Barriers to Industrial Decarbonisation

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smarter climate policy

CONTENTS

EXECUTIVE SUMMARY

Industries operating within the EU's Emissions Trading System (ETS) account for some 42% of the bloc's total CO_2 emissions. Reducing these sources of greehouse gases is critical to meeting the EU's overall emissions targets and limiting global temperature rise in line with the Paris Agreement. In practice, cutting emissions has proven to be particularly challenging for a host of reasons. This paper explores both the barriers faced in decarbonising industries and solutions put forward by stakeholders - in their own words.

In previous reports, Sandbag has analysed emissions profiles of industrial sectors operating within the ETS, tracked their performance in reducing emissions, and scrutinised the policies designed to deliver CO_2 reductions. While undertaking these projects we regularly hear accounts of the challenges faced in realising low carbon production from stakeholders in different sectors. It has become apparent that issues raised to us often manifest themselves in ways that are particular to certain industries but share common underlying elements or origins. **To gain insight into those challenges, Sandbag issued an open call for evidence in November 2017 where we sought feedback from stakeholders about their experiences of EU industrial emissions policy**. In view of the recently concluded ETS reforms and the Commission's ongoing efforts to implement policy for Phase IV of the ETS, our enquiries were focussed particularly on these areas. This report summarises responses to our call for evidence which brought to light numerous complexities and issues around decarbonising industrial sectors and their implications. These are detailed in the sections that follow.

Carbon pricing & CO_2 abatement

Many potential levers for reducing GHG emissions were highlighted by respondents. It is apparent, however, that in the current carbon pricing regime, there is an unwillingness to invest in CO_2 abatement solutions that significantly increase production costs in the short to medium-term, unless those investments can be recouped through reduced compliance costs, cost pass-through, EU funds and grants, or other measures.

The lack of alignment between ETS sectoral emissions trajectories and the EU's overall emissions targets, and a further discrepancy between those targets and the EU's ambitions under the Paris Agreement, also sends mixed signals to the market. While a less ambitious short term target might seem less onerous to business at present, the implication is that most of the work to cut emissions will be delayed until after 2030. This, according to respondents, is not conducive to attracting continued investment in industrial production in Europe.

Many respondents alluded to the importance of strengthening the price signal of the EU ETS while providing clear rules and long-term investment certainty for industries. Several felt the ETS carbon price is not sufficiently high or stable to support the cost of developing breakthrough decarbonisation technologies. At the same time, concerns were raised over how industry will sustain itself in the face of future ETS carbon price rises which will lead to increased financial pressure on industrial sectors in the short term. Meanwhile those same industries will necessarily undergo a period of technological transition requiring high levels of investment. Historically, this issue has been addressed through Free Allocation which was accepted as a temporary derogation from the polluter pays principle of Article 191 of the Treaty of the Functioning of the European Union. Free Allocation was intended to provide a cushion during the initial years of the ETS that would allow innovation while shielding industry from full exposure to the carbon price. However, carbon prices have not risen to the levels envisaged when Free Allocation was introduced and this has contributed to a weak investment climate for CO_2 abatement solutions in industrial sectors.

Respondents from industrial sectors also called for harmonised compensation for indirect carbon costs in the price of electricity as well as increased coordination of EU and Member State funds to support low carbon technology pilot and demonstration projects, and greater access to low carbon energy infrastructure. There is an expectation among many stakeholders that national governments bear responsibility for putting in place shared infrastructure, such as hydrogen distribution networks, low carbon electricity and CO_2 transport and storage infrastructure that is necessary for low carbon manufacturing. It is not clear whether Member State governments share this expectation although several do at present compensate industries for indirect carbon costs, for example in electricity consumption.

ETS product benchmarks

The role of product benchmarks in driving emissions reductions was a particular focus of this call for evidence. Several respondents felt that investments to reduce carbon intensity could be justified at installation level. However, by virtue of free allocation being based on a benchmark calculation of top performers, they believe certain operators will be less willing reduce emissions at a single plant so as not to lower the associated product benchmark value which might increase their ETS compliance costs for other less efficient assets. Over a third of all respondents felt that the ETS encourages a cautious approach to cutting emissions at present - one that is geared towards distributed incremental improvements rather than supporting breakthrough CO_2 abatement technologies. Further assessment is needed to determine the extent to which this view is borne out.

There was also concern among respondents that even CO_2 reduction solutions which incur low or negative costs are not being implemented to their full potential. For example, there is a historic precedent of product substitution, particularly in the steel and cement sectors, whereby low carbon materials are commonly used to partially or completely replace more carbon-intensive materials. However, in some cases low carbon substitutes have been excluded from applicable ETS product benchmarks and producers of those materials therefore don't benefit from receiving equivalent levels of free allocation. One such example put forward by respondents relates to iron ore pellets - a lower-carbon substitute for sinter in steelmaking - which, based on the existing evidence, falls into the product definition of sinter that is used in the EU Benchmark Decision but has to the present date been treated under a different benchmark. This approach to applying benchmarks actively discourages substitution and, in some cases, has created competitive distortions that favour more polluting technologies over innovative products and processes. There is a compelling case for improving product benchmark definitions to include viable processes and product substitutes regardless of production technology - as mandated in Article 10a of the ETS Directive. Moreover, using a more selective

approach to applying fallback benchmarks would help address competitive distortions while avoiding a situation where more polluting processes are incentivised or substitutable products are treated under separate product benchmarks.

Respondents from industrial sectors overwhelmingly supported the updating of existing ETS product benchmarks (which are based on data from 2007-2008) with more recently available data. A particular cause for concern with existing benchmarks is the perceived discrepancy between the benchmark values and achievable performance of industrial installations. A number of respondents consider that some current benchmarks reflect theoretical calculations rather than current best performance. New information collection would provide a basis upon which to revise such benchmarks using actual data from installations within the EU ETS.

Product benchmarks for the first half of Phase IV will be based on the observed improvement between the 2007-2008 values and values calculated with newly collected 2016-2017 data. It was pointed out that sectors which have achieved greater emissions reductions during that period will most likely be required to cut at a faster rate in the future than those whose emission levels have changed little. This appears to put producers who have taken early action to reduce emissions at a disadvantage.

