



TEES VALLEY
COMBINED
AUTHORITY

TEES VALLEY MAYOR

PROCESS, CHEMICALS AND ENERGY

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1. Foreword

Introduction by Paul Booth

Tees Valley Sector Champion and LEP Chair

- 1.1 The process, chemicals and energy (PCE) sector put Tees Valley on the map and those engaged in the sector across the globe have either trained here or traded with companies based in the region – it continues to be our principal globally competitive sector.
- 1.2 Tees Valley is home to the largest single cluster of PCE companies in the UK, the second largest in Europe, and also produces 50% of the country's hydrogen, however staying at first place is an ongoing challenge. This means ensuring that the right business fundamentals are in place: both affordable feedstocks and a skilled labour force, but also that industry is future-proofed. This can only be achieved by ensuring that innovation is being embraced, particularly making sure we have access to new and emerging feedstocks and materials, and that local businesses can continue to grow by undertaking more and varied export activity and diversifying into new supply chains.
- 1.3 Industry 4.0 will have a significant impact on the sector, providing more and better integrated data, which can be used to encourage local sourcing of materials and go some way to repairing fractured supply chains.
- 1.4 However the region faces a clear challenge, its traditional economic base has tended to be those industries that are more intensive emitters of greenhouse gases and specifically CO₂. This doesn't have to be a constraint to growth, but through circular economy solutions may be a source of affordable yet sustainable energy supplies.
- 1.5 I have a four point plan which I know will ensure Tees Valley's continued competitiveness:
 - Utilise existing locally sourced feedstocks to reduce the need for expensive imports. **Circular economy** solutions (such as hydrogen, lithium batteries and district heating) must be tested, and for that we will need to fund **test-bed/ demonstration facilities**;
 - We need to enhance our existing business base: foreign owned and those middle sized family run companies. Both do too little research and development locally and by **encouraging them to test** new materials and processes here, in particular **industrial digitisation applications**, will anchor existing activity and generate new inward investment;
 - We need to address the replacement jobs gap in the sector. Many of our most experienced people are coming up to retirement and there is not an immediate locally sourced pipeline of talent to replace them. **In-work training must be supported and a pipeline of talent developed**; and
 - We need to actively promote the Tees Valley as part of a wider Northern Powerhouse business proposition, we have a lot to offer, but in conjunction with Humber and Liverpool, we can be world beaters again: **attracting more inward investment and in the short run, sourcing more materials locally and building strong supply chains**.

'Tees Valley is globally competitive in the chemicals sector and with the correct investment, can continue to be the UK hub'

2. Introduction

- 2.1** The following report provides a high level summary of the scope and scale of opportunity for the process, chemicals and energy (PCE) sector in Tees Valley, as well as a preliminary list of indicative activities.
- 2.2** This report is based on the following consultation exercise:
- Survey: December 2016: 550 businesses (across all sectors engaged);
 - Consultative interviews with sector champions and businesses; and
 - 2 Focus Group sessions, with businesses and stakeholders.
- 2.3** The choice and definition of sector for this report emerges from the findings of the Refreshed Tees Valley Strategic Economic Plan (SEP): The Industrial Strategy for the Tees Valley 2016-2026, which identified the PCE sector as a key priority.
- 2.4** The PCE Sector Action Plan in common with the other six priority sector action plans¹ will be updated annually through consultation with our key local partners.

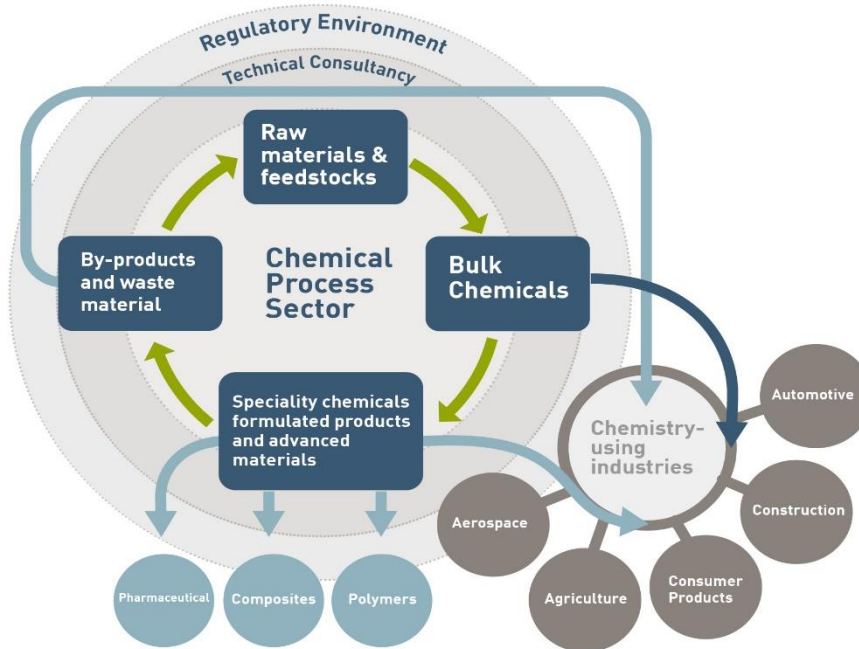
Sector Definition

- 2.5** The PCE sector has been defined by Tees Valley Combined Authority (the Combined Authority) as the aggregation of a number of sub-sectors across manufacturing and utilities. This local definition does not align perfectly with the UK definition and is an amalgam of multiple industry sectors. However, the refreshed SEP identifies the PCE sector as being particularly important, defining the make-up of the Tees Valley economy and its industrial heritage. Driven by the presence of unique assets and natural resources, the sector is of prime importance to Tees Valley and the wider national economy.
- 2.6** Within the PCE sector, the refreshed SEP pinpoints a number of important sub-sectors, namely:
- Petrochemicals;
 - Polymers;
 - Materials: Primary production and secondary processing;
 - Energy, including nuclear; and
 - Pharmaceuticals and Biotechnology.

¹ Advanced manufacturing, logistics, health and biologics, digital, culture, leisure and creative and business and professional services.

