



Summary

This briefing reviews the current contribution of steel manufacturing to the Welsh economy and considers how new technological opportunities around decarbonising steel production – with potential to service the transitioning economy - might affect this contribution and the pattern of environmental effects connected to the industry. We address a series of factors that might be considered by policymakers in connection with the future evolution of steelmaking in Wales, where around 8,000 (largely full-time) people are currently employed in the sector, with an additional 2,000 or so full-time equivalent jobs in related activities, such as metal casting. However, the issues discussed are relevant to other parts of the UK with important steel manufacturing sectors such as Teesside. We set these in terms of considering the current economic contribution of the industry's primary steel production with focus on Port Talbot, setting this contribution against the associated point source emissions. This enables consideration of the potential impacts and trade-offs in considering both the domestic impacts of industry change on jobs, incomes and regional unemployment challenges, and increased reliance on imported steel and its associated carbon emissions. We then consider potential options for, and implications of, decarbonising and/or change in the production profile of the Welsh industry, set in the context of potential market opportunities as economies move through the net zero transition.

1. Introduction

The steel sector in Wales has been a major employer and with activity in Wales dominated by Tata Steel operations. These are focused on the integrated steel mill at Port Talbot. The mill supports a number of ancillary Tata operations within the Welsh economy. Final markets for steel are extremely competitive. This is combined with the Port Talbot plant facing increasing regulatory pressure, and relatively higher costs than many of its competitor mills in Europe and globally. However, final markets for steel are also changing as economies move to decarbonise. There is increasing attention in terms of local material content and carbon footprints. This includes, for example, the UK Government commitment to increase reliance on offshore renewables in powering our homes brings new demand for steel for offshore energy construction purposes.

For many years the economic viability of the Port Talbot integrated mill has been in question, although activity at this site has been resilient, having survived a number of takeovers and waves of restructuring. Speculation has been rife about a potential Chinese firm takeover of Tata steel making operations in the UK. This emphasises the need to consider questions

around both the future of the UK steel industry and the nature of production and the markets it serves. One also needs to consider the longer term implications of overseas control of UK steelmaking, and challenges around how local steel content in UK supply chains can sustainably evolve in line with the UK Industrial Strategy, while carbon emissions are reduced.

The Port Talbot mill is the largest point producer of carbon emissions in Wales (and one of the largest producers of territorial CO₂ emissions in the UK). In charting the future for the heavy end of steel production in Wales, opportunities are beginning to appear to produce green steel, reducing the point source emissions connected to basic iron and steel production. This leads to important questions in terms of how different technology options available to primary (and secondary) steel production may affect how the steel sector contributes to the Welsh, and ultimately the wider UK, economy. This contribution is set generally in terms of factors such as employment and output, and specifically regarding the expected economic and environmental costs of maintaining current technology in steel production.

The focus of this briefing

Our briefing covers the following areas. In Section 2, we start by examining the scope, scale and significance of current Tata operations in Wales and the contribution of these single-firm dominated operations to the Welsh economy. We position this activity in the context of current point source or territorial carbon emissions. Section 2 then goes on to provide some indication of the scale of economic activity that could be at risk were operations to be reduced further as a result of market pressures or perhaps if the firms were unable to move forward

