

The Future of SM, PS and ABS: Infinite Possibilities

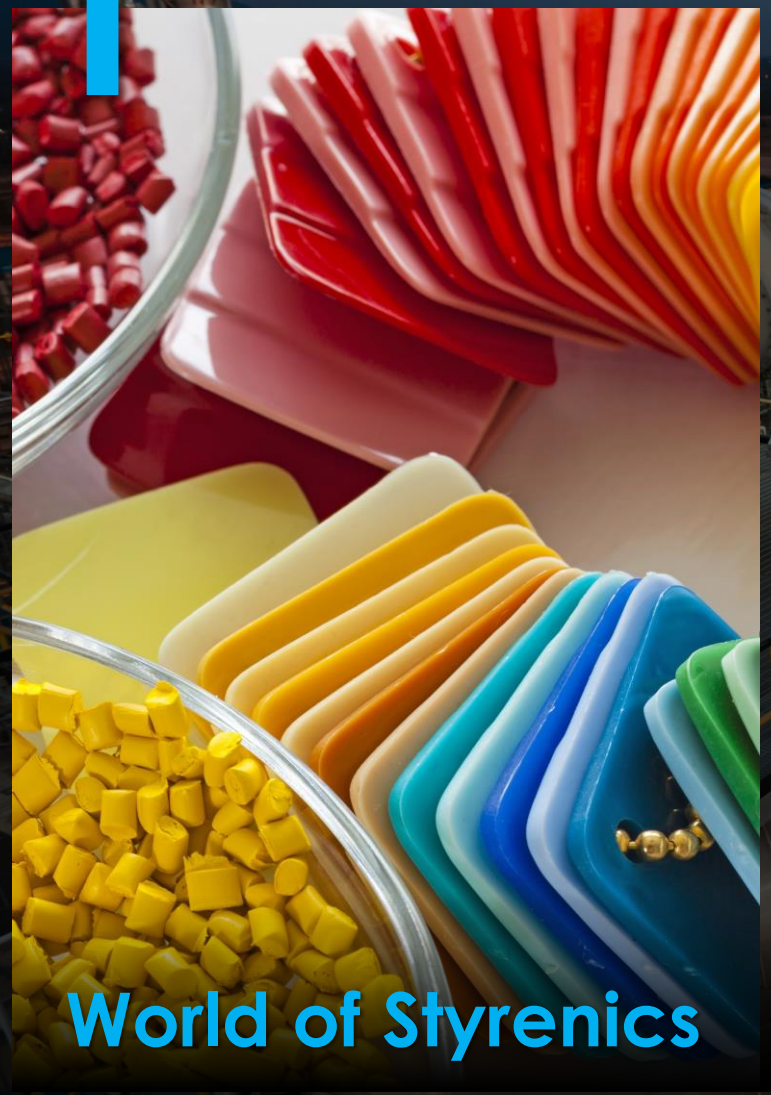
The 14th PTT Group Petrochemical Outlook Forum

