

A NEW INDUSTRY FRAMEWORK

FOR ACHIEVING THE EU GREEN DEAL
'ZERO POLLUTION' GOAL



**INDUSTRIAL EMISSIONS DIRECTIVE
AND CLIMATE ACTION:
KEY ELEMENTS FOR A REVIEW**

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**Carbon
Market
Watch**



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Executive summary

Under the EU Green Deal, the European Union is committed to reaching climate neutrality by 2050. A clean industrial transformation is urgently needed to achieve this goal. This paper proposes changes to the current industrial policy framework to ensure that the existing legislation covering industrial pollution drives a rapid transition towards zero pollution.

The Industrial Emissions Directive (IED) regulates pollution from around 50,000 large industrial installations in Europe. It requires industries to meet performance-based pollution limits, which are periodically reviewed to take into account innovation and progress. The IED aims to prevent pollution from industrial activities. All relevant environmental impacts should be taken into consideration: emissions to various environmental media (land, water and air), the use of resources such as water, energy, material or chemicals, waste prevention and general production efficiency, accident prevention, etc. This integrated approach is meant to achieve a high level of environmental protection as a whole.

However, while protecting the environment, the IED does not address greenhouse gas pollution and climate impacts directly. Instead, the regulation of greenhouse gas emissions is left to the EU carbon market (or Emissions Trading System – ETS).

Because greenhouse gas emissions were excluded from the scope of the IED with the introduction of the market based approach of the EU ETS directive, EU governments have not set limits on these emissions when issuing environmental permits under the IED. For the same reason, it is also optional for governments to set binding energy efficiency standards based on performance on those installations that are covered by the EU ETS.

These limitations are counter-productive and incompatible with the integrated approach of the IED to prevent (all) pollution at source. They also provide little incentive to industries to invest in more environmentally friendly processes and reduce their greenhouse gas emissions. In light of the urgent need to tackle the climate crisis, this oversight and shortcoming needs to be corrected. The revision of the industrial emissions directive is an opportunity to include greenhouse gas emissions within the scope of the legislation, and strengthen its key elements to ensure that it fulfills its full potential and yields the best environmental outcomes. The inclusion of greenhouse gas emissions within the scope of the IED does not entail duplication of regulation vis-a-vis the EU carbon market rules because both frameworks are complementary and follow different approaches. In addition, unlike the IED, the carbon market does not use the “best available technology” concept, so the IED’s best available techniques reference documents (BREFs) would be reinforcing and complementary regulation, not overlapping.

In order to drive the clean industrial transformation, different policy instruments are needed. The industrial emissions directive can and should be used to reinforce the market-based approach under the EU emissions trading scheme. For this to happen, the European Commission needs to propose deleting art. 9.1 that excludes greenhouse gas emissions from the industrial emissions directive, and to make energy efficiency standards mandatory in environmental permits. This can be done in the context of the ongoing revision of the industrial emissions directive. It is an opportunity not to be missed to ensure a new industrial policy framework that will help Europe reach its goals under the EU Green Deal.

Glossary

BAT Best Available Techniques: the "most effective and advanced stage in the development of activities and their methods of operation which indicates the practical suitability of particular techniques for providing the basis for emission limit values and other permit conditions designed to prevent and, where that is not practicable, to reduce emissions and the impact on the environment as a whole".

The notion of the three BAT elements are further clarified as follows:

"best" = most effective in achieving high level of environmental protection as a whole

"available" = developed at a scale which allows implementation in relevant industrial sectors under economically and technically viable conditions based on cost/benefit considerations.

"techniques" = technology used but also the way in which the installation is designed, built, maintained, operated and decommissioned.

BAT-Conclusions The binding sections of an EU BREF (see below), translated in all official EU languages.

BREF Best Available Techniques Reference Document. A document resulting from the exchange of information (Sevilla Process), drawn up for defined activities and describing, in particular, applied techniques, present emissions and consumption levels, techniques considered for the determination of best available techniques as well as BAT conclusions and any emerging techniques.



Background on the EU Industrial Emissions Directive (IED) and the EU Emissions Trading System (ETS)

The Industrial Emissions Directive (IED) regulates around 50,000 large industrial installations in Europe. It requires these installations to comply with relevant environmental quality standards linked to e.g. water and air pollution, as well as the substitution of potentially hazardous chemicals.

The IED takes an integrated approach on pollution prevention (over control) from industrial activities. This means addressing all relevant environmental impacts: emissions to various environmental media, the use of resources such as water, energy, material or chemicals, waste prevention and general production efficiency, accident prevention, etc. This integrated approach is meant to achieve a high level of environmental protection as a whole.