2. The current picture of Tata activity in Wales – what is at risk from industry change?

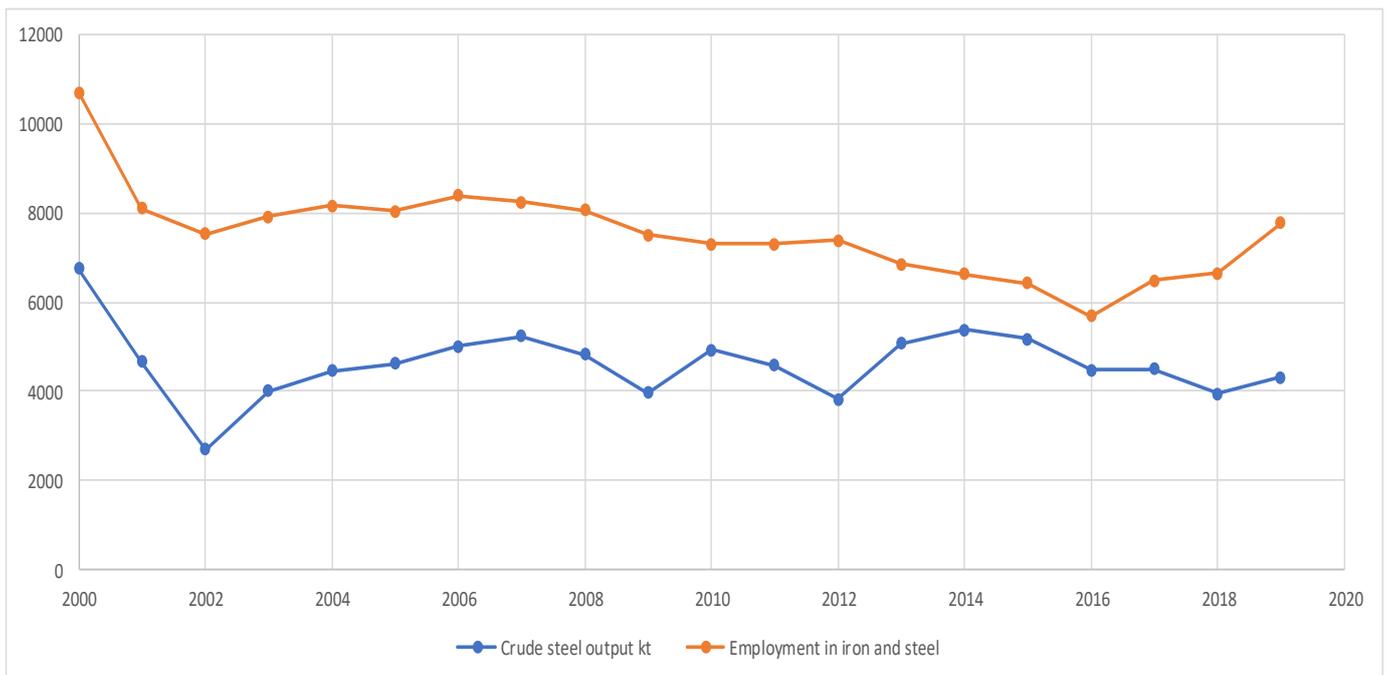
Tata dominates steel industry employment in Wales

The steel sector (defined here as iron and steel production Standard Industrial Classification 241) in Wales as a whole employed around 8,000 (largely full time) people in Wales in 2019, with an additional estimated 2,000 jobs in sectors such as metal casting, other products of first processing of steel, and manufacture of tubes and structures of steel (Figure 1). There are other steel making facilities in Wales including Liberty Steel at Newport, and Celsa in

with new technological solutions required to drive down territorial emissions. We highlight the fact that the latter may increase reliance on imported emissions. In Section 3 we describe the expected effects associated with future technological options in terms of the introduction of electric arc furnaces and the decarbonisation of primary steel production and seek to show the impacts of such changes on the amounts of economic activity that are supported by Tata in Wales. Section 4 concludes by summarising three key factors that policymakers in Wales and the UK need to be aware of in respect of the direction of the steel industry in Wales.