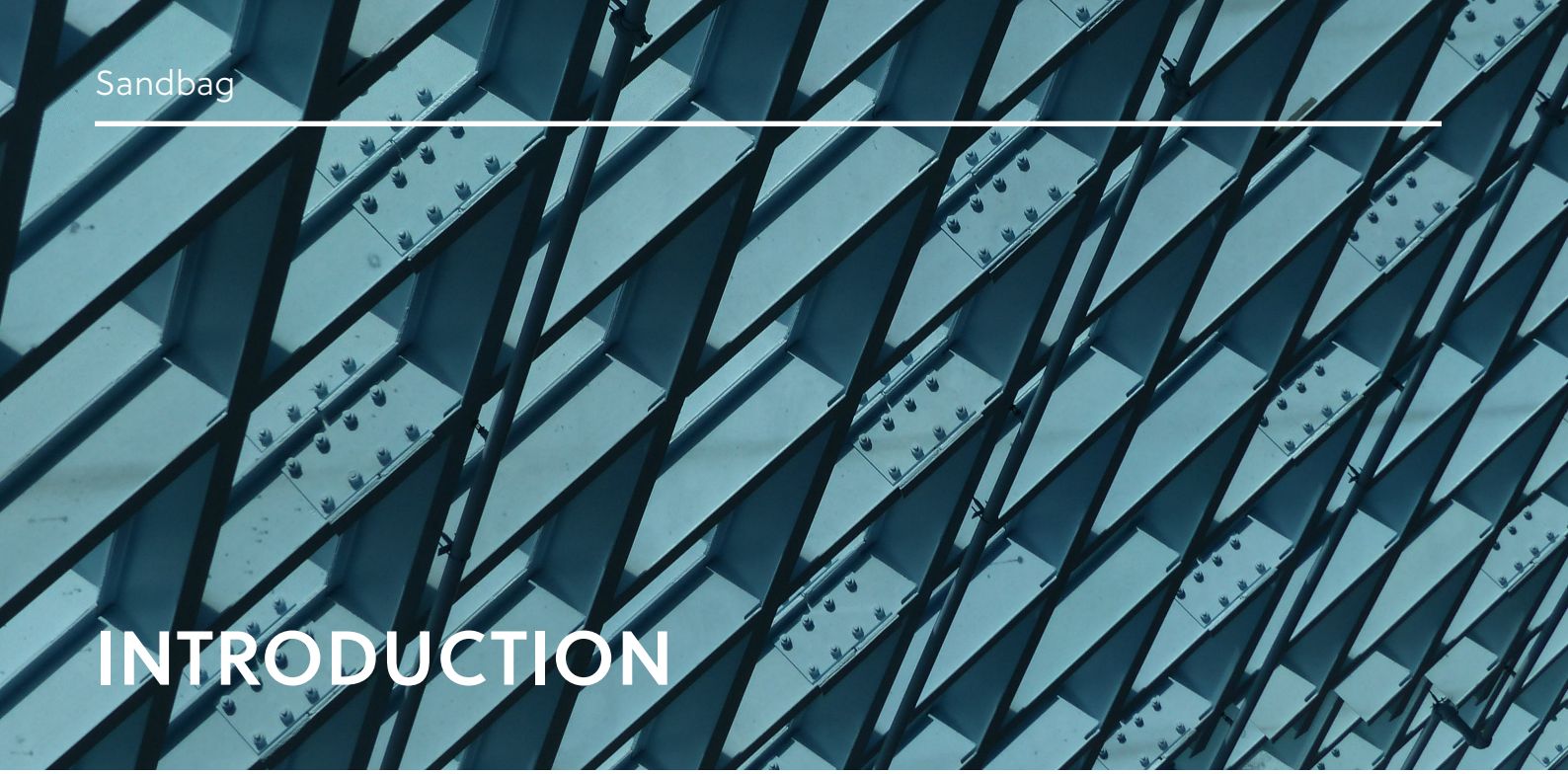
Another view commonly shared by respondents is that ETS benchmarks and free allocation focus on emissions at specific points in a supply chain and do not fully account for product lifecycle emissions or cross-border material flows. This has contributed to the sense of an uneven playing field between competing businesses both within the European Single Market and internationally. A commonly shared sentiment is that the burden of environmental compliance is not distributed equitably throughout the value chain or applied consistently for same product sold in the EU but produced in different jurisdictions. A broad range of measures were suggested for improving this situation including green public procurement, expanding the scope of benchmarks to include upstream emissions, crediting useful manufacturing by-products under the ETS, integration of carbon pricing and trade policy, and carbon consumption taxes.

Going beyond the ETS

Around a quarter of respondents felt the role of national bodies in driving green public procurement should be expanded. The public sector's position as major consumer of basic materials creates opportunities to specify low carbon materials as part of a procurement strategy for taxpayer-funded projects. Material costs typically represent a fraction of overall project budgets and additional costs arising from green procurement are therefore likely to deliver value for money. Given the scale of public sector works, it follows that the potential impact of green procurement on CO_2 emissions can be significant over relatively short timescales. As noted by some respondents, this is contingent on public authorities being afforded the tools, expertise and financial flexibility to enact green procurement criteria.

Finally, the importance of keeping technical norms relevant and up to date was emphasised by a number of respondents. Norms are intended to maintain product performance and safety while also supporting innovation. However, outdated or prescriptive norms lead to technological lock-in and delay products' entry to the market. Oversight of norms falls outside the remit of policymakers. However, norms must be compliant with EU legislation and are therefore not immune to legislative changes.

As preparations are made for the start of Phase IV of the ETS, several key elements remain to be finalised, including the carbon leakage list and product benchmark values. Both decisions will influence how industrial sectors are incentivised to cut emissions. It is therefore important that experiences from the current phase of the ETS inform decisions on implementation in the next phase so that barriers to decarbonisation can be overcome.



INTRODUCTION

The EU has set targets to reduce domestic GHG emissions by at least 40% in 2030 and 80% by 2050 (relative to 1990 levels). It has established a broad climate policy framework encompassing a range of instruments for cutting greenhouse gas (GHG) emissions across all major sectors of the economy. Its cap-and-trade carbon market, the Emissions Trading Scheme (ETS), which was launched in 2005, is a core component in this framework. It is currently the largest market of its kind, covering 1.8 gigatonnes of CO_2 emissions from more than 14,000 power, industrial and aviation permit holders in 2017, and it has inspired the creation of similar schemes in other parts of the world.

