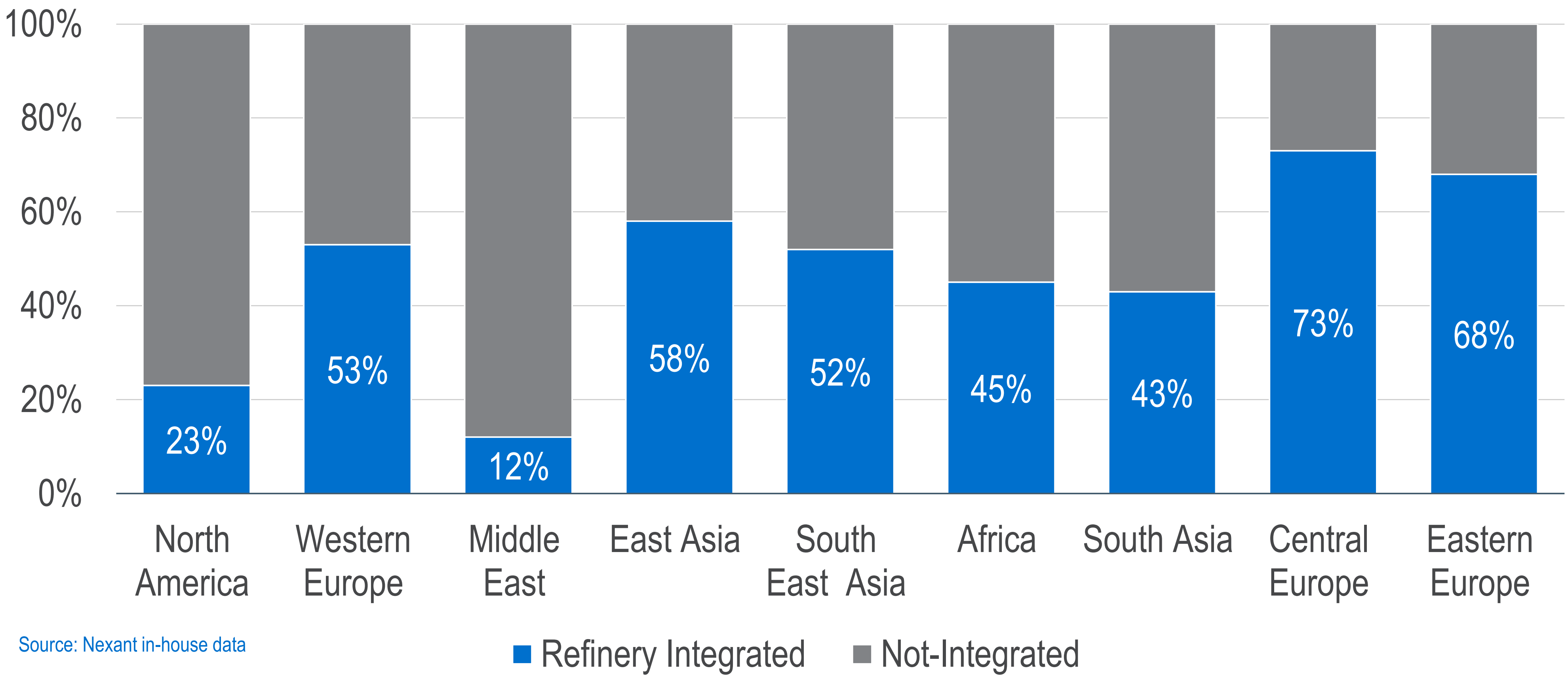
Two principal drivers for industry development – Push and Pull

Push	Pull
Sufficient competitive advantage to develop (largely/partly) export-oriented projects: • needs incentives – often low cost feedstock • Very focussed on C1 and C2 chains • Access to markets is important	Downstream sector demand growth enables competitive scale production – replacing imports: • need domestic/regional market size • Logistics savings is a key driver

Recent global developments are influencing the opportunities in the Middle East and have implications for Iran

Issue	Impact
▪ Lower Oil Price Environment	▪ Changed relative competitiveness of upstream chemicals sector
▪ Limited GCC ethane availability	▪ Slow down in project activity ▪ Shift to heavier feedstock: • broader range of feedstocks • changed competitiveness ▪ Increased refinery petrochemical integration focus - broader range of feedstocks
▪ Economic growth in region	▪ Shift to more sophisticated products: • pay for value ▪ Increased end use sector demand: • reaching critical mass?

