The business and economic case for sustainable chemistry

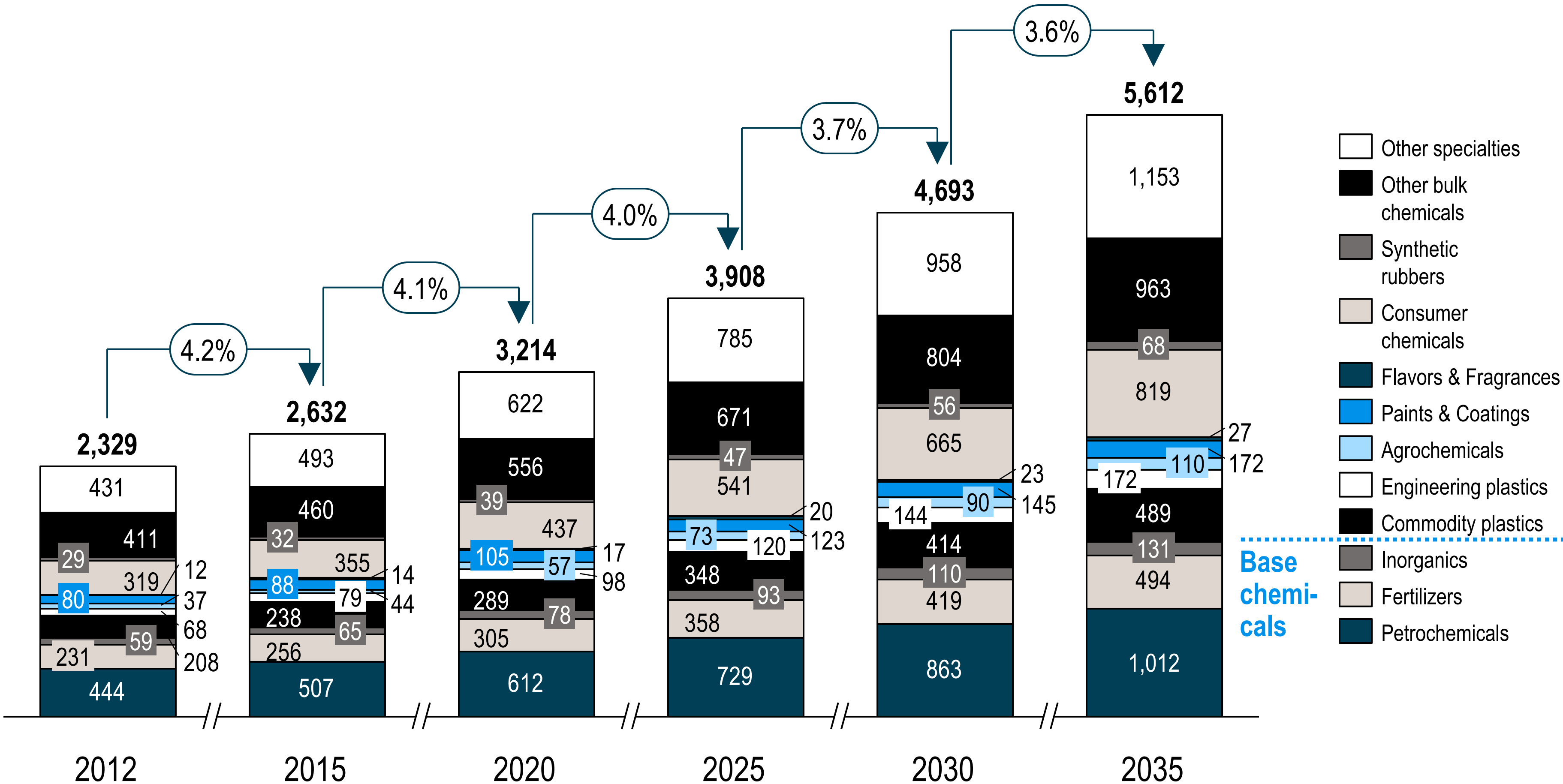
Global trends, drivers, and opportunities

Berlin, September 24, 2015

Roland Berger

Although the global chemical market will more than double in the next 20 years, growth levels are expected to decrease

Total chemical market real value forecast, 2012-2035F [EUR bn]