Since 2005, European power sector emissions have fallen significantly but progress has been slower in cutting emissions from industrial sectors which represent 42% of the Bloc's total emissions. This is due in large part to EU-wide policies targetting reductions in power sector emissions and exposure of the power sector to carbon pricing regimes. Conversely, industrial sectors are largely shielded from carbon costs and, even where exposed-to carbon pricing, the costs of compliance are, in many cases, well below the cost of emissions abatement. The recently concluded package of ETS reforms for the post 2020 period together with the introduction of a market stability reserve are unlikely to completely rein in the chronic surplus of allowances that has built up since 2008. Sandbag's analysis suggests the allowance surplus will persist through 2030 with an inevitably impact on prices.[1]

Under the 2015 Paris Agreement, the EU commited to further reduce emissions by 2050 in line with limiting warming to well below 2°C. This is yet to be reflected in the EU's policy targets while other key players in the international community have targeted rapid CO_2 cuts by reducing coal burning and promoting investment in clean energy and more efficient manufacturing. According to Climate Action Tracker - an organisation that assesses NDCs - India and Morocco are among the regions which rank higher in terms of climate action than Europe.[2] If the EU is to maintain its mantle of climate leadership, additional actions will need to be taken in all sectors of the economy to cut emissions before 2030 and to address the gap between Europe's carbon budget and its commitments under the Paris Agreement.

1 Sandbag. (2017). Out of touch ETS reform puts Member States in the spotlight https://sandbag.org.uk/2017/11/09/touch-ets-reform-puts-member-states-spotlight/

2 Climate Action Tracker: Countries. http://climateactiontracker.org/countries/eu.html (accessed on 28th February 2018)

As part of the ETS Directive reform, the European Commission will soon adopt an implementing act to determine the new ETS product benchmarks for the first half of Phase IV on the basis of recent data collected for 2016 & 2017 under Article 11. The benchmarks represent the emissions intensity values for the 10% best performing installations for each product product type and provide a basis for allocating free allowances to all installations. The level at which benchmark values are set is of importance to businesses regulated by the ETS, particularly energy intensive industries.

In this context, Sandbag launched an open call for evidence in November 2017 to better understand how the benchmarks have affected different industries and what key stakeholders see as the main barriers and opportunities to industrial decarbonisation in the EU.

What follows is a summary of the feedback Sandbag received to our call for evidence from 15 respondents spanning a range of industrial sectors and stakeholder demographies (see Table 1).

In light of the Commission's benchmarking review, we sought views on the performance of the ETS product benchmarks which are key to fulfilling the EU's climate objectives and therefore have a broader societal impact.

We have taken care to faithfully reflect the views expressed by respondents and, wherever possible, to give equal weighting to different viewpoints. To that end, this document does not promote Sandbag's own views and does not constitute an endorsement for the views of stakeholders expressed herein.

We express our sincere thanks to all respondents, many of whom provided highly detailed information, whose inputs have made it possible to produce this paper.

Navigating this report

This report is structured around the questions posed to respondents to Sandbag's call for evidence.

Responses have been grouped by their affiliation to particular industrial sectors and the aggregated views in each sector are compared in the sections which follow. The number of respondents from a given sector who raised a particular point is denoted by the symbol [•] for sectors where multiple responses were received.

Total number of respondents	**15**
Responding on behalf of companies or institutions	9
Responding in a personal capacity	6
Respondent demographic (14 EU-based, 1 non-EEA)	
Working in an energy intensive industry	5
Industry association	3
Academic	2
Consultant	2
NGO	1
National government employee	1
Member of the public	1
Sectoral coverage of response content	
General/ETS	**5**
Cement	**4**
Iron & Steel	**4**
Aluminium	**1**
Flat Glass	**1**

Table 1: *Respondents to Sandbag's call for evidence*

What are the main pathways for reducing CO_2 emissions from industrial sectors?

Overview

Options for decarbonisation vary from sector to sector. However, several common lines emerged from responses:

Energy efficiency was highlighted multiple times with respondents noting that potential improvements are possible through adoption of best available technologies (BAT) where this has not yet been implemented. However, one respondent suggested the opportunities to reduce CO_2 emissions through future energy efficiency gains have largely been exhausted.

Process innovation - in particular, electrification combined with renewable electricity - was raised by two respondents.

Material substitution with lower-carbon materials and recycled content was considered as a means to reduce production emissions.

Material efficiency and end of life product design were promoted as ways to reduce lifecycle emissions and improve material recovery and recycling rates.

Demand-side incentives that create a price signal for consumers, such as taxation based on the carbon content of certain products, were proposed by several respondents to encourage responsible consumption of materials.

Carbon capture and utilisation or storage (CCUS) was put forward as a long term abatement measure that will be required for cutting process emissions from CO_2-intensive processes. It was noted that the technology requires significant capital investment an infrastructure in the near term with payoffs that may only be realised at an undertermined point in the future.

Iron & Steel

- The choice and methods of processing raw materials has implications for total steelmaking emissions. Three respondents also agreed that, of the blast furnace feed types, pellet production has lower CO_2 emissions (by 6 to 7 times, according to one respondent) compared to production of iron ore sinter.

- Evidence was presented of blast furnace operations in Europe, the USA and Japan having switched from feeds with high sinter content to using pellet ratios of up to 100% at various points in the last 30 years, resulting in reduced fuel consumption. According to two respondents, the interchangeability of sinter and pelletized blast furnace feeds without need for equipment changes means converting to pellet operation is a relatively inexpensive way to cut emissions and has already happened to a large extent in parts of the world.

- Steel production in the direct-reduced iron and electric arc furnace (DRI-EAF) can reduce emissions but only makes economic sense when energy costs are low.

- Process integration, where multiple steelmaking processes occur at a single plant, is more efficient than distributed production and facilitates internal re-use of by-products such as waste gases. Conversion of secondary materials such as slag, fines and process gases (H_2, CO and CO_2) into products like plastics and ethanol could lead to further emissions reductions.

- Increased recycling of scrap metal in furnace burden as a key lever in reducing emissions. One respondent added that scrap steel recycling generates approximately 15% of the emissions created when steel is produced from virgin ore and both agreed that doing so also enhances circularity of materials, reducing overall lifecycle emissions.

- Carbon capture and utilisation or storage (CCUS) technologies offer potential CO_2 emissions abatement. A project to combine iron ore reduction and melting in a single vessel was quoted by one respondent as an example of a promising CCS-ready technology.

- Hydrogen-based technologies for reduction of iron ore using renewable electricity could effectively eliminate process emissions though one respondent indicated that the process is more energy intensive compared to a blast furnace and would incur higher power costs.

- Improvements in energy efficiency have the potential to reduce steelmaking CO_2 emissions by 10-15%.

Cement

- Lowering clinker content through increased use of blended cements is a major lever in reducing emissions in many cement applications but would also increase electricity consumption. Two respondents noted that availability of certain types of cementitious materials used to replace clinker, such as fly ash and blast furnace slag, are in decline but that other low carbon clinker substitutes, such as calcined clays and pozzolanic materials, are not being used to their full potential.