2.7 The chart below illustrates the relationship between the PCE and the wider economy:

Figure 2.1: Sectoral Definition



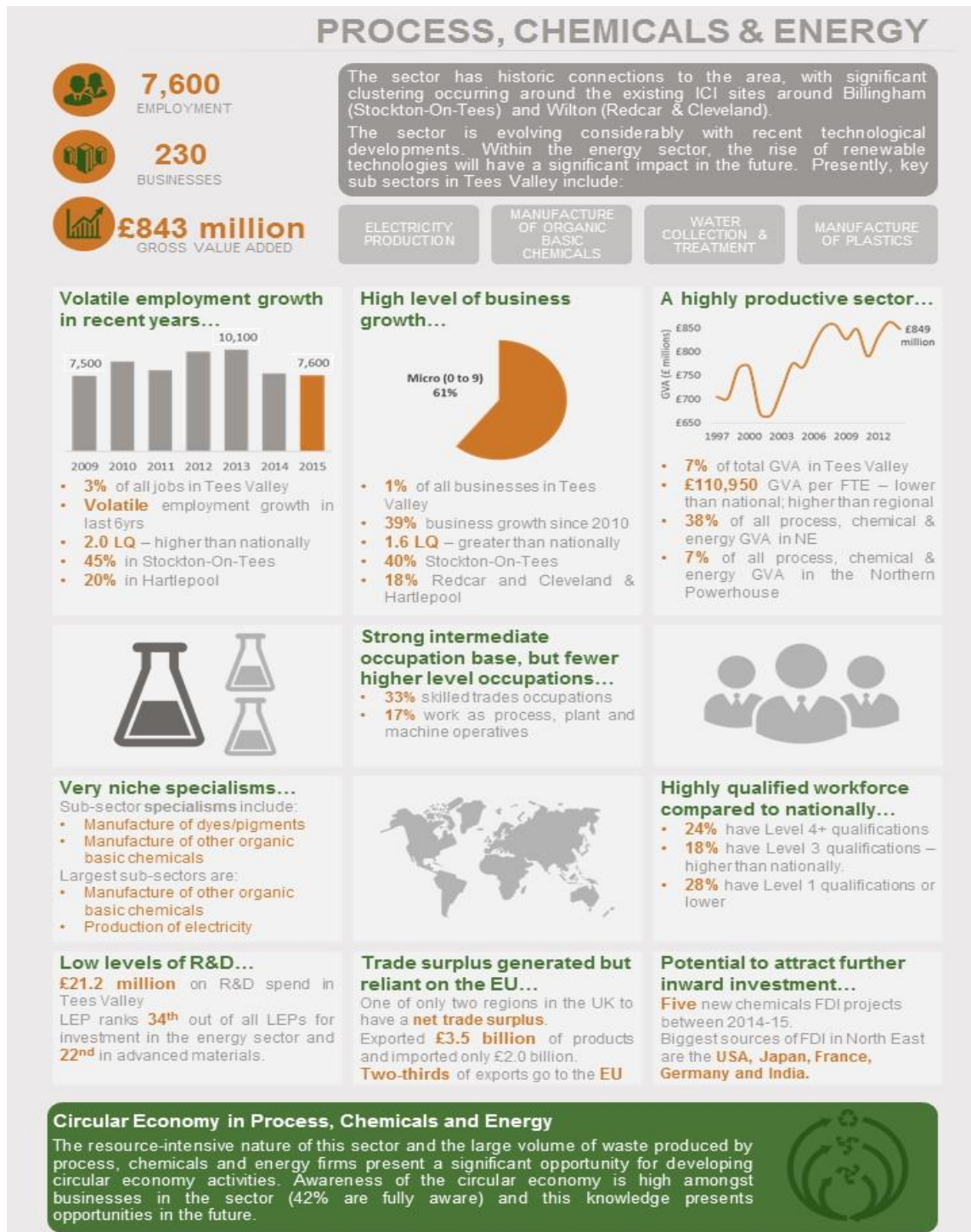
Source: Northern Powerhouse Science and Innovation Audit (2018)

- 2.8** The UK process and chemistry reliant industries can be split into two categories: the 'upstream' consisting of chemical producing industries and 'downstream' chemical using industries. The chemicals, process and energy sector is an enabling industry, helping provide technological solutions to many challenges faced by other parts of the economy – it underpins sustainability in downstream industries such as healthcare, electronics, automotive and textiles among others.
- 2.9** The PCE sector is one of the most productive sectors in Tees Valley accounting for around 7% of total GVA produced, despite only accounting for 3% of the total workforce. However, the true importance of the sector is only recognised when the downstream impacts are fully considered, i.e. chemicals and energy have supply chain implications for 90% of UK manufacturing. A more productive PCE sector has disproportionate benefits to the wider UK economy.
- 2.10** The SEP has a target of creating an additional 2,000 process, chemicals and energy jobs and increasing GVA per hour by 30%.
- 2.11** A detailed sectoral definition may be found in Appendix A.

Statistical Overview

2.12 Figure 2.2 provides a summary of information on the process, chemicals and energy sector. This has been developed by analysing secondary data, primary research (business survey, consultations and focus groups) and relevant literature:

Figure 2.2: Sector summary

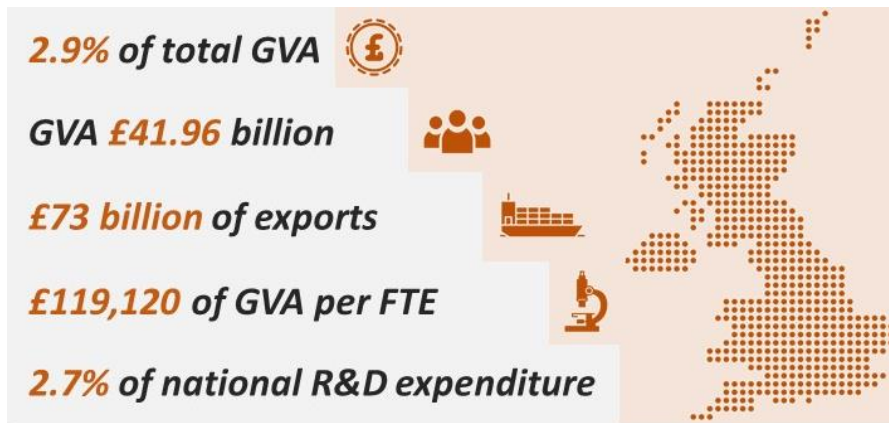


Source: Regeneris Consulting

3. How the sector compares

- 3.1 Across the UK, the process, chemicals and energy sector produced output valued at £42 billion accounting for 2.9% of total GVA produced:

Figure 3.1: Sector national positioning



Source: Regeneris

The sector is one of the most productive in Tees Valley...



- 3.2 The sector generates a high value add per employee. The Tees Valley area boasts a process, chemicals and energy GVA per FTE of £110,950, 12% higher than Northern Powerhouse productivity and nearly double the average GVA per FTE produced across all sectors in the Tees Valley area.
- 3.3 The process, chemicals and energy sector is one of the most productive sectors in Tees Valley, accounting for around 7% of total GVA produced, despite only accounting for 3% of the total workforce. Tees Valley accounts for around 38% of all process, chemicals and energy GVA produced in the North East region.

Table 3.1: Process Chemicals and energy sector, 2015

	Tees Valley Combined Authority	North East	Northern Powerhouse	England
Process, Chemicals and Energy GVA	£843 million	£2.23 billion	£11.91 billion	£41.96 billion
Process, Chemicals and Energy GVA (% of total GVA)	6.8%	4.7%	3.9%	2.9%
Process, Chemicals and Energy GVA per FTE	£110,950	£109,210	£97,480	£119,120
All sector (average) GVA per FTE	£56,960	£55,540	£56,540	£67,280

Source: ONS, 2015

Note: GVA information only available at a broad sector.

Results from the Tees Valley Business Survey show that process, chemicals and energy firms had the worst performance out of all sectors of the economy over the last 12 months, with only a third reporting an improvement in the firm's performance, a third reporting no change in performance, and a third saying the firm's performance had declined. This is largely as a result of the falling pound and the increased costs related to the importation of raw materials.

However, **growth appetite in the sector is strong**. Based on our survey and business engagement exercise, the local Chemicals, Process and Energy sector seems equally optimistic. Of the 58 businesses that answered the growth questions, **88% expected turnover to grow, 67% expected employment to grow and 66% expected productivity to increase**.