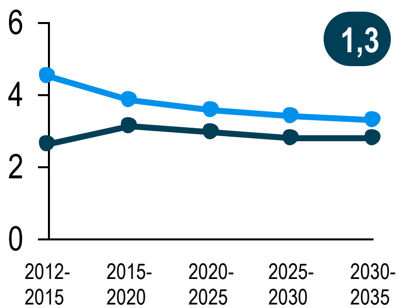


Source: Roland Berger market model

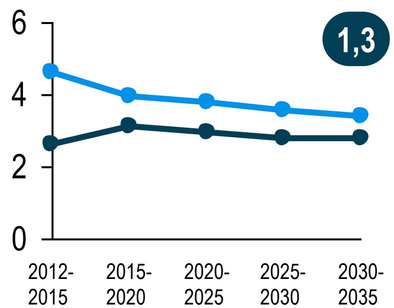
Eight segments as examples – Growth rates coming closer to GDP levels over time

World chemicals CAGRs vs. GDP[1)] development, 2012 – 2035 [%]

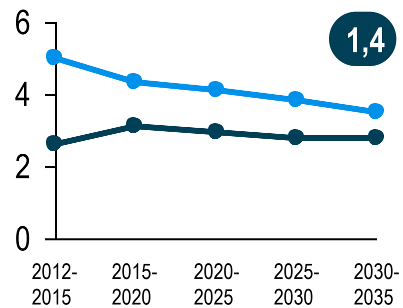
Petrochemicals



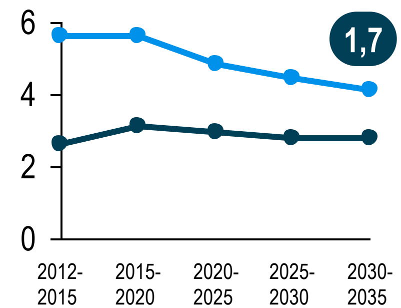
Commodity plastics



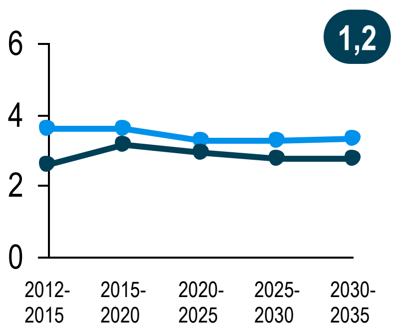
Engineering plastics