- Alternative fuels (AF) can reduce emissions through diverting waste from landfill. One suggested that AF use could increase from its current rate of 40% to 60% but noted that expanding AF use could also slow kiln upgrades as the negative costs of using AF improve the economics of older, less efficient kilns in some cases.

- Efficient use of concrete in the built environment has a major role in reducing material use (and associated emissions). One respondent provided an example of partially hollow structures that reduce concrete usage by 70% while maintaining structural performance.

- Natural carbonation of concrete in the built environment offsets some emissions associated with cement production. The impact is on the order of 150 $kgCO_2/t$ cement over an object's lifetime but is difficult to accurately quantify for the entire building stock.

- Literature provided by one respondent suggested that technological advances in cement making over the last decade are characterised by improvements in energy efficiency. Two respondents indicated that improving the thermal efficiency of clinker production by replacing old cement kilns with best available technology could yield modest emissions reductions. On average, European clinker production requires 3,750 MJ/t clinker whereas best available technology requires around 3,200 MJ/t clinker.

- Carbon capture (CCS/U) provides a means of CO_2 mitigation from the pre-calciner/kiln. However, it was pointed out that CCS significantly raises electricity consumption and may indirectly increase power emissions. Two respondents suggested CCU is favoured over CCS due to the potential to sell CCU-derived products and recoup the costs of capturing CO_2.

- There is potential to recycle cement from concrete in demolition waste and while not all components in concrete can necessarily be reused, enhanced fragmentation technologies allow recovery of materials that are of a similar quality to virgin cement and aggregate. Due to the significant energy requirements, economics do not favour cement recovery at present.

Aluminium

The main lever cited for reducing the carbon footprint of aluminium production is through decarbonising the electricity market. Aluminium production using renewable electricity has a CO_2 footprint of 3.5$kgCO_2$ per kg of aluminum. This increases to 16-20$kgCO_2/kg$ if electricity is sourced from coal-fired plants.

Siting aluminium production close to renewable electricity supply is the best guarantee of low emissions.

Recycling aluminium reduces energy consumption by 95%. It was suggested that no technology exists today to deal with direct process emissions from aluminium production (for example, anode production) and that breakthrough technologies would be needed in future.

It was also argued that substituting steel with lighter weight aluminium in the automotive sector would reduce vehicle use emissions.

What barriers & opportunities are there to cutting industrial CO_2 in relation to the ETS?

Overview

- Product benchmarks do not take account for the latest technologies and some direct substitutes of products covered by the ETS are excluded from the benchmarks.

- The carbon (EUA) price is too low to trigger investments in low carbon technologies that would put EU on track to meeting long term targets. Furthermore, not all sectors are equally exposed to carbon pricing which results in competitive distortions while the differential treatment of indirect costs creates competitive distortions by making some lower-carbon but electricity-intensive production methods less competitive.

- The manner in which free allocation is implemented has slowed the rate of CO_2 reductions in some industries. Free allocation has also proven to lessen the impact of carbon pricing and companies have de-prioritised cutting CO_2 because the actual cost of emitting is negligible compared to the cost of abatement.

- The restrictive nature of technical norms, some of which are based on single technology, creates regulatory lock-in in certain sectors.

- ETS cap and Linear Reduction Factor (LRF) should be aligned with long term climate objectives.

- Benchmark reduction rates for the post 2020 period are far slower than the overall ETS emissions trajectory. For some products, benchmark reductions are as low as -0.2%/year and this indicates a decarbonisation timline of around 500 years for those products.

- ETS participants' ability to borrow allowances from the following year reduces their need to take into account real scarcity in the market. Unlimited banking of allowances also increases risk of breaching long term targets.

Iron & Steel

- The manner in which ETS product benchmarks for sinter production are implemented undermines the objective of reducing emissions. (This claim is elaborated on in sections that follow).

- At present, iron ore sinter tends to be favoured in hot metal production as it is cheaper than pelletised iron ore and attracts higher levels of free allocation even though it is more polluting than pelletised iron ore.

- The absence of an EU framework that extends beyond funding for research and innovation is a barrier to commercialising new technologies. The same respondents also consider the availability of public grants for piloting and upscaling low carbon alternatives to existing production methods as being necessary for achieving emissions reductions targets for their sector.

- Uncertainty over energy prices, price visibility over a long period, and the degree of protection from indirect carbon cost are considered to be important factors in low carbon investment decisions by two respondents.

- The is limited access to infrastructure for additional energy, hydrogen and CCS required to decarbonise the sector. Industry is not in a position to develop the necessary infrastructure and is looking to governments to provide this.

- The ETS approach of counting direct emissions at critical points in the value chain is better suited to regulating emissions in linear value chains but does not promote and protect business models that engage in material circularity. Energy efficiency improvements at an installation can also lead to reduced free allocation due to lower energy consumption.

- Access to EU funds supporting the commercialisation of new technologies is needed to make investment in innovative projects attractive to the private sector. One respondent indicated that €10bn worth of funding (for up to 75% of capital costs) would be needed to see low carbon technologies through to commercialisa-

tion, much of which would be needed for technology demonstration projects.

Cement

- The ETS clinker product benchmark does not provide an economic incentive for companies to reduce the clinker content of their cement. With clinker-based free allocation, decreasing clinker production leads to a reduction in free allocation.

- There is a lack of readily deployable CO_2 mitigation technologies. Carbon capture technology is currently being piloted only at a handful of cement plants.

- The aforementioned notion of a technological deficiency was disputed by another respondent who referred to a range of products that already exist to decarbonise cement and concrete. At present, only emissions reductions from Portland cement clinker reduction are credited under the ETS. Recognition of other relevant business models that can deliver emissions reductions in the sector is key.

- The lack of a carbon price signal in cement sales prices - due to the modest net CO_2 cost in cement production - provides no incentive to consume cement with a lower carbon footprint. The respondent also quoted cement industry data published by the Cement Sustainability Initiative which show a marginal increase in the clinker content of cement since 2012 and slight reduction in specific emissions from cement since 2009.

- The differentiation of grey and white clinker benchmarks has eroded the CO_2 price signal in cement. White clinker is significantly more energy-intensive to produce than grey clinker but has the same performance characteristics when used in cement. The latter can also be combined with other materials of lower carbon intensity to produce a cement that is white in colour although the existence of a separate benchmark for white cement does not encourage producers to do this.

- Information supplied by a respondent indicates that companies do not necessarily benefit from recycling cement in concrete due to extensive restrictions relating to the demolition process.

- A lack of knowledge diffusion between producers and consumers has led to overspecification of concrete by the latter (which often means ruling out recycled concrete) as well as fostering a perception that low carbon products are risky.