Wednesday, 12 July 2023



Image by starline on Freepik

1



World of Styrenics

2



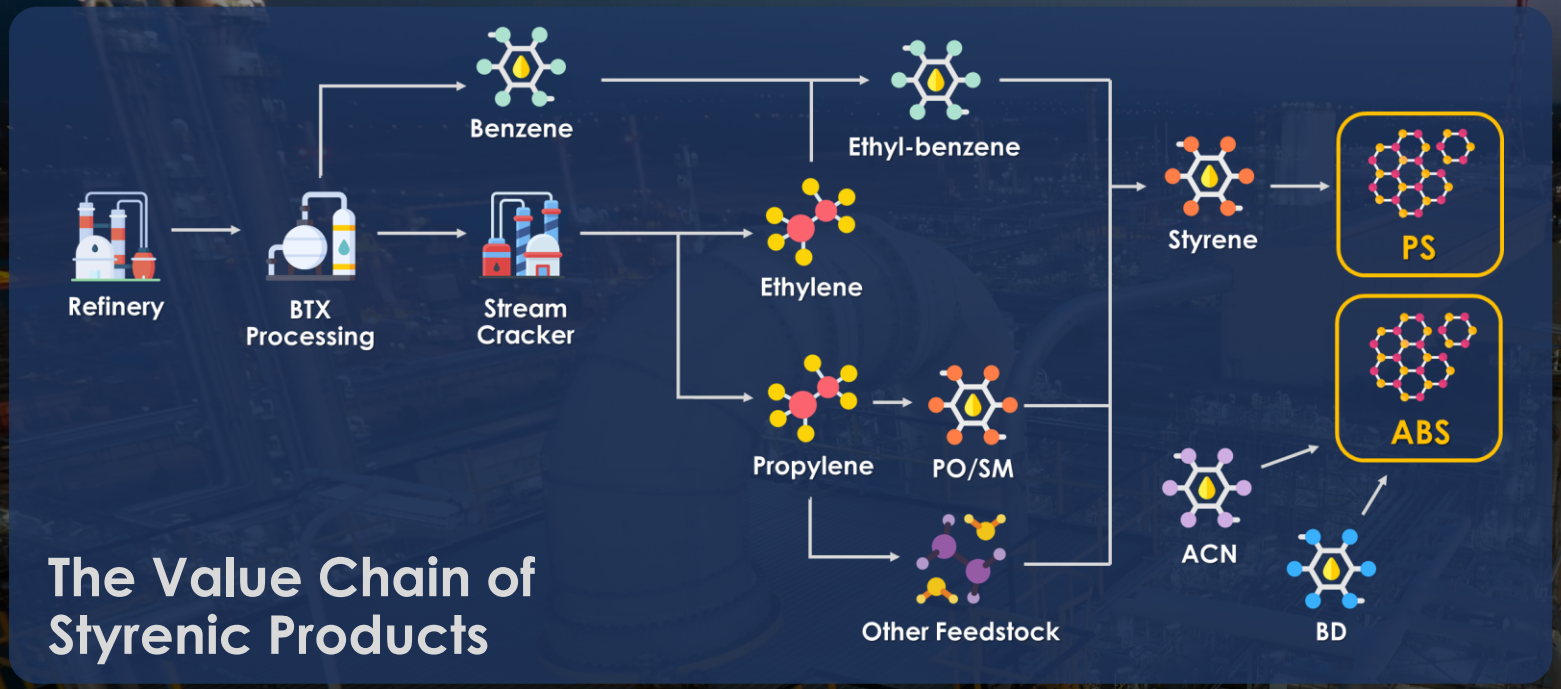
Balance Change

3



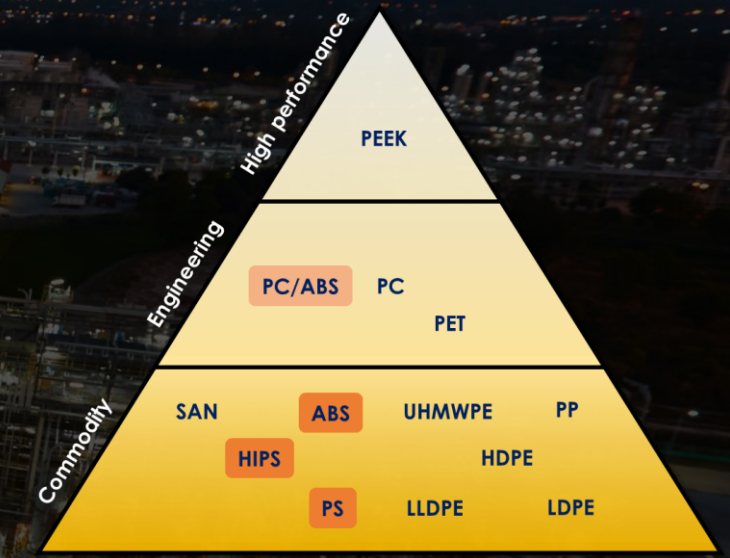
World Change

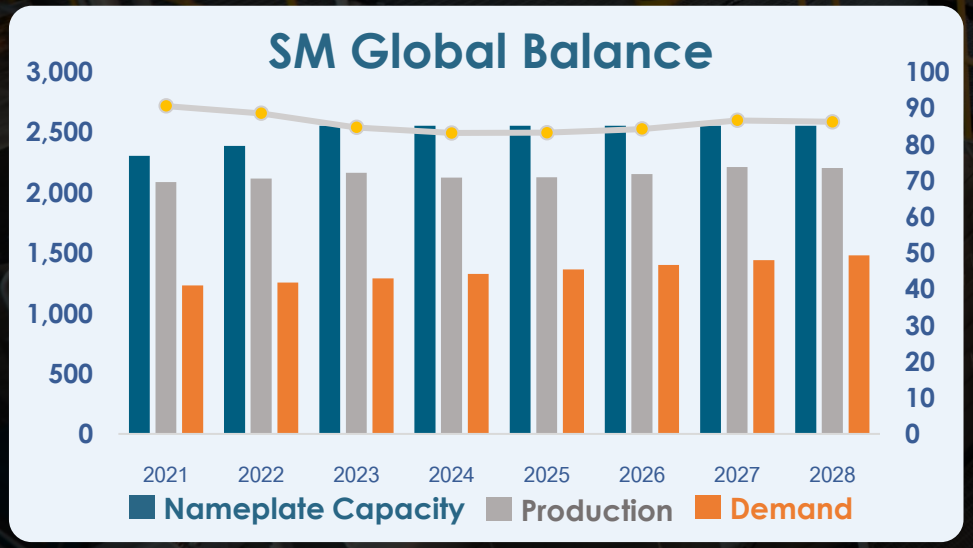
Characteristic of Styrenics

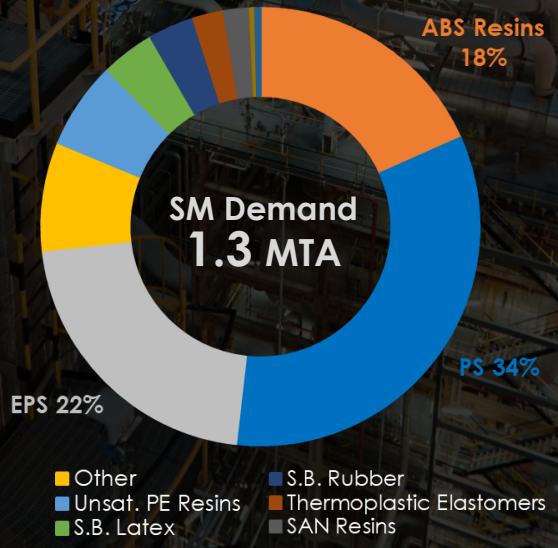


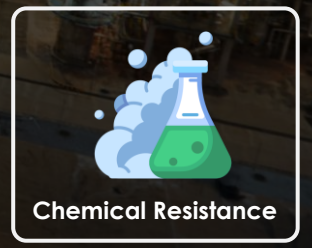
The Value Chain of Styrenic Products

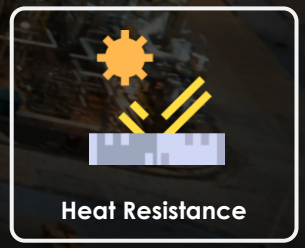
Strength of Styrenic Products



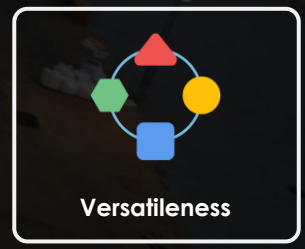












Characteristic of Styrenics by Application

Food Packaging

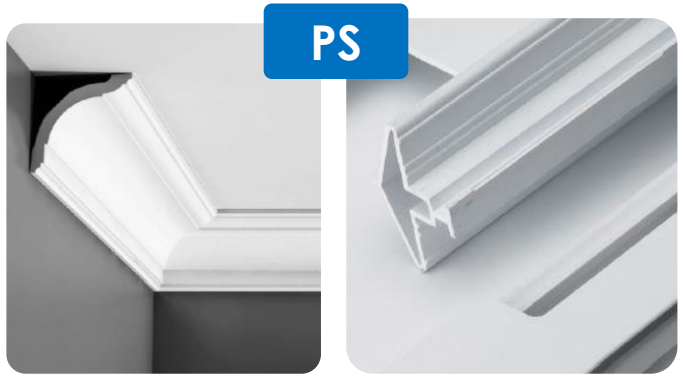






Construction

PS





ABS



Recreation







Characteristic of Styrenics by Application

Electronics & Appliances



Automotive



1



World of Styrenics

2



Balance Change

3



World Change

2



Balance Change

PS

ABS

PS Global Demand by Industry

Polystyrene

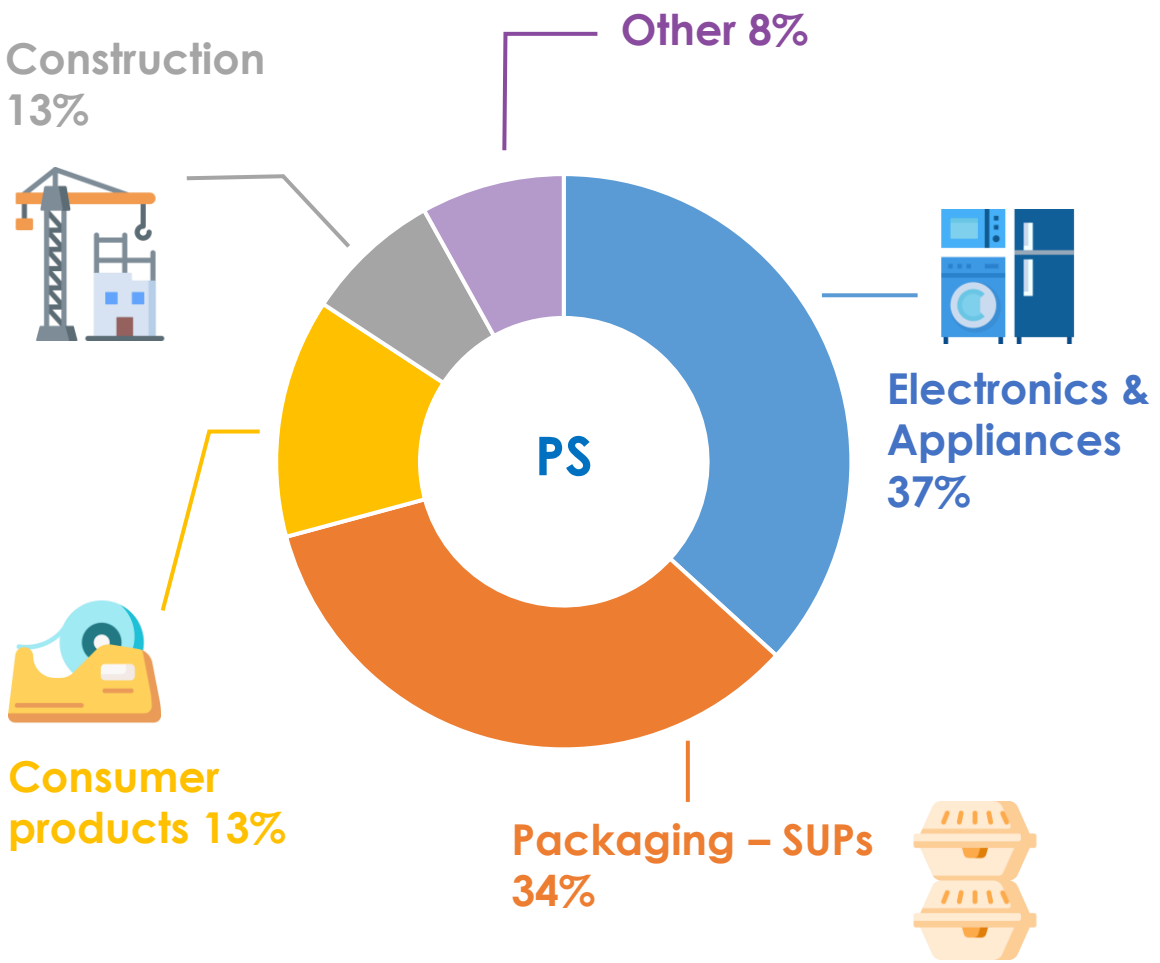
Unit : KTA

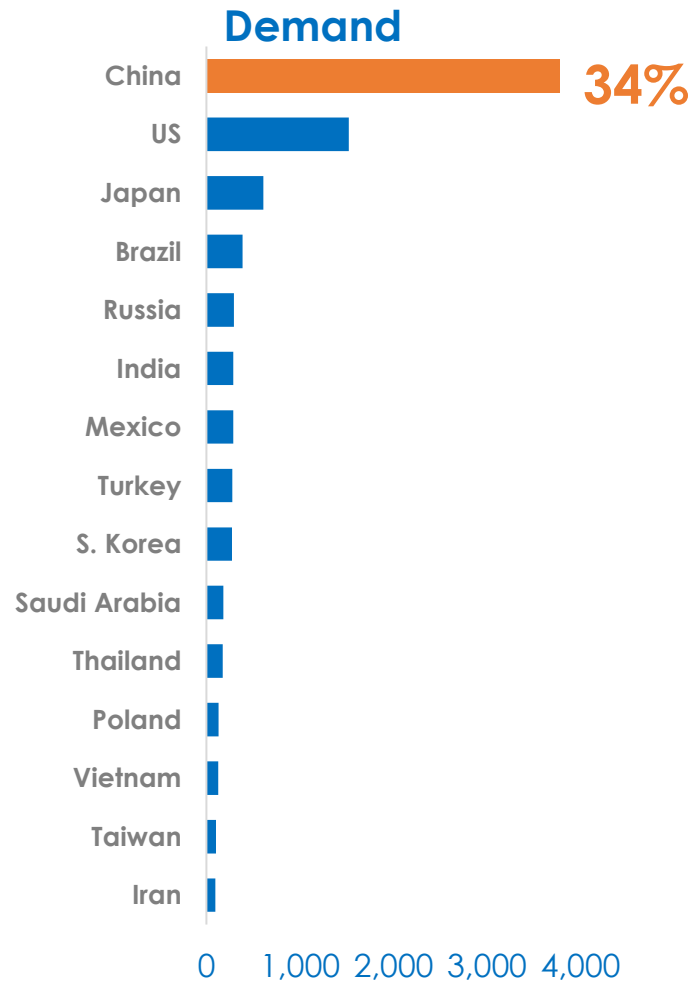
Global

Total Demand in 2023

~11,000

KTA





Source : 2023 Edition: Spring 2023 Update, Chemical Market Analytics / Dow Jones Company

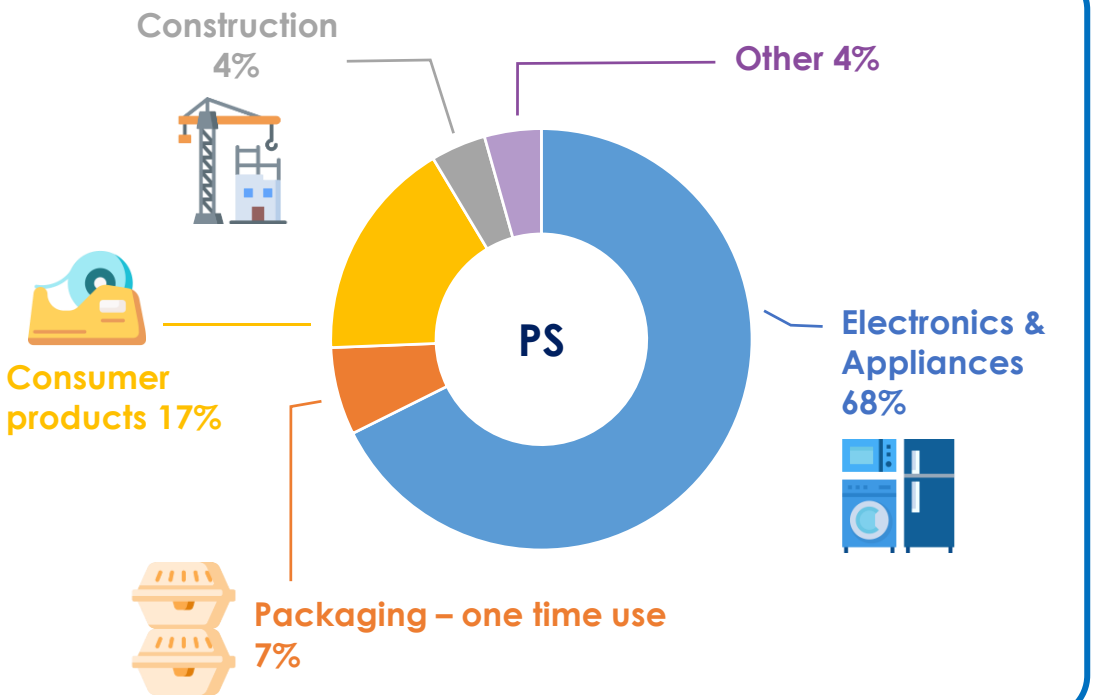
PS Demand

Polystyrene

Unit : KTA

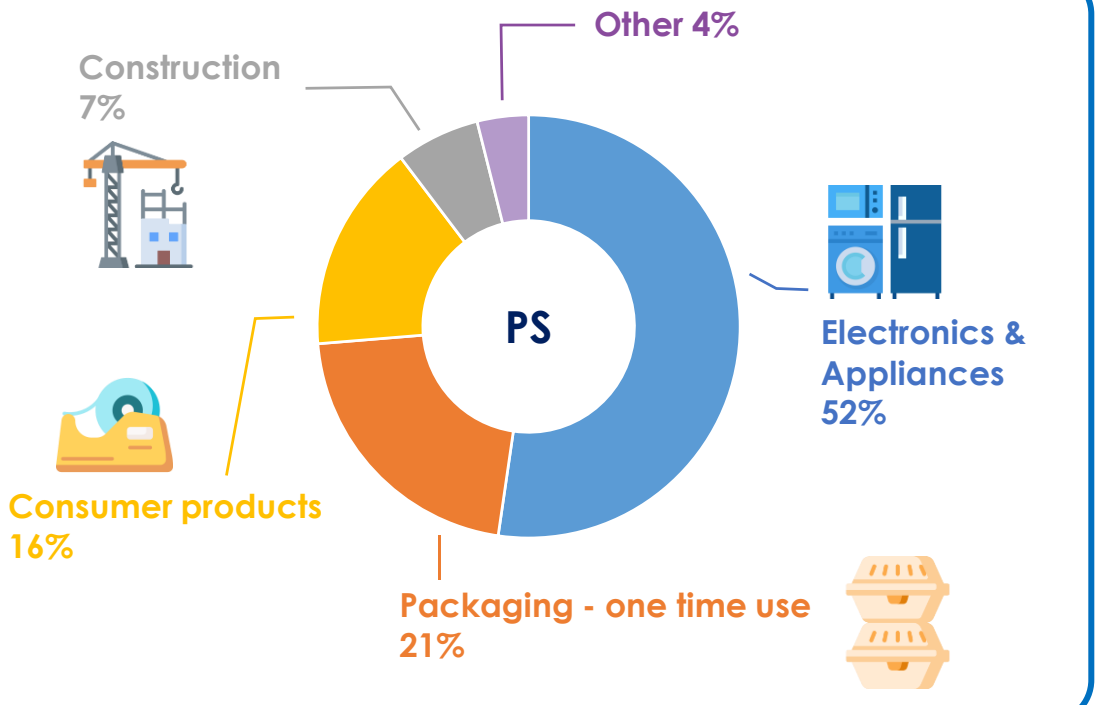
China Total Demand in 2023

~ 3,800 KTA



Thailand Total Demand in 2023

~ 170 KTA



Source : 2023 Edition: Spring 2023 Update, Chemical Market Analytics / Dow Jones Company

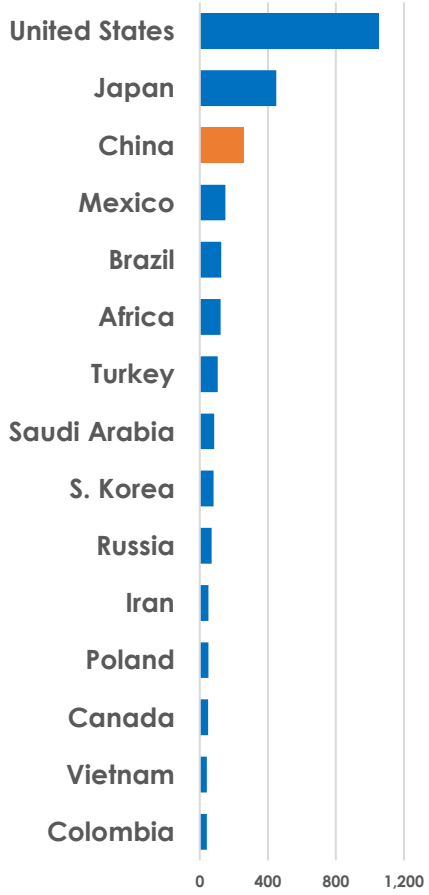
PS Demand by Industry

Unit : KTA

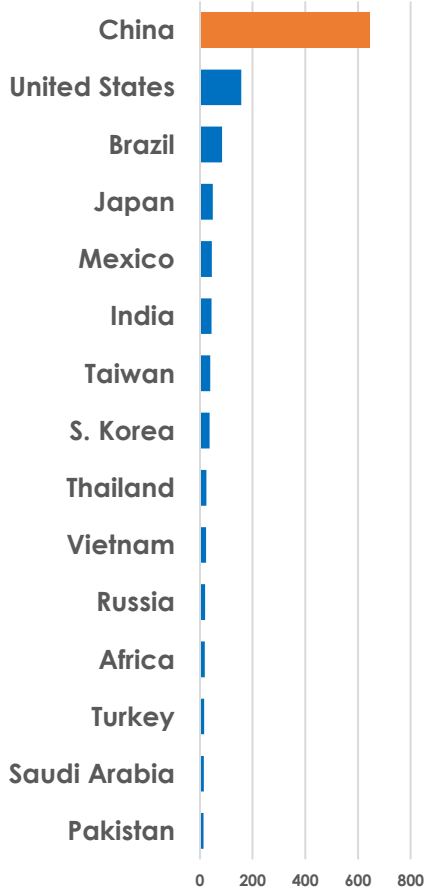
Electronics & Appliances



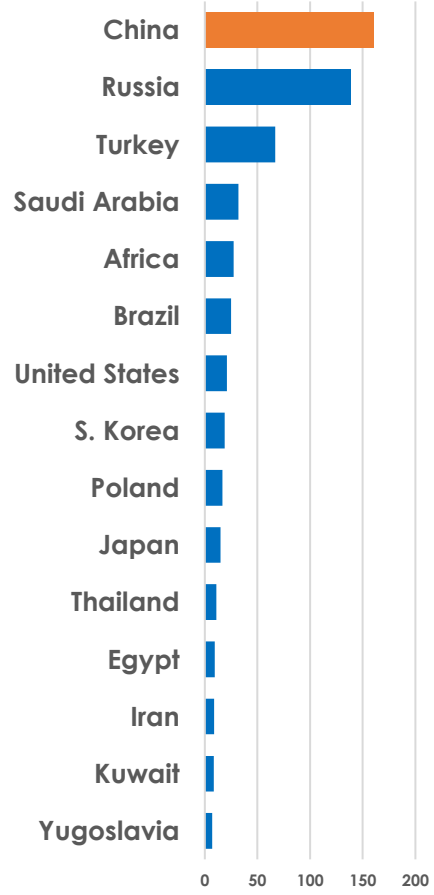
Packaging - SUPs



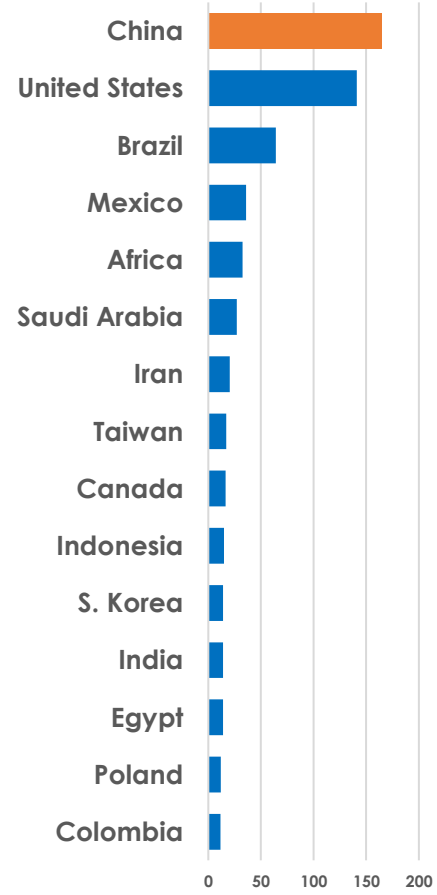
Consumer products



Construction



Others



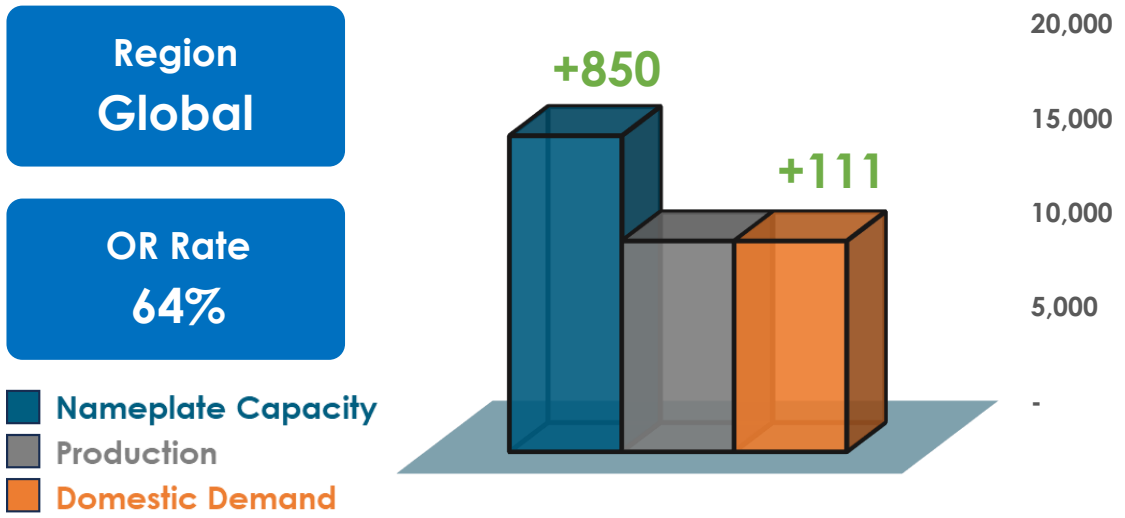
Source : 2023 Edition: Spring 2023 Update, Chemical Market Analytics / Dow Jones Company