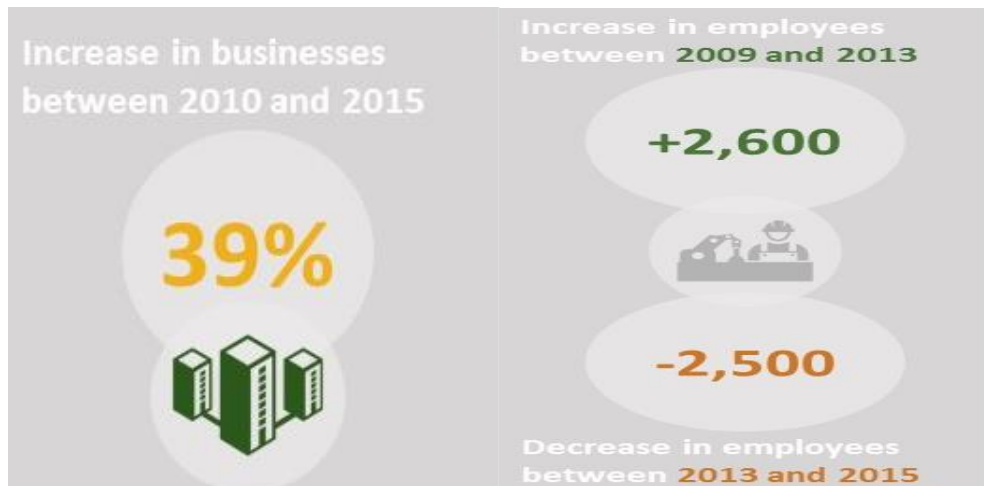
- 3.4** This strong growth appetite is further compounded by national level ambitions, mooted by the Chemical Growth Partnership (CPG); a sector partnership which is designed to enable Government and industry to work together to address the key challenges and opportunities for the chemical sector. The Partnership comprises business leaders from the chemical sector, and has agreed a sector strategy with Government. The vision is that:

Chemical Growth Strategy Vision:

“By 2030, the UK chemical industry will have further reinforced its position as the country's leading manufacturing exporter and enabled the chemistry-using industries to increase their Gross Value Added contribution to the UK economy by 50% from £196billion to £300 billion.”

- 3.5** The strategy also sets out future scenarios for growth. These envisage minimum annual growth of 1.8% until 2030, with more optimistic scenarios raising annual growth to 3.6%. This means that the prospects for indigenous and new chemical manufacturing could be strong and sustained.

The number of businesses in the sector has grown strongly at the same time as volatile employment growth...



- 3.6** In 2015, around 7,600 people were employed in the PCE sector in the Tees Valley area. The sector has experienced very volatile employment performance over the last six years and this can be largely attributed to the opening and closure of large (foreign owned) plants. Averaged out over the last six years, there has been 2% net growth in the number of people employed in the sector. However, between 2009 and 2013, employment grew by 36% to a total of 10,100. Since 2013, employment in the sector has declined by 25%, with around 2,500 jobs lost. This follows a similar trend to the Northern Powerhouse, which experienced a 13% increase in employment between 2009 and 2013, followed by a 6% fall since 2013.

The Tees Valley Business Survey found that 57% of PCE firms had recruited new staff in the last 12 months, compared to 65% across all sectors.

- 3.7** In Tees Valley there has been strong business growth in the process, chemicals and energy sector over the last six years, with 39% more businesses in 2016 compared to 2010 (65 new businesses). This level of growth is comparable to that experienced nationally (+43% since 2010). Tees Valley has outperformed business growth levels in the Northern Powerhouse, with the number of businesses growing by 24%. The majority of business growth in Tees Valley has occurred since 2012, with the highest growth occurring between 2015 and 2016 (+17% business growth).

PCE businesses in Tees Valley are far more likely to export their products than other sectors of the economy, with 65% exporting compared to 34% across the whole economy (Tees Valley Business Survey). Of those businesses who export, 70% export to Asia and Oceania, 67% export to the European Union and 67% export to the Middle East and North Africa.

However evidence from the Tees Valley Business Survey suggests the primary barrier to growth was the accessibility of new markets or supply chains (38%), followed by access to finance (30%), skills availability (23%) and a lack of a business-friendly environment (19%).

- 3.8** The UK continues to be a significant player in the global chemicals market, however it is important to place the value of the sector relative to other worldwide markets. Table 3.2: summarises comparative sales of chemicals amongst the leading markets using data sourced from CEFIC Facts and Figures 2017 of the European Chemical Industry, CEFIC Landscape of the European Chemicals Industry (2018), and Worldometers.info world population estimates by country.

Table 3.2: Comparative sales of chemicals amongst the leading markets, 2017 data:

Country	Sales (Billion €)	Population (Million)	Sales per head of population (€)
China	1,331	1,415	941
US	476	326	1,460
Germany	185	82	2,256
Japan	140	127	1,102
South Korea	113	51	2,216
France	70	65	1,077
India	76	1,354	56
Taiwan	63	23	2,739
Spain	63	46	1370
UK	60	66	909
Netherlands	55	17	3235
Italy	52	59	881

- 3.9** The most significant growth has been in the emerging markets such as China, India and Brazil. The global market is expected to grow by a further 3% in the next 20 years as the Asian industry and industry in the Middle East continue to grow. By 2030, Asia is expected to account for almost two thirds of the global chemical industry market.
- 3.10** Demand for chemicals, particularly intermediate and finished goods continues to expand both in Britain and globally. However, what is in question is the UK's ability to

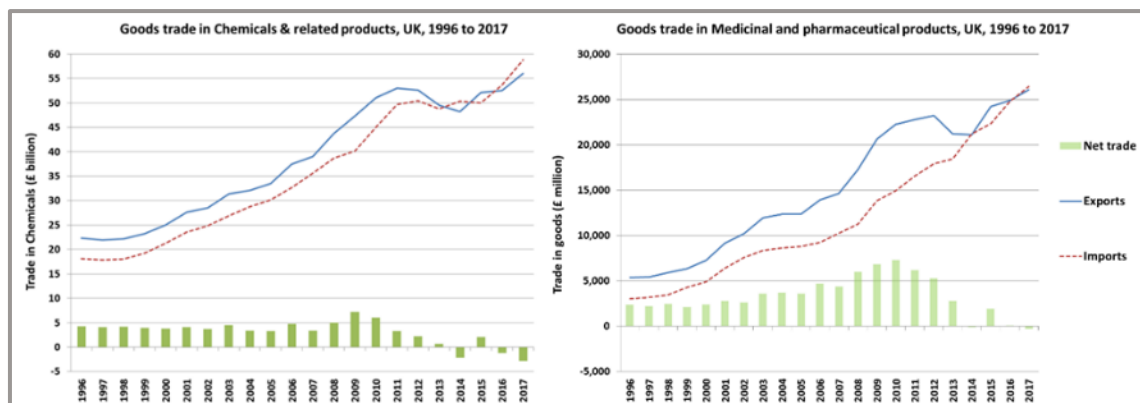
meet both indigenous and export demand, as increasing competition from both East (e.g. China) and West (e.g. USA) is driving down revenues and making it harder for UK-based firms to compete in the global marketplace.

3.11 The chemicals industry within the Northern Powerhouse (including Tees Valley) has traditionally had a very strong export orientation. Trade, both in terms of imports and exports of chemicals has more than doubled in the last twenty years, which is in line with the overall economy, however the significance of the chemicals sector to Britain's overall trade figures continues to increase, but at a declining rate, in particular:

- Chemicals exports have risen from circa £23bn in 1996 to £56bn in 2016 with a more significant rise in imports from a baseline of circa £18bn in 1996 to £58bn in 2016 (Overall exports have risen from £167bn in 1996 to £306bn with imports rising from £180bn to £462bn in 2016); and
- In proportionate terms, the importance of the chemical sector has increased from 14% to 18% for overall exports and 10% to 12% in terms of imports.