- The inclusion of imported cement and clinker in the scope of the EU ETS would provide a means of addressing concerns over competitiveness of EU industries in response to declining Free Allocation.

Aluminium

Relatively high electricity prices in Europe and lack of compensation for indirect carbon costs are the main barrier to continued investment in the sector. Aluminium produced in Europe is, by virtue of its electricity mix, less polluting than imported aluminium made in other parts of the world.

The high threshold for increased allowances due to capacity expansion is also viewed as a challenge to investing in more efficient capacity.

Flat Glass

Due to wear and tear, plants become less efficient over their lifetime which can affect their balance of free allocation.

The float glass benchmark reduced by 0.88% from 2008 to 2012 but there is a lack of breakthrough technologies to drastically reduce emissions or the benchmark.

Funding for fundamental research is needed to cut the sector's emissions in line with EU decarbonisation objectives. Once breakthroughs are identified, then demonstration projects will need to be supported.

What can be done to improve the competitiveness of low carbon products and processes in view of the existing ETS benchmarks?

Overview

- Benchmarks should be made neutral to plant configuration and production technology, for example, by adjusting their scope to account for whether inputs are produced on or off-site.
- Benchmarks should encourage emissions reductions achieved through the creation of valuable by-products, which does not happen at present in the ETS.
- Some industrial activities are covered by a fallback heat benchmark including, for example, much of the sugar sector, but could instead be given a product benchmark and receive appropriate levels of free allocation.
- The ETS benchmark review process is designed to account for recent efficiency gains in each benchmark. This methodology implies that sectors which have made more progress will face higher benchmark reduction rates while those that have been slower to cut emissions will be given more time to decarbonise. An approach that accounts for best available technology applicable to each benchmark would provide a more achievable and robust signal to EU industry.

Aluminium

The competitiveness of aluminium products could be improved through compensation for indirect carbon costs associated with electricity consumption.

Annual benchmark reductions penalise even the best performers and more recent benchmark data are needed to provide appropriate incentives to decarbonise.

Iron & Steel

- There was support for a broader regulatory framework and financing initiatives beyond ETS benchmarks to promote low carbon processes.
- The inclusion of pelletised iron ore in the ETS sinter benchmark - owing to it being directly substitutable with, and sharing the characteristics of sinter - is necessary to promote best available technology for reducing emissions both from sinter production and the overall steelmaking process. Doing so would reduce the sinter benchmark from 0.171t CO_2/t sinter to 0.037t CO_2/t and is also consistent with Article 10a of the ETS Directive (2003/87/EC) which states that substitutes should be covered by the same product benchmark and that benchmarks should not provide incentives to increase emissions.
- Fallback approaches to benchmarking should be minimized in order to guarantee equal treatment between sectors and installations and safeguard the environmental integrity of the applied benchmarks.

Cement

- One respondent argued that the benchmark for the cement industry should not be based solely on clinker. They advanced a hybrid clinker-cement benchmark (following a methodology proposed by Branger & Quirron, 2014) as a more appropriate measure for awarding free allocation in a way that encourages producers to reduce the clinker content of their cement.
- Covering grey and white clinker under a single benchmark would have environmental benefits that outweigh the advantages of retaining separate benchmarks for those products.

Flat Glass

For products which cannot be substituted by other materials, measures shall be provided to avoid a substitution of EU products for equivalent non-EU products.

Does the EU ETS benchmarking design support the development and uptake of low carbon materials and processes?

Overview

- The ETS' focus on emissions from producers, rather than promoting emissions reductions across value chains, limits opportunities for cost pass through and does not in itself support the uptake of low carbon products.
- Early action to reduce emissions can result in reduced future free allowances.
- Output based allocation incentivises overproduction.

Cement

- The ETS clinker benchmark, which broadly covers emissions from the cement sector, provides incentives to reduce the carbon intensity of clinker but not to reduce the amount of clinker in cement or concrete which is a primary lever for reducing sectoral emissions.
- The clinker benchmark implies that reductions in emissions from Portland cement clinker represent the only means of decarbonising the sector. However, other business models have proven to be more effective in delivering emissions reductions per unit product of cement.

Iron & Steel

Opinion was divided on how ETS benchmarks affect the uptake of low carbon materials and processes.

- Three respondents felt the way in which steel benchmarks are implemented - in particular the sinter benchmark - penalises best-performing installations. Two respondents argued that the current system, where pelletised iron ore is covered by a fallback benchmark rather than the sinter benchmark, has helped increase EU steel sector emissions by favouring more polluting processes. Another respondent described the sinter benchmark as being unfit for purpose due to the inclusion of a plant that processes both sinter and iron ore pellets which makes it difficult for sintering installations to reach the benchmark emissions level.
- The proposed reduction trajectory for steelmaking benchmarks in Phase IV does not correspond with actual improvements in the efficiency of blast furnaces.
- The ETS benchmarks can support low carbon production where they promote improvements in performance while providing effective leakage provisions. Measures in addition to free allocation are needed to maintain the competitiveness of European Industry.

Flat Glass

- Benchmarking has delivered emissions (and ETS benchmark) reductions while the difference between the 10% most efficient installations and remaining installations has decreased suggesting improvement across the board.

What factors should EU policymakers take into account in developing policies to reduce industrial CO_2 emissions?

Overview

- National policy frameworks should be consistent with longer-term policy objectives and the EU ETS target should align with the Paris Agreement.
- ETS product benchmark reduction rates should be made compatible with long term emissions targets.

Aluminium

Policies should preserve the global competitiveness of European producers, particularly when it comes to accounting for energy prices, and should take account for developments in international carbon markets.

Iron & Steel

- Technology neutral policy should be a priority: for two respondents, this was in relation to the treatment of low carbon products that are direct substitutes of products covered by ETS benchmarks, while another sought greater neutrality in the context of grants for financing projects.
- Policies to reduce emissions should account for end-of-life product design to promote recoverability of steel in end products.
- Two respondents support compensation for indirect carbon costs for inputs such as electricity to encourage low carbon processes. One of whom wanted an EU regulatory framework that keeps energy prices at a globally competitive level.
- The above respondents also want EU institutions to create a level playing field for byproducts of steelmaking and renewable fuels, including those derived from process gases.
- A global level playing field for CO_2 mitigation costs would help combat the risk of carbon leakage. One also called for equitable environmental requirements for EU installations and those in third countries that use ferrous scrap by augmenting the Waste Shipments Regulation.
- Relaxation of EU state aid rules would unlock financing projects through to industrial demonstration phase and help balance the need for low carbon technologies and competitive industries.