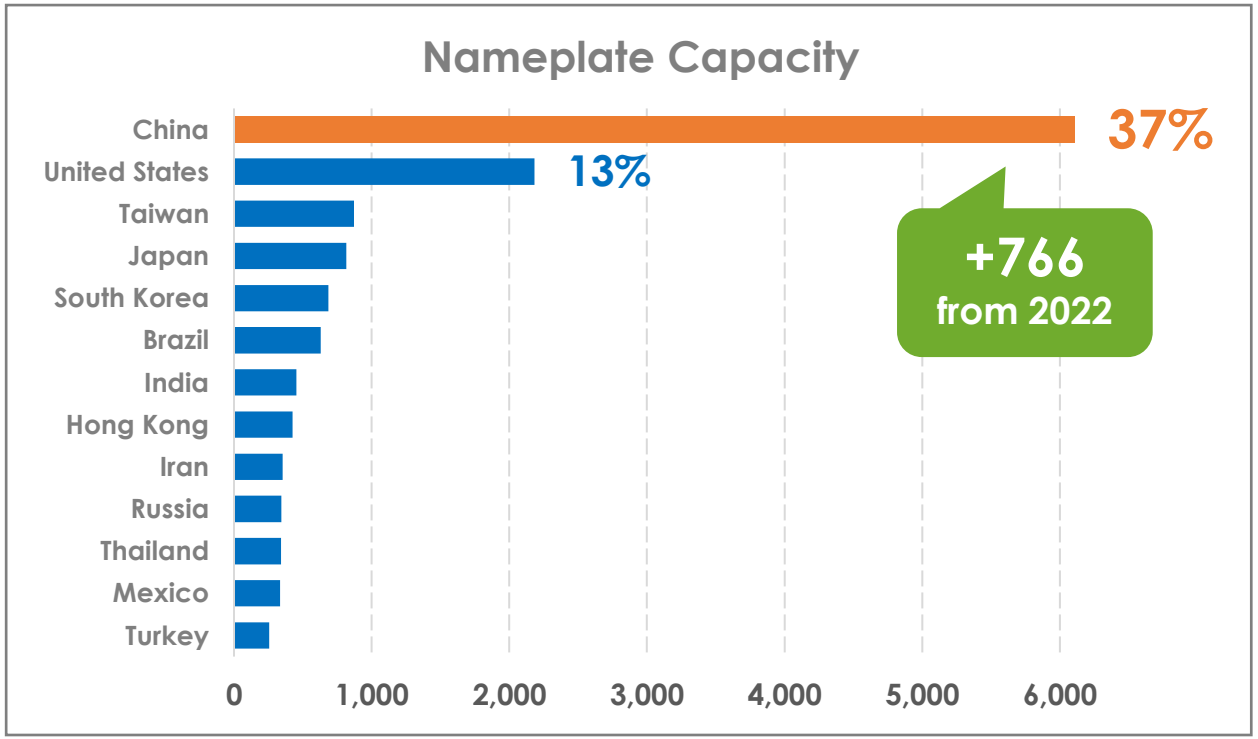
PS Supply 2023

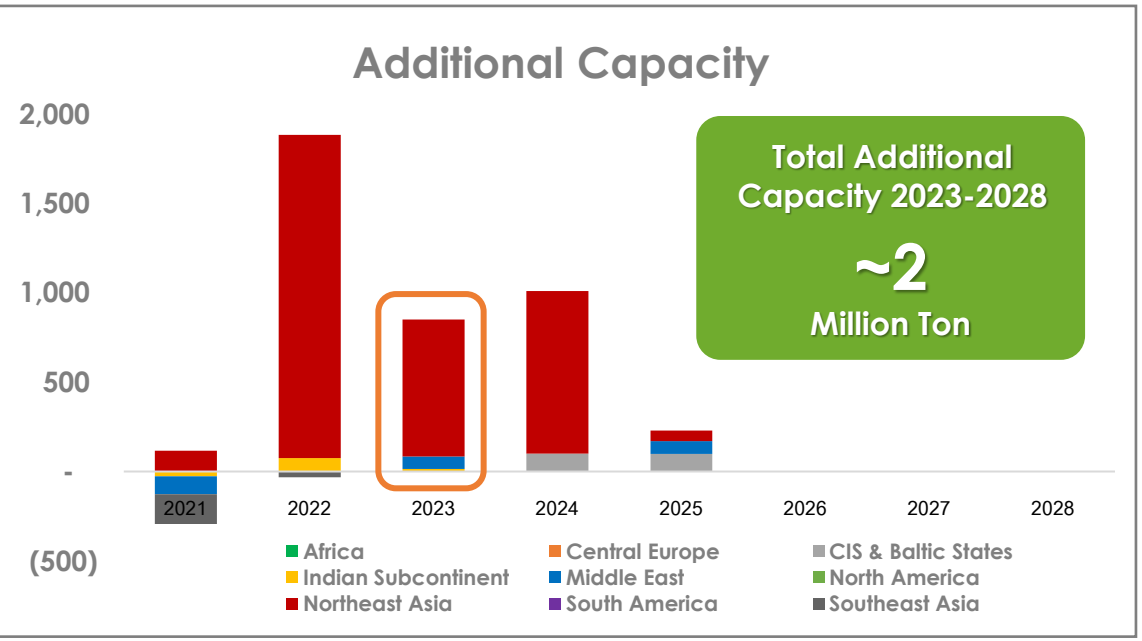
Unit : KTA

Region
Global

OR Rate
64%







China

- PS **importer**
- 2023-2028 Additional capacity **~970 KTA**
- Demand growth **~120 KTA**

Thailand

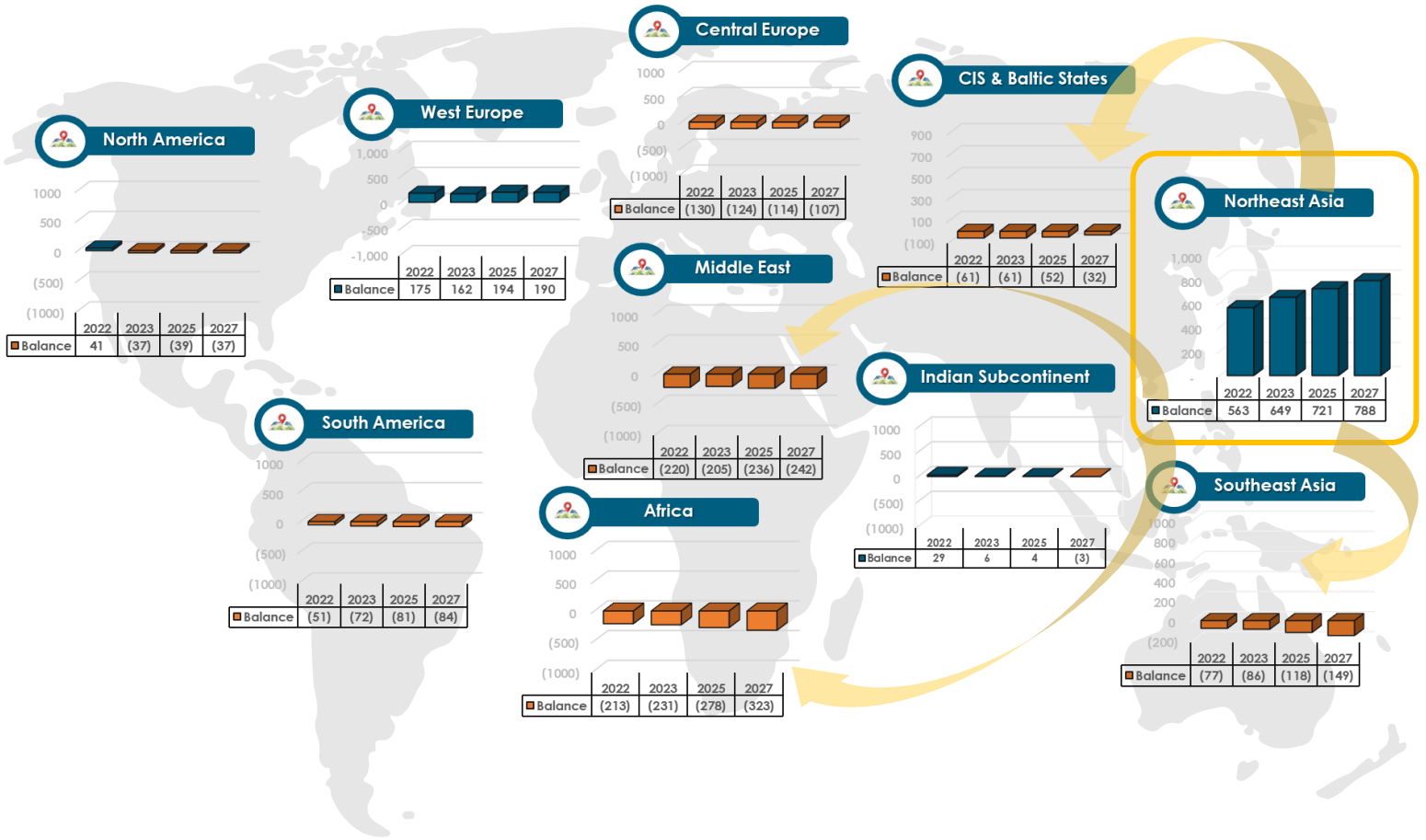
- PS **exporter**
- **No** additional capacity plan for 2023-2028
- Demand growth **~6 KTA**

Source : 2023 Edition: Spring 2023 Update, Chemical Market Analytics / Dow Jones Company

PS Supply 2023

Global Trade Flow

: Net Export
: Net Import



Supply from NEA will flow to importing countries

PS Outlook Summary

- **Demand**

1   2  

- **Supply**

Supply growth > **Demand growth**

; **Majority supply portion is from NEA**



The largest consumer and player is **China**

Source : 2023 Edition: Spring 2023 Update, Chemical Market Analytics / Dow Jones Company

2



Balance Change

PS

ABS

ABS Global Demand by Industry

Acrylonitrile Butadiene Styrene

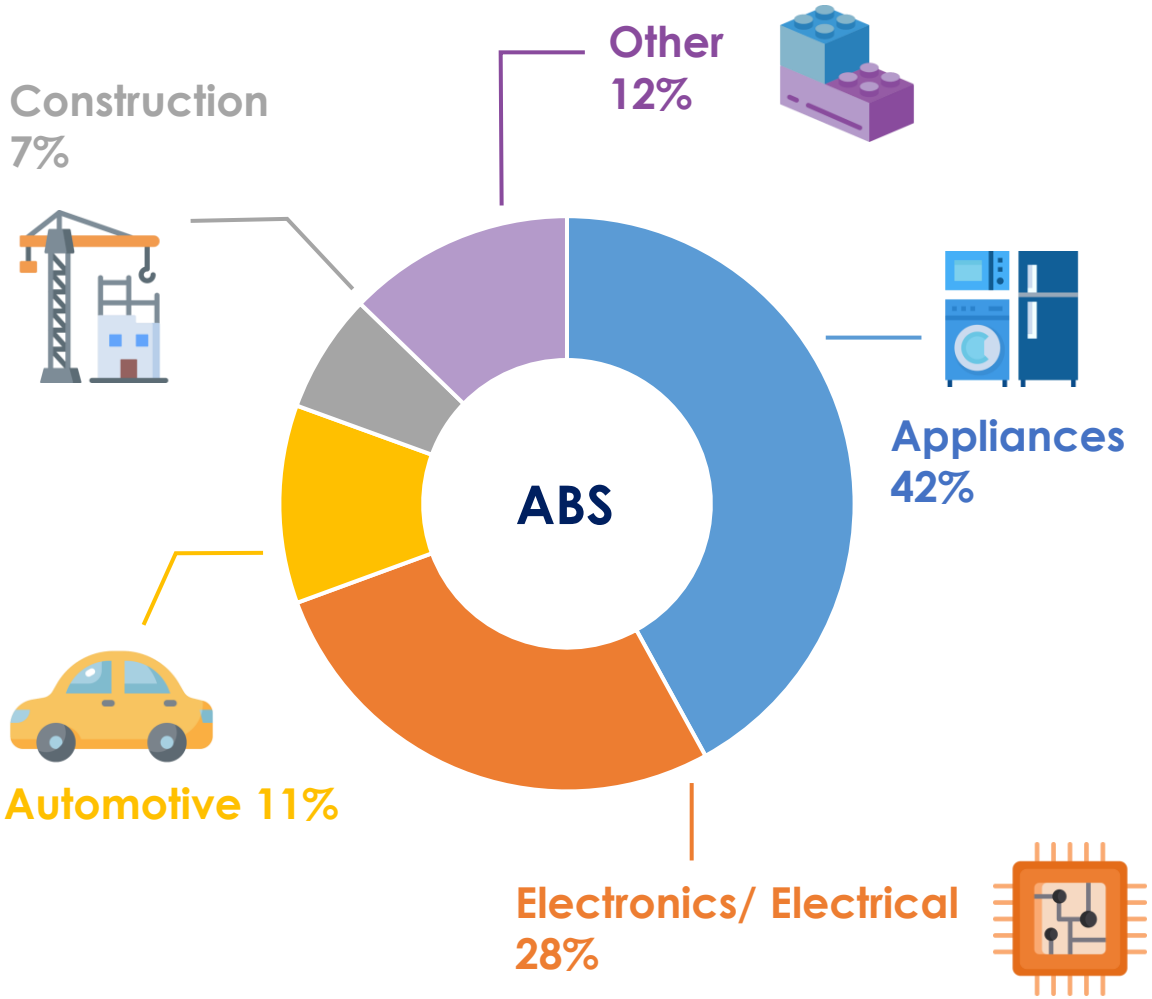
Unit : KTA

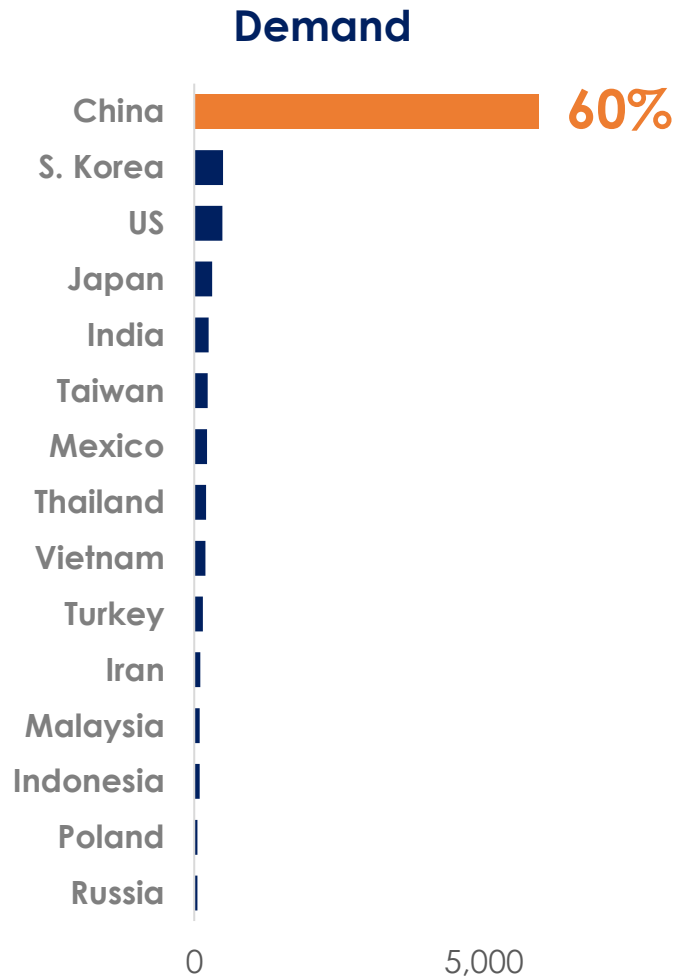
Global

Total Demand in 2023

~ 9,900

KTA





Source : 2023 Edition: Spring 2023 Update, Chemical Market Analytics / Dow Jones Company

