

Chemical Sciences Scotland: Industrial Strategy Consultation.



This response to the UK Government Industrial Strategy Green Paper is submitted on behalf of Chemical Sciences Scotland (CSS), the Industry Leadership Group responsible for the sector. We strongly support the development of an industrial strategy and agree with the ten pillars identified.

CSS was established in 2007 to bring together the chemical sciences sector in Scotland to be a voice for the sector and to facilitate collaborations and partnerships between chemical companies, the research base and the broader public sector. CSS has been the catalyst for many new initiatives including the formation of the Industrial Biotechnology Innovation Centre (IBioIC) in Glasgow, which has helped put Scotland at the forefront of a global transformation, the joint Life and Chemical Sciences (LCS) Manufacturing Strategy ([Scottish Life and Chemical Sciences Manufacturing Strategy](#)) and the recently approved Grangemouth Vision, the partnership strategy for growing this important national asset.

Background:

Before responding in detail to the Green paper we would begin by asserting that the societal importance of the chemical industry cannot be overstated. At any given moment if we stop and look round at our immediate environment we will find ourselves surrounded by products and innovations of the chemical industry that we depend on to safeguard and enhance our quality of life. Put another way the products of the chemical industry keep us safe, keep us warm, keep us healthy, keep us fed and watered, keep us connected and keep us entertained.

Whilst the demand for material goods is constantly evolving it is not diminishing. The Chemical industry continues to innovate to meet these market expectations for example **between 1990 and 2010 the sector reduced energy input per unit of output by 35%**. The environmental benefit is not limited to energy savings, with an independent study by McKinsey ([Innovations-for-Greenhouse-Gas-Emission-Reductions-Executive-Summary.pdf](#)) indicating that the energy used in manufacturing chemical products is **saved more than twice over** during the lifetime of the products by virtue of improved product attributes (versus alternatives) such as being lighter weight, lower friction, more insulating and also by enabling improved productivity e.g. improving agricultural yields.

Economically the Chemical/Pharmaceutical sector is massively significant; the most recent figures from the Chemical Industries Association (CIA) indicate that the chemical and pharmaceutical industry adds **£14 billion** of value to the UK economy every year from a total annual turnover of around **£40 billion**. The sector employs around **160,000 people** directly and supports in total around half a million jobs. This means that this is also a **high productivity** sector having increased productivity by 10% between 2008 and 2014 and delivering a **value add per employee of around £100,000**.

The sector is the UK's **largest manufacturing exporter**; in Scotland it is second only to food and drink and the most recent ONS statistics showed that the Scottish sector maintained double digit export growth between 2014 and 2015, even before the recent weakening of the pound. This however also means the sector is acutely sensitive to the imposition of any tariffs and other barriers that will make exports less competitive and is exacerbated by the common need to import raw materials. The sector also depends on a stable, transparent and admired regulatory environment. All possible measures to limit the impact of BREXIT on these critical levers should be vigorously pursued.

The sector invests heavily in capital assets, the most recent figures give an annual figure of over **£4 billion**. This ensures that the UK is a leading global chemical and pharmaceutical producer and we would contend represents one of the nation's strengths referred to by the Secretary of State in his introduction to the Green Paper.

For these reasons we would have liked to have seen the sector feature more prominently in the Green Paper and would stress again that as well as being a cornerstone of the economy in its own right it is a key enabler of many of the laudable aspirations expressed in this document in terms of new products, processes, materials and devices and is a source of well paid jobs for the current and future workforce.

We are reassured by recent discussions with the **Chemistry Growth Partnership** (CGP) that the pivotal role of the sector is understood by Government and would emphasise our commitment to working with the CGP and other leadership groups to deliver a **coherent and ambitious sector deal** that will help address many of the undoubted challenges we face, and ensure that the sector flourishes.

Investing in science, research and innovation

We welcome the **increased investment in the science base**, and initiatives which bring together the science base and industry such as the EPSRC Centre for Innovative Manufacturing in Continuous Manufacturing and Crystallisation (CMAC). In addition to which we would also encourage the development of mechanisms for **increased business to business collaborative R&D** activity, believing this to be another critical lever for growth.

By way of evidence we would highlight that in the recent ONS figures (March 2017) national R&D intensity still lags behind that of other nations. The total R&D expenditure in the UK in 2015 (GERD) represented 1.68% of gross domestic product (GDP), and while this represented an increase of 0.02% from 2014, this was below the European Union (EU-28) provisional estimate of 2.03% of GDP, and placed the UK 11th of all member countries. As the Business R&D (BERD) component of this is around 60%, the target of increased GERD will require BERD to grow. We would contend that large scale growth in R&D intensity is hindered, at least in part, by the increased proportion of SME's who may lack the absorptive capacity to assimilate, explore and exploit new research.