Cement

- A conservative attitude towards reducing emissions exists within the cement industry, particularly where pursuing such efforts conflicts with the objective of maximising revenues. One respondent added that European policymakers should be aware of the objective of European and National cement trade associations to prevent production cost increases and risks to the value of assets potentially resulting from environmental legislation.

- Established groups have sought to influence expectations around the decarbonisation trajectory of the sector and promote particular pathways to decarbonisation through the publication of technology roadmaps. It is argued that roadmaps have been used to dampen expectations around the prospects of particular technologies by limiting their usefulness to niche markets while protecting the status of existing technologies.

- CCS for cement plants requires large scale pipeline infrastructure which will demand considerable efforts from governments - not only in terms of financing but also in gaining public acceptance.

- The high capital intensity of cement making and long investment cycles in the sector make it difficult to decarbonise cement quickly. High market concentration, strong buyer-supplier ties and vertical integration also pose significant barriers for new businesses or low carbon products seeking to enter the market.

- The boundary conditions which drive policy implementation, such as strong path dependence due to lengthy investment cycles and a competitive market environment, are often ignored in policymaking, leading to inertia.

- The low cost of cement production and lack of any evidence of carbon leakage creates scope for mitigation policies that drive up costs to a certain extent without stifling the construction industry. The example was given of NESHAP and CISWI emissions standards in the US which led the cement industry there to make environmental investments worth an estimated USD 5bn in total.

- Integration of carbon pricing and trade policies whereby carbon costs are reflected in product pricing for end consumers, would create an economic incentive to consume low carbon products.

- Recognition in policy that relevant alternatives and susbtitutes to Portland cement exist would facilatate rapid decarbonisation of the cement sector and promote best available technology.

In what ways is the ETS framework helping industries to reduce CO_2 emissions?

Aluminium

Customer demand for green products as well as the EU carbon price, even at its low value [January 2018], have helped in prioritising efficiency investments.

As a result of increased demand for green products and national arrangements for indirect cost compensation, the respondent's company had invested in new plant capacity which will reduce specific energy consumption by around 15% per kilo of product.

Iron & Steel

- ETS benchmarks for steel have helped put pressure on the industry to maximise the efficiency of their processes.

Cement

- A small reduction in EU cement emissions has been achieved over the last decade.
- The ETS does not provide real incentives to reduce emissions in the sector. Prior to 2008, the prospect of EUA prices in excess of €20 brought the ETS to the attention of top management. The fading of such risks and low CO_2 price signal has reduced incentives to cut emissions and led to a stagnation in energy efficiency improvements.

What are the longer term challenges for your industry?

Aluminium

Decarbonising the electricity market may challenge the global competitiveness of European aluminium producers if it leads to higher system costs.

Iron & Steel

- Funding the roll out of breakthrough low carbon steelmaking technologies is a major long term challenge.
- A value-chain approach to decarbonisation is needed that takes account for product lifecycle emissions.

Cement

- An integrated approach to decarbonsing the sector, incorporating all available mitigation options, is required in the long term.
- The cement industry's overdependence on CCS to achieve emissions reductions will inevitably delay action to cut emissions until such a time as CCS can be deployed commercially.
- The vast scale on which cement and concrete are used makes it difficult to find low carbon alternatives that are available in abundance.
- A prevaliaing narrative that implies there is a lack of cost-competitive technological solutions for decarbonising the cement sector is holding back adoption of relevant proven technologies that can reduce cement and concrete emissions.

What opportunities to reduce industrial emissions are not being supported by the ETS at present?

Overview

- Project-based carbon price guarantees would help reduce the costs and risks of low carbon investments. Such a scheme might involve companies investing in low carbon production in return for a Member State-backed minimum carbon price guarantee to help de-risk investments in emission reductions.

- Better integration of funding channels and coordination both at EU and Member State levels to make more efficient use of funds.

Aluminium

Energy efficiency investments and technology development are currently hampered by unpredictable indirect compensation.

The EU's increasing import dependency for aluminium has not helped to reduce emissions.

Iron & Steel

- The European Commission's treatment of iron ore pellets in the context of the sinter benchmark (which has implications for free allocation) does not support the use of less polluting pellets in place of sinter, while also conferring a competitive advantage on sinter producers which are subject to a less stringent benchmark.

- The development of hydrogen, CCS and low carbon power infrastructure needed to decarbonise steelmaking is not currently supported within the ETS framework and funds. One added that the ETS has not yet helped to justify the costs of transitioning to low carbon technologies.

- By-products of steelmaking such as slag and CCU-based fuels and plastics, which displace emissions from other sectors, are not credited under the ETS unlike installations which produce equivalent products as their primary output.

Cement

- The carbon price has been too low to encourage investment in energy efficiency improvements, let alone CCS. The same respondent also claimed the ETS provides only marginal incentives to use alternative fuels.

- The opportunity offered by non-Portland cement products to significantly reduce emissions from the sector is not being capitalised on. Support for such business models is lilkely to deliver more rapid CO_2 reductions compared to focussing solely on emissions in Portland cement production which has been the main policy goal to date.

What additional EU policy improvements could help companies significantly reduce CO_2 emissions?

Overview

- It is important ensure full carbon price pass through to end consumers. Two respondents explicitly supported a carbon consumption tax or border carbon tax.

- The role of green public procurement (GPP) in promoting low carbon products should be increased. One respondent highlighted that, in Germany alone, EUR 500bn is spent on public procurement each year. The same respondent noted that most procurement is done locally (rather than at the Federal level) with projects chosen on a lowest cost basis and without accounting for lifetime costs or externalities. The EU has green procurement guidelines but does not make reporting environmental costs in procurement tendering criteria mandatory. Few public officials have training to use models for life cycle costing and more training should be given to support authorities in public procurement. The Netherlands is one of the few EU countries which operates a GPP model.

  Respondents spoke more generally of a financing gap for commercialisation of technologies and urged this to made a priority in addition to existing funding streams for R&D. One called for more innovation funding as well as conditions requiring recipients of free allocation to commit to making low carbon investments.

- Sector roadmaps could be refined through public-private cooperation and increased knowledge sharing.

- Industry's indirect emissions from the electricity sector could be reduced by accelerating energy transition.

Iron & Steel

- Policies for cutting emissions should be technology neutral with emphasis on consistent implementation of ETS legislation and the promotion of technologies based on CO2 abatement cost.

- Low carbon technologies would likely result in increased production costs and a regulatory framework which promotes products based on material circularity would be needed to support business models that incorporate low carbon processes.

- CO_2 savings already being realised through the production of valuable by-products from steelmaking should be credited under the ETS. By-products such as blast furnace slag and synthetic fuels can displace emissions in other sectors.