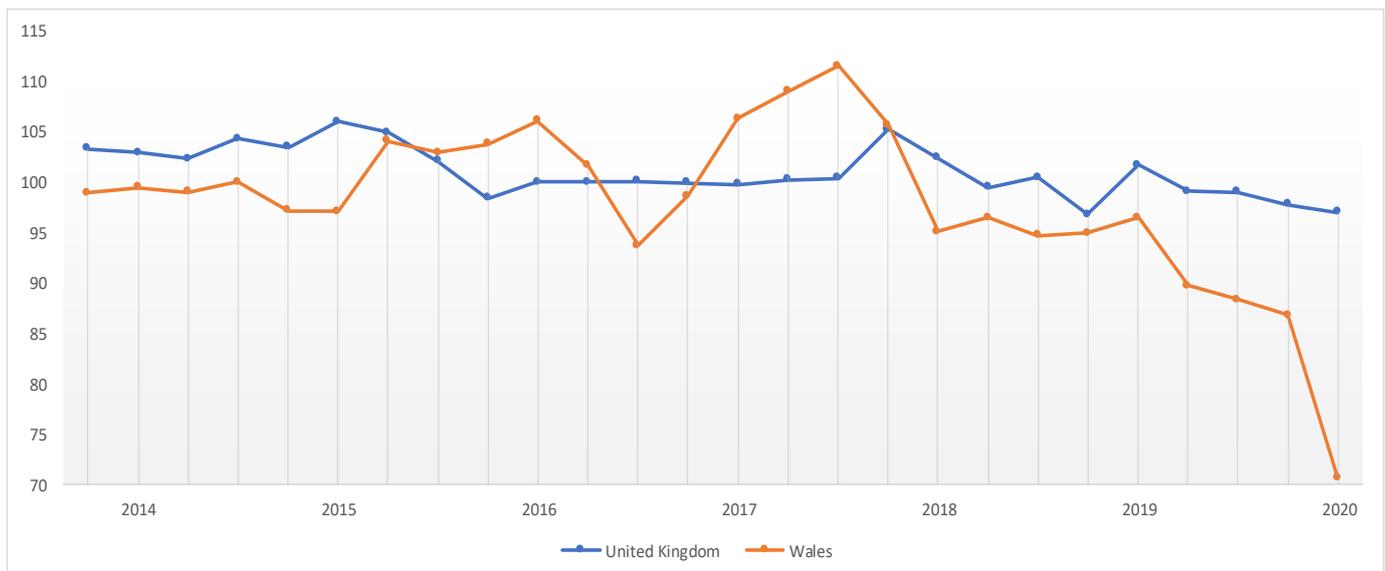
Cardiff, with those two combining to contribute around 1,000 direct jobs). However, Tata dominates employment and output in the sector. Crude steel output in Wales in 2019 was around 4.3m tonnes. Output in the sector has fallen sharply more recently, with Figure 2 revealing a sharp fall in the first quarter of 2020. In part, this reflects uncertainty around Brexit, but was also down to a sharp fall in demand resulting from Covid-19. Indeed in January 2020, Liberty Steel had announced some 72 job losses at its Newport plant as a result of tough conditions in the run up to Brexit, while in July 2020 Celsa at Cardiff was an early recipient of assistance for the UK Project Birch scheme to assist struggling large firms in the wake of Covid.¹

Figure 1: Employment and output trends in iron and steel production Wales



Source: [StatsWales](https://stats.wales.gov.uk/)

Figure 2: Index of Output trends in Wales and UK Iron and Steel Production



Source: [StatsWales](#) (noting that 2020 data are provisional)

Employment at the Tata plants in Wales has been relatively stable since 2,000 at between 6,000 and 8,000 and now is estimated to be around 7,000 people. The Port Talbot mill is estimated to employ around 4,100 producing slab, hot-rolled and cold-rolled steel. Ancillary and allied operations of Tata in Wales comprise: the Trostre (Llanelli) mill employing around 650, manufacturing tinplate and packaging steels; Llanwern (Newport) which employs around 1,300 rolling steel and galvanizing for the car industry; Orb (Newport) employing around 300 people making electrical steels; and Shotton employing around 700 producing galvanized and colour coated steels.

Why is Tata activity important to Wales?