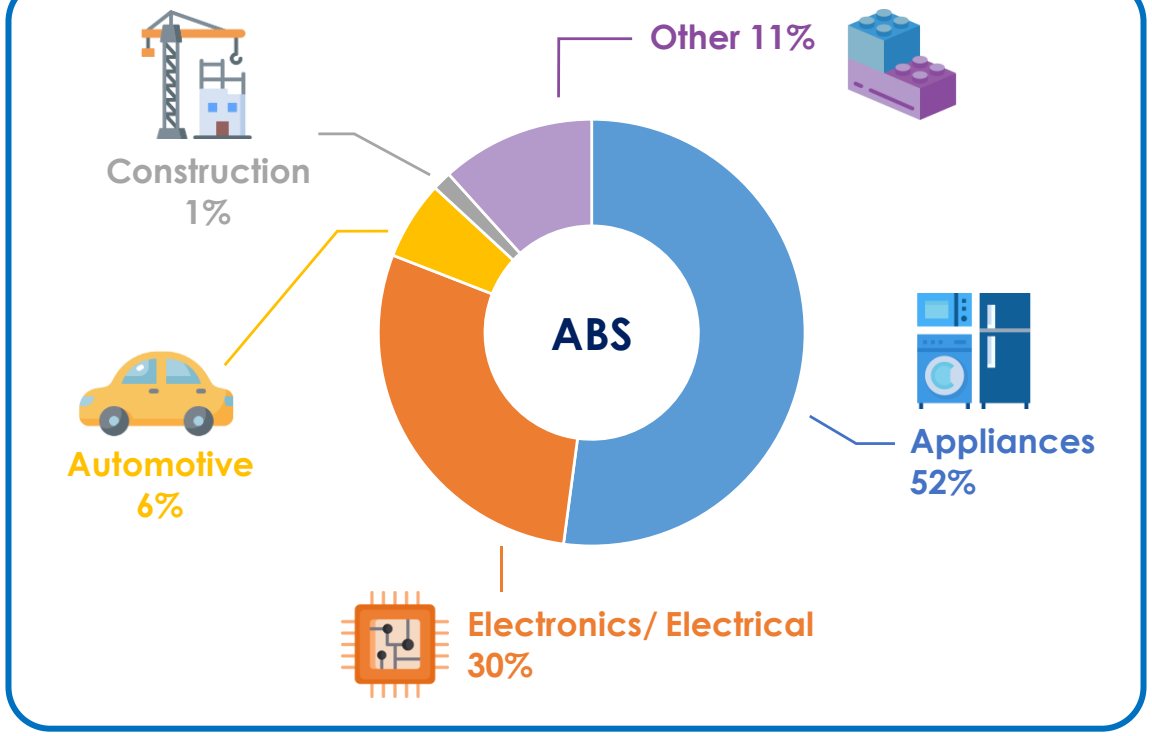
ABS Demand

Unit : KTA

Acrylonitrile Butadiene Styrene

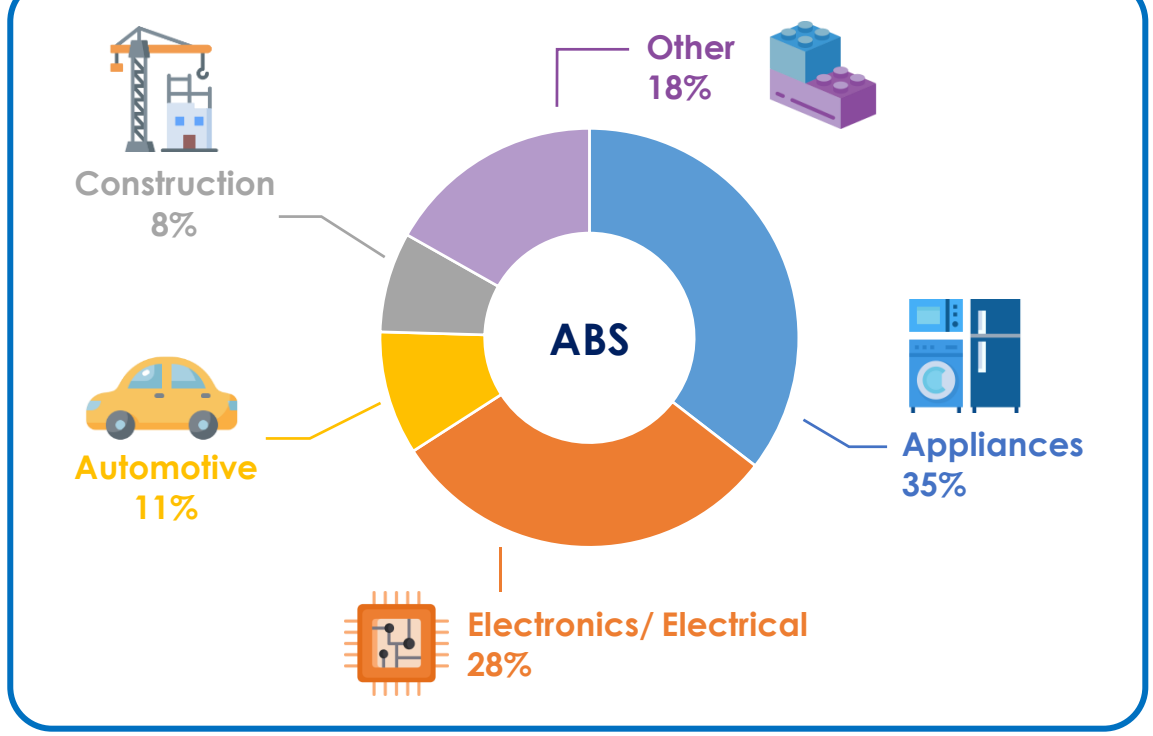
China Total Demand in 2023

~ 5,900 KTA



Thailand Total Demand in 2023

~ 200 KTA



Source : 2023 Edition: Spring 2023 Update, Chemical Market Analytics / Dow Jones Company

ABS Demand by Industry

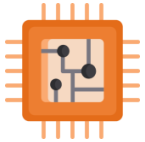
Unit : KTA

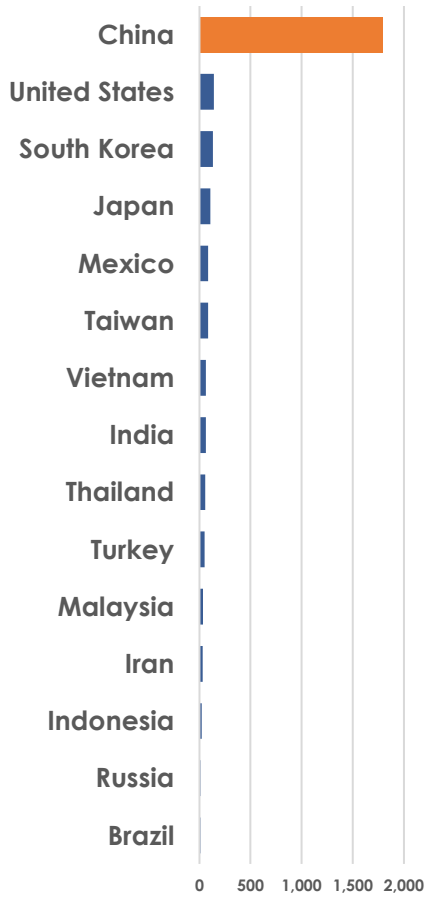
Appliances





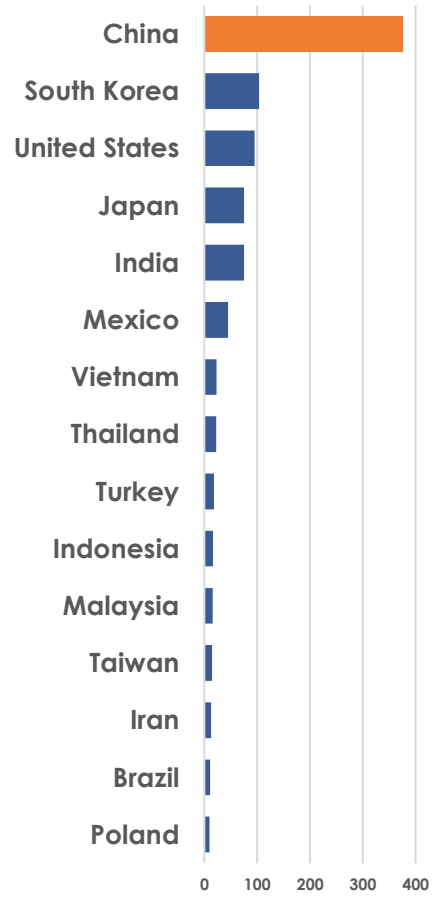
Electronics



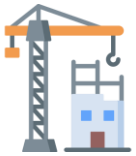


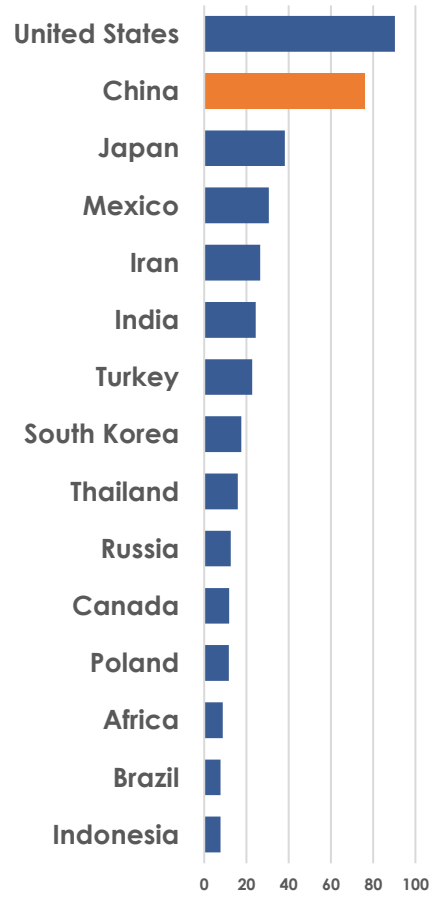
Automotive



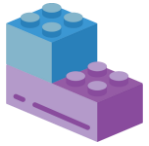


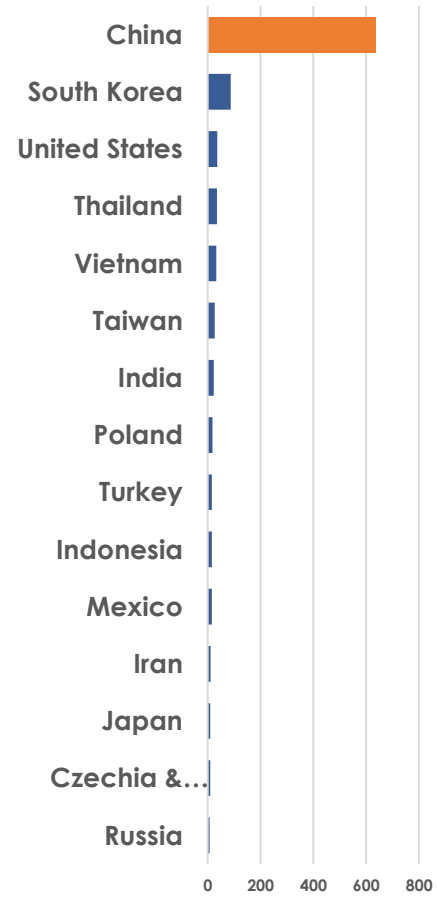
Construction





Others





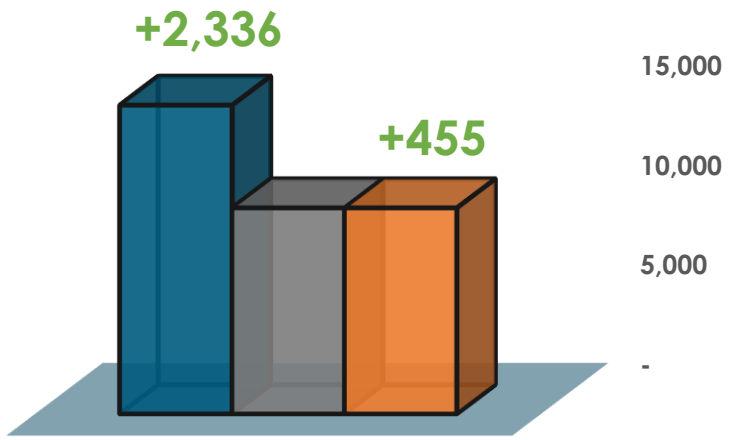
Source : 2023 Edition: Spring 2023 Update, Chemical Market Analytics / Dow Jones Company

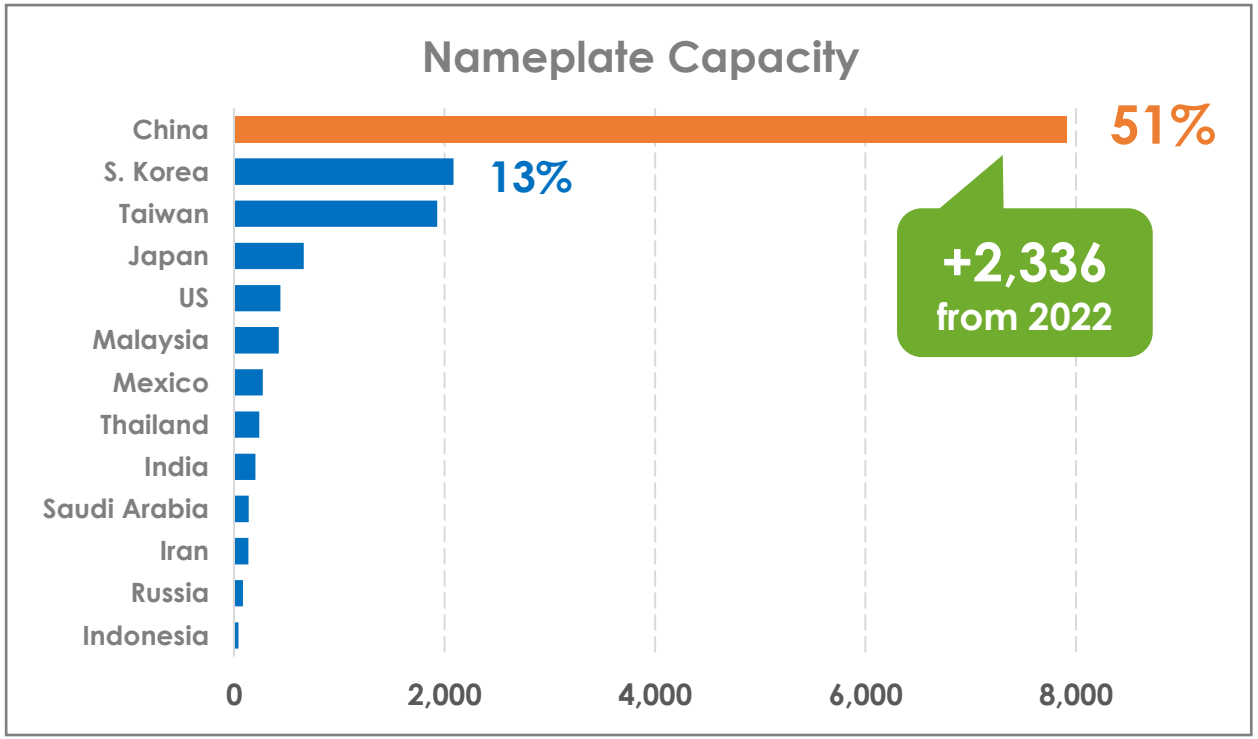
ABS Supply 2023

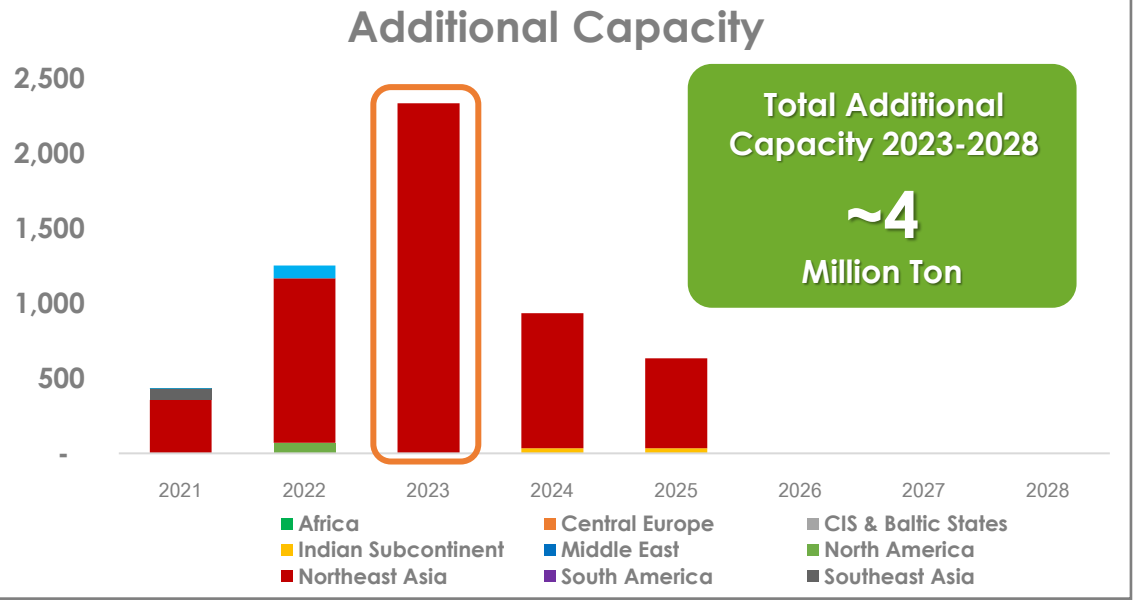
Unit : KTA

Region
Global

OR Rate
67%







China

- ABS **importer**
- 2023-2028 Additional capacity **~1,500 KTA**
- Demand growth **~450 KTA**