Ethylene Integration By Region



Source: Nexant in-house data

- Middle Eastern and North American ethylene plants:
  - lowest percentage of refinery/petrochemical integration
  - mainly process gas feedstocks (ethane)

Sadara will be the first complex in the GCC to crack naphtha. The project will have a differentiated product slate as 14 of the 26 products will be new the Kingdom. New products streams from Sadara will provide opportunities for downstream industries

Saudi Aramco Natural Gas Grid

Ethane C2 → 40%

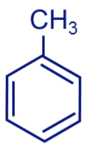
Saudi Aramco Shell Refinery Company (SASREF)

Naphtha C5-C12 → 60%

Saudi Aramco Total Refining & Petrochemical Company (SATORP)

Benzene


SASREF

Toluene


SABIC →

Linde →

Others →

Hydrocarbons

Single Mixed Feed Cracker
Ethylene
Propylene
C4's

Aromatics Hydrogenation & Extraction

Sadara Clusters:

Plastics
- LLDPE & HDPE
- Elastomers
- LDPE

Chemicals
- Propylene Glycols (PG)
- Polyols
- Butyl Glycol Ethers (BGE)
- Ethanolamines (EDA)
- Ethyleneamines (EAE)

Isocyanates
- Polymeric Methylene Diphenyl Diisocyanate (PMDI)
- Toluene Diiosocyanate (TDI)

Dedicated Offtakers via PlasChem Park

- Speciality films
- Household products
- PU systems
- Adhesives and sealants
- Paints and coatings
- Laminates
- Oil and gas chemicals
- Detergents
- Water treatment
- Cables
- Construction material
- Compounding
- Furniture/ insulation
- Automotive fluids
- Automotive components

Ethylene Oxide Value Chain – first availability of EO for downstream projects in the GCC

Ethylene Oxide

Reacted with	Product	End uses
Water	Ethylene Glycol and Higher Glycols	PET Bottles, PET Film, PET Fiber, Antifreeze, Heat Transfer Fluids
Ammonia	Ethanolamines	Detergents, Gas Purification, Herbicide Intermediate, Textiles, Metal Cleaning
Alcohols	Glycol Ethers	Coatings, Inks, Cleaners, Insecticides, Herbicides, Solvents
Alkyl Amines	Alkylalkanolamines	Pharmaceuticals, Water Treatment, Coatings, Gas Treatment
Alkyl Phenols	Alkyl Phenol Ethoxylates	Surfactants, Detergents, Antioxidants, Emulsifiers
Primary Linear Alcohols	Primary Alcohol Ethoxylates	Surfactants, Cleaners, Laundry Detergents, Degreasers
Ethylene Oxide	Polyethylene Glycols	Lubricants, Chemical Intermediates, Processing Aids, Surface Releases
Propylene Oxide	Polyols, Polyalkylene Glycols	Polyurethanes, Rigid/Flexible Foams, Adhesives, Elastomers
H2, CO	1,3-Propanediol	Coatings, Adhesives, Coolants, Heat Transfer Fluids, Polyurethanes, UPR

Uncertain times – but sources of competitive advantage remain clear and robust in refining and chemicals sectors

PARAMETER		KEY OBJECTIVES
Size	→	Capture economies of scale
Location	→	Access to low cost feedstocks/ deficit markets
Configuration	→	Cost advantage/product differentiation
Integration	→	Synergies with adjacent facilities

What does this mean for the development of the Iranian industry?

