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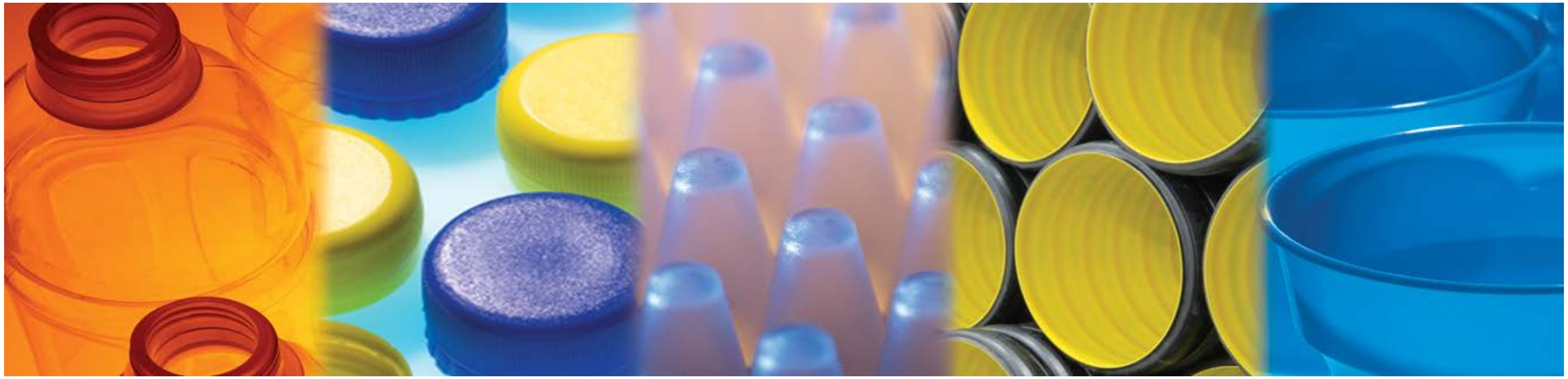
An associate of PTTGC & LyondellBasell

Polypropylene Capacity in SE Asia in Light of Recent Growth

Martyn N Tickner, President, HMC Polymers Thailand
03 April 2019



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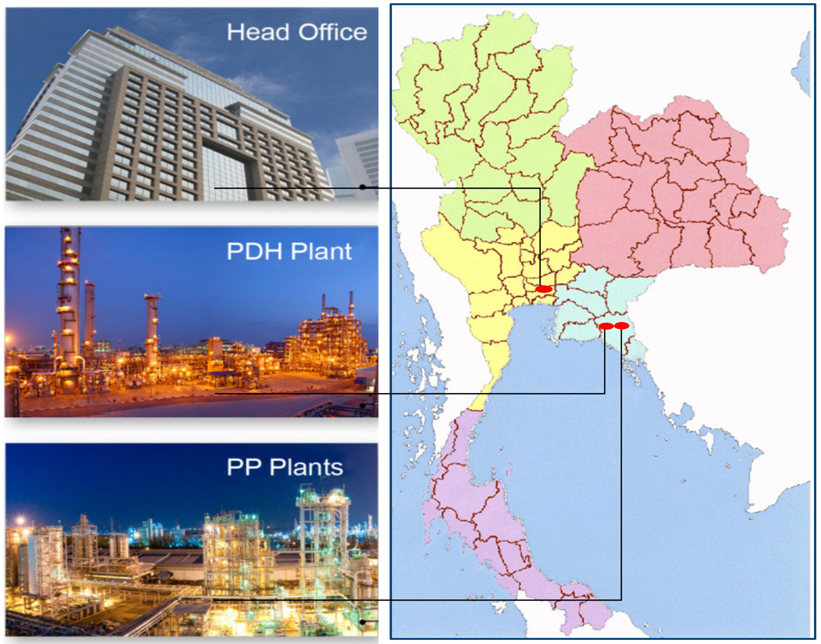
Facts

HMC Polymers **Head Office** Sathorn City Tower 20F Sathorn, Bangkok	Total asset value (2018) • 36 Billion THB • 1.1 Billion US$ Annual sales revenue (2018) • 31 Billion THB • 1 Billion US$
PDH Plant Map Ta Phut, Rayong Province	• Area: 59 rai | 9.4 hectares • Propylene Capacity: 300 kt pa • Technology: UOP’s Oleflex • ISO 9001 and ISO 14001
PP Plants Map Ta Phut, Rayong Province	• Area: 156 rai | 25 hectares • PP Capacity: 810 kt pa • Two *Spheripol* PP lines • One *Spherizone* PP line • Technology: LyondellBasell • ISO 9001 and ISO 14001

• Total Employees ~ 400



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Success Enabled by our Shareholders

GC

PTTGC PLC 41%

lyondellbasell

LyondellBasell 29%

Thai Investors

Thai Investors 30%

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A Differentiated Polypropylene Producer

- Heat Sealable Film

- Pressure Pipe

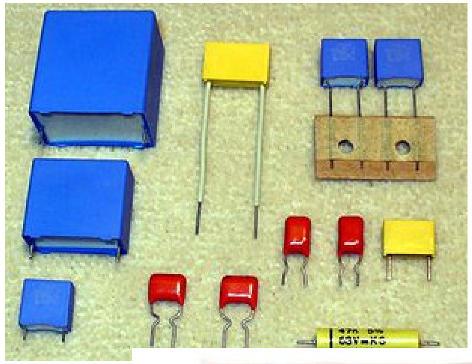
A Differentiated Polypropylene Producer (cont')

- Sewage Pipe

- Medical

A Differentiated Polypropylene Producer (cont’)