A sustained decrease in Tata steel production (or closure) in Wales would have major consequences for the regional economy. Figure 3 summarises some key areas of the wider regional context around steel production. In this respect:

- The integrated mill supports significant direct employment in Neath Port Talbot (c. 3,500-4,000) area. These are some of the highest paid jobs in the immediate economy. Importantly a very high proportion of Tata employment in Wales is full time as opposed to part time.
- The iron and steel industry as a whole in Wales is relatively productive in comparison to other parts of regional manufacturing, and in relation to average labour productivity in the economy as a whole. In 2018, for example, gross value added per employee in

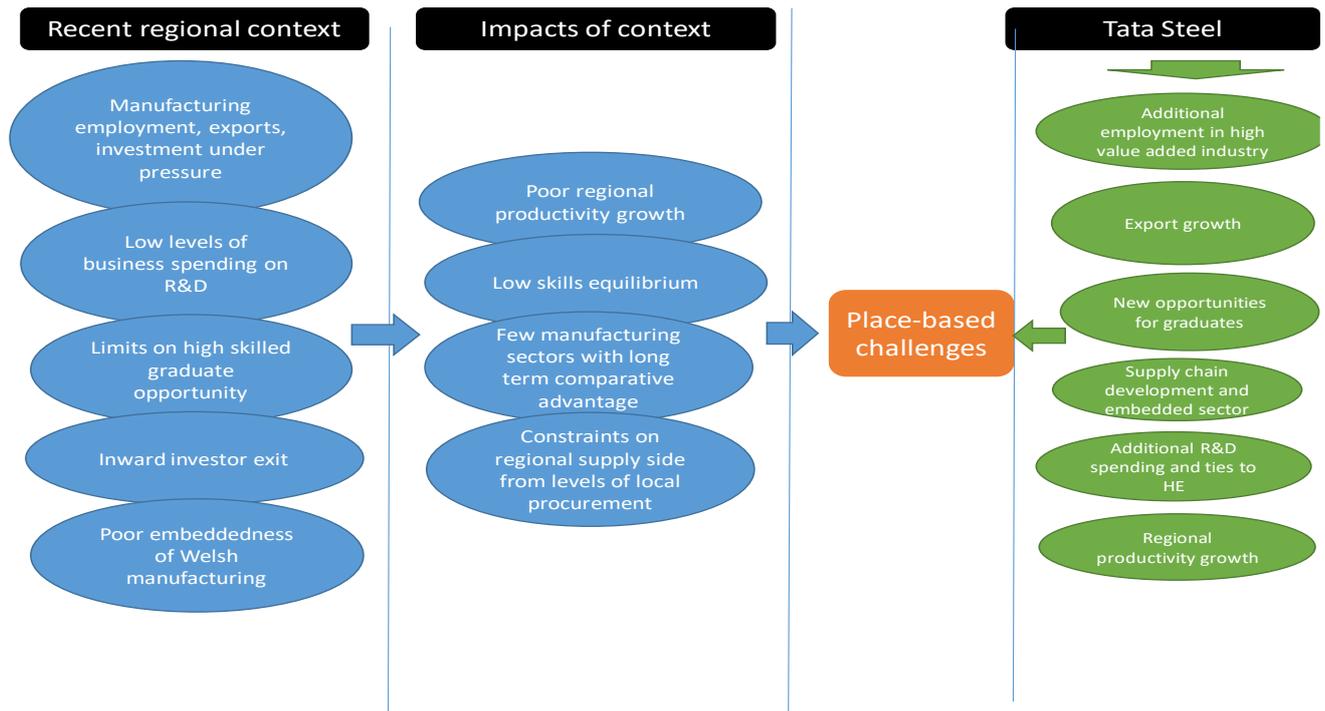
basic iron and steel production in Wales was around £104,000. Average earnings in the iron and steel sector tend to exceed the Welsh average of around £27,500. For example, average 2019-20 remuneration in firms such as Tata and Celsa in Wales is between £40,000 and £45,000.