3.12 Figure 3.2 shows that 2013 was the first unfavourable imbalance in trade for the chemicals and related products sector. This fall mirrors that in the pharmaceutical products sub-sector which represent nearly 50% of export trade and can largely be attributed to a number of Astra Zeneca products going off patent in 2011/12. However, the increase in imports for the NPH is at a faster rate than growth in the sector as a whole, indicating that imports are substituting domestic production and in increasingly higher value-added elements such as medical & pharmaceutical products, i.e. 19 times the value in 2016 compared to 1996. This sub-sector accounted for £3.5bn (42%) of the total increase of the whole Chemicals sector.

Figure 3.2: Net Trade for the Chemicals and related products 1996-2017



3.13 The reduction in exports has been across the board including price sensitive sub sectors like manufacture of organic chemicals and fertilisers and nitrogen, but also in high value products such as pharmaceuticals.

3.14 In short, the Northern Powerhouse and Tees Valley in particular, is losing its competitiveness, access to supply chains and export orientation across the full range of products, at the same time as a proportionate decline in export activity across most chemical sub-sectors. This decline in export orientation may have a causal effect on the level of innovation activity undertaken.

- 3.15** As noted above, the sector is dominated by large overseas controlled companies and circa 500 middle tier companies across the entire Northern Powerhouse and approximately 80 in Tees Valley who largely compete on price in established supply chains. This has manifested itself in two ways:
- A useful proxy for business expenditure on research and development is tax credits. Of the total claims 20.5% were from the NPH region (business base of region is 23%), accounting for 11.4% of the total amount claimed and 9.6% of the total expenditure. These figures suggest the NPH region could be doing more to invest in R&D; and
 - Location information based on where R&D is actually performed rather than the location of the head office shows a disproportionately large amount being spent on R&D in the South East and East of England, with under-representation within the Northern Powerhouse.
- 3.16** There is a need to curb the loss of market share/reduced export orientation and this may be largely mitigated through investment in innovation. The development of and investment in the circular economy and resource efficiency represents a significant opportunity for the chemical and process sector to re-shore activity and build new product bases. The use, re-use and remanufacture of raw materials and products aligned with further resource efficiency has the potential to address many of the present sector asks. In addition, industrial digitisation and particularly mass machine learning has the potential to mitigate sectoral fragmentation and address the coordination market failure which usually impedes the roll out of circular economy solutions at the industrial level.

Average company size is larger than regional and national comparators...

- 3.17** On average, Tees Valley businesses in the PCE sector employ more people than other businesses. Only 61% of businesses employ fewer than 10 employees, compared to 88% across all sectors. Around a fifth of businesses employ between 10 and 49 employees (compared to 10% across all sectors) and 30 businesses (13% of the sector's business base) employ between 50 and 249 employees. Within the Tees Valley, five businesses employ over 250 employees in this sector, including:
- Huntsman International (Stockton on Tees);
 - Chemoxy International (Middlesbrough);
 - Lotte Chemical (Redcar);
 - J&B Recycling (Hartlepool); and
 - Fine Organics (Middlesbrough).
- 3.18** Ownership patterns in the sector are dominated by overseas based investors and multidivisional firms. These tend to be slightly larger than average, and they co-exist with a not insignificant number of smaller, more specialised private limited companies in the supply chain.
- 3.19** The process, chemicals and energy sector is highly specialised in the TVCA area. The area has double the concentration of employment in the sector compared to nationally (location quotient = 2.0), and a higher proportion than in the Northern Powerhouse (location quotient = 1.5).

Table 3.2 Employment and Businesses in the Process, Chemicals and Energy Sector

	Employment (2015)				Businesses (2016)	
	No.	Change 2010-15	LQ*	% of Tees Valley	No.	Change 2011-16
Darlington	700	-8%	0.9	9%	<50	0%
Hartlepool	1,500	+4%	3.5	20%	<50	+17%
Middlesbrough	700	-32%	0.8	9%	<50	+100%
Redcar & Cleveland	1,300	-42%	2.2	17%	<50	+33%
Stockton on Tees	3,400	-2%	2.8	45%	100	+50%
Tees Valley	7,600	-15%	1.0	100%	250	+48%

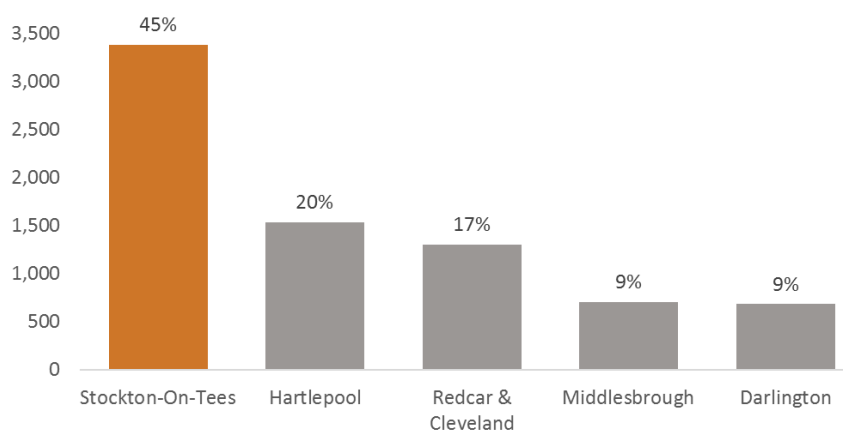
Source: BRES (2015), UK Business Count (2016)

Note: * - LQ (Location Quotient) shows how concentrated activity in the sector is in an area compared to nationally. A location quotient above 1 shows that activity is more specialised in an area than nationally.

- 3.20** The district with the most employees in the process, chemicals and energy sector is Stockton-On-Tees (3,400 employees), accounting for 45% of employment in Tees Valley. There are also smaller concentrations of activity in Hartlepool (1,500 employees) and Redcar & Cleveland (1,300 employees).
- 3.21** The number of employees has fallen across Tees Valley by 15% since 2010, with the highest falls experienced in Redcar & Cleveland and Middlesbrough. By comparison, the business base has grown strongly over the last five years (+48%), although this is from a relatively small base.

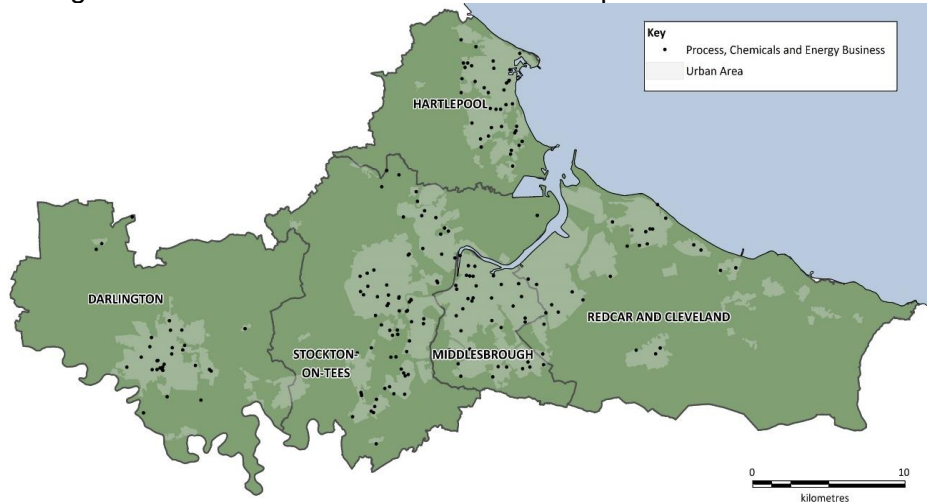
Figure 3.3: Number of process, chemicals and energy employees by TVCA district