Evidence from the UK Innovation survey published in 2016 [UK innovation study](#) also shows that many companies look to customers, suppliers and even competitors as a source of new ideas. Any structured intervention to bring Businesses together could catalyse enhanced R&D activity and ultimately yield economic impact. **Catapult Centres** and in Scotland the network of **Innovation Centres** can play an important role. We also watch with interest the impact of the newly constituted UKRI.

The lower than average R&D intensity is not specific to the Chemical/Pharmaceutical Sector, indeed the most recent figures show this sector to be very research active, with an investment of £5 billion, representing about 20% of the entire UK spend and almost equal in magnitude to the whole of the services sector (£5.6 billion).

Support for Commercialisation of ideas and companies of scale

In light of the need to **grow Companies of scale** we would also support activities to assist the move up through the Technology Readiness Levels and Manufacturing Readiness Levels and secure necessary funding for appropriate exploitation. Such developments in our sector are typically associated with high capital expenditure and, relatively, few jobs, making existing fiscal interventions difficult. Public support for **later stage research and development, scale-up facilities, demonstration plants** and first-of-kind flagship projects are crucial to de-risk private investment This could include, but not be limited to Grants, Loan Guarantees and tax incentives, .

Training and skills.

We would support the initiative to **enhance training and skills at all levels**. We would emphasise the need to ensure that any new qualifications are clear to both employers and those receiving the training. Within CSS we have an active Skills Investment Plan and as mentioned above have, in collaboration with the Life Sciences Sector a separate Life and Chemical Sciences (LCS) Manufacturing Strategy. Through these, our members clearly indicate the need for Continued Professional Development for their workforce and we would highlight the need to **develop leaders of the future** who can build and nurture the sustainable industrial base. The Leadership theme of the LCS Manufacturing Strategy is addressing industry needs by establishing and developing a cohort of future leaders. We would support the use of the apprenticeship levy for such legitimate workforce development purposes.

Infrastructure.

In manufacturing (including our sector) the transport of raw materials and finished and semi-finished goods is a critical component of competitive advantage and as such we would support the **upgrading of physical and digital infrastructure**.

Raw materials for manufacturing.

On the topic of **raw materials**, we would stress the critical importance of this issue to our industry. Whilst there are many and several potential energy sources (fossil, wind, wave, solar, nuclear), the materials on which society relies will be carbon based. Whilst the chemical industry is in the vanguard of circular economy concepts [Decarbonisation and Energy Efficiency Roadmaps.pdf](#) there will be a need for new material to enter the value chain. For a period of time this will be hydrocarbon (fossil) derived carbon and we would make note of the revolutionary impact **unconventional (shale) gas** has made on the chemical industry in the USA. Whilst recognising conflicting opinions in this area we had expected to see at least some consideration of this technology in a national Industrial Strategy and would seek some clarity on how this is envisaged.

Any future transition to **renewable feedstocks** will demand the sector to deliver fundamentally new technological solutions based on advances in chemistry, biotechnology and engineering. Similar demands will arise from the development of new materials and devices. We would therefore support the **establishment of structures** to develop and grow our national competence in underpinning areas such as **biotechnology, catalysis, process intensification and formulation** amongst others.

Energy requirements for manufacturing.

In common with every consumer the **energy** needed by the Chemicals sector must be affordable, reliable and environmentally responsible. Whilst we are clearly amongst the energy intensive industries the sector has made huge advances in reducing energy usage and will continue to do so. However for our sector we would contend that **energy and raw materials is a nexus** and goes beyond energy efficiency. This interconnectedness needs to be appreciated more widely, reflected in policy and used as a lever for growth. As such, policy should enable and indeed ensure that correct strategic decisions are made when determining the use of materials as sources of energy or raw materials. This is equally applicable to both fossil and renewable resources.