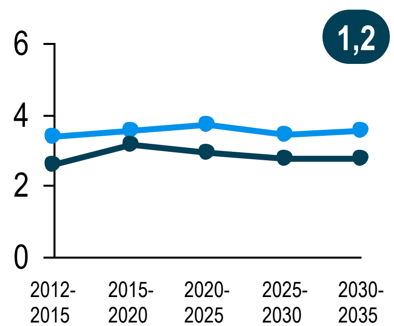
Agrochemicals



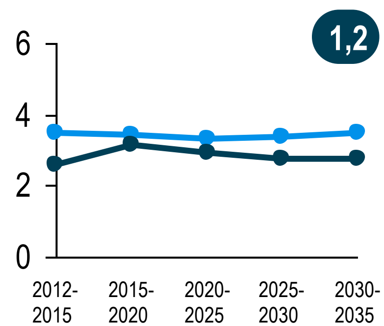
Fertilizers



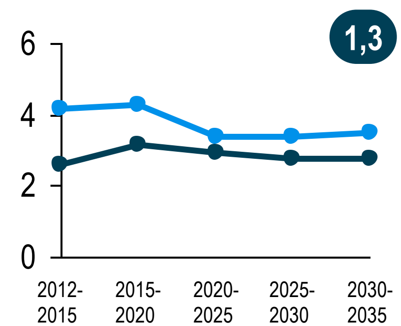
Inorganics



Paints and Coatings



Flavors and Fragrances



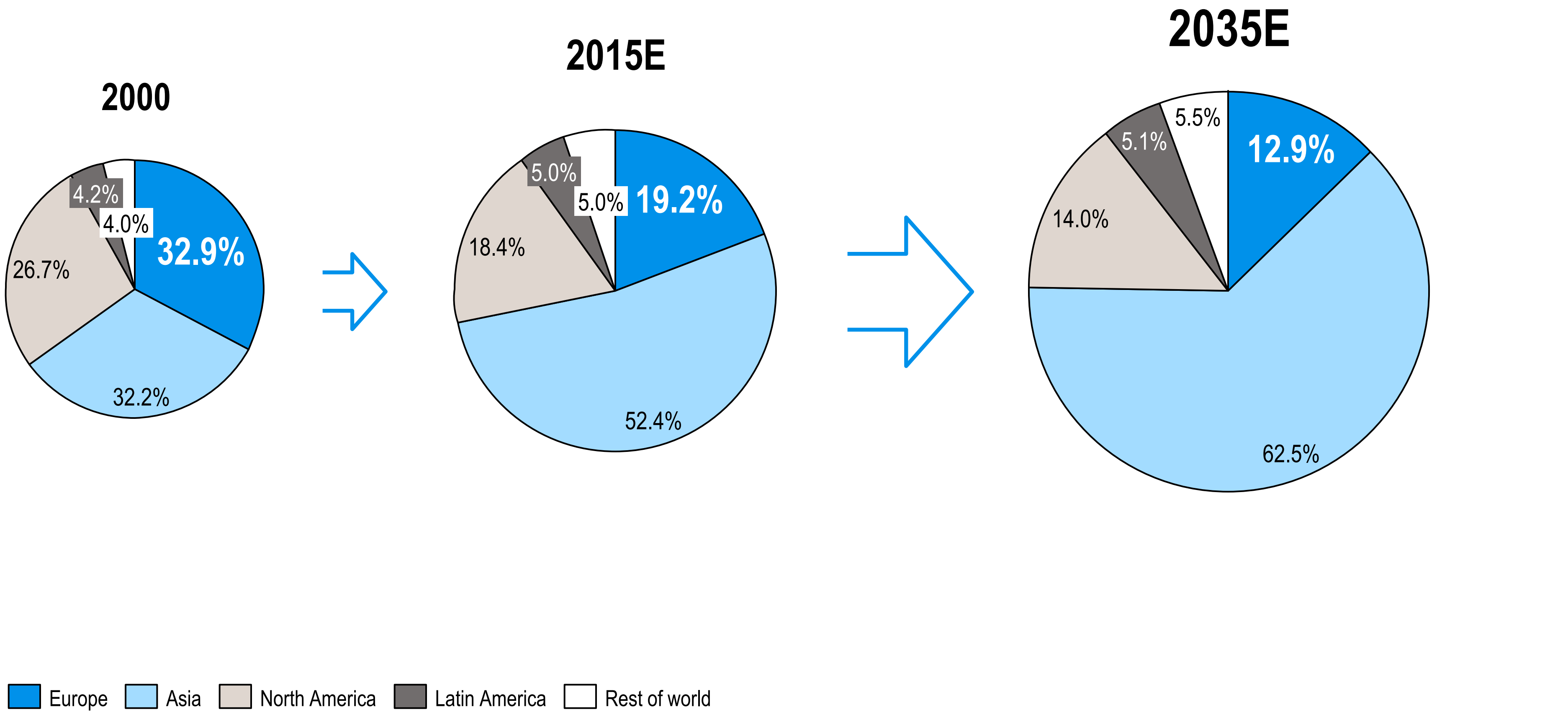
Chemical segment GDP - real xx CAGR '12-'35 / GDP '12-'35

1) Real GDP growth

Source: Roland Berger analysis

The European market view – Although its absolute size is still growing, the global importance is rapidly eroding