- The steel industry in Wales is comparatively well embedded into the local economy in terms of supplier linkages. For example a study by Pinto & Jones (2013)² showed that Tata plants in Wales created about £1.3bn of Welsh GVA directly (3% of the Welsh total) and about £0.3bn indirectly. The analysis revealed that each full time job in the iron and steel production sector supported a further 1.8 jobs in other parts of Wales, and each £1m of iron and steel output supported a further £0.5m of output elsewhere in the regional economy. Clearly, some of the indirect activity supported induced links through to household effects and the spending of wage incomes.
- Tata contributes strongly to Welsh manufacturing employment. Currently many parts of Welsh manufacturing, particularly those that trade internationally - including electronics and automotive components - are under extreme pressure as a result of both Brexit uncertainty and Covid-19. In terms of trade, Tata supports directly and indirectly steel exports from Wales. Latest information for 2018 from the *Trade Survey for Wales*³ reveals that fabricated metal products as a whole made up close to £4bn of Welsh

exports, around one quarter of total exports. Tata operations make it an exporter in its own right, and this at a time when economic conditions facing some of the region's other large exporters are under real threat. But, critically, Tata also provides steel to industries in the rest of the UK that subsequently export to the EU and elsewhere.

- Tata, unlike many parts of Welsh manufacturing, supports a broad range of higher value added functions. It does not have the characteristics of the branch plants that are common in Wales, supporting 'production-only' operations. Tata also enjoys well developed research links with a series of Welsh higher education institutions.

Figure 3: Tata Steel – Regional Significance Factors



Tata Steel

But Port Talbot is Wales' largest point polluter

Set against the strong economic benefits provided by Tata Steel are significant externalities. Uppermost is the fact that the Port Talbot mill is the largest point polluter in Wales (probably UK); it produces about 6Mt CO₂ per annum. Compared to other parts of the UK, industrial production in Wales as a whole is intensive in carbon dioxide emissions, well in excess of CO₂ equivalent emissions per capita for England and Scotland: this speaks to specific types of pollution intensive manufacturing activity including Tata.

Subtle policy issues BUT with potentially important impacts

There are subtle issues here for policymakers who might aim to intervene in Wales to support net zero carbon targets based on territorial

emissions within the UK. Here policymakers are seeking to reduce carbon emissions embedded in supply chains servicing UK consumption demands, but also have concerns about maintaining the economic benefits of a vibrant steel sector. Wales is a devolved nation with a sustainable development duty enshrined in law.⁴ The fact that emissions generated in producing goods and services to meet final export demand are attributed to the producing nation's emissions account has crucial implications. Indeed, this was recognised in the Climate Change Committee's 2019 advice that Wales achieve 95% greenhouse gas emissions reduction, rather than net zero, by 2050.⁵

Crucially in the current context, pollution generation associated with steel manufacturing in Wales is largely driven by consumption decisions in other parts of the UK and overseas,

and here the regional government has ‘no jurisdiction’ (ability to act to effect consumption drivers outside of Wales). Accounting for industry emissions using the common territorial or production accounting principle (PAP i.e. examining emissions produced within the geographical boundaries of the reference economy as required under UNFCCC agreements and 2019 net zero legislation), will produce very different results from accounts based on a Consumption Accounting Principle (CAP). The latter focusses on emissions produced globally to meet consumption demand within the regional economy.