- Capacitor Grade



- POF Shrink film

About SE Asia

SEA:
Population: 662 MM growing 1.0% p.a.
PP per capita: 8.7 KG pp/year
PP Consumption: 5,900 KTA, 4.9% AAGR

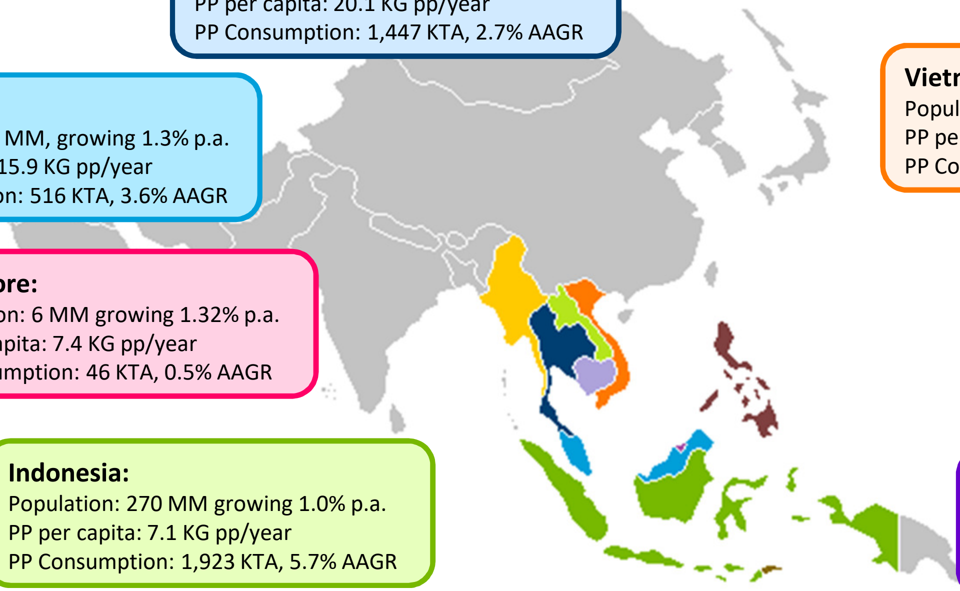
Thailand:
Population: 69 MM growing 0.2% p.a.
PP per capita: 20.1 KG pp/year
PP Consumption: 1,447 KTA, 2.7% AAGR

Malaysia:
Population: 32 MM, growing 1.3% p.a.
PP per capita: 15.9 KG pp/year
PP Consumption: 516 KTA, 3.6% AAGR

Vietnam:
Population: 97 MM growing 1.0% p.a.
PP per capita: 14 KG pp/year
PP Consumption: 1,361 KTA, 7.6% AAGR

Singapore:
Population: 6 MM growing 1.32% p.a.
PP per capita: 7.4 KG pp/year
PP Consumption: 46 KTA, 0.5% AAGR

Philippines:
Population: 108 MM growing 1.5% p.a.
PP per capita: 4.5 KG pp/year
PP Consumption: 478 KTA, 5.3% AAGR



Indonesia:
Population: 270 MM growing 1.0% p.a.
PP per capita: 7.1 KG pp/year
PP Consumption: 1,923 KTA, 5.7% AAGR

Other SEA Countries:
Population: 80 MM growing 1.1% p.a.
PP per capita: 3.7 KG pp/year
PP Consumption: 129 KTA, 9.2% AAGR

0.7 bn people consuming 9 kg PP per person → high growth potential. But economies are quite diverse

SE Asia convertors

Strong presence of global brands amongst local convertors, combined with growth in individual wealth will drive market sophistication

2019 SE Asian PP Producers

Total Capacity : 6.6 MM TA
Effective Capacity : 5.7MM TA

Thailand	**: 2,305 KTA**
HMC	: 810 KTA
IRPC	: 775 KTA
SCG	: 720 KTA

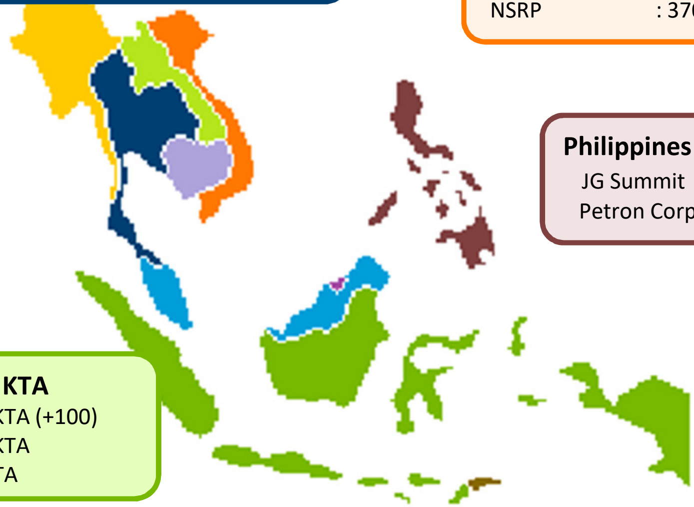
Vietnam	**: 520 KTA**
Petro Vietnam	: 150 KTA
NSRP	: 370 KTA

Malaysia	**: 1,540 KTA**
Lotte Chemical Titan	: 640 KTA
Petronas Chemicals	: 900 KTA

Philippines	**: 350 KTA**
JG Summit	: 190 KTA (+100)
Petron Corporation	: 160 KTA (+65)

Singapore	**: 1,610 KTA**
ExxonMobil Chemical	: 930 KTA
TPC	: 680 KTA

Indonesia	**: 765 KTA**
Chandra Asri	: 480 KTA (+100)
Polytama Propindo	: 240 KTA
Pertamina	: 45 KTA



Central region, low labour cost, low capital cost and strong market potential make it an interesting region for investment.