Industrial activities covered by the directive are extremely resource and energy-intensive. Not only are they the main emitters of traditional air and water pollutants but they are also the largest emitters of greenhouse gas pollution in the EU (e.g. large combustion plants, refineries, iron and steel, glass, cement production and chemicals industry).

While protecting the environment, the IED does not, however, address climate pollution directly. Instead, the regulation of greenhouse gas (GHG) emissions is left to the EU Emissions Trading System (ETS).

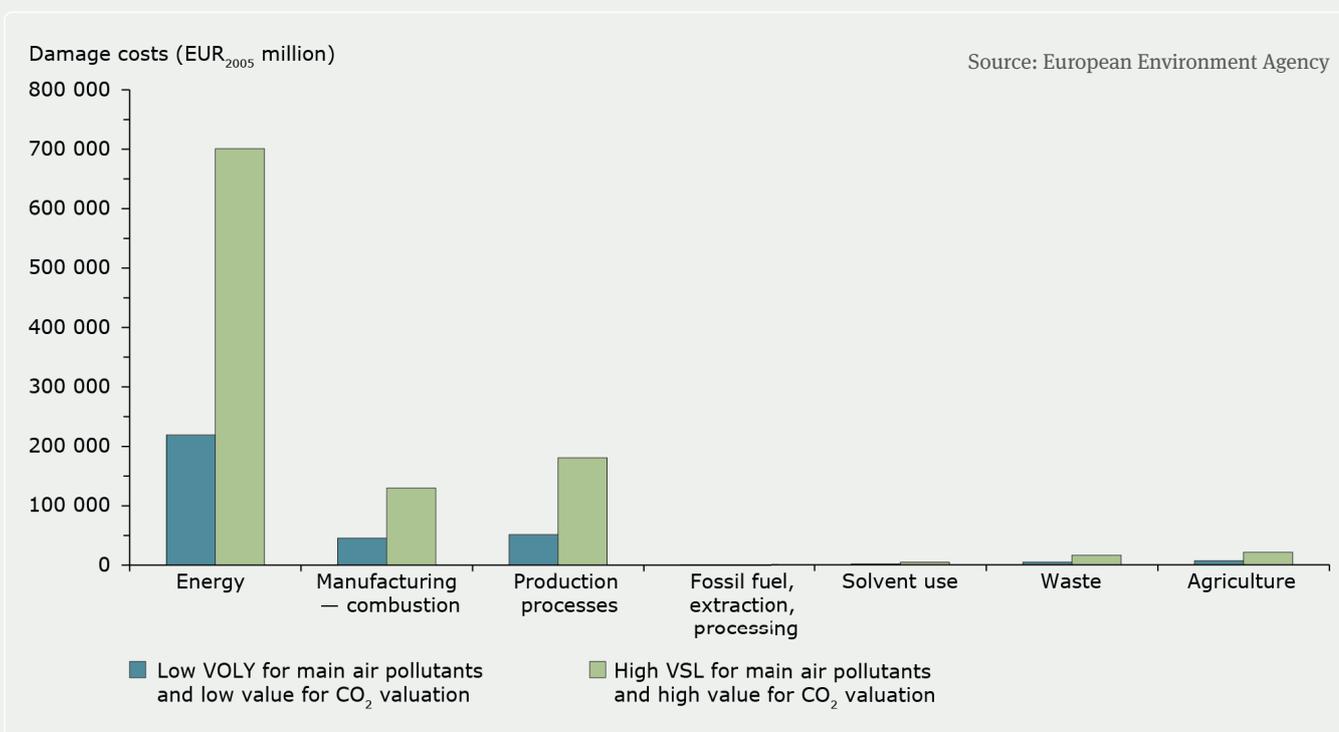
The EU ETS has been in operation since 2005 and covers about 45% of the EU's total greenhouse gas emissions, originating from approximately 11,000 large polluting installations. It is a market-based 'cap and trade' system, which means that it puts a limit (a 'cap') on the total volume of GHG emissions that installations covered under it can emit. These installations receive or buy EU emissions allowances (EUAs) to be able to pollute. One allowance (EUA) corresponds to one tonne of CO₂. The overall cap is reduced each year, which means that fewer allowances are available and therefore emissions are reduced over time in line with the overall EU climate target.