Source: ONS, 2016



Source: ONS, 2016

3.22 The figure below illustrates the location of companies across the Tees Valley:

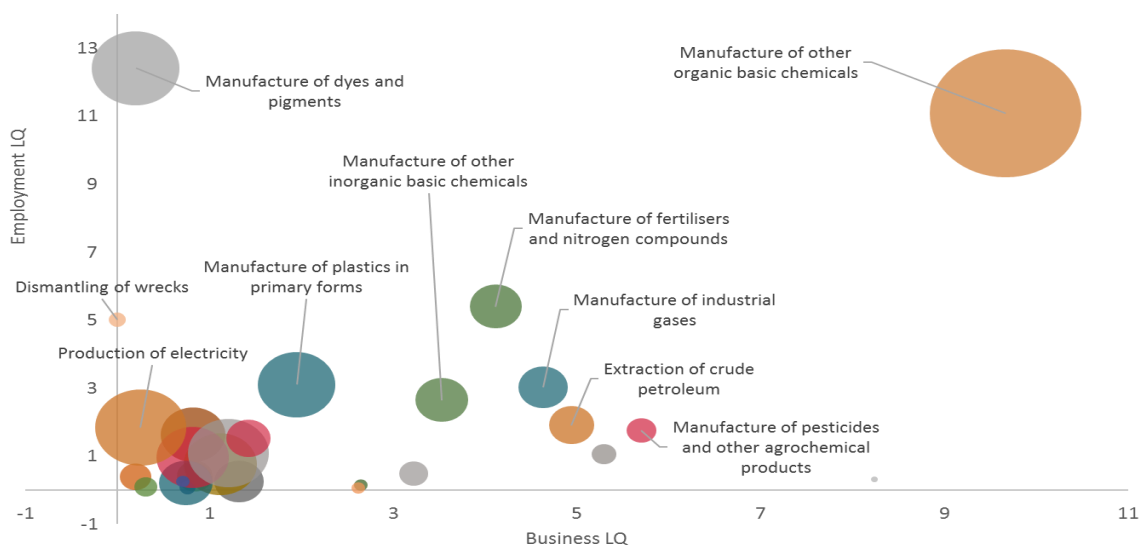


Source: FAME Database

Tees Valley has a number of highly specialised sub-sectors compared to England...

3.23 Location quotient reveals that TVCA has employment and business concentrations in a number of process, chemicals and energy sub-sectors. The chart below shows the location quotient for employment on the left axis and for businesses on the bottom axis for each sub-sector. The size of the bubble represents the level of employment within each sub-sector in the TVCA area. As each point moves above one, the more concentrated the sector is in employment and the number of businesses, relative to England.

Sub-Sectors' Business and Employment Concentrations of Activity



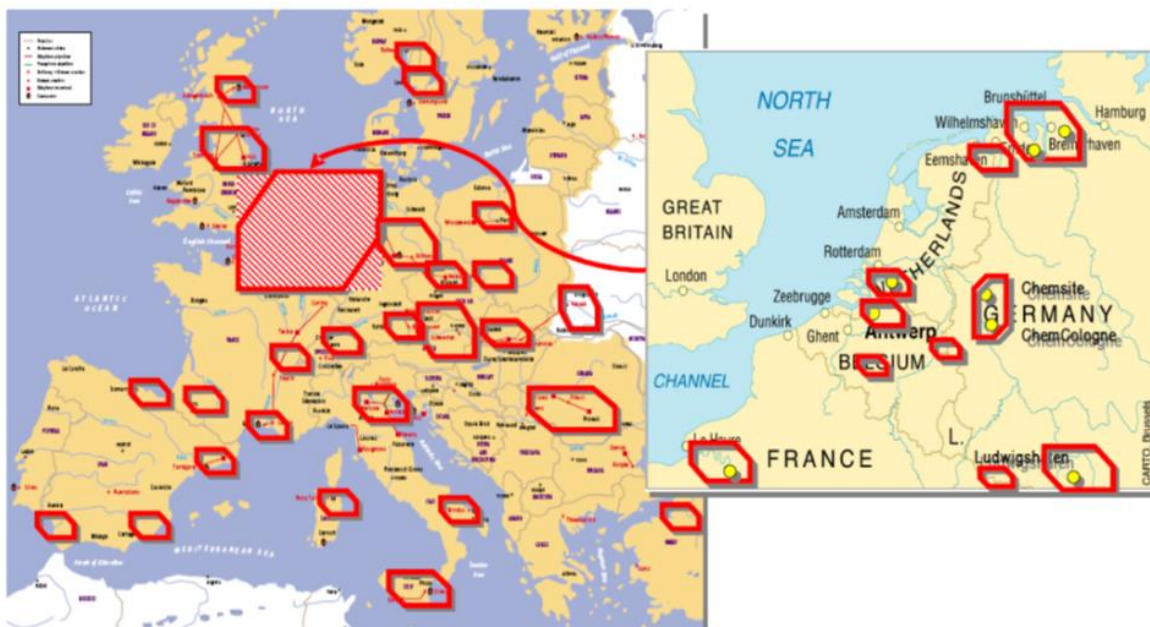
Source: ONS, 2016

Note: The size of the bubble is proportional to the amount of employment in the sub-sector. The location quotient compares the concentration of businesses and employment in the sub-sector in the TVCA area, relative to England.

International Benchmarks

- 3.24** Despite the rise of investment in China and the Far East, and their growth in basic chemicals and feedstock, the key hotspot comparators for the wider PCE sector are in the EU. Figure 3.4 gives an indication of the major sites:

Figure 3.4: European Chemicals Investment Hotspots



- 3.25** According to the European Chemistry Industry Council (CEFIC) and the European Chemical Site Promotion Platform (ECSP), successful chemicals and process clusters in the EU share the following characteristics:

- Investment environment: role and support of the authorities in providing incentives and support in the development of infrastructure or attracting investment
- Availability of land
- Raw material and feedstock supplies at competitive prices
- Energy and utilities at competitive prices
- Relative proximity and easy access to most important customers
- Availability of efficient services (logistics, finance, IT, packaging, security, marketing, promotion etc.
- Availability of labour (skilled and unskilled) at competitive prices
- Efficient logistics infrastructure
- Low-risk and stable business climate and stable regulatory environment
- Good schooling and educational facilities
- Co-siting & partnering opportunities

- 3.26** Some if not many of these factors are present in the Tees Valley, but the list does provide a useful scorecard to assess progress against major European comparators.
- 3.27** Table 3.4 shows the top chemicals clusters locations in Europe, pre-recession:

Table 3.4: Top 10 Chemicals Clusters in Europe

Cluster	Country
Rheinhessen-Pfalz (Mainz)	Germany
Lombardi (Milan)	Italy
Cataluna (Barcelona)	Spain
Dusseldorf	Germany
Vlams Gewest (Antwerp)	Netherlands
Rhone-Alpes (Lyon)	France
Istanbul	Turkey
Darmstadt (Frankfurt)	Germany
Koln	Germany
Zuid-Nederland (Maastricht)	Netherlands