SE Asia Supply/Demand Balance

CAPACITY ADDITIONS:

2018
Lotte, MY 200 KTA
NSRP, VN 400 KTA

2019
Petronas, MY 900 KTA

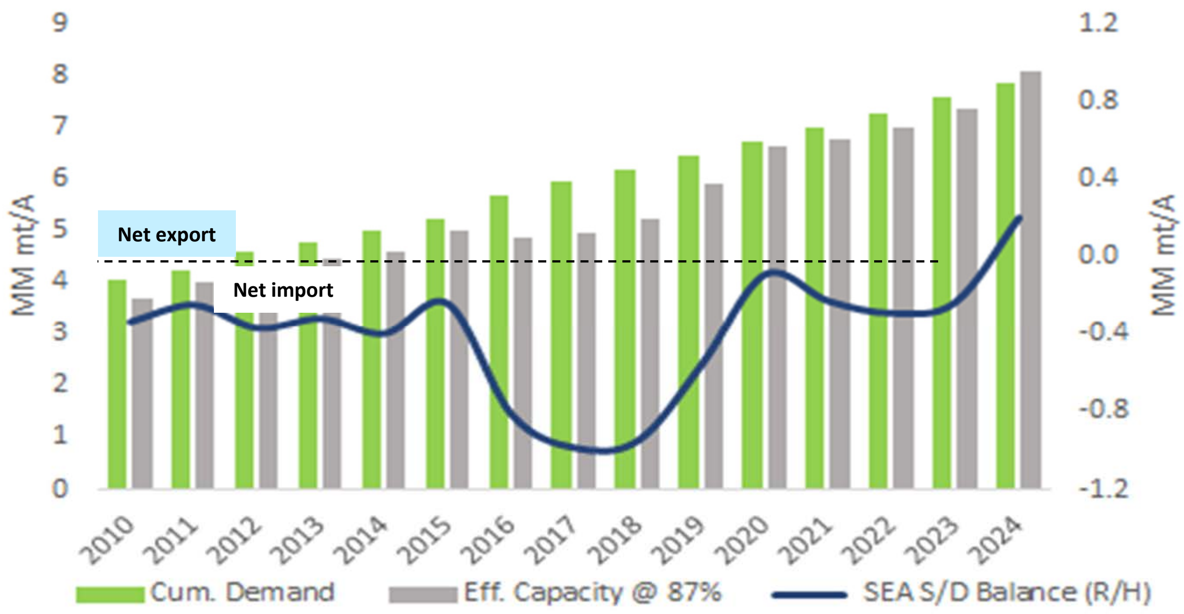
2020
Hyosung VN 300KTA (600 KTA?)
CAP1, IN Debot. 100KTA