Thailand

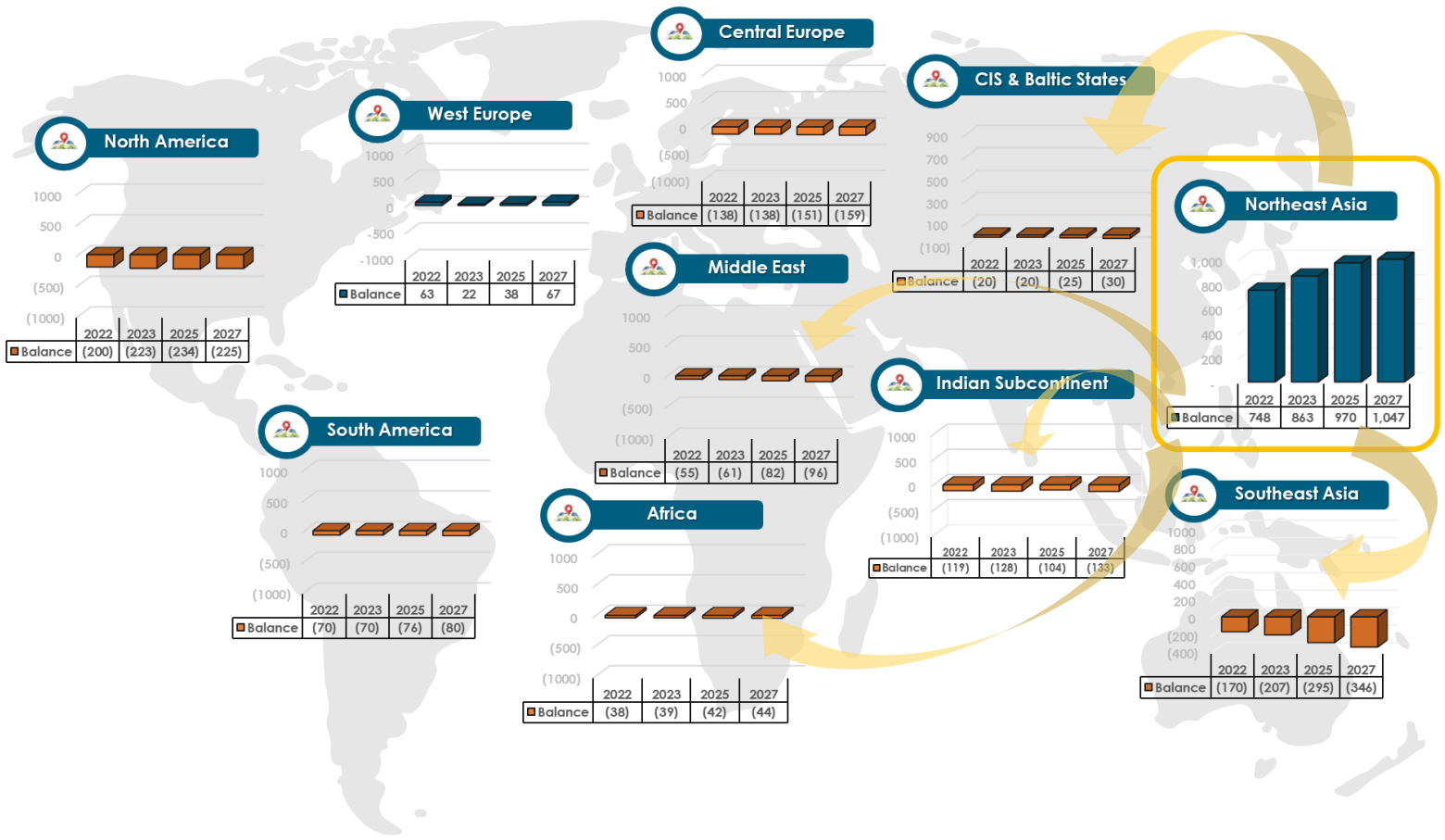
- ABS **importer**
- **No** additional capacity plan for 2023-2028
- Demand growth **~10 KTA**

Source : 2023 Edition: Spring 2023 Update, Chemical Market Analytics / Dow Jones Company

ABS Supply 2023

Global Trade Flow

: Net Export
: Net Import



Supply from NEA will flow to importing countries

ABS Outlook Summary

- **Demand**



- **Supply**

Supply growth > Demand growth

; Majority supply portion is from NEA



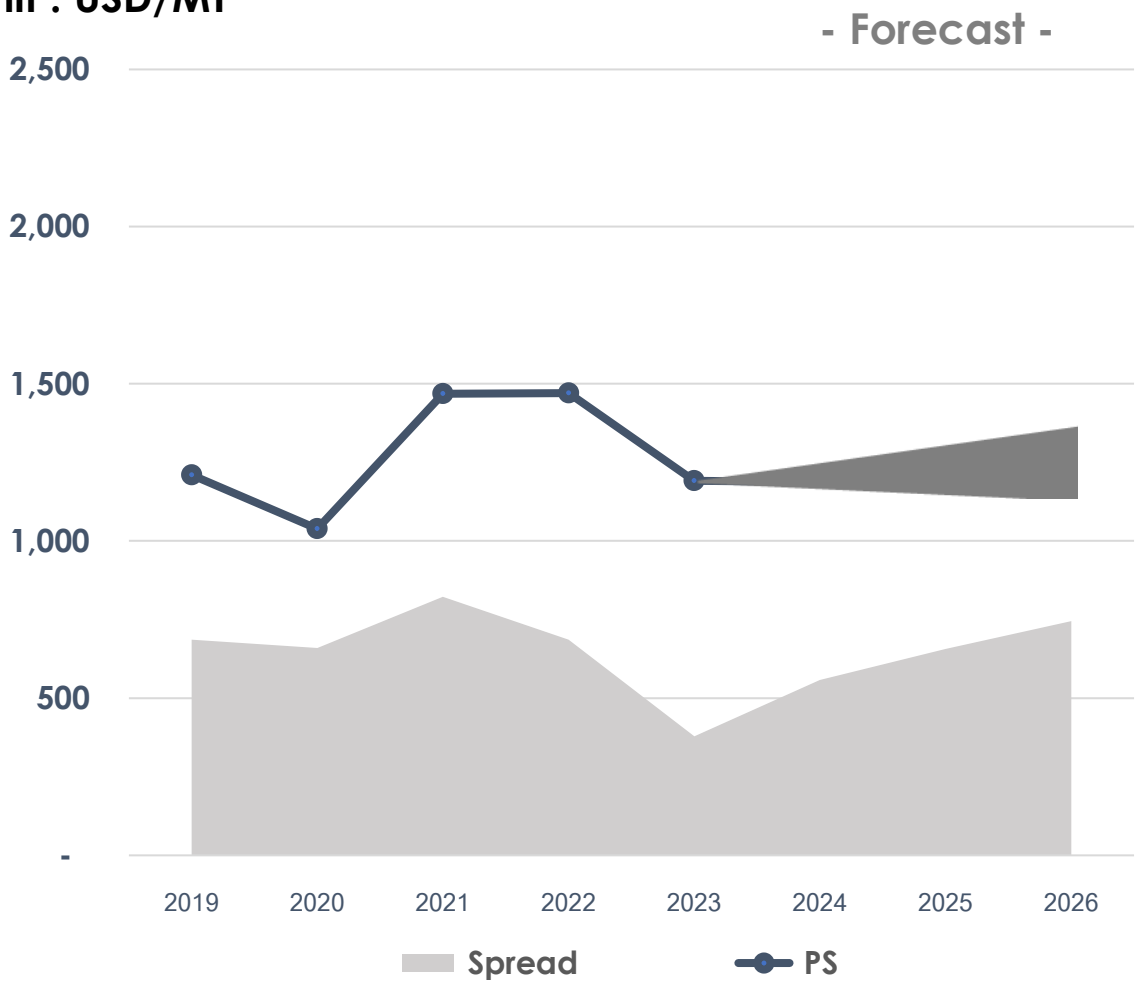
The largest consumer and player is **China**

Source : 2023 Edition: Spring 2023 Update, Chemical Market Analytics / Dow Jones Company