Source: CEFIC/Regeneris Consulting

- 3.28** In general, these were a mixture of basic and petrochemicals based sites, together with more advanced R&D related clusters.
- 3.29** Post-recession, one of the most successful inward investment locations has been the Netherlands. The chemical industry in the Netherlands, is a priority sector of the Dutch government. The chemical industry has agreed on a long-term strategy aimed at increasing productivity, doubling both turnover as well as CO₂ reductions and reducing the environmental footprint. Their goal is to be known as the Green Chemistry Country and to be ranked among the top three producers of high-tech materials worldwide by 2050.
- 3.30** The Netherlands has been successful because it enjoys an excellent geographical location, with a strong transport infrastructure. The Netherlands not only operates Europe's largest inland shipping fleet, but has also built an extensive network of roads, railways, pipelines. The Netherlands is also home to one of Europe's best airports for cargo and passenger transportation (Schiphol), and Europe's largest and most important sea port (Rotterdam).
- 3.31** The competitiveness of the Dutch chemical industry lies in its internal and inter-company integration. Chemical companies purchase from - and supply to - one another. They work together on innovation and production, and take advantage of regional clustering. As a whole, the clusters are more competitive than the individual companies put together. Because of its integrated nature, the Netherlands now hosts 19 of the world's top 25 leading chemical companies, as well as a number of world class R&D institutes for fundamental and applied research.
- 3.32** Within the strong chemical and process community, the Dutch have formalized and structured the approach to co-operation. This is done with formal, long-term public-private partnerships (such as BE-Basic, the Institute for Sustainable Process Technology and the Dutch Polymer Institute) as well as through 'open innovation' in so called Centres for Open Chemical Innovation (COCI). The three COCIs are Chemelot, the Green Chemistry Campus and Plant One.

- 3.33** There are three sustainable areas in particular that excel in the Netherlands: 1) the Dutch industrial biotechnology cluster combines world-class knowledge on agri-food and chemistry with cross-disciplinary co-operation and innovation. Dutch excellence in high-performance materials (2) and fine chemistry (3) benefit from a strong foundation in basic and petrochemicals. In the area of advanced materials (polymers, composites, etcetera), the Netherlands consistently punches above its weight, producing world-renowned innovations in materials such as Twaron, Dyneema and Glare.
- 3.34** Innovation is essential for the Dutch chemical industry. This is demonstrated amongst other things by the investment the sector continues to make in research and development. The chemical industry in the Netherlands devotes approximately 2.5% of its revenues to in-house research and development, approximately € 1.4 billion per year.
- 3.35** Tees Valley must ensure that its emerging innovation ecosystem emulates the best practice identified in the Dutch model.

4 Asset Base and Ecosystem

4.1 The table below identifies the major innovation, learning and other assets within the TVCA area.

Asset	Sector-Specific Offer
Education and Skills	
Teesside University	Careers Hub
Apprenticeship Hub	Tees Valley Skills Event
Centres of Excellence	
Centre for Process Innovation (CPI)	The Welding Institute (TWI)
Technology Futures Institute (Teesside University)	Training and Education (C-STATE)
Digital Futures Institute (Teesside University)	Middlesbrough College STEM Centre of Excellence
Large Employers with R&D Activity	
Nifco UK	A Japanese-owned manufacturer of plastic fittings and dampeners to the automotive industry. It has recently opened a new £8.5m site in Stockton-On-Tees.
SABIC Petrochemicals	One of the world's largest makers of chemicals, fertilisers and plastics. They have recently invested in a new world-scale cracker at Wilton which will be able to crack US shale gas.
INEOS	INEOS is a global company whose nitriles technology is responsible for over 90% of the global production of acrylonitrile
Lotte Chemical	Is a global chemical company and one of Korea's largest corporations with annual sales in excess of \$45billion.
Ensus	Is one of the largest production plants for bioethanol in Europe and is a member of the Crop Energies Group, one of the leading European manufacturers of sustainably produced bioethanol for the fuel sector today.
BOC	A global company which is also the largest supplier of industrial gases and gas equipment in the UK.
Tees Alliance Group (TAG)	Recently opened a £20 million offshore wind manufacturing facility with specialist automated equipment for the manufacture of large diameter cans for offshore turbine foundations.
JDR Cables	Cable manufacturers for sub-sea and power cables.
Able UK	Developed new marine and terrestrial facilities at Middlesbrough Port, investing over £50m since 1996 into this extensive 126-acre facility.
Sites and Facilities	
New Energy & Technology Park, Stockton-On-Tees	Teesside Advanced Manufacturing Park (TAMP), Middlesbrough
Wilton International, Redcar & Cleveland	Five development plots, with a fully serviced chemical complex and has existing infrastructure including power, steam and water giving companies the opportunity to 'plug and play'.

Support and Business Networks	
Teesside Engineering Network	Tees Valley Apprenticeship Grant for Employers
Tees Valley Business Compass	Tees Valley Catalyst Fund
Tees Valley Enterprise Zone	SSI Taskforce Funding
Other Enabling Infrastructure	
Tees and Hartlepool ports (Teesport)	Passenger and freight connections going South to London and North to Glasgow and Edinburgh
Middlesbrough Port	A1(M) and A19 provide a link to the North and South while the A66 provides a link to the West.

Source: Regeneris Consulting,

5 Trends and Policy Context

- 5.1 In an ever-changing world, it is important that the UK does not lose its competitive edge. It therefore needs to build upon any continuing/emerging advantage in the global market in order to deliver further growth and business opportunities. The following PESTLE analysis identifies those key drivers of global change and how they will impact on the chemicals sector in the UK:

Table 5.1: Summary Pestle Analysis: Process, Chemicals and Energy Sector

Heading	Analysis
Political	<p>BREXIT: The implications of Brexit are still unclear, especially with the lack of certainty around possible trade deals and the likelihood of the UK remaining within the single market. The UK exported €19.3bn of chemicals to the rest of the EU in 2016, accounting for approximately 7% of total EU sales, and imported approximately €22.6bn of chemicals from the EU, accounting for around 4.5% of EU27 sales. Based on total EU sales figures, approximately 75% of all chemical imports to the UK arrive through the EU. Many chemical and chemistry-using industries face supply chains being disrupted and extra tariffs on imports and exports being imposed.</p> <p>The UK's established growth sectors (aerospace, agri-tech, automotive and life sciences) all rely on chemical process industries for raw materials, expertise and facilities. Industry therefore needs to build on the infrastructure which already exists within the UK by re-building UK supply chains in order to remain globally competitive.</p> <p>BREXIT will also have implications for companies that rely on the global mobility of employees and industries that want to bring people in from overseas.</p> <p>Finally, there is the potential loss of European collaborative research, as the UK may not be viewed as the partner of choice in post Horizon 2020 funding bids.</p> <p>Industrial Strategy Grand Challenges: The BEIS Industrial Strategy was launched in November 2017. This has significant linkages with the chemicals and process sector and presents huge opportunities in terms of addressing the four 'Grand Challenges', relating to artificial intelligence and data, ageing society, the future of mobility and clean growth.</p>
Economic	<p>Global growth: The total revenue of the global chemical industry in 2016 was £3.8 trillion. The global industry has grown over the last 30 years, mostly due to growth in Asia which now accounts for over half of all global chemical sales. The global market is expected to grow a further 3% in the next 20 years as the Asian industry and industry in the Middle East continue to grow. By 2030, Asia is expected to account for two thirds of the global chemical industry market. Chemical sales in the EU have grown over the last 30 years but their market share has declined due to dilution effects from expanding markets in other countries.</p> <p>The EU now has a 15.1% share in global chemical sales with the UK representing a 7% share in EU sales which therefore equates to a 1.1% share of the global market. In order for EU and UK markets to remain competitive on a global scale, they need to focus on innovative solutions to the current gaps in the chemical & process sector whilst maintaining their strength in the saturated markets they are traditionally strong in.</p> <p>Remaining globally competitive: Alongside Brexit there is increasing competition from global chemical process industries, especially from Asia and the Middle East. Increased productivity from these countries is driving prices down as supply begins to outstrip demand. To remain competitive against big industries in countries such as China, the UK needs to once again ensure its own supply chains are secure with a move towards internalising them. As with Brexit, it is also important for the UK to</p>