These differences are important. For example in the context of steel manufacturing, if the regional focus were on CAP-based targets, this would imply that policymakers were less concerned with any reduction in the emissions embodied in what an industry exports, since these might be considered the responsibility of consumers/firms in another jurisdiction. Alternatively, continuation of PAP-based targets may, over time, lead to replacing domestic production with imports of CO₂-intensive goods and services – almost like a quasi-race to the environmental bottom in steel production.⁶ This has important implications for both devolved and national policy decision makers in the UK, where the *Industrial Strategy*⁷ places great importance on both clean growth and building strong domestic content in supply chains servicing all consumption needs, including our growing reliance on renewable energy. Crucially, any investigation of the implications of continuing to produce high quality steel – and sustain associated jobs and output while attempting to reduce associated PAP source emissions – must

3. Future technological options and market opportunities

Several technological options are being ‘discussed’ in the context of the future of the Welsh industry with Port Talbot at the core. These include decarbonisation of material inputs (including potential use of hydrogen) and/or the deployment of CCS in primary steel production¹⁰, but potentially also a shift to secondary steel production involving the use of electric arc furnaces.¹¹ How might such options impact on the levels and nature of activity supported by the sites currently owned and operated by Tata in Wales? Perhaps as important is the question of how far new innovative directions can be

be set in the context of considering what markets exist and/or may emerge and evolve to motivate continued production of steel within the UK regions.

More recent concerns at Tata

The viability of primary iron and steel production has long been an issue for Wales. The Port Talbot mill is the last survivor of an industry that employed tens of thousands of people in Wales. Conclusions relevant to the competitiveness of the UK steel industry as a whole are more pressing in Wales. Prior analyses⁸ reveal that while selected elements of the steel industry are competitive, larger swathes of primary and secondary production face cost penalties when compared to other EU and global plants. For example, key issues raised in reference to Tata at Port Talbot⁹ have been in terms of relatively high energy costs (with some of this potentially connected to the age of steel industry capital in Wales), high business rates (a factor that also affects electricity generating firms in Wales), and high levels of regulation (not least linked to ETS). Added to this have been issues connected to weak sterling pushing up raw material import costs, the threat of tariffs and quotas resulting from a hard Brexit and persistent over capacity in global steel production.

What may be regarded as the perfect storm of factors facing steel production in Wales provides the overarching context for calls for investment in new ways of making iron and steel and/or decarbonizing parts of the process. This includes outline proposals to move to electric arc furnaces but with such a move expected to reduce the scope and scale of heavy end steel production at Port Talbot.

reconciled to developing a market-focused strategy that enables the best quality steel to meet the requirements of evolving consumption needs at home and abroad, in ways that enable both the UK and the wider global economy to achieve the net zero ambitions of the Paris Agreement. Furthermore, what is the expected role of the Welsh steel industry in servicing markets to support evolving demands for greener steel in industries such as electric vehicles and renewable energy technologies? Crucially in this context, if manufacturers begin to demand greener steel, will this effectively split demands between green and ‘fossil’ steel and how far might green steel attract a premium price? Even where opportunities to shift to green

steel production can be exploited, to what extent will reliance on imported primary steel continue, and what are the net implications for jobs, incomes and global carbon footprints? Can competitive and sustainable green primary production be realised through on-site carbon

capture or use of decarbonised hydrogen fuel? These questions are difficult to answer. However, it is valuable at the outset to consider the likely direction of travel on key steel industry indicators.

Figure 4: Future routes for steelmaking in Wales – some simple scenarios

Key factors	Continuation with current technology	Replacement of Blast furnaces with Electric Arc	Primary production decarbonisation (CCS or Hydrogen feedstocks)
Tata physical output kt steel, and resulting gross value-added (GVA)			
Tata Port Talbot and other company employment in Wales			
Indirect employment supported in Wales in supply chain and supported through wage spending			
Wales steel exports			
UK trade balance in iron and steel			
Production point carbon emissions – Wales			
Imported carbon emissions associated with Wales & UK steel consumption			

Figure 4 seeks to take the first steps in developing an expected ‘scoreboard’ linked to different technology options pursued in the heavy end of steel production in Wales. We adopt a Wales focus here, but do not discount the importance of wider UK effects both in that context and in terms of the potential applicability of the scorecard to other sites and regions. These are extremely broad scenarios and we accept that the direction of travel in indicators of interest will be a contested issue, and that a fuller set of refined and more specific indicators will ultimately be required. At the very least we hope Figure 4 highlights some central variables that might be considered as the industry evolves around the three pathways. We have coded these pathways as (i) ‘current technology’; (ii) replacement of blast furnaces with electric arc furnaces and iii) decarbonisation of primary steel production, potentially using perhaps hydrogen fuels or elements of carbon capture and storage on site.