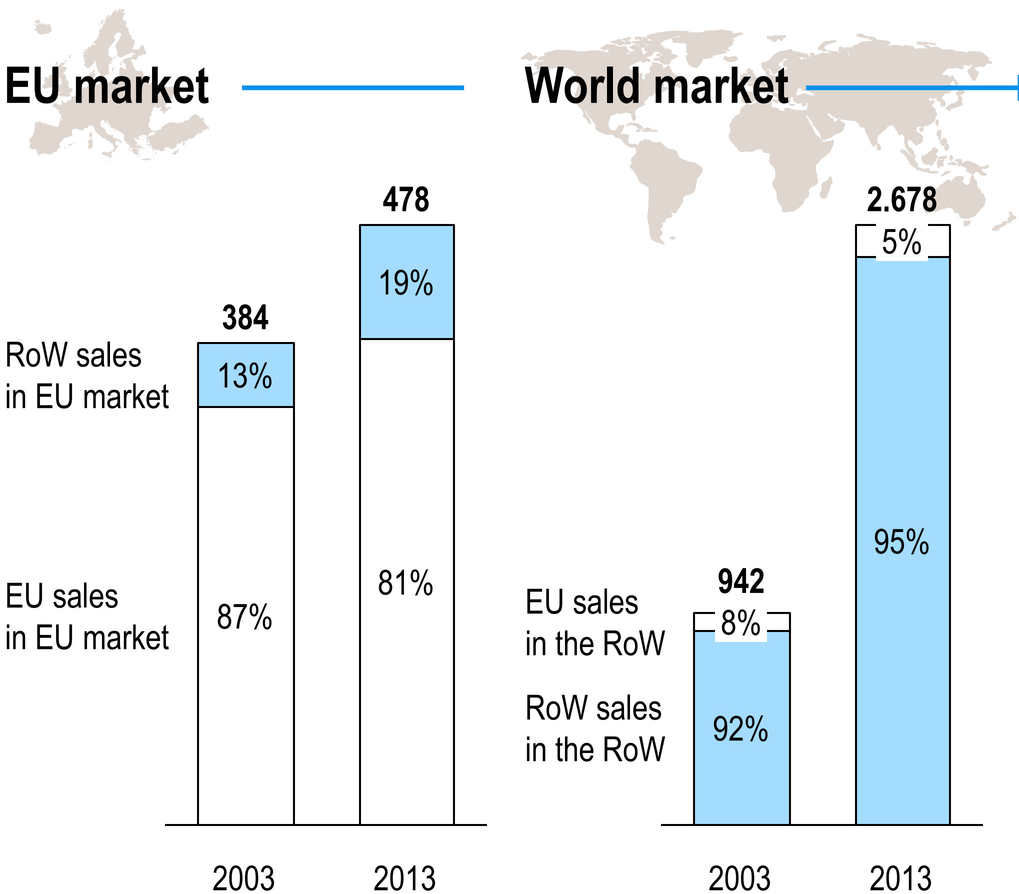
Market share Global sales [% share]



Source: Roland Berger analysis

The European chemical industry view – Still being the world's top exporter of chemicals, but clear downward trend

EU made chemicals share [EUR bn]



EU is losing competitive positioning putting high value at risk

- In 2013 the EU was the biggest exporter of chemicals worldwide with EUR 139 bn
- The EU chemicals trade surplus in 2012 reached nearly EUR 49 bn
- Total chemical imports are growing faster than total chemical exports, revealing deteriorating competitiveness of the overall EU chemical industry
- The trade position of certain sub-sectors show signs of serious deterioration, in particular raw materials and energy-intensive parts of the chemical industry
- Petrochemicals trade shows signs of serious decline when comparing the Trade Competitiveness Indicator of period 2008-2012 with 2003-2007

Source: Roland Berger analysis

What does this mean for Europe and its chemical industry?

Impact of EU losing market share in global chemical sales

Risk of **decreasing innovation capabilities in Europe**, losing educated, professional and challenging customers

Relocation of **production to foreign players** with different standards – In terms of

> Production safety & efficiency

> Environmental standards

> Labor law and others

Shift of asset base of European players with increasing **investments** (in production capacity) **outside of Europe**

Decline of the **export business** "out of Europe" endangering local production and employment

Source: Roland Berger

Roland Berger

Overall, Europe's chemical industry decline is the result of a number of structural drivers

Key drivers impacting the European chemical industry and the strategic agenda

Feedstock

Feedstock disadvantage

> Middle East moves forward to capture more value
> US shale gas undermines Europe's feedstock and energy position
> Biobased not ready for large scale take-off

Chemical production

Professionalization of chemical industry in growth markets

> Consolidation of fragmented industry
> Know-how build up through overseas M&A
> Professional production structures, e.g. chemical parks