Push Opportunities:

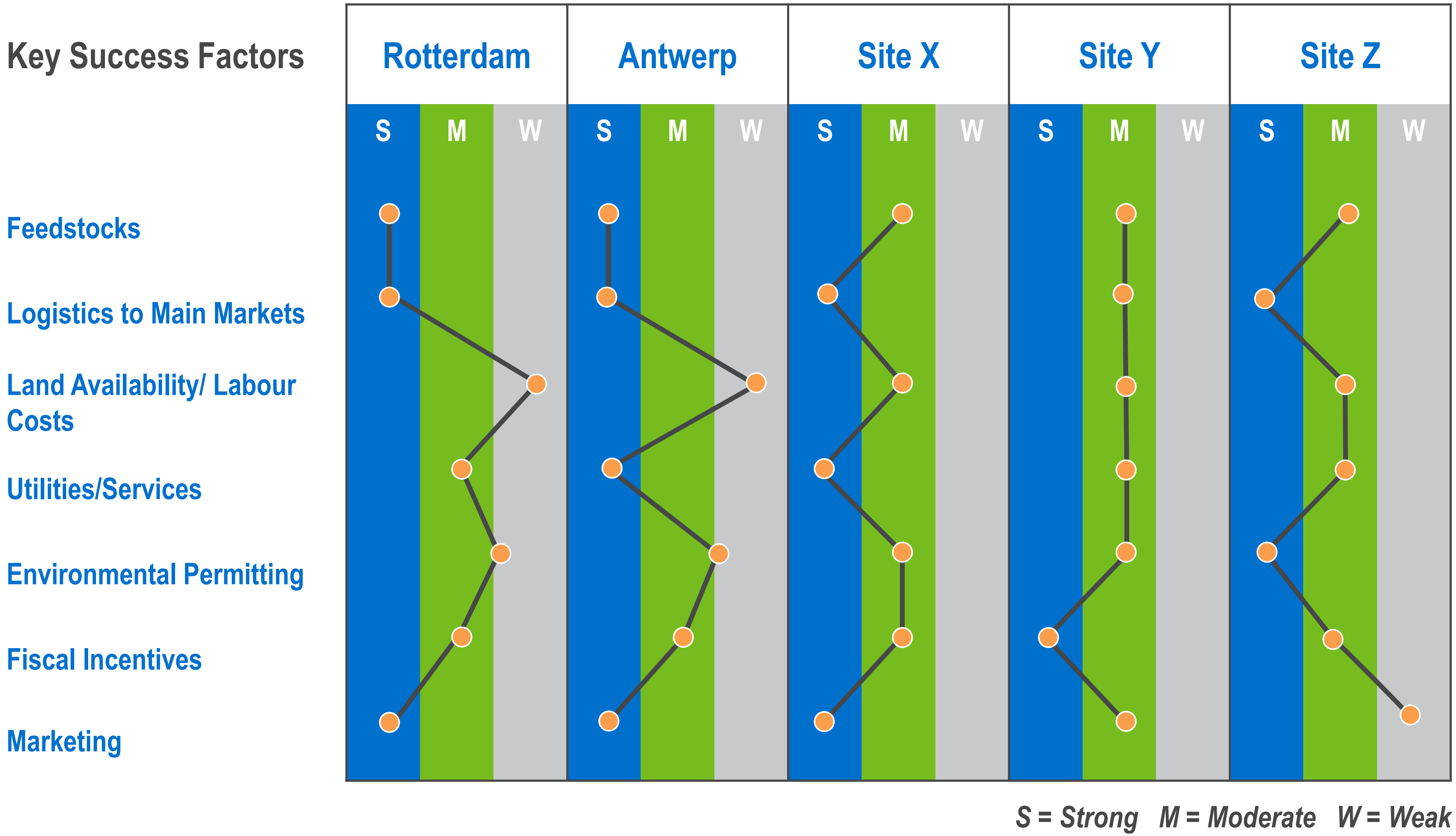
- Significant opportunities for export oriented, gas-based projects in light of limited other ME feedstock or appetite:
  - Availability of feedstock is assured, the price will be key
  - The appropriate integration will need to be found to enhance profitability:
  - Market based approach to downstream integration, product selection and where attractive, refinery petrochemical integration
- Mega project = mega financing

Pull Opportunities:

- With the size of the population and as the economy grows more opportunities will emerge in the downstream sector. Key will be:
  - Sensible integration and market balance (domestic/export); competitiveness in export markets
  - Learn the lessons from GCC efforts to develop these industries