Continuation with current technology

Current technology embraces the continuation of the current blast furnace/basic oxygen process. At a Welsh level, it is expected that continuation along these lines will lead to a continuation of existing trends. That is, a longer term reduction

in Welsh steel industry output, associated with falling direct and indirect employment supported. Clearly, existing steel quality might be maintained, but with the likelihood of falling market demand for such steel from new industries. Overcapacity and competitive pressures will remain prevalent in the industry, and one cannot discount swifter innovative advances from steel makers overseas, which will further erode UK and overseas market potential. A result could be falling Welsh steel exports, and potentially a worsening UK trade balance in iron and steel. This could be combined with more subtle socio-economic effects as new investment opportunities fall, accompanied by reduced contracting opportunities for the Welsh construction industry.

Critically, as the UK moves through the low/net zero carbon transition, markets for different transportation, energy and other goods/services will change and these will cause final and intermediate markets for steel to change. Were production to be maintained along current methods (and CO₂ intensity) then an opportunity is lost to play a role in servicing new markets.

BUT what of emissions? Clearly any depreciation of the scale of the Welsh industry will result in falling PAP/territorial emissions *within* both

Wales and the UK. There would be expected to be secondary effects associated with this, not least negating health issues in the areas around heavy steel making, but, at the same time, one cannot discount the heavy social and health costs on any employees displaced through time from the plant. Moreover, there is the equally depressing prospect that consumption accounted emissions are maintained, or even increased, with domestic firms sourcing and transporting albeit greener or, worse, cheaper 'old technology' steel from overseas in ways that lead to global emissions (the central concern of international UNFCCC agreements) potentially rising. In many ways it might be argued that more polluting processes around steel are better carried out where regulatory mechanisms are stricter and, thus, closer to where value added is gained from the process.

In short, any displacement of emissions to other states (particularly if under this scenario one includes the possibility that steels are imported to Wales from elsewhere for further processing) would be an important issue for Welsh Government with its sustainable development duty. In this context, we note that among the Welsh SD indicators are ones that link to consumption such as the ecological footprint.

Electric arc steel making

While electric arc steel making may have the effect of producing 'greener' steel, this depends in part on how that electricity is generated, and more generally on the supply chain and lifecycle emissions involved (including use of scrap steel).

Moreover, a move to electric arc furnaces might secure the future for the Port Talbot plant, but would in practice lead to falling output and employment simply because volumes of steel produced would be lower (partly given availability of scrap steel) and with, consequently, lower exports. There are also quality issues associated with steel made from scrap steel that could limit domestic and export markets for such steel downstream. Potentially, the productivity (simply measured) of the Port Talbot mill might increase. However, high demands for scrap could have indirect implications for other industries as prices rise, while still leaving a problem of the scrap resource still being connected to basic iron production 'elsewhere'.

In summary, electric arc production may give rise to new steel markets with some exports maintained but with a fine balance between quality, volumes and trade expected with a move

to electric arc technology. The new opportunities brought by different technology may also require new skills and new research, particularly around maintaining steel quality. On the other hand, the key benefit would be a large fall in production point emissions (and CO₂ intensity) - assuming electricity use is in large part connected to renewables - and potentially some reduction in aggregate Wales and UK steel consumption related emissions, even where some firms are obliged to source raw steel from elsewhere.