Application manufacturing

EU manufacturing stays behind

> Local demand from EU manufacturing industry is lagging behind
> Specific sectors moved out of Europe e.g. textile and electronics

End use

Demand shift

> Demand change of end-users requires new products and business models

Source: Roland Berger

Roland Berger

China sees positive environmental impact via professionalization of the chemical industry & slowly increasing environmental awareness

Development and structure of chemical industry in China

Potential development of China chemical market

2005 – Driven by **excessive demand**, the Chinese chemical industry **increases** efforts towards further **downstream integration**

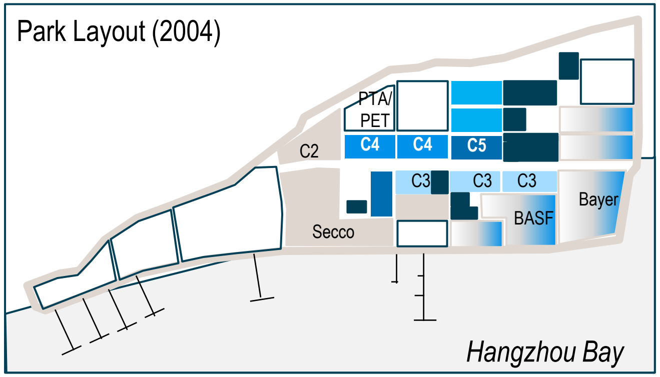
2020 – Significantly increased demand, backed by **population growth,** decreases Asia's self sufficiency and raises the **need to import** the needed goods

2035 – **Decelerating population demand growth** rates generate **margin pressures** as main demand driver fades out

Environmental awareness in China (indicative)

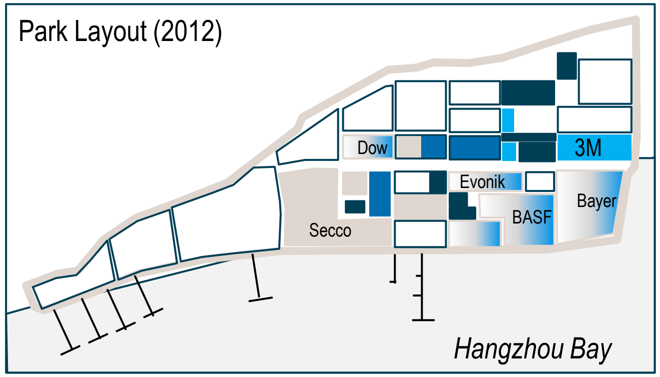
The government setting overall directions

Park Layout (2004)



Chemical companies deciding on portfolios

Park Layout (2012)



> Industry structure is highly fragmented with numerous small and only a few large companies (app. 30,000 companies in total)

> China is expected to undergo consolidation. Companies will
  – Invest more
  – Export more
  – Intensify competition

> China's chemical industry is also heavily impacted by the country's 5 year plans

> Slowly increasing environ-mental awareness, driven by existing problems, e.g., air and soil pollution, is conceivable in recent plans – It is expected that this development will gain further momentum

> Overall, competition in domestic and export markets will intensify – New, so far unknown competitors, will arise from consolidation