	<p>shift focus towards innovation and developing new technologies that address global issues and are unique to the UK, so marking the UK as globally important (and necessary) in the chemical process sector.</p> <p>BREXIT: Uncertainty over BREXIT is perceived to be affecting staff recruitment, in particular replacement for more senior positions in many overseas owned plants.</p>
Social	<p>Expanding global population and urbanisation: It is predicted that by 2030 the world population will reach 8.5 billion people, of these, 60% will be living in urban areas. There will be an estimated 2 billion cars on the roads by 2030 and the amount of global energy usage will have doubled by 2050 [20]. Chemistry will be an essential component in meeting the challenges associated with the extra demands on the planet, the chemical & process sector will therefore be key in helping the world to continue developing (such as developments in mobility) whilst preserving the limited natural resources available.</p> <p>Demographics: The UK currently has an ageing workforce, especially in sectors like bulk manufacturing, with a shortage of people coming through to fill the gaps. There is also a skills gap in general within the chemical and process sector due to fewer people specialising in STEM subjects than necessary to maintain the workforce. A problem more specific to the Northern Powerhouse is attracting people to work in the north. The skills gaps within the sector extend through the entire supply chain and are not specific to the defined sub-sectors. The skills gap increases the importance of attracting students to universities within the Northern Powerhouse to increase the chances of them remaining in the region post-graduation.</p>
Technological	<p>Digitisation: As industries become increasingly interconnected, networking and digitisation is becoming an essential component of all industrial processes and the chemical and process sector is not exempt from this. The development of the internet of things is forcing industries to maintain an online presence in order to remain competitive. As digitisation becomes increasingly and inevitably important, the importance of technical consultancies will become greater and their use by the chemical and process sector will expand. The importance of digitisation is also recognised as part of the artificial intelligence and data Grand Challenge.</p> <p>Onshoring / Reshoring: Reshoring is increasing in UK manufacturing, driven by shifting consumer preferences; a reduction of the wage gap with emerging economics; volatile international transport costs, and a desire by management to better control quality and supply chain risks.</p> <p>Maximising use of limited resources: Pressures created by limited natural resources and the drive towards a low carbon economy will require the securing of UK supply chains and local feed stocks, alongside new innovations to reduce reliance on fossil fuels and drive low-carbon technologies forward. A more circular economy to reduce waste will also be essential to this. [A Circular Economy is a deviation from the more traditional linear economy whereby products are made, used and then disposed of. In a circular economy, resources are kept in use for as long as possible and the maximum value is extracted from them.]</p>
Legal	<p>The EU has adopted several pieces of legislation on chemicals, which are primarily 'trade regulations' harmonising the conditions under which chemicals can be placed on the market. The aim of REACH is to protect human health and the environment. REACH shifts the responsibility from public authorities to industry with regards to assessing and managing the risks posed by chemicals and providing appropriate safety information for their users.</p> <p>REACH is constantly evolving, having been amended 38 times since it was enacted in 2006. REACH is enforced by the European Chemicals Agency (ECHA) and relatively little of its regulation has been transposed into UK law. For the UK to</p>

	continue to trade with the EU there may be a need to adopt REACH regulations, which may be increasingly expensive.
Environmental	<p>Climate change: The drive towards low-carbon technologies and a need to preserve the natural environment has created a need for new technologies to be developed in order to allow production methods to be altered in a way that allows them to be economically viable, whilst having as small an impact on the environment as possible.</p> <p>Maximising use of limited resources: A key problem with the move towards internalising supply chains and a circular economy is that all industries naturally want to look after their own interests. This means industries tend to pull in different directions, and any requirement to work together to form a circular economy will involve a shift in base-level thinking. Both issues of climate change and utilising limited resources are helped to be brought into even sharper focus for the sector by the clean growth Grand Challenge.</p>

6 Summary SWOT Analysis

Figure 6.1 High Level SWOT Analysis



7 Indicative Actions

Emerging Proposition

- 7.1** The PCE sector across Tees Valley is mature, both in the technology being used and also the sectoral age profile. There are few new business start-ups and a relatively low churn (i.e. few company closures). In addition, the sector has a high proportion of middle and large scale companies, with the former generally delivering goods to the latter for subsequent exporting.
- 7.2** Most middle tier companies are indigenously owned and generally compete in terms of price, whilst the large companies are mostly 'branch plants' of international concerns with overseas headquarter and research functions.
- 7.3** The sector has relatively few new business start-ups, this is largely attributable to the maturity of the technology (no immediate disruptor technologies) and high start-up costs (as the sector is capital intensive).
- 7.4** Unlike other sectors of a similar level of maturity, chemicals and process companies are becoming more fragmented at the same time as having a significantly higher proportion of (largely family owned) middle tier companies. Much of this fragmentation is the result of overseas buy out, designed to increase market control and secure supply chains.
- 7.5** There is a need to curb the loss of market share/reduced export orientation and this may be largely mitigated through investment in innovation. The development of and investment in the circular economy and resource efficiency represents a significant opportunity for the chemical and process sector to re-shore activity and build new product bases. The use, re-use and remanufacture of raw materials and products aligned with further resource efficiency has the potential to address many of the present sector asks. In addition, industrial digitisation and particularly mass machine learning has the potential to mitigate sectoral fragmentation and address the coordination market failure which usually impedes the roll out of circular economy solutions at the industrial level.
- 7.6** Unlike other sectors, it is our contention that even though ownership is becoming increasingly fragmented, technological advancement such as industrial digitisation and the circular economy may facilitate more integration. In addition, industry is becoming increasingly clustered in fewer but more globally competitive locations which have the essential prerequisites to compete. A survey of the sector conducted by NEPIC in 2018 prioritised the key components of regional and sectoral growth and identified mechanisms (based on international benchmarking conducted by Technopolis) for its further enhancement within the Tees Valley:

Key Attractor	Priority	Description of Best Practice and application to Tees Valley
Access / Cost of Feedstocks	1st	<p>The availability of inexpensive indigenously sourced gas in the Gulf Coast region of the US has been the key to its success as the gas is used as a feedstock in the production of various chemical commodities.</p> <p>The local sourcing of affordable resources, will not only permit import substitution, but will also be a prime motivator for the reshoring of further production methods. The price of feedstocks was judged to be the most important factor in support of inward investment.</p> <p>In conjunction with the use of indigenously sourced gas, the simplification of the American Tax system, through the Tax Cuts and Jobs Act 2018 has led to a significant increase in attraction of inward investment of chemical manufacturing activity. A potential consequence of the proposed tax reform, specifically lowering business taxes, is that the U.S. would be a more attractive place for foreign capital (investment money). In addition, the Gulf Coast has a long tradition of utilizing sector specific (chemical) approaches to free trade zones, such as:</p> <ul style="list-style-type: none"> • No customs duty on goods imported into the free trade zone and then re-exported; • Inverted tariffs are permitted meaning that goods produced in the zone benefitted from lower import taxes; and • Additional infrastructure and utility support. <p>There is the opportunity to utilise the reform of the tax system post Brexit to develop a sectoral Free Trade Zone (possibly using block chain solutions)</p>
Access to transport / location of main markets	2nd	<p>There is a need to replicate the Catalisti cluster model which was set up in Belgium to capitalise on access to transport, encourage more co-location at transport hubs, create supply chain solutions and address any constraints through the development of cross sectoral partnerships between small and large companies, research institutions and government organisations.</p>
Application of emergent technologies	3rd	<p>Digitisation of chemicals manufacturing is the cornerstone of the Industry Transformation Map for the energy and chemical sector in Singapore. It is anticipated that it will support productivity through automated measurement using advanced manufacturing sensor technology, sophisticated data analytics and visualisation will enable improved manufacturing efficiency while connectivity across the supply chain will streamline the sector as a whole. There will be implications too for the safety of people and assets, as well as cybersecurity.</p>
Skilled labour force	4th	<p>The Economic Development Board for Singapore have supported consultants, Accenture in mapping digital skills needed including data and trend analysis, automation management, cybersecurity, big data management, modelling and simulation and user interface design.</p>