- Two respondents argued for a policy shift towards shared responsibility for the environmental burden across the whole value chain and expressed interest in measures such as inclusion of carbon consumption taxes on end products.

- An additional 500 TWh of zero-carbon electricity is needed to fully decarbonise the sector and this calls for the development of an energy masterplan. Successful deployment of low carbon technologies will depend on the availability of energy at competitive prices.

- There is a need for funding mechanisms that promote risk-sharing, shorter decision timelines for funding, and greater use of public-private partnerships. It was argued that the Innovation Fund should focus on CO_2 abatement technologies and integration of renewables and hydrogen into energy efficiency processes.

- EU and Member States should approach CCS in a similar manner to the policies that have supported growth in renewable energy technologies.

- Border carbon taxation is a viable means of protecting investment in low carbon steelmaking, provided such taxes could be applied across the whole value chain.

Cement

- Extensive regulations which govern the introduction of new building materials prevents new low carbon products from reaching the market: The prescriptive nature of product standards for cement and concrete act as a barriers to innovations that reduce cement emissions. All three support a shift towards more performance based product standards for cement and concrete. One claimed that existing product standards for cement and concrete are inconsistent with the Construction Products Regulation. Another argued that larger incumbent firms wield significant influence over the process of developing and updating technical norms. Standards in the EU are not set by policymakers but by relevant national or international bodies in conjunction with industry representatives. Standards that are applicable in the EU must however be compliant with legislation.

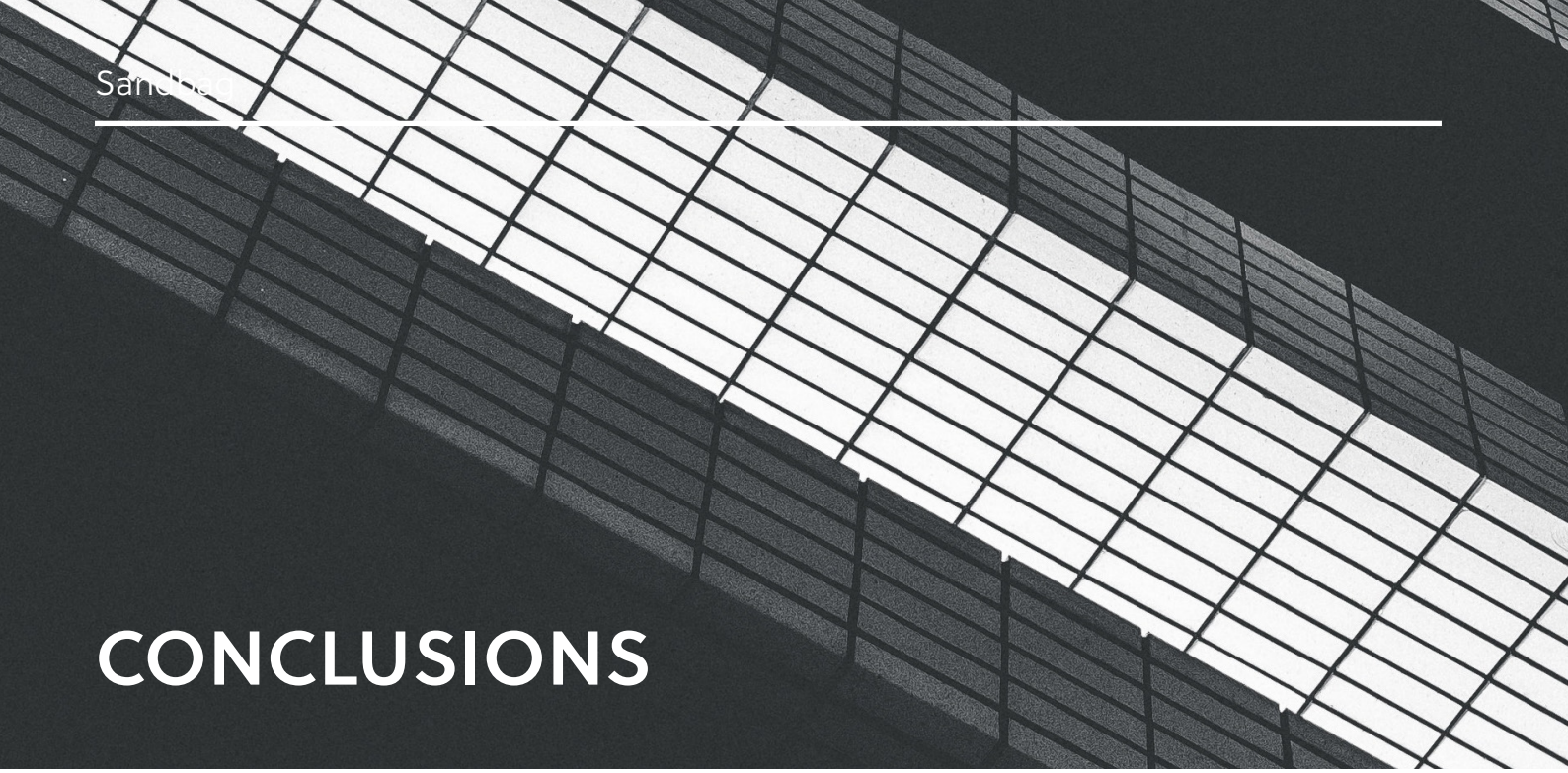
- Public agencies could better use their role as a market maker and support the introduction of carbon footprint assessments or specific criteria for procurement tendering, particularly for publicly funded projects.

- Some Member States place restrictions on the use of certain types of cement in concrete based on their performance in harsh environments. One respondent considered these restrictions to be generalised and inappropriate given that some varieties of cement which fall into restricted categories actually perform well in harsh environments. The same respondent expressed dissatisfaction that test data generated for a product undergoing a European Technical Assessment - a process that new products which do not fall under relelvant standards are required to undergo in order to be certified for the EU market - in one Member State were not recognised by other Member States.

- Mandatory CO_2 and energy product eco-labelling for construction products, similar to that which is used for vehicles and appliances, would allow consumers to make informed decisions about buying products.

Aluminium

Respondents are seeking a predictable framework for indirect cost compensation from 2020 and industrial policy which promotes research, innovation and funding.



CONCLUSIONS

EU greenhouse gas emissions from industrial sectors have remained high despite the trend of falling emissions in the power sector. Sandbag's call for evidence collected responses from the industrial stakeholders on what they see as the main barriers to decarbonising industry.

Responses to our call for evidence suggest that numerous opportunities exist to decarbonise industrial sectors but, in many cases, are not being pursued. This is often due to limited appetite to make such investments in the current policy environment or a policy gap in relation to supporting best available technologies.