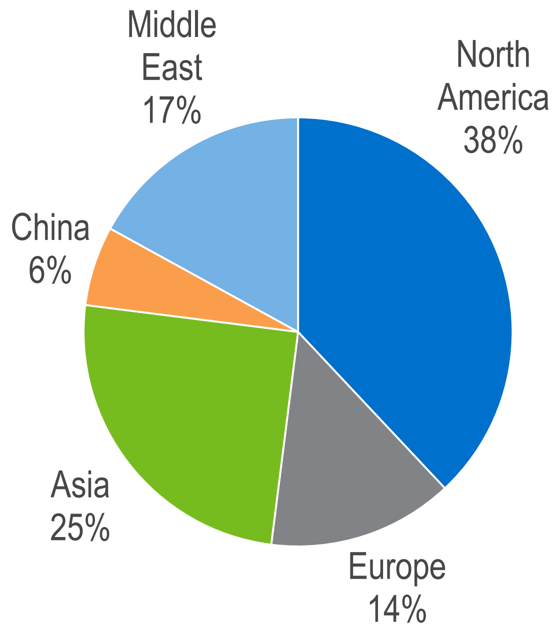
Those that understand the changes and the implications will be the winners of the future

Benchmarking helps identify the strengths and allows opportunity to address the weaknesses – necessary to create a competitive cluster



The changes in MEG are an example of how an industry can change dramatically over a relatively short time