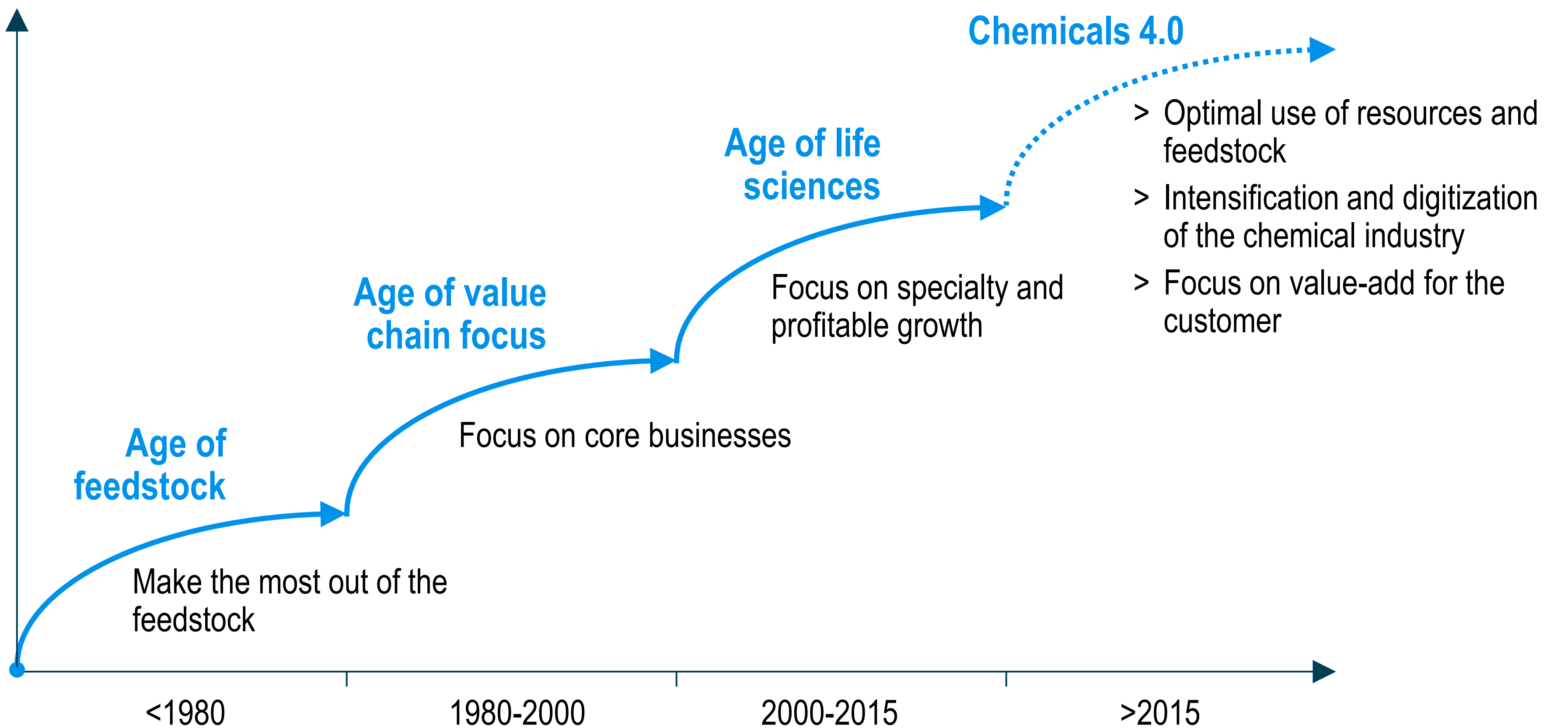
Ethylene derivative | Propylene derivatives | C4 | Aromatics | Integrated | Fine chemicals | Pubic facility | High | Low

Source: Roland Berger

Roland Berger

What to do - "Age of application" can contribute to European growth and further improved sustainability cradle-to-cradle

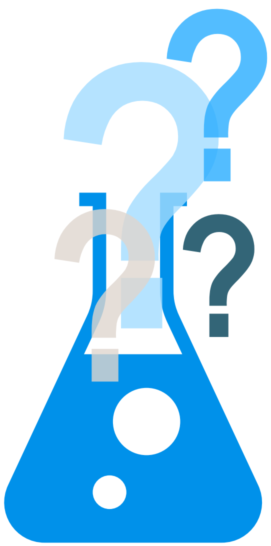
Long term view on chemical industry transformation



Source: Roland Berger

Sustainability and regulation – What is the future way for the German and European chemical industry?

Long-term view on chemical industry transformation



- Current **regulation** is the **undisputed framework of doing chemicals business** in Europe
- Despite all developments shown before, **Europe** and **Germany** are **not only heritage**, but also a **strong asset** for the industry where **every player**, including Chemical majors and mid-sized companies, **wants to be present**
- **Sustainability** and **environmental protection** is in the **DNA** of the industry
- **Changing the perspective** – Chemical industry becoming an active driver of sustainability by:
  - To what extent is it possible to change **from a "regulating scheme" to a "incentive scheme"**
  - How can **the industry actively position itself** amongst all stakeholders as a real **cornerstone of sustainability**, way beyond the impact of its own production

Source: Roland Berger

Roland
Berger