The design of the ETS supports incremental reductions in carbon-intensity but can end up penalising businesses that adopt non-mainstream processeses or achieve rapid emissions cuts at a single installation due to the way in which benchmarking works.

An issue linked to ETS benchmark definitions and implementation has been identified which results in low carbon product substitutes such and iron ore pellets being excluded from applicable benchmarks or covered by a fallback benchmark with reduces incentives to use substitution as a means of decarbonising. Updating of benchmarks based on the latest data is also needed to provide appropriate incentives to decarbonise.

The manner in which benchmark reduction rates are determined will also have an unintended consequence of reduced trading wins for first mover product sectors which will be given steeper emissions reduction targets as a result. An increase in benchmark reduction rates is inevitable and may need be on the order of several mutiples of existing rates to bring them in line with the Paris agreement.

Existing EU climate policy instruments do not account for product lifecycle emissions which is limiting incentives to reduce emissions throughout the value chain.

Sectoral emissions targets are inconsistent with overarching policy targets, creating uncertainty over future policy direction.

Overly prescriptive technical norms are delaying entry to market for low carbon innovations.

To overcome some of these barriers, stakeholders proposed a number of solutions which include:

More active involvement of Member State governments in the planning, financing and development of large scale infrastructure to facilitate the deployment of low carbon technologies.

Greater coordination of EU and National funds for large decarbonisation projects to improve the chances of coming into fruition.

Applying an accurate interpretation of ETS product benchmark definitions to include low carbon substitutes and upstream emissions, thereby avoiding competitive distortions.

Promote adoption of green public procurement to help drive adoption of low carbon products and processes which contribute to meeting national emissions reduction targets.

Accounting for CO_2 savings that result from the creation of useful by-products from industrial processes (such as slag, or synthetic chemicals) under the relevant ETS benchmarks as well as accounting for lifecycle emissions.

Integrating trade policy and carbon pricing to ensure a level playing field between producers and a carbon price signal for consumers of industrial products.

Align the EU's ambition under the Paris Agreement and emissions targets for industrial sectors to set a stable emissions trajectory that provides certainty to investors.

Promoting the development of product norms that apply technology-neutral criteria and support best practice in terms of product and environmental performance.

Disclaimer

Some information used in this report has been shared confidentially with Sandbag. Other data may be available to interested parties upon request. Please send information requests to info@sandbag.org.uk

About Sandbag

Sandbag is a not-for-profit climate change policy think tank based in Brussels and London. Our mission is to advocate evidence based policies that drive cost effective and sustainable emissions reductions in Europe.

We conduct wide ranging research on EU and national climate policies and provide analysis of industrial and power sector emissions. You can learn more about our objectives and work at sandbag.org.uk.

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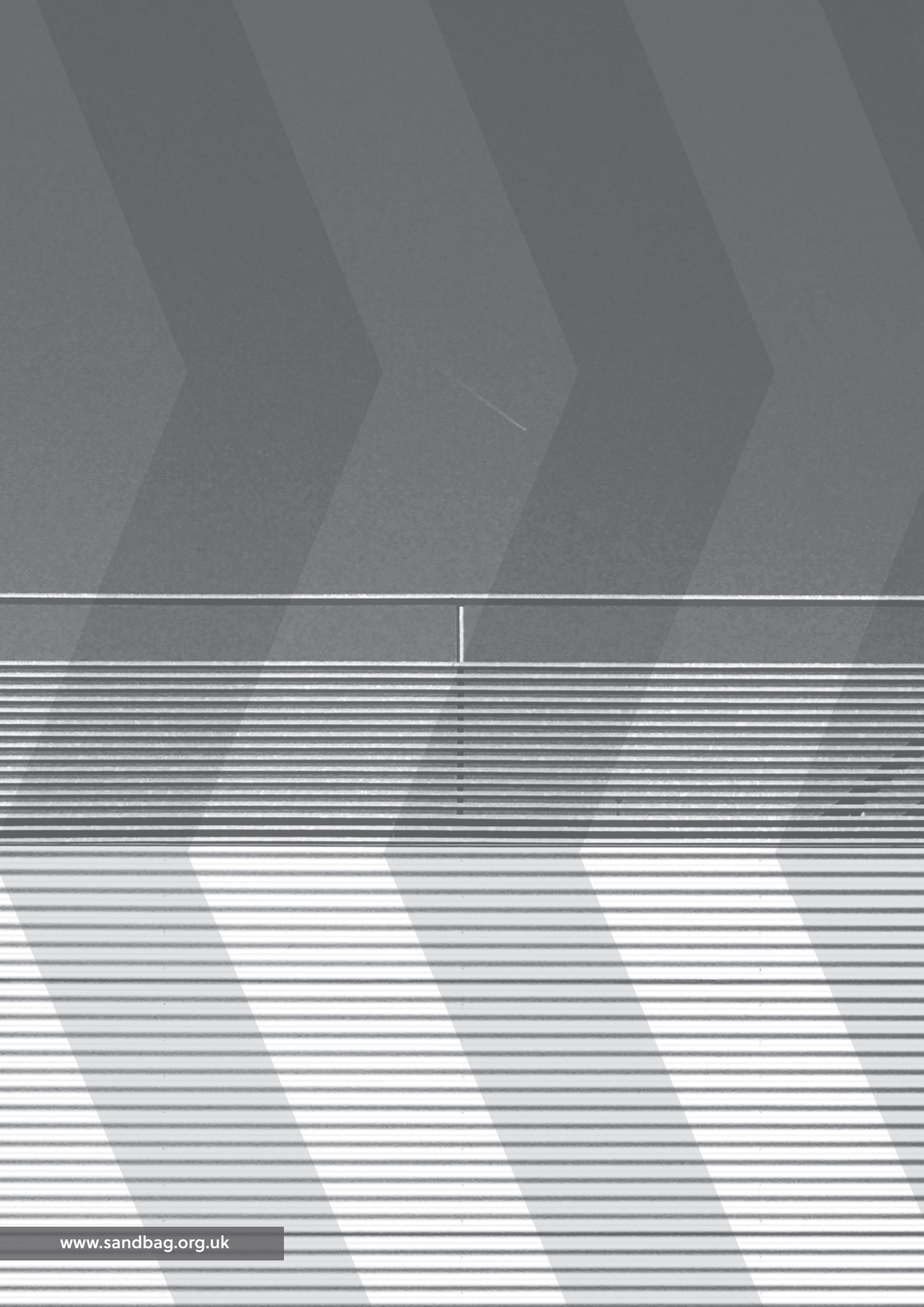

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