2021
JG Summit, PH Debot 100KTA

2022
HMC Polymers, TH 250 KTA

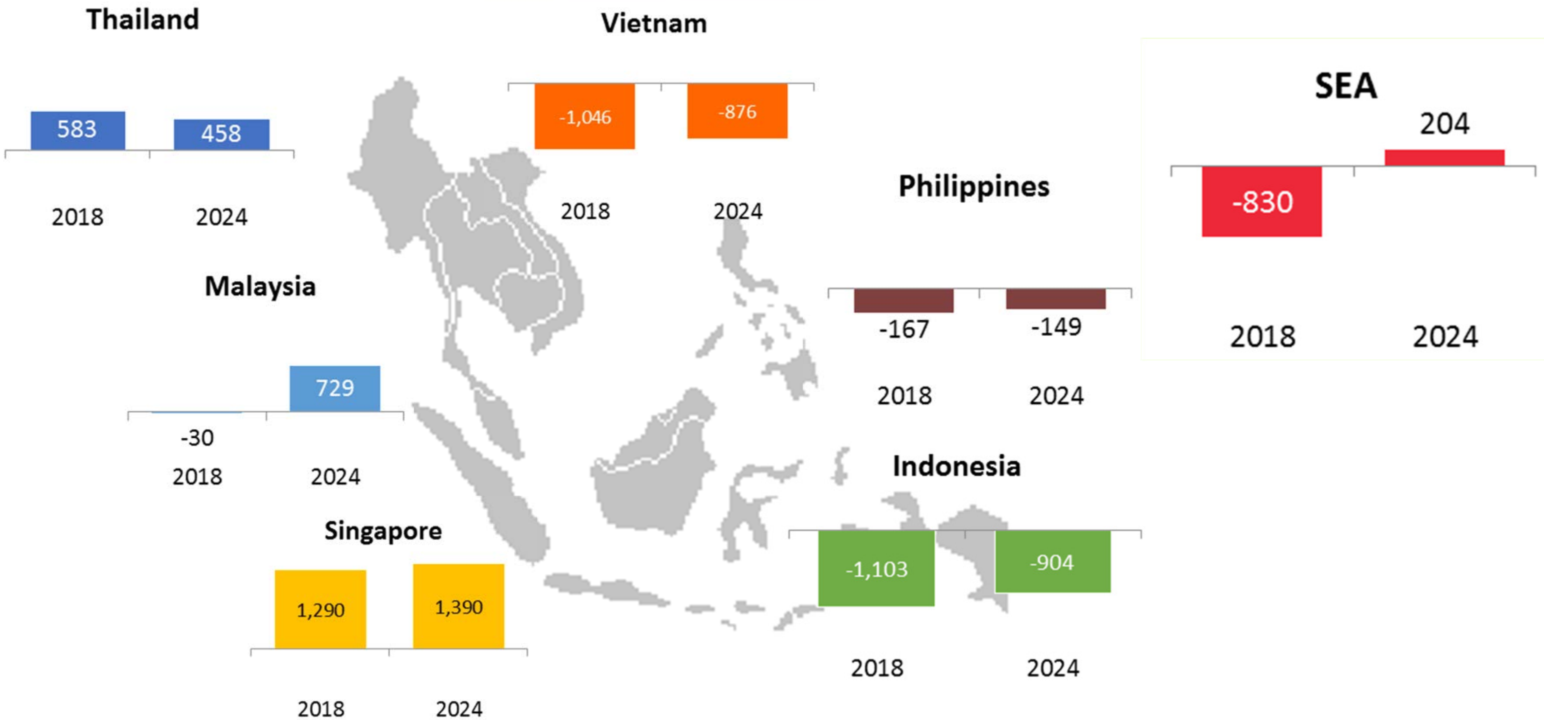
2023
LSPC, VN 400KTA

2024
CAP2, IN 450KTA
Lotte, IN 400KTA



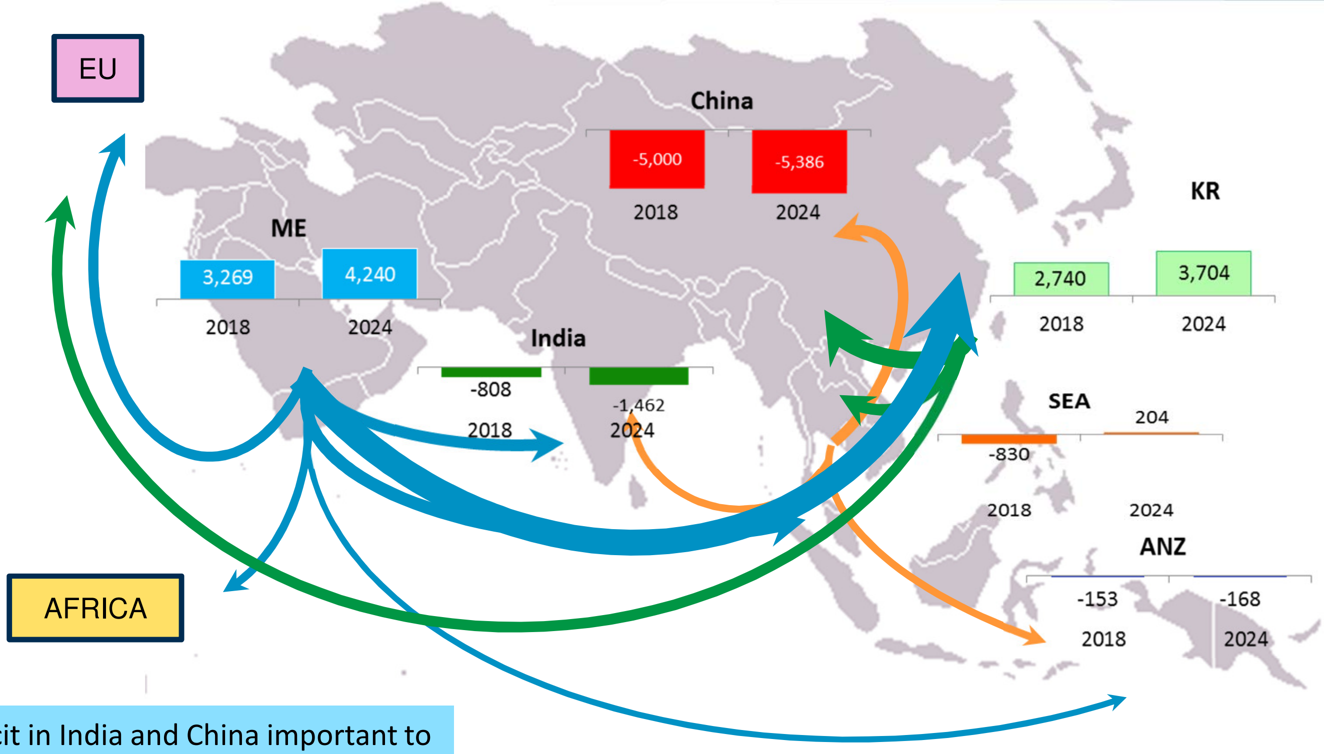
Recent and future capacity additions amount to 60% increasing, bringing the region back into balance/slightly long despite 1.5MMT demand growth

SE Asia PP Net Trade Flows



Malaysia will join Singapore and Thailand as a net exporter; region becomes balanced to slightly long

What's happening next door ?



Continued deficit in India and China important to mop up excess from Middle East and Korea

What could change this picture ?
China

China:
Population: 1.4 bn growing % 0.3 p.a.
PP per capita: 18 KG pp/year
PP Consumption: 26 MMTA, 5.8 % AAGR

CAPACITY ADDITIONS:

2019
Dongguan GR 600KTA, 2H/19
Boufeng Energy 300KTA, 2H/19
Zhongan Lianhe Coal 350KTA, Q4/19
Hengli PC 450KTA
Qinghai Damei 400KTA