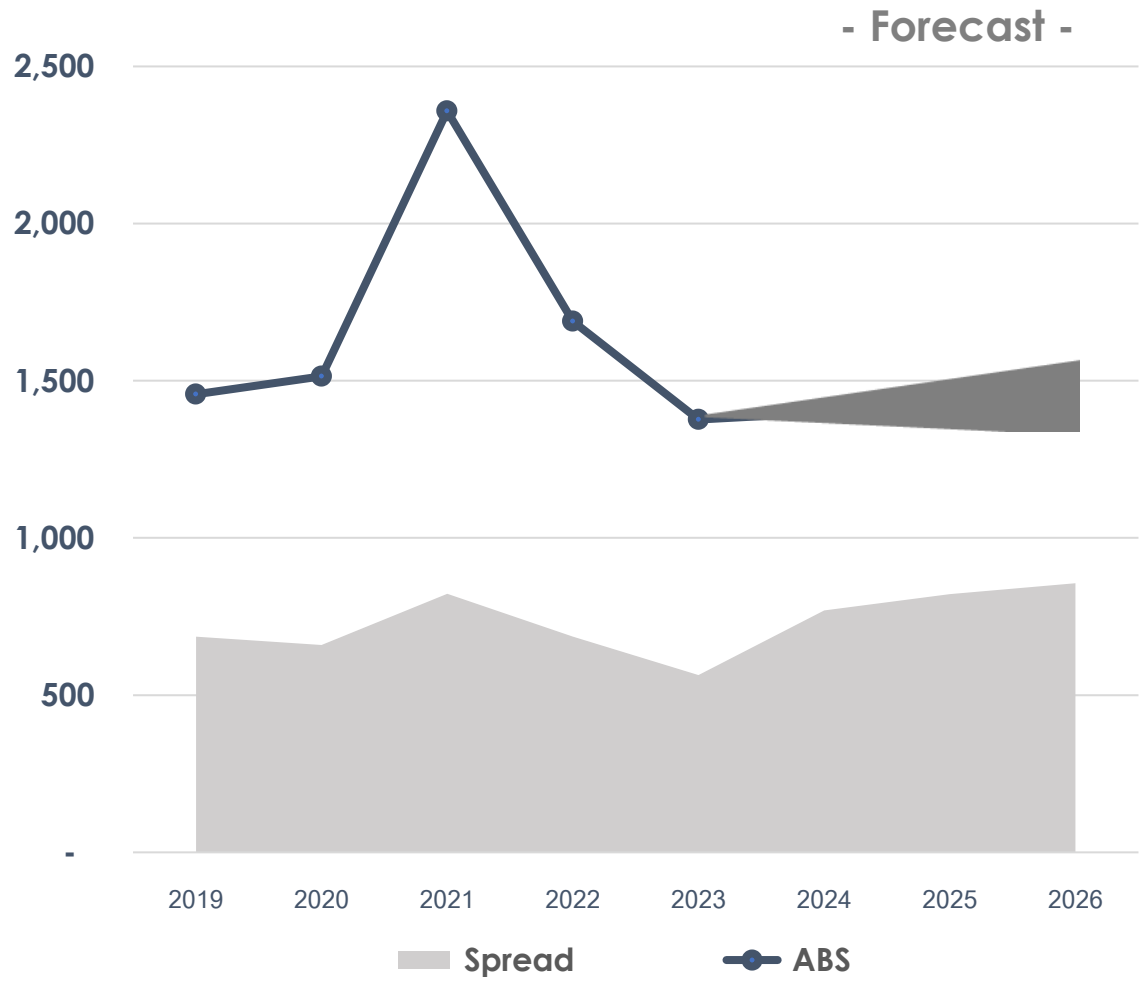
Styrenics Outlook

PS

Unit : USD/MT



ABS



Source : PRISM / POLIMAXX Intelligence Unit

1



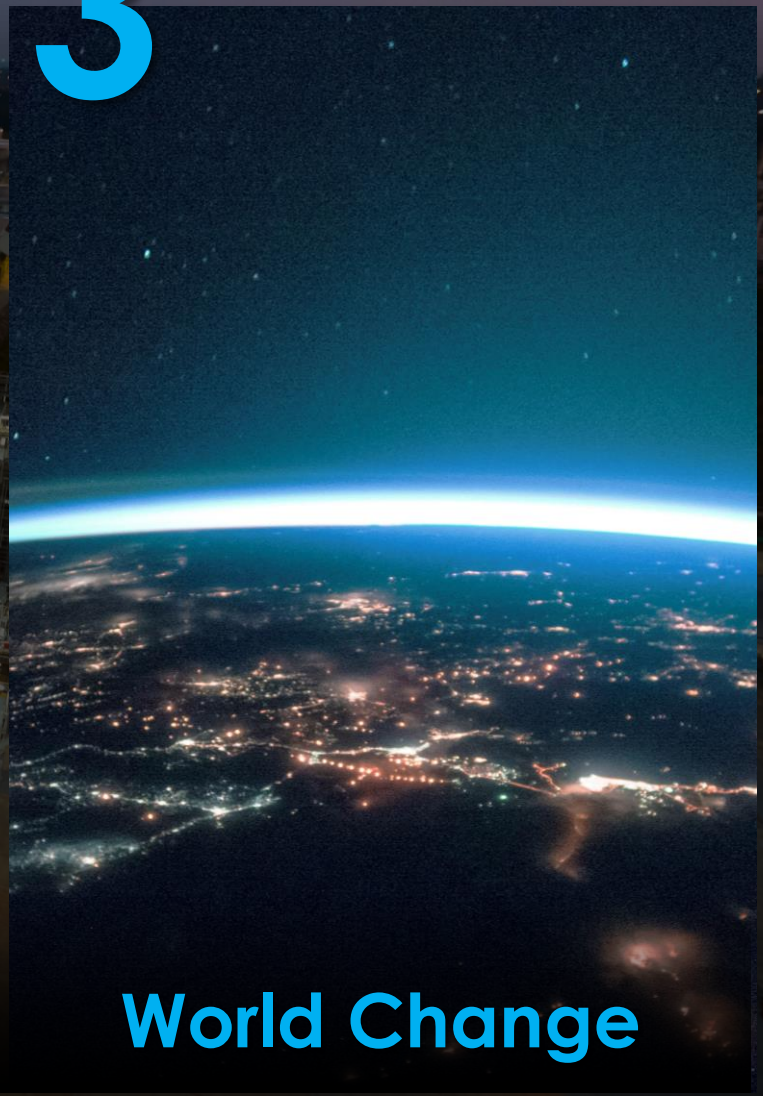
World of Styrenics

2



Balance Change

3



World Change

4 MEGATREND Disruptions toward Petrochemical Industries

Image by Freepik



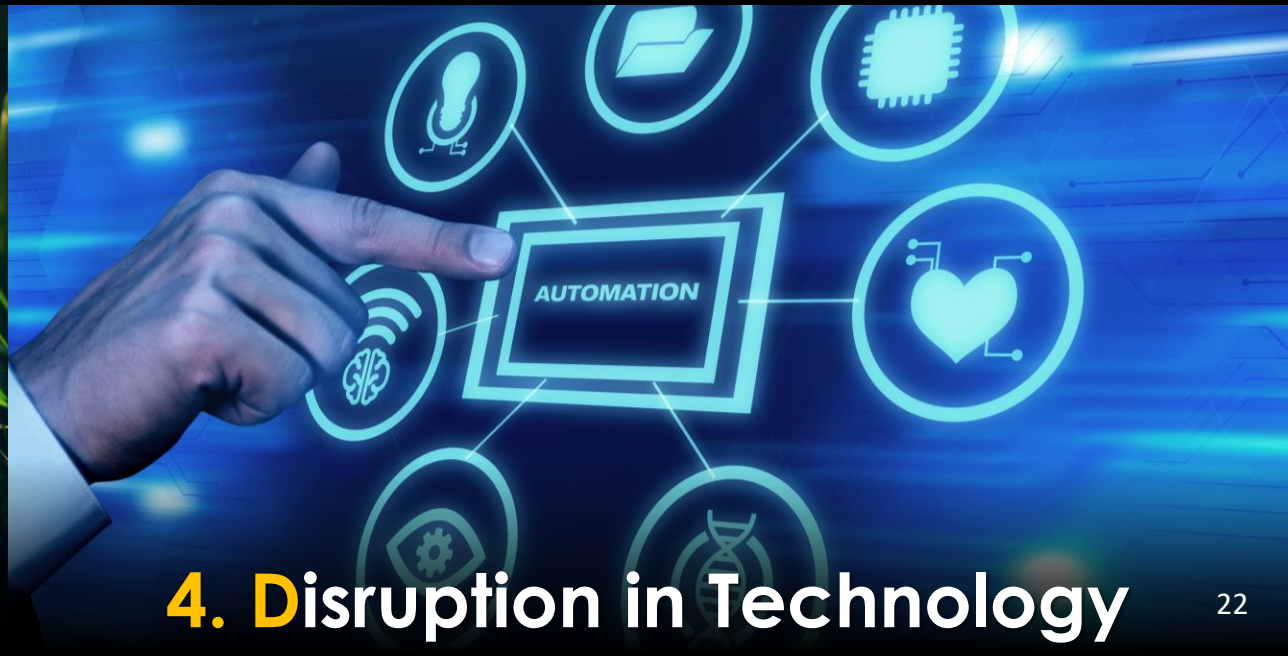
1. Demographic Shift



2. Deglobalisation

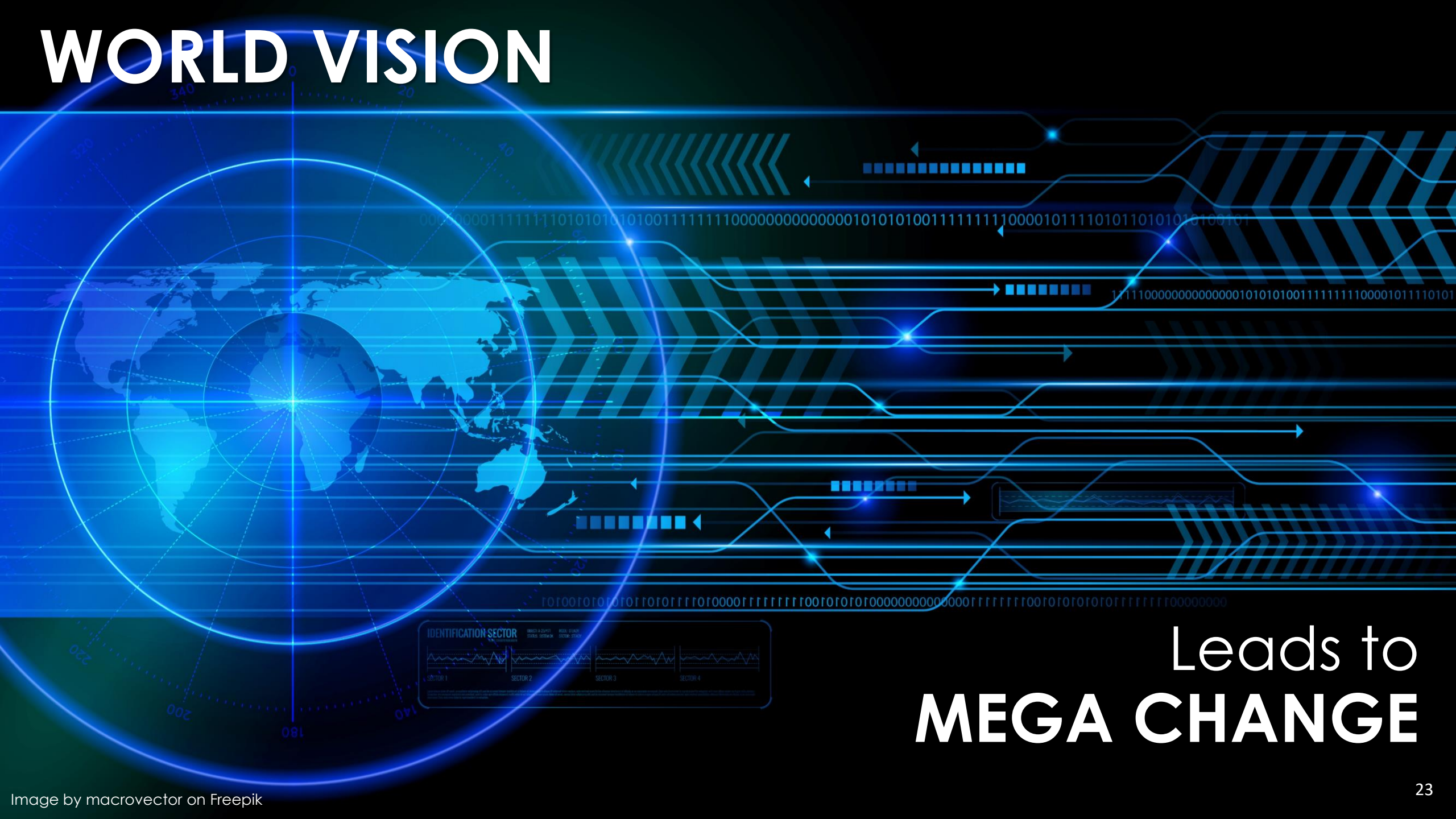


3. Decarbonisation



4. Disruption in Technology

WORLD VISION



Leads to

MEGA CHANGE

Image by macrovector on Freepik

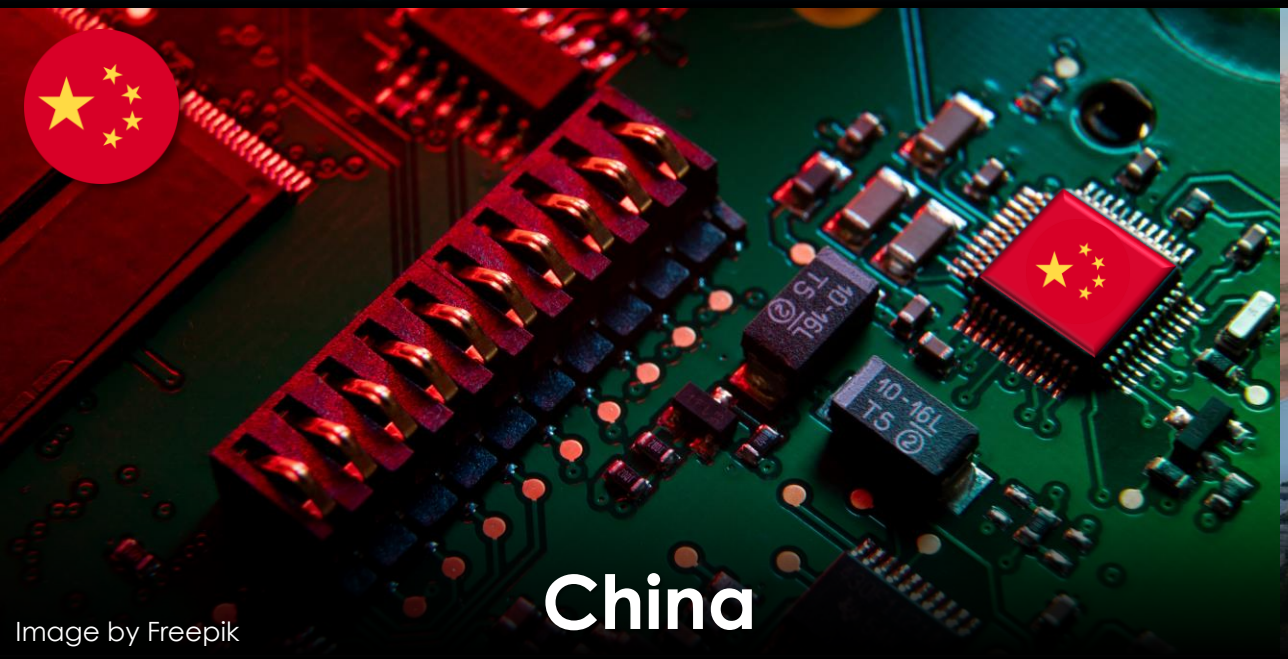
World Vision



India



Malaysia


China



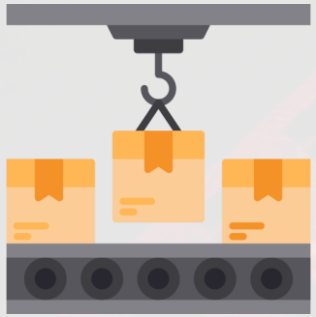
Saudi Arabia

Image by Freepik

China

中国制造2025 MADE IN CHINA

Phase I
(2015–2025)



Developing Basic Industrial

Phase II
(2025–2035)



Increasing Manufacturing with Innovation

Phase III
(2035–2045)



Being Manufacturing Leader with Advanced Technology

Target Sectors



Electrical Equipment



Information Technology



New Energy Vehicles



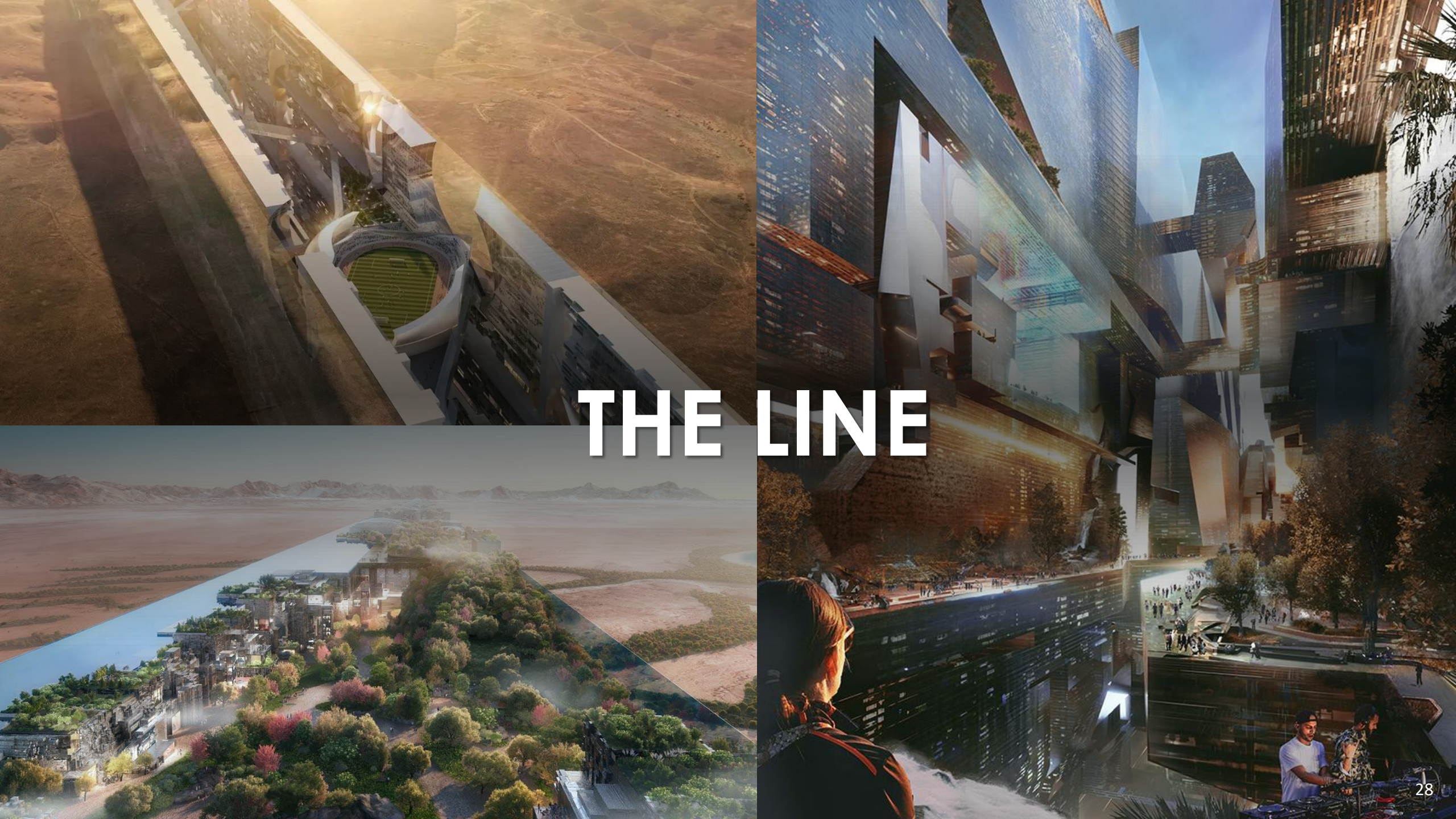
Aerospace Equipment

etc.