Decarbonisation of primary production

Decarbonisation of basic iron and steel production might work to secure output and gross value added generated by the steel industry in Wales if this can be done in ways that ensure continued competitiveness. It would require significant levels of new investment in adapting production methods and in decarbonised energy supply and/or carbon management infrastructure. Ensuring competitiveness may require at least transitory public support, but over time would carry the implicit assumption that there are growing markets for greener steel, thus enabling the Welsh industry to grow and incentivising similar costly decarbonisation activity in other steel producing nations.

Notwithstanding, it is difficult to see any significant direct employment growth under such a scenario as productivity in integrated steel mills continues to improve, and new developments are expected to involve more capital intensive production involving fewer people. Even so, here there is a route to higher levels of safeguarding of direct and indirect employment, particularly if greener steels also find their way into secondary steel processing and metal goods production activity in Wales. In this regard, exploring the potential role of CCS at the Port Talbot site in the South Wales regional industrial cluster would align with the strategy set out in the 2018 'CCUS Action Plan' element of the UK Industrial Strategy.¹²

In terms of trade, the implication of adopting new decarbonisation technology may provide a route to safeguarding of Welsh steel exports (and extending to metal products made from decarbonised steel in the region), and, thus, an improved trade balance for the UK in the iron and steel sector. As importantly, decarbonisation of primary production is a route to both falling production and consumption emissions, particularly if greener steel displaces imports.

4. Conclusions and recommendations

The aim of this briefing note is to alert the reader to questions that need to be asked about the future of steel production in Wales. Clearly, any technology pathway will not be costless in environmental terms, but the steel case is connected to subtle issues over responsibility for carbon emissions, and indeed reveals that depreciation in production point emissions would potentially link through to a growth in consumption accounted emissions.

Thus, there is a challenge for policymakers of not merely focusing on the regional employment contribution of steel but also in terms of:

- Awareness of more subtle economic, social and environmental factors connected to changing or maintaining technology in Welsh and UK steel making. Here, it is critical to understand how a focus on production accounting emissions ignores both global emissions and regional economic transition

problems associated with an offshoring of carbon intensive elements of steel production.

- Understanding that, in terms of a global net zero standpoint, steel making might be better placed in a more regulated context where there is more scope for technological innovation to reduce the industry's carbon footprint, while improving the quality of the product for evolving new industry and greener market demands.
- Attention to changing traditional political economy narratives associated with steel production in Wales/UK, which have tended to be focused primarily on employment issues.

We would encourage careful and informed deliberation around the types of pathways set out here, crucially taking account of the potential economic, trade and environmental consequences of alternative courses of action and policy interventions.

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Endnotes

¹ See <https://www.theguardian.com/business/2020/jul/02/celsa-steel-gets-uks-first-covid-19-corporate-bailout>

² See <https://wer.cardiffuniversitypress.org/articles/abstract/138/>

³ See <https://gov.wales/trade-survey-wales-2018>

⁴ See the Environment (Wales) Act at <https://wcva.cymru/influencing/legislation/the-environment-wales-act/>

⁵ See <https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/>

⁶ For further discussion see Turner, K. et al (2011) Incorporating jurisdiction issues into regional carbon accounts under production and consumption accounting principles, *Environment and Planning A*, 24, pp. 722-741.

<https://doi.org/10.1068/a43234>

⁷ See the [UK Industrial Strategy](#) published by BEIS in 2017.

⁸ See House of Commons Library 2018 Research Briefing 'UK steel industry: statistics and policy' at <https://commonslibrary.parliament.uk/research-briefings/cbp-7317/>.

⁹ See BBC news story, [Tata Port Talbot: First minister raises energy price concerns](#).

¹⁰ See for example the BBC news story on [£35m Sustain Research hub involving Swansea, Sheffield and Warwick Universities seeking to assist the iron and steel industry become carbon neutral by 2040](#).

¹¹ See BBC new story, [Tata Steel: Job fears at Port Talbot over furnace plan 19th July 2020](#).

¹² See the ['The UK carbon capture, usage and storage \(CCUS\) deployment pathway: an action plan'](#) published by BEIS in 2018.