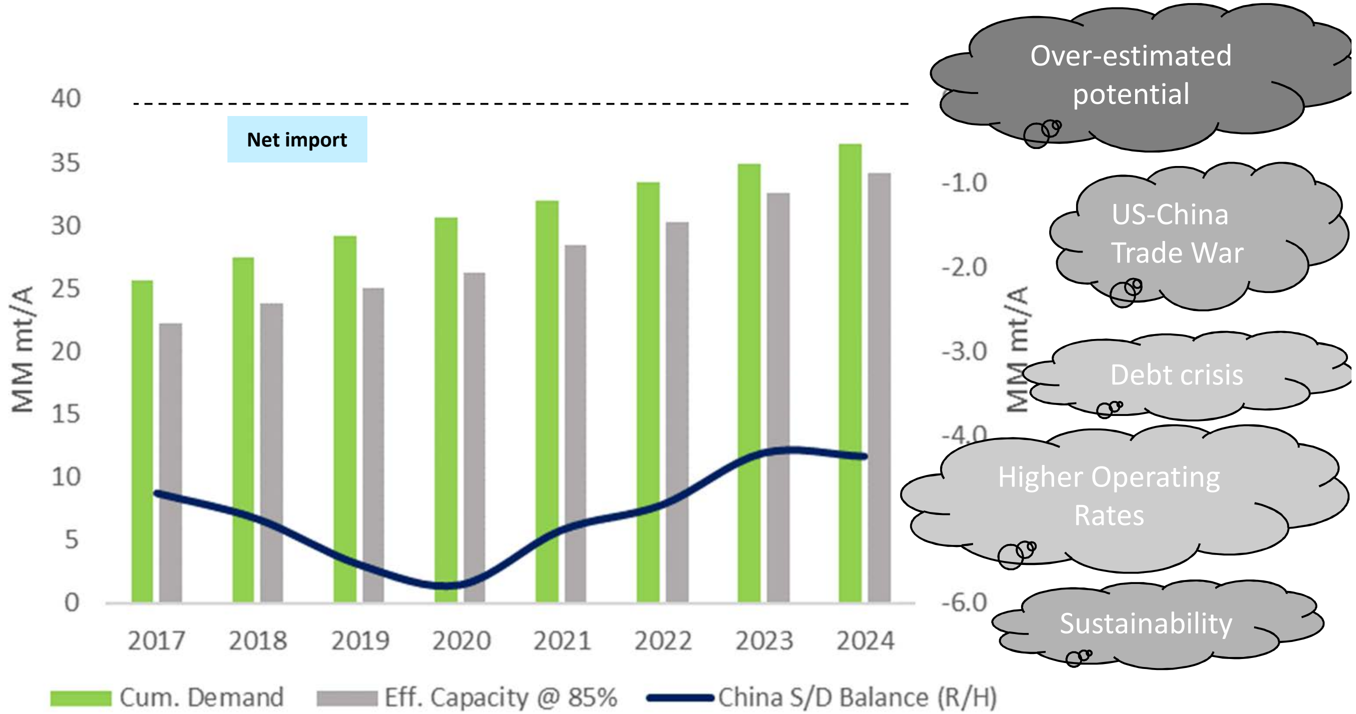
2020
Shanxi Coking Corp 300KTA
Shanxi Yulin 300KTA, 2H/2019
Hebei Haiwei 200KTA
Hengli PC 2x200KTA

2021
Boutou Shenhua 410KTA, 2H/2021
Sinopec KPC 600KTA
Zhejiang PC 450KTA
Shenhua Ningmei SABIC 450KTA

2022
Sinopec Zhijin 300KTA
Qinghai Mining 200 KTA
Oriental Energy 400KTA
Fujian Gulei PC 200KTA
Fujian Zhejiang PC 2x600KTA

2023
Liaoning Bora 2x300KTA
Jinneng STC 450KTA
ExxonMobil Huizhou 2x300KTA
Jinneng STC 450KTA
Wison Taizhou 350KTA (MTO)*
Shandong (Dongmin) 200KTA?

2024
* Anticipated capacity



Solid demand growth supported by strong economic policy; imports remain at 4-6 MMT p.a. level
But any hiccup in growth will have an immediate impact on global supply/demand

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What could change this picture ?
India

India:
Population: 1.4 bn growing 0.7% p.a.
PP per capita: 3 KG pp/year
PP Consumption: 4.7 MMTA, 7 % AAGR

CAPACITY ADDITIONS:

2018
OPAL 340 KTA

2019
IOC 700 KTA

2020

2021
HPCL 500 KTA

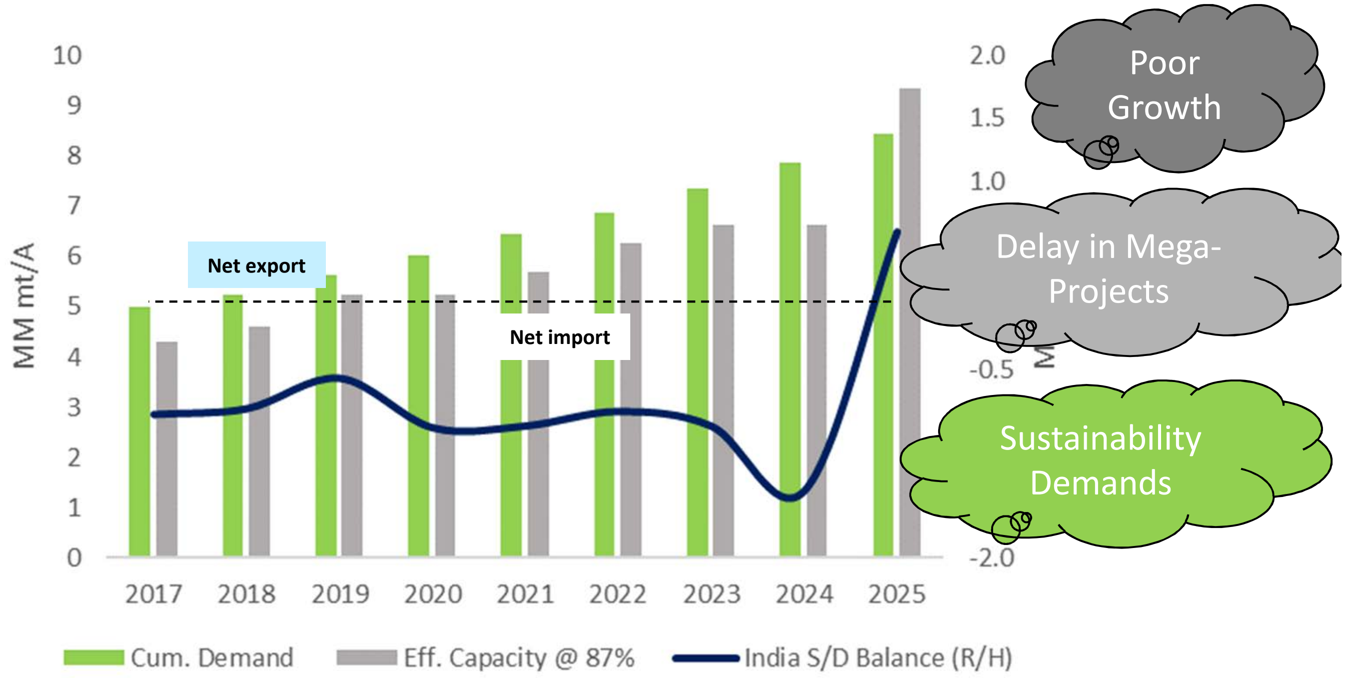
2022
Nayara (Rosneft) 450 KTA

2023
IOC 200 KTA

2024
IOC 420 KTA

2025
Ratanagiri 3000 KTA (Jun18)
ExxonMobil 600 KTA (Nov18)*

*** Anticipated completion**



- Demand growth in next 5 years of 2 MMT, and with large population and low per capita consumption, growth could accelerate further
- However the mega-projects being discussed have the potential to more than satisfy that demand growth

What could change this picture ?
South Korea

CAPACITY ADDITIONS:

2018
S-Oil (Aramco) 405 KTA

2019

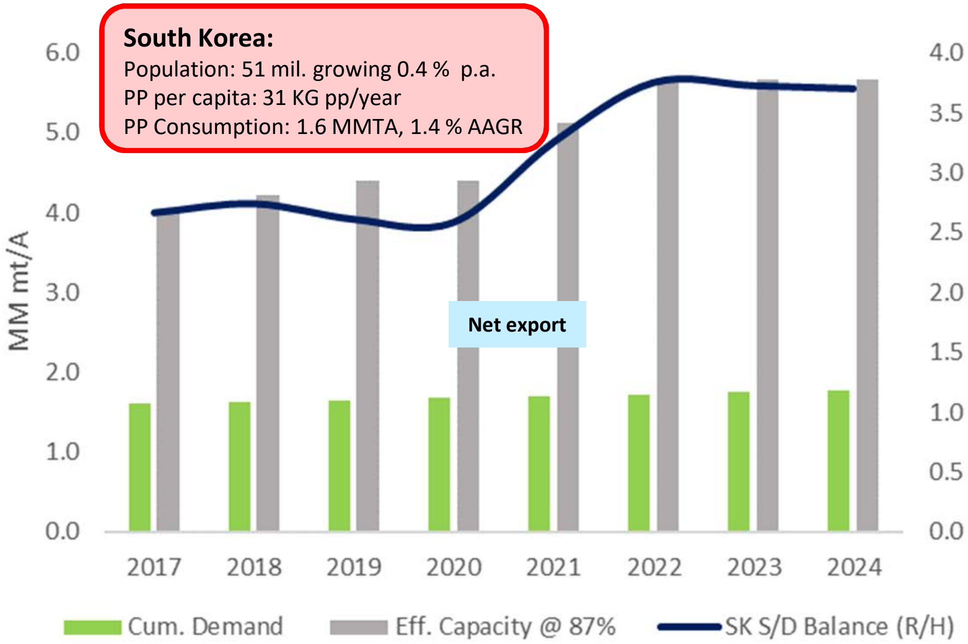
2020

2021
Hyundai Chemical 400KTA
Hanwha Total 400 KTA, 2H/2021
Ulsan PC 400 KTA, 2H/2021

2022

2023

2024

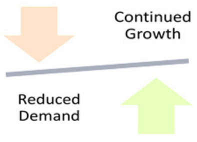


South Korea is already a major exporter competing with ME export volumes, targeting higher end applications

Impact of Focus on "Sustainability"

- Issue of marine litter is bringing "plastics" into poor repute
- The response is multi-faceted and not yet aligned on priorities and best practice solutions
- Many of the current initiatives may prove to be environmentally unsound or economically not feasible.
- Nevertheless, there will undoubtedly be some impact on the demand for virgin plastics…
  - Reduction in single use through policy led bans, brand owner choices, consumer backlash and re-design of applications for multi-use
  - Switch to alternative materials – paper, glass, metal, bio-based etc.
  - Increased use of recycled material through investment in infrastructure for collection, segregation and cleaning to facilitate recycling of consumer waste.
- The extent to which these will impact virgin polymer demand depends on competing factors…

- Inadequate pace to address marine litter
- Intervention from policy makers and brand owners in response to consumer demand
- Lack of standards/challenge to ensure solutions are environmentally sound