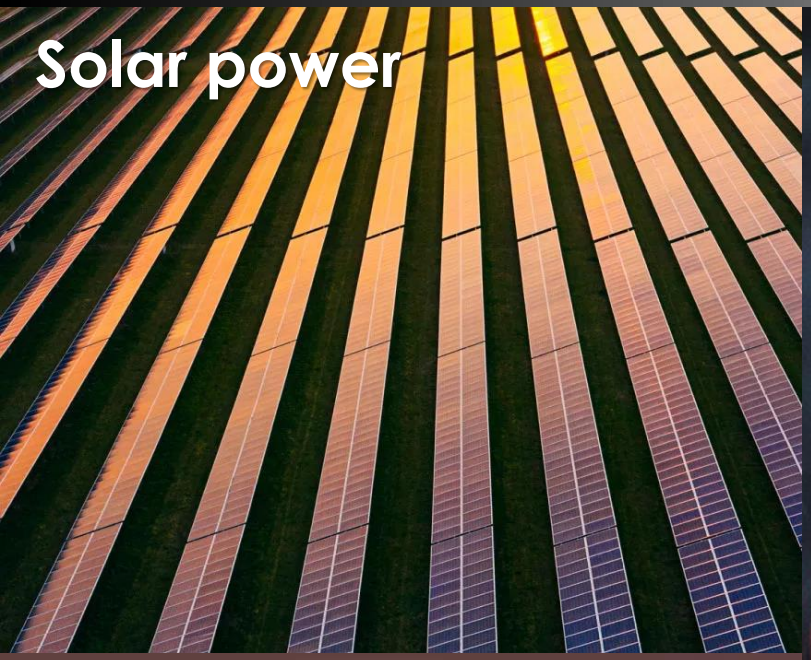
Saudi Arabia




THE LINE
REVOLUTIONARY URBANISM
NEOM
"The vision of what the future could be"
THE LINE IS COMPRISED OF A SERIES OF INTERCONNECTED MODULES, REACHING 500M HIGH.
THE CORE ELEMENTS OF EVERY MODULE ARE STANDARDIZED TO MAXIMIZE COMPATIBILITY AND DRIVE DOWN CONSTRUCTION COSTS.
170 KM
LENGTH OF THE LINE
500 M ABOVE SEA-LEVEL
HEIGHT OF THE LINE
200 M
WIDTH OF THE LINE
34 SQ.KM
FOOTPRINT OF THE LINE
2% OF CONVENTIONAL CITIES
THE LINE
NEOM.COM


THE LINE

Leading The World to Development



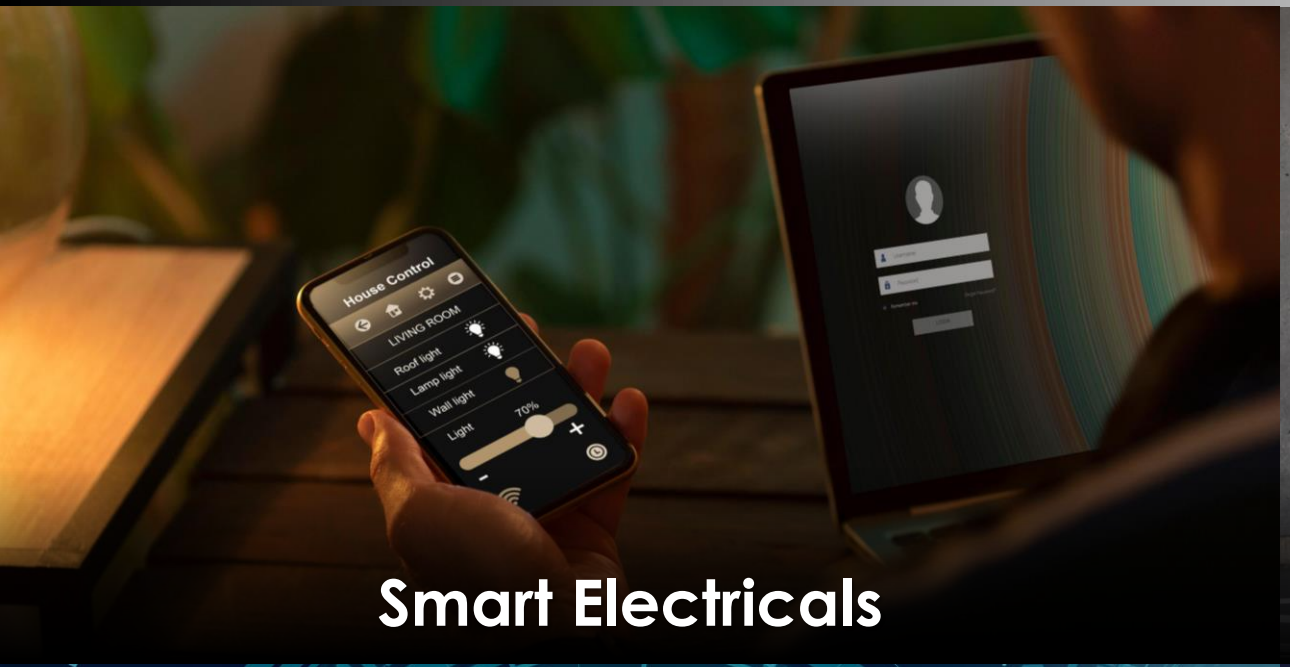




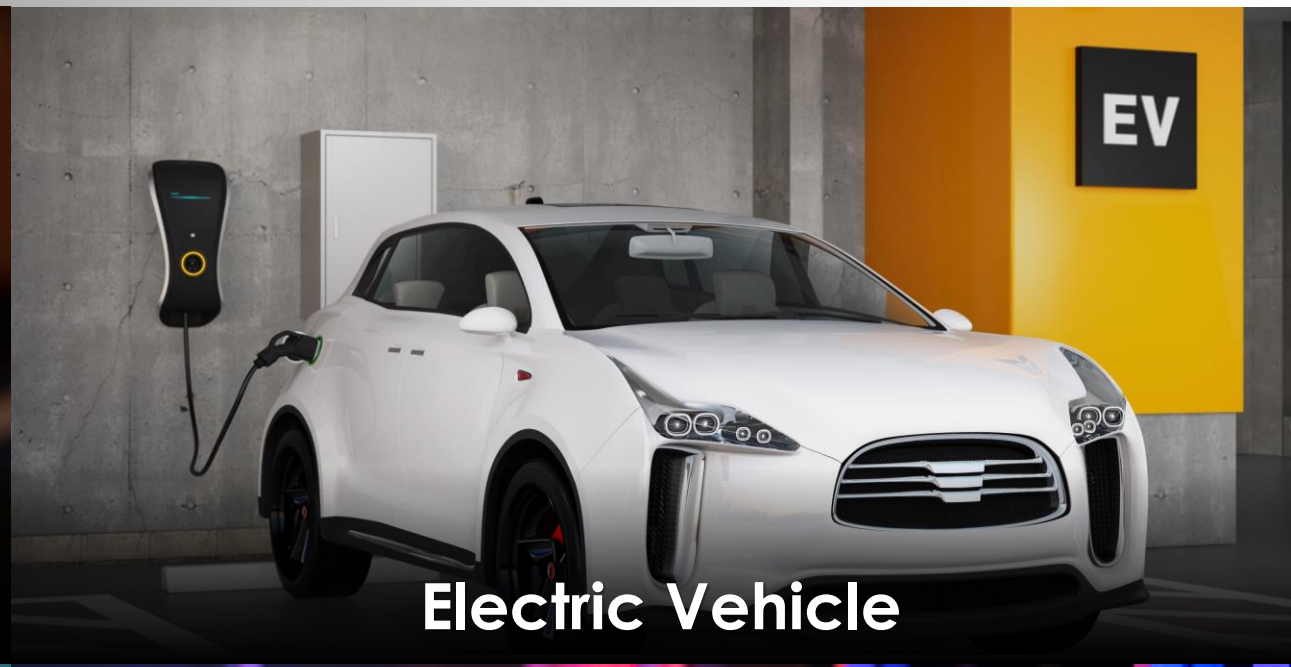




New Demand of Styrenics



Smart Electricals



Electric Vehicle

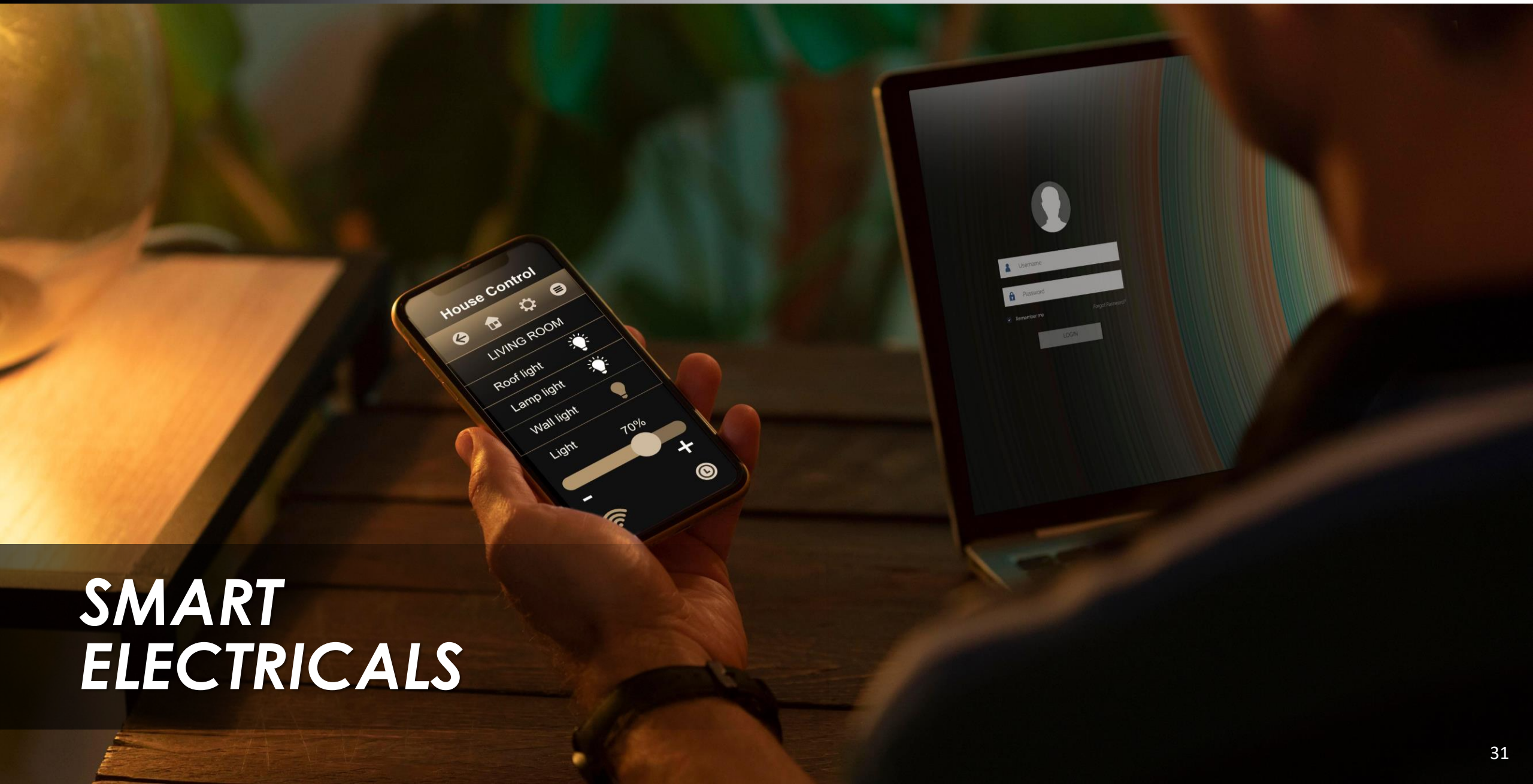


Robotic



Virtual Reality

New Demand of Styrenics



SMART ELECTRICALS

New Demand of Styrenics

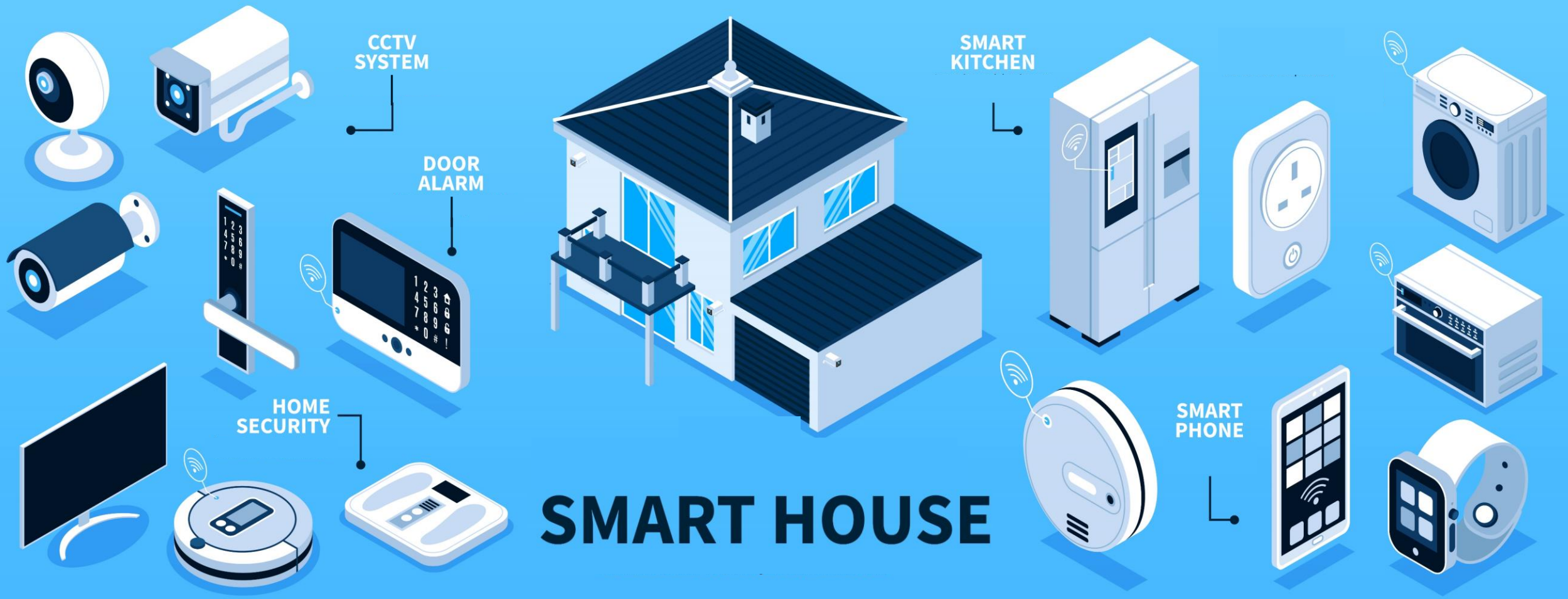
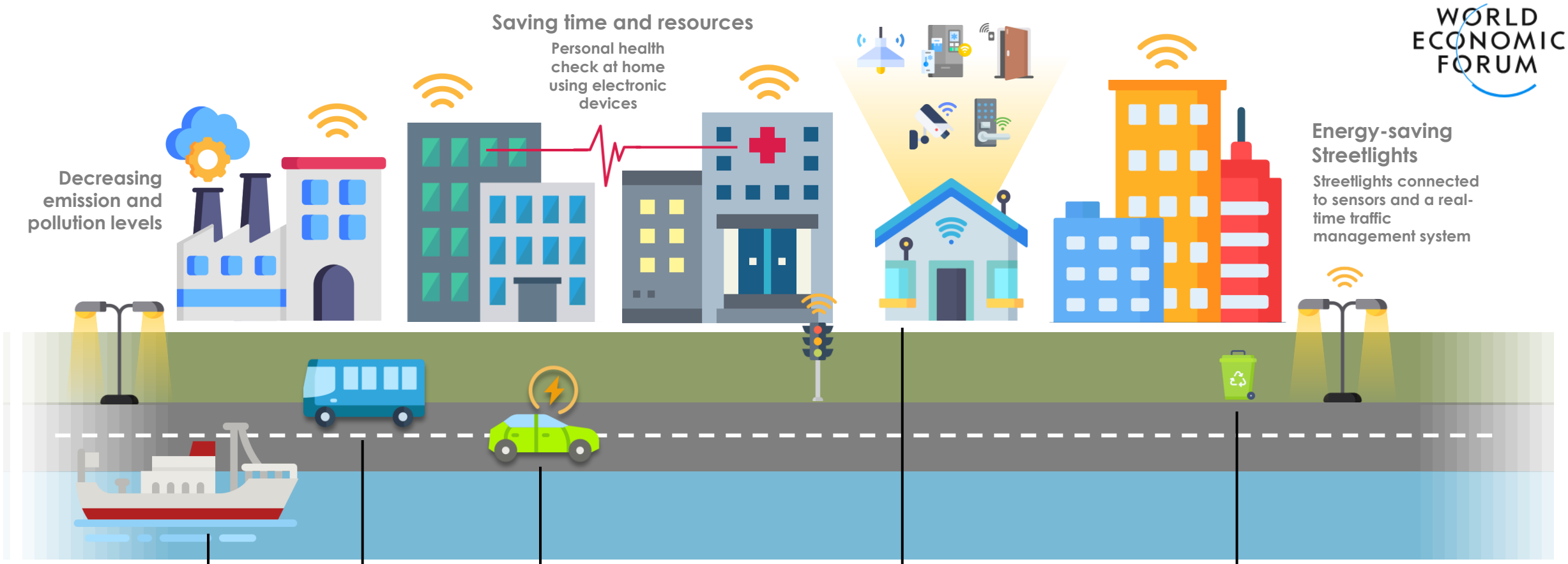


Image by macrovector on Freepik

The Beginning of Smart City Era



Saving time and resources

Personal health check at home using electronic devices

Decreasing emission and pollution levels

Energy-saving Streetlights

Streetlights connected to sensors and a real-time traffic management system

Optimising City Mobility Using Application

Plan and buy your most efficient route-bus, taxi, ferry, bike – or combine vehicles

Improving Traffic Flow, Reducing Congestion

- Find car sharing pool
- Real-time traffic data
- Nearest available parking space
- etc.