Innovation Ecosystem	5th	The Chemelot Innovation campus model provides a creative ground for innovation and for new company formation. Key impacts include: Higher rates of business start-up; and Enhanced translational research, through the co-location of research facilities and provision of on-site knowledge transfer partnerships.
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Summary Action Plan - Chemicals, Process and Energy

The following action plan can be delivered by resources within the Tees Valley:

Nature of Opportunity/Need	Actions
Ensuring the continued critical mass of the sector by anchoring the process, chemicals and energy branch plant economy in the Tees Valley through the attraction and retention of further added value functions	<ul style="list-style-type: none"> • Creation of an inward investment prospectus and supporting infrastructural support (linked to industrial symbiosis) i.e. identified enterprise zones focused on PCE sector • Additional In-market (Export) Support/ Mayoral Trade Development Role;
Addressing the opportunity of enhanced servitisation by ensuring knowledge transfer	<ul style="list-style-type: none"> • Use digital technologies to ensure access to export markets and enhanced collaboration (and support the free-zone proposition) • Development of key sector networks to encourage knowledge transfer/collaboration;
Few business start ups/scalable companies	<ul style="list-style-type: none"> • Focused Strategic Account Management to develop scalable/mid-sized companies within the sector; • Use demonstration space (circular economy and industrial digitisation) to attract (out of region) university spin-outs to the region
Mitigating the high costs of doing business within the Tees Valley through reducing energy and raw material costs	<ul style="list-style-type: none"> • Work in conjunction with industry to identify and utilise indigenous energy feedstocks • Ensure the resilience of utilities infrastructure to meet identified need • Use the circular economy / indigenously sourced energy stocks to mitigate the high costs of doing business in Tees Valley,
Addressing the emerging skills replacement gap within the sector	<ul style="list-style-type: none"> • Programme of support to develop talent across Tees Valley. Development of an integrated training and skills programme, primarily focused on the coordinated delivery of apprenticeships: including, recruitment, training and placement across the region. • In addition, work with existing knowledge providers to impart specialist leadership and technical training driven by industry. This will in large part be driven by emerging technological absorptive incapacity in, for example the circular economy and industrial digitisation. • The integrated model would address the issue of emerging fragmentation across the sector and will therefore significantly benefit both business and individuals if cross-company apprenticeships could be supported.
Addressing funding constraints	<ul style="list-style-type: none"> • Creation of a patient capital programme and additional (sector specific) investor readiness programmes
Need to diversify supply chains and export markets	<ul style="list-style-type: none"> • Foreign Markets Programme- additional wraparound export support • Tees Valley/Mayoral Trade Ambassadors Programme
Ensuring that there is 'fit for purpose' business accommodation Need for enhanced broadband speed and coverage	<ul style="list-style-type: none"> • Updated Sites and premises study • Roll out of full fibre network and 5G Testbed approach

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There is a need for Tees Valley to engage with the wider Northern Powerhouse (N11 Group) to deliver the following strategic initiatives:

Proposed intervention	Actions:
Northern Powerhouse Chemicals and Process Sector Development Vehicle	<p>Augmenting existing sectoral representative bodies: the Development Vehicle will be tasked with delivering an enhanced business support function, including but not limited to: supply chain/export diversification and foreign direct investment.</p> <p>Specific actions:</p> <ul style="list-style-type: none"> • Tees Valley must be at the lead of any emerging Northern Powerhouse inward investment proposition with a real target on ensuring higher value adding functions (Research and development, legal and procurement) choose to relocate to the region; and • Tees Valley Mayor to take on mantle of trade ambassador for the sector in the wider region
<p>Resource efficiency:</p> <p>Develop new feedstock base for chemical industry</p>	<p>Consider the options that (existing and emerging) affordable feedstocks may give the North and Tees Valley in particular.</p> <p>This would require feasibility studies and a roadmap for industry development.</p> <p>Develop indigenous energy sources and wider circular economy proposition to mitigate feedstock concerns.</p> <p>Northern chemicals sites could provide a base for new industries and materials. This would require active engagement with the players developing these industries, as well as the development of a number of pilot/demonstrator projects</p> <p>Specific actions:</p> <ul style="list-style-type: none"> • Provision of nationally funded demonstration space/test-bed facilities for new technologies and materials such as: District Heating, Hydrogen, Lithium Fuel Cells and wider circular economy agenda. • Roll out of demonstration space will be in close proximity to existing: <ul style="list-style-type: none"> ○ innovation ecosystem; ○ enterprises areas; ○ mayoral development corporation
Unifying the innovation ecosystem	<p>Establish, an integrated science and technology innovation network (a 'knowledge-based growth hub) which would provide a one stop shop approach to research and development for both local companies and overseas based organisations.</p> <p>Specific actions:</p> <ul style="list-style-type: none"> • Tees Valley to support local innovation ecosystem to fully avail of emerging opportunities, in particular, encouraging the co-location of test facilities/business support functions within the region.

Appendix A: Sectoral Definition

Table A.1 Definition of the TVCA's process, chemicals and energy sector

SIC code	Description	SIC Code	Description
0610	Extraction of crude petroleum	3511	Production of electricity
0620	Extraction of natural gas	3512	Transmission of electricity
1910	Manufacture of coke oven products	3513	Distribution of electricity
1920	Manufacture of refined petroleum products	3514	Trade of electricity
2011	Manufacture of industrial gases	3521	Manufacture of gas
2012	Manufacture of dyes and pigments	3522	Distribution of gaseous fuels through mains
2013	Manufacture of other inorganic basic chemicals	3523	Trade of gas through mains
2014	Manufacture of other organic basic chemicals	3530	Steam and air conditioning supply
2015	Manufacture of fertilisers and nitrogen compounds	3600	Water collection, treatment and supply
2016	Manufacture of plastics in primary forms	3700	Sewerage
2017	Manufacture of synthetic rubber in primary forms	3811	Collection of non-hazardous waste
2020	Manufacture of pesticides and other agrochemical products	3812	Collection of hazardous waste
2030	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	3821	Treatment and disposal of non-hazardous waste
2041	Manufacture of soap and detergents, cleaning and polishing preparations	3822	Treatment and disposal of hazardous waste
2042	Manufacture of perfumes and toilet preparations	3831	Dismantling of wrecks
2051	Manufacture of explosives	3832	Recovery of sorted materials
2052	Manufacture of glues	3900	Remediation activities and other waste management services
2053	Manufacture of essential oils	4222	Construction of utility projects for electricity and telecommunications
2059	Manufacture of other chemical products n.e.c.		
2060	Manufacture of man-made fibres		

Source: Tees Valley Combined Authority



TEES VALLEY
COMBINED
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