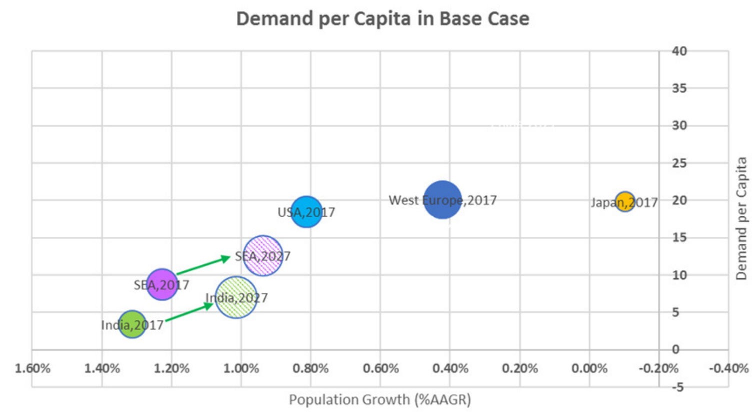


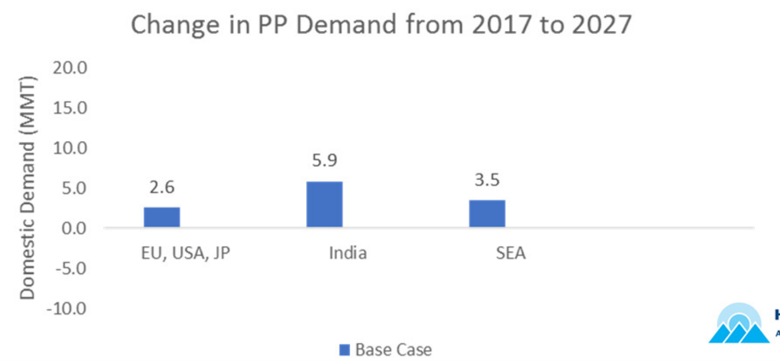
- Focus on other issues, e.g. climate change
- Difficulty/economics of mechanical recycling (including food safety)
- Environmental footprint of alternative solutions
- Fast development of best practice solutions – collection & containment; energy recovery; feedstock recycling

Quantifying that impact…

Primary driver for PP growth is from population growth and per capita usage

Per capita usage is driven by trends in personal wealth and urbanization, and can be assumed to trend over time to the same high levels as Europe, Japan, USA – 20 kg/person.





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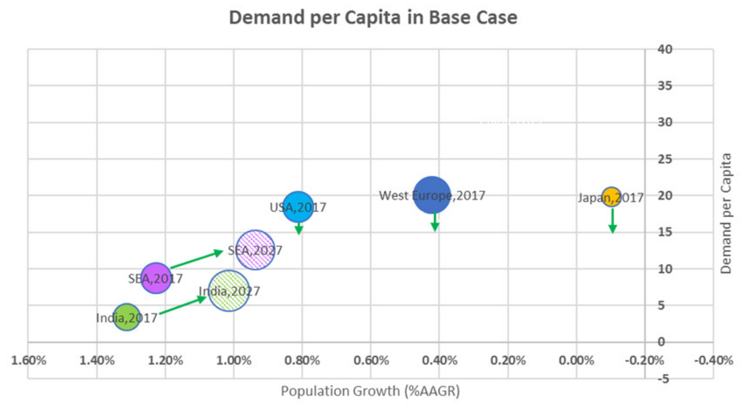
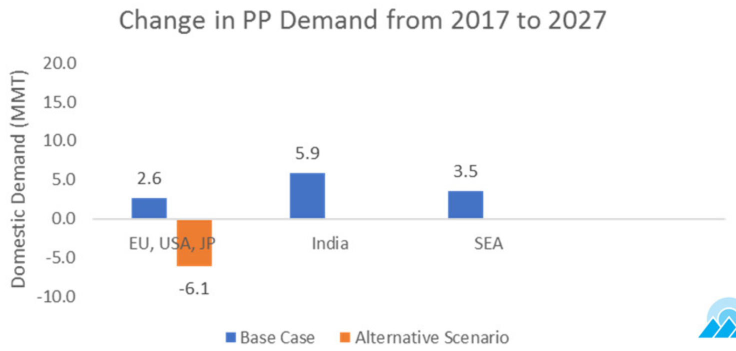
Consider however a case where "sustainability" considerations result in per capita usage in the developed economies – EU US and Japan – reducing from 20 kg/person to 15 kg/person.

By 2027, consequence is a reduction in demand growth of 6.1 MM TPA





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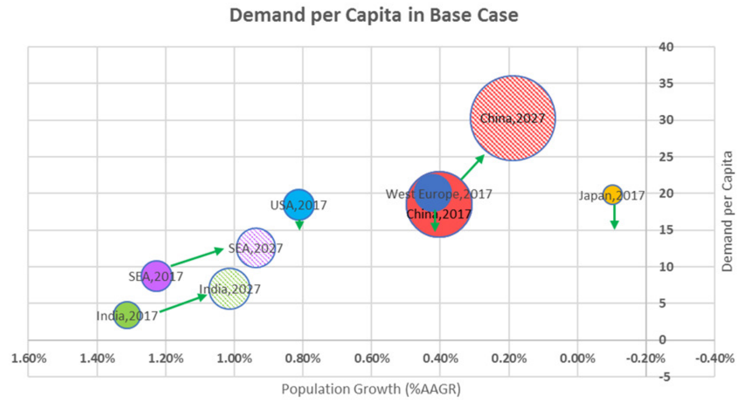
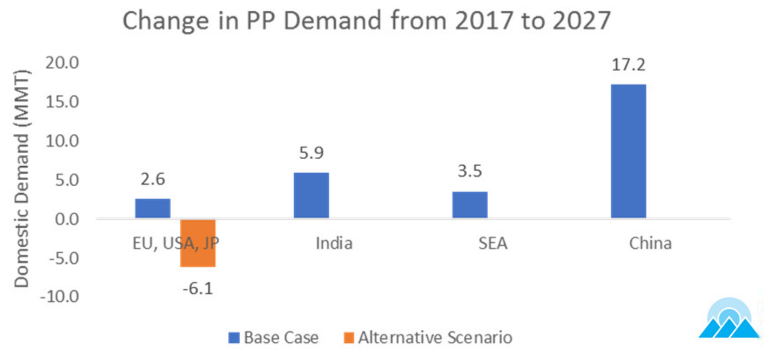
But what happens in China is critical !