Integrating Smart Electricals

Smartphone control to switch on-off electronic devices from outside

Efficient waste disposal & waste

- Solar powered, sensor-enabled waste bins that measure waste levels
- Planning collection route based on demand to save fuel

New Demand of Styrenics



ELECTRIC VEHICLE

Climate Change is The Greatest Threat





THE PARIS AGREEMENT & COP



Its goal is to limit global warming to well below 2, preferably to 1.5°c, compared to pre-industrial levels.



Aim to reach global peaking of GREENHOUSE GAS EMISSIONS as soon as possible to achieve a climate neutral world by mid-century.



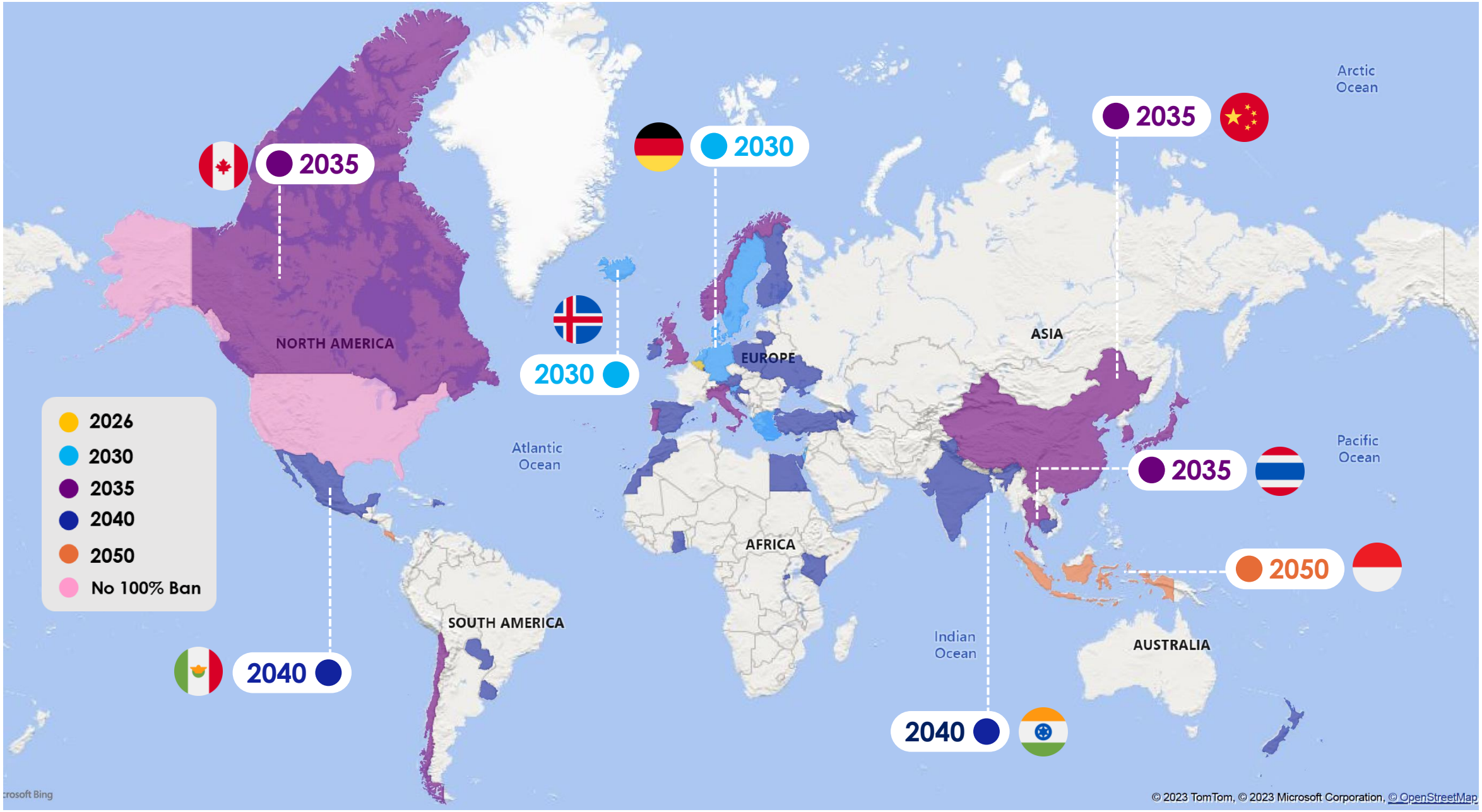
Working on a 5-yr cycle of increasingly ambitious climate action carried out by countries.



Providing a framework for FINANCIAL, TECHNICAL AND CAPACITY BUILDING SUPPORT to those countries who need it.

Source: CO2 Highlights (International Energy Agency, 2021), Global Non CO2 Projections (Environmental Protection Agency, 2019)

Countries with Aspirations to Ban Fossil-fuel Vehicles

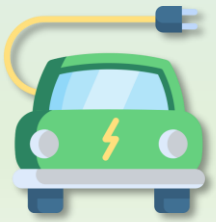


Vehicle Brand Owner Target to Net Zero



Factory Target

EV Target



	2025	2030	2035	2040	2045	2050	2051
Factory Target		CO_2 -80% Scope 1&2 CO_2 -40% vs 2013 by 2030	Net Zero Emissions	Net Zero Emissions CO_2 -40% vs 2010 by 2040 NZE 2039	Net Zero Emissions	CO_2 -80% vs 2016 by 2050 Net Zero Emissions	Net Zero Emissions
EV Target	Launch xEV model by 2025 100% xEV sale 40% xEV sale	100% xEV sale with 5% BEV All model have xEV option 70% -100% xEV sale CO_2 -25% vs 2013 by 2030 40% xEV sale 50% xEV sale	PHEV 2026 BEV 2030 40% xEV sale 2030 50% xEV sale 2030	100% xEV sale 50% xEV sale 50% xEV sale 80% xEV sale			

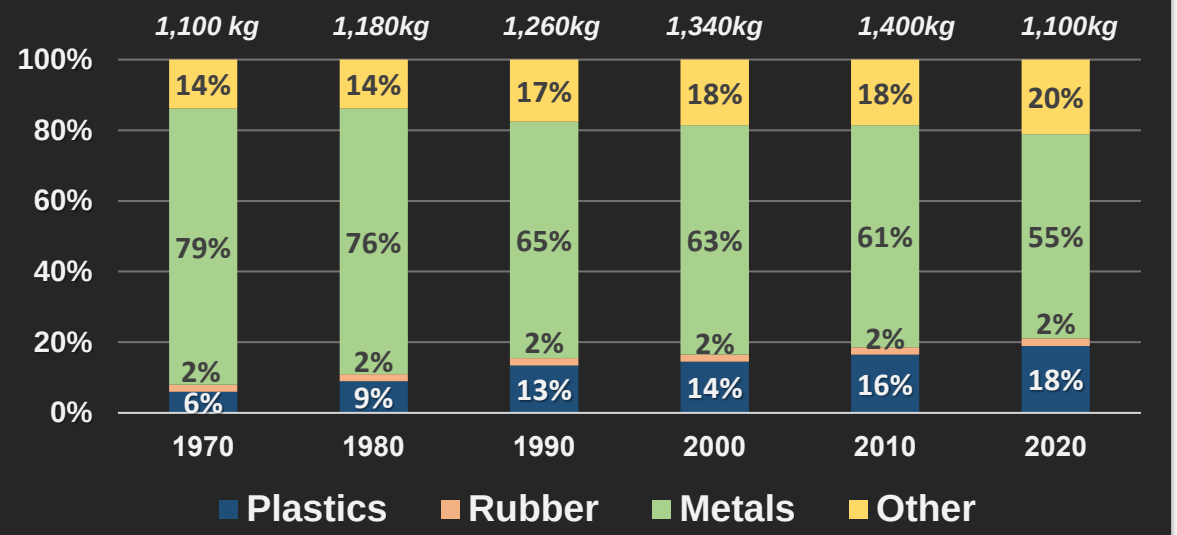
© Thailand Automotive Institute

ABS and Polymer Composite is the Key for EV

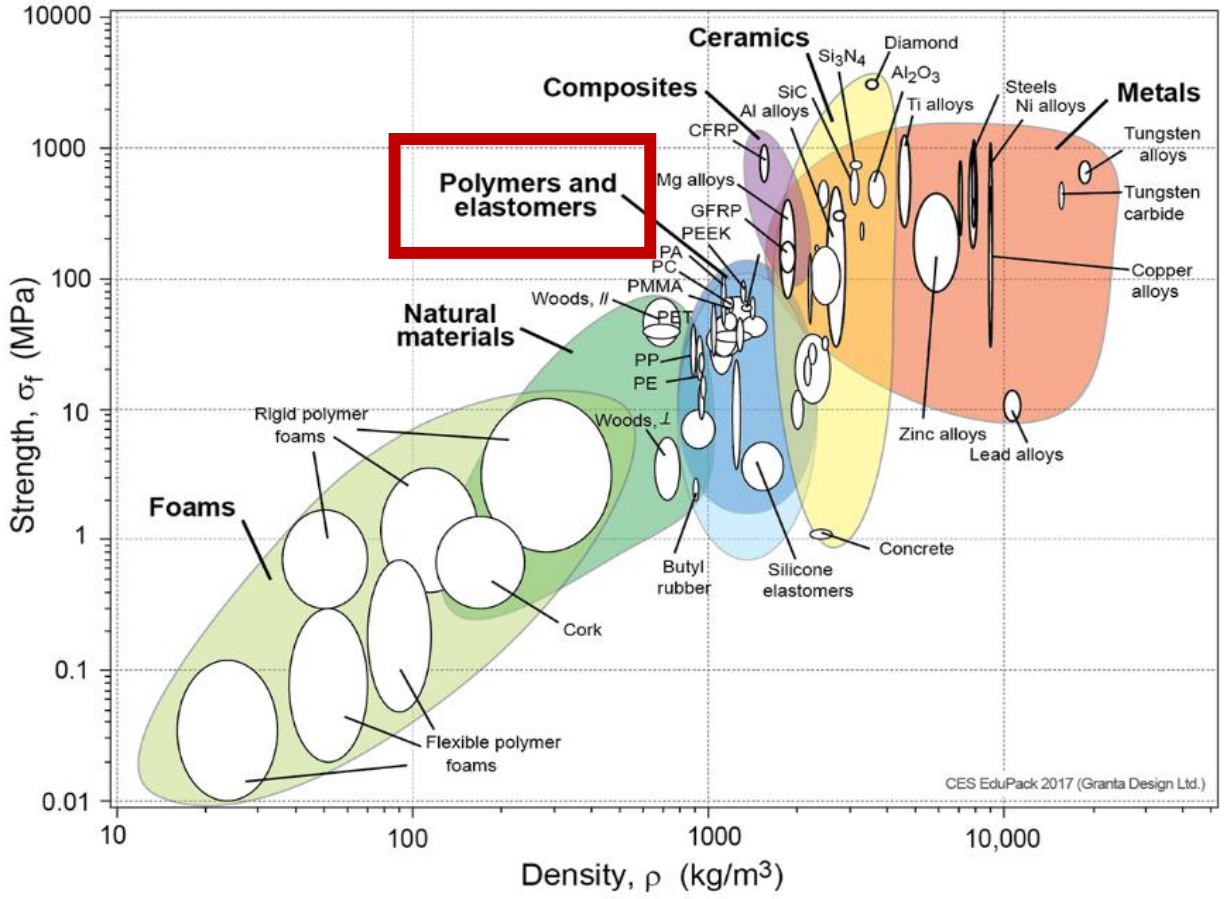


Component	Main types of plastics	Weight in av. car (kg)
Bumpers	PS, ABS, PC/PBT	10,0
Seating	PUR, PP, PVC, ABS, PA	13,0
Dashboard	PP, ABS, SMA, PPE, PC	7,0
Fuel systems	HDPE, POM, PA, PP, PBT	6,0
Body (incl. panels)	PP, PPE, UP	6,0
Under-bonnet components	PA, PP, PBT	9,0
Interior trim	PP, ABS, PET, POM, PVC	20,0
Electrical components	PP, PE, PBT, PA, PVC	7,0
Exterior trim	ABS, PA, PBT, POM, ASA, PP	4,0
Lighting	PC, PBT, ABS, PMMA, UP	5,0
Upholstery	PVC, PUR, PP, PE	8,0
Liquid reservoirs	PP, PE, PA	1,0
Total		**105,0**

Portion of Plastics and Rubber Used in Vehicles



The Material Properties Chart for Vehicles Design



New Demand of Styrenics



ROBOTICS

Robot Become Widely Used in Mass Production

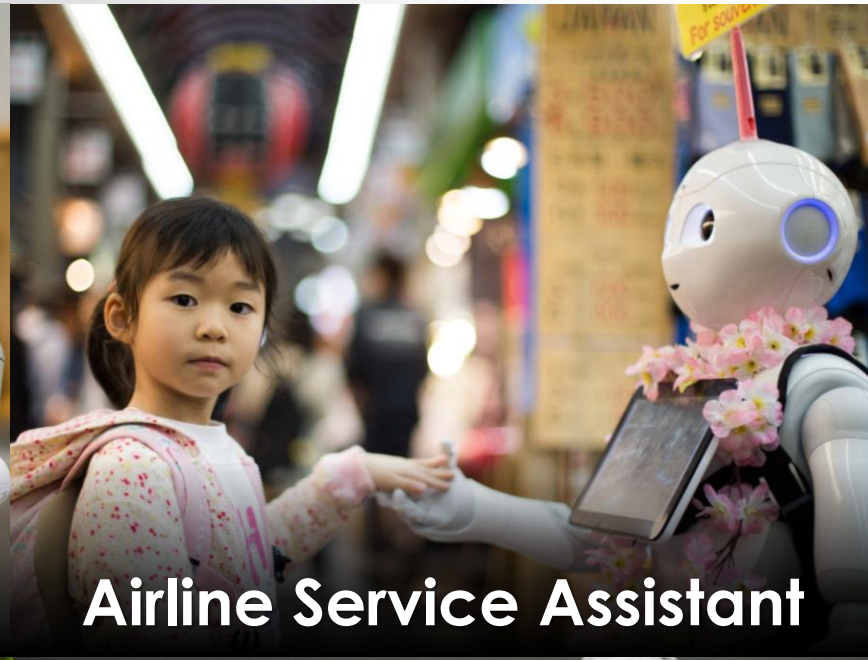


Image by usertrmk on Freepik

And Robot Come Even Closure in Our Daily Life


Harvester


Cooker


Airline Service Assistant



Waiter


Cleaner


Medical Assistant

Image by Freepik, Unsplash and PIXELS

NEW Demand of Styrenics



VR Becomes Widely Use in Many Applications









Image by Freepik

New Demand of Styrenics



Smart Electricals



Electric Vehicle



Robotic



Virtual Reality

Key Takeaway: Styrenic Products

Supply

- **China** has the greatest **capacity** for both products
- There will be high amount of **additional capacity** for styrenic products from NEA

Demand

- **China** has the greatest **demand** of styrenic products
- **Electronics and appliances** are the largest portion of all industries

4 Mega Trend Disruptions + **World Visions** → **New Demand of Styrenic Products**

Strength

- Chemical Resistance
- Heat Resistance
- Impact Strength
- Versatileness

Styrenic products are KEY MATERIALS for the future.



Image by Freepik