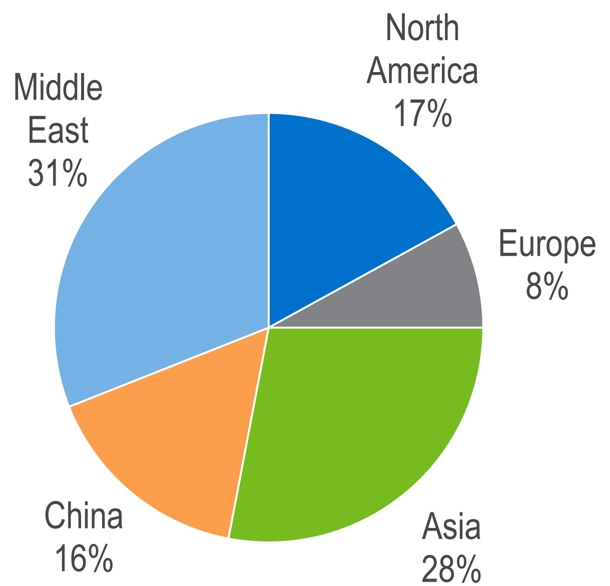
GLOBAL MEG CAPACITY: 2000



Total = 25 million tons

Source: Nexant

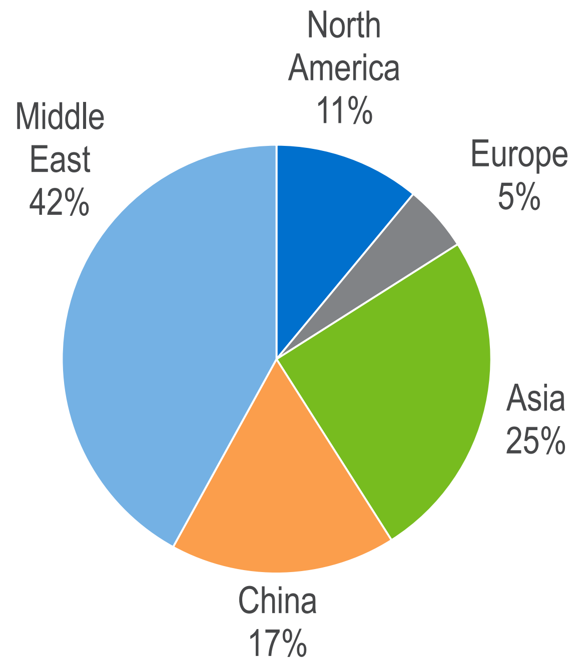
GLOBAL MEG CAPACITY: 2010



Total = 27 million tons

Source: Nexant

GLOBAL MEG CAPACITY: 2020

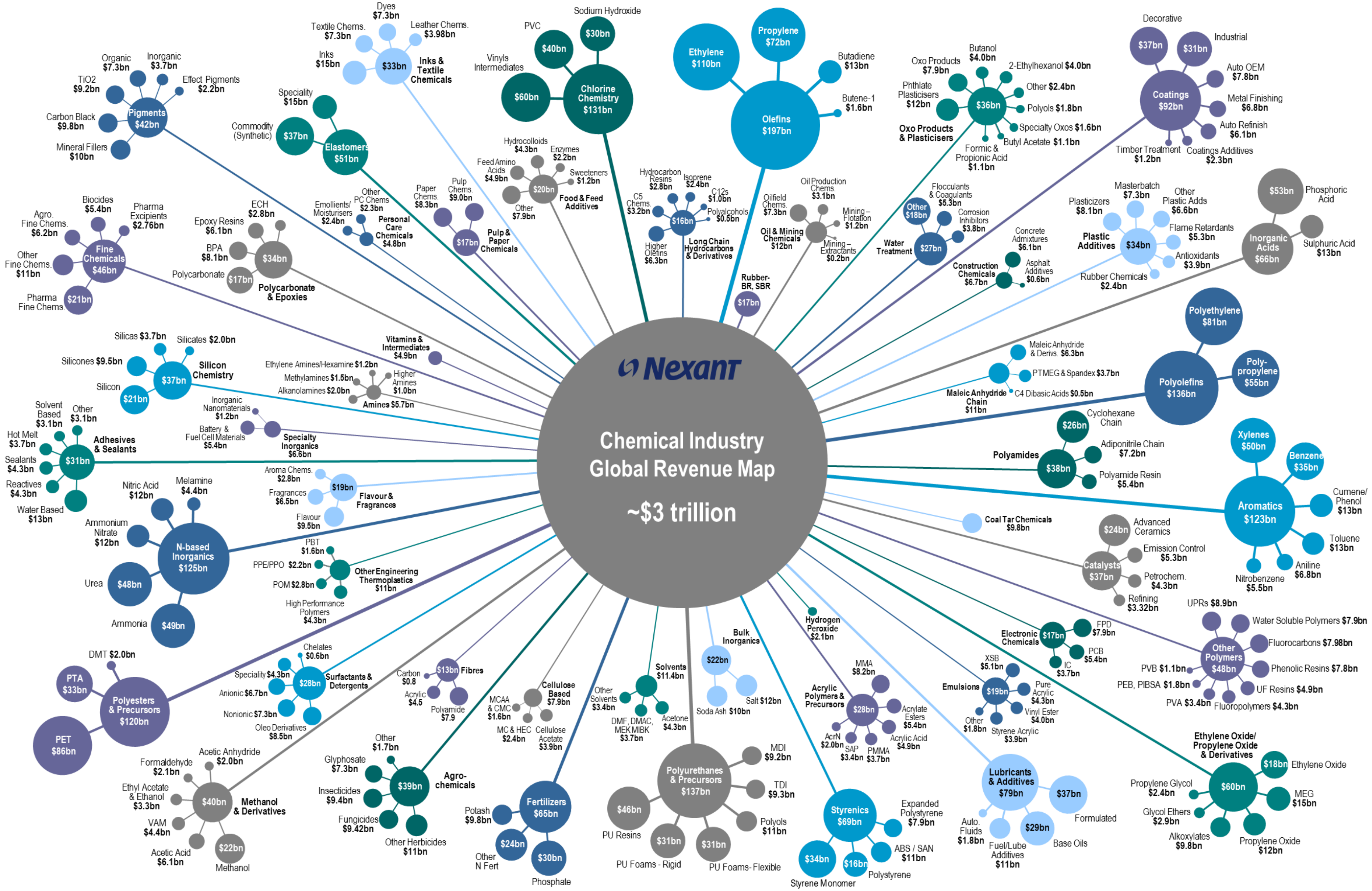


Total = 32 million tons

Source: Nexant

It is critical to look at the long term outlook when developing the industry in Iran

There are many sectors of the wider chemicals value chain that could be developed from a solid foundation



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