17.2 MMt demand growth envisaged from 2017 to 2027.





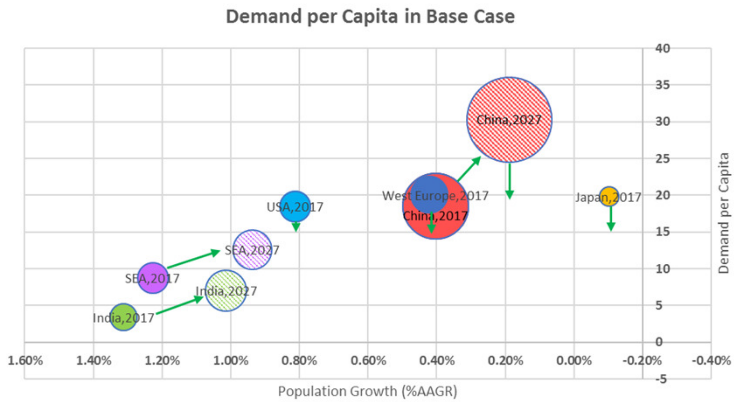
Quantifying that impact…

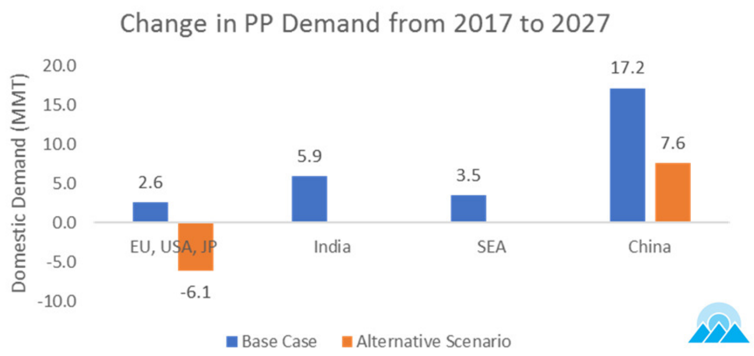
Primary driver for PP growth is from population growth and per capita usage

Per capita usage is driven by trends in personal wealth and urbanization, and can be assumed to trend over time to the same high levels as Europe, Japan, USA – 20 kg/person.

Consider a case where "sustainability" considerations across the world results in per capita usage declining in the developing countries, and failing to grow in China beyond 20 kg/person

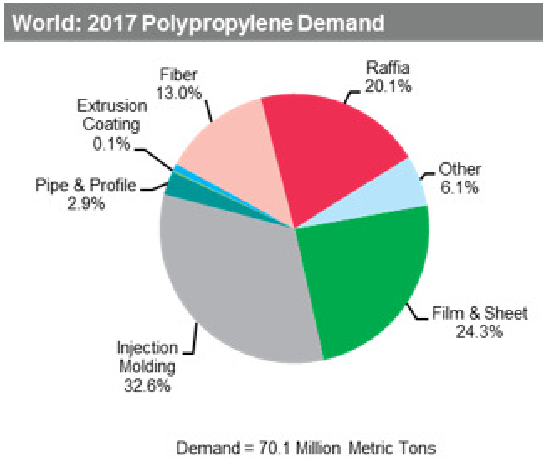
By 2027, consequence is a reduction in demand growth from 105 to 87 MMT, equivalent to 2% per annum lower growth





In conclusion…

- <u>Single Use</u>: **up to 10 MMTA reduction**
  - 40% of polypropylene is used in single use plastics. Imagine reduction of that virgin PP consumption by 30% through Reduce, Re-use, Recycle (and Replace)
- **<u>Durable/Multiple Use</u>: up to 10 MMTA reduction**
  - 50% of capacity is used in durable applications. Imagine that less demanding applications use 50% recycled material.
- Achieved by 2030, that corresponds to 2% p.a. reduction in global demand growth – from 6 new plants to 3 new plants in the world per year



Is this too extreme a scenario ???

Answer = Probably Yes

- **The large populations of developing countries require cheap solutions to improve their standard of living**
- **Mechanical recycling will prove to be very difficult/expensive and requires huge infrastructure investments**
- **Energy recycling and eventually feedstock recycling will become prevalent**
- **Consumer focus will swing to global warming at same time as LCA will prove that alternatives have a higher carbon footprint**

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Key Messages

- SE Asia is a region of rapid economic growth and hence increasing PP demand – for increasingly sophisticated products
- Despite significant new capacity, region will remain balanced and life should be good for PP producers
- Potential downside risks to an otherwise healthy outlook are..
  - Decline in economic growth in China (world)
  - Increase in cost of Propylene
  - Disappointing economic growth in India, or mega-projects propelling India to self-sufficiency
  - Sustainability impacting demand for virgin polymer
  - Next US investment wave - PDH/PP ?

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Thank you for your attention

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