The chemical sector offers further dimensions to this debate. The potential exists to convert e.g. carbon dioxide arising from industrial activity into useful products, as described in published **decarbonisation strategies**, ([CO₂ Utilisation summary report](#)). Secondly the chemical industry can offer choices about the best way to valorise low carbon electricity (power), this can be used to displace conventional sources for e.g. domestic use or as an energy source in a manufacturing complex to generate even lower environmental impact products. This opportunity has an **element of place**; in

Scotland for example there have been times when the available supply of renewable energy exceeds domestic demand. This excess power could be transmitted elsewhere or used locally to split water to generate hydrogen, this in turn could be used either as a means of storing energy or as a chemical feedstock to combine with waste gases to generate new products. Such approaches present **scientific, technological and commercial challenges** and may be solved using new chemistry, biotechnology, engineering or most likely a combination of all three. This will require a **long term commitment** beyond the immediate investment horizons of much of industry but would be appropriate to a National Industrial Strategy. This would of course again also require a stable and positive legislative and regulatory environment. In this we again echo the initiative proposed by the CGP of the development of a wider decarbonisation programme.

We would also look to an Industrial Strategy to encourage the development of **cross-sectoral indigenous value/supply chains**, from raw material to finished products. In a hypothetical example this could entail the linkage of the rural economy as a provider of renewable feedstock, via logistics providers through primary conversion involving the chemical or biotechnology sector and then on via manufacturing of a (semi)finished product such as an advanced composite to an aerospace or automotive manufacturer. This is aligned with the proposed establishment of a National Composites Materials Centre advocated by CGP.

The development of such value chains has the **scope and ambition** appropriate to a National Strategy. Governments role in this could be to facilitate initial interactions and activities as well as the more obvious use of the substantial public procurement budget, including considering the US Government procurement programme to encourage adoption of renewable-based products ([US BioPreferred Programme](#)).

Manufacturing, Regional Sites and Inward Investment:

Within the LCS Manufacturing Strategy in Scotland we have industry-led working groups for priority themes addressing re-shoring i.e. developing durable supply chains. As above this will depend on affordable energy and raw materials.

Such value chains are more likely to be geographically anchored by a feedstock than by a product, but infrastructure, logistics and the presence of a skilled workforce will also play a role. Well-**developed manufacturing sites** exist, such as Grangemouth in Scotland, and their full exploitation is to be encouraged. They would also seem to be natural choices for the location of facilities for the demonstration/scale up of new processes and products. Ultimately the location of commercial exploitation could be dictated by feedstock or market but the development of **sectoral clusters** in locations has been demonstrated to be successful elsewhere (OECD <http://www.oecd.org/innovation/policyplatform/48137710.pdf>) . This can foster collaboration, build durable skills and expertise whilst offering career mobility and progression for individuals.

Many of these considerations (enabling Company growth by de-risking scale-up, efficient use of energy and renewable raw materials and development of the necessary new technologies) ,can be considered to converge on the concept of a Biorefinery; this is already part of the ambitious Industrial Biotechnology Strategy for Scotland [Scotland's IB strategy 2015-20125](#) and we support the proposed development of a biorefinery demonstrator advocated by the CGP

Such hubs can also act as a **magnet for FDI**, another critical cornerstone of any growth strategy. Within any sector the compelling value proposition that wins the investment will vary from Company to Company; some may value the Intellectual Property environment, others an established academic expertise, others a skilled workforce, others an emerging feedstock etc., etc. It is difficult if not impossible to develop a universal set of attributes that will appeal to all potential investors. We would

strongly support the development of a more **strategic approach to targeting inward investment**, including measuring success in terms of the impact of investment on growth and reviewing what can be learned from inward investment strategies of key competitors.

There may be an opportunity to use the **expertise of our Science base** as a more direct part of this process, but any such involvement would need to be recognised and benefit the career progression of individual academics alongside teaching and research metrics. It could be argued that this is more credible than relying on spin-offs from Universities the deliver meaningful economic growth.

The UK has an extensive diaspora that can be used. The Globalscot network in Scotland is one such example, where Scots in senior positions across the world are able to facilitate introductions to new partners and customers for Scottish companies and organisations, as well as promoting the strengths and benefits of a Scottish base.

In summary, we welcome the Industrial Strategy as set out in the Green Paper, agree with the broad pillars suggested, but would stress that a National Industrial Strategy has to also support, nurture and grow the best of the current industry base. We would contend that the broad Chemical sector is critical, offering current and future societal, economic and environmental benefits and underpinning new areas of potential growth such as advanced materials, healthcare, new devices and other transformative technologies.

We would also strongly encourage the consideration of the 10 pillars in a holistic way as opposed to isolated strands of the overall strategy. Strong, but connected regional and industrial sectors and engaged stakeholders across the public and private arenas will result in a stronger national economy.



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