Because greenhouse gas emissions were excluded from the scope of the IED with the introduction of the market based approach of the EU ETS directive, EU governments have not set limits on these emissions when issuing the permits under the IED. For the same reason, it is optional for governments to set binding energy efficiency performance-based standards as a complementary measure to the market-based approach, when those installations are covered by the EU ETS scheme. These limitations are counter-productive and incompatible with the integrated approach of the IED to prevent (all) pollution at source.

An environmental AND a climate problem

Greenhouse gas (GHG) emissions from resource and energy-intensive industries, such as steel, cement and chemicals, currently represent 19% of total European GHG emissions. Emissions from these sectors, which are in the magnitude of some 425 million tonnes CO₂ per year, have not decreased since 2012, and according to the European Environment Agency, are not foreseen to do so until 2030¹.

In addition, in 2012, the top five air pollutants (excluding GHGs) alone emitted from the largest installations covered by the industrial emissions directive (IED) generated an annual health cost of up to €189 billion². It is worth highlighting that just 1% of all 14,325 assessed facilities were responsible for 50% of the total damage costs, and just 11% were responsible for 90% of total damage costs. Those are large combustion plants (LCPs), refineries and iron and steel plants where significant combustion activities take place, predominantly from fossil origin. It is clear that the energy sector (combustion) is responsible for the highest damage cost share of all activities covered by the industrial emissions directive.



NOTE: on greenhouse gas emissions from agriculture and other industrial sources

The graph above should, however, be handled with care when it comes to the damage costs listed under “agriculture”. These costs only cover a subset of industrial scale “agricultural” activities under the industrial emissions directive, namely intensive pigs and poultry rearing farms above a high threshold of animal number³. It excludes for example cattle and aquaculture. Those generate a lot of methane and ammonia emissions that also occur from handling and spreading manure⁴. Those off-site emissions are not accounted for under the European Pollutant Release and Transfer Register (PRTR) reporting or IED reporting (unless occurring on-site). Methane or N₂O emissions are not covered by the EU ETS either.

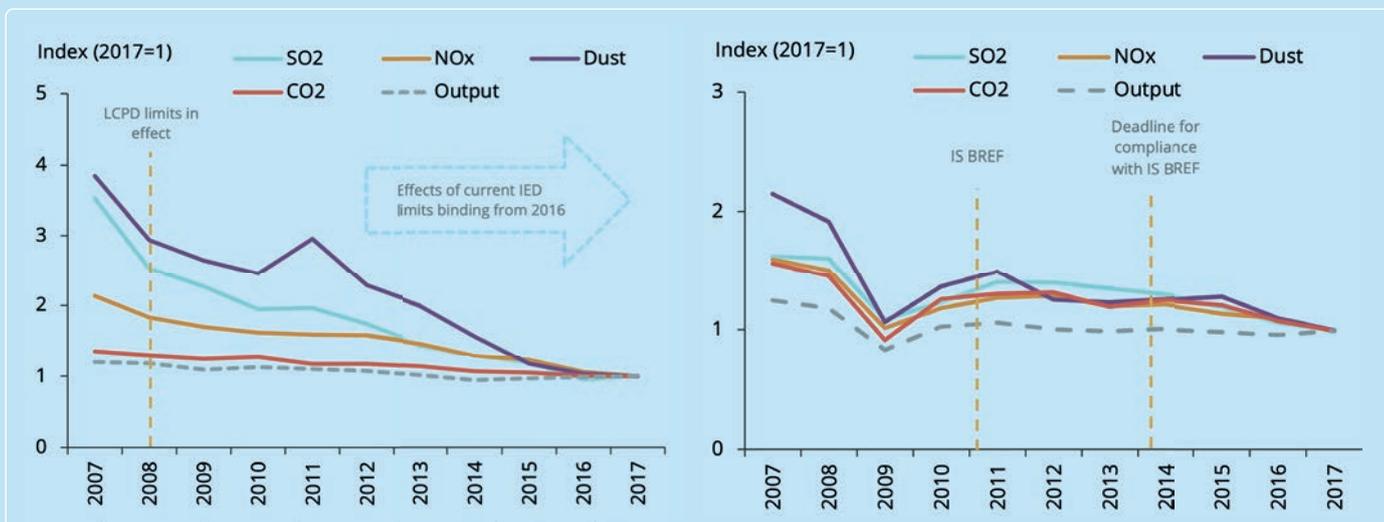
Further certain large-scale industrial activities, such as underground coal mining and landfills, release a significant amount of GHG (methane) emissions. Even if operators report those emissions, they are so far not subject to any regulatory requirements within the IED or EU ETS, which is a clear legal gap.

Combustion of fuels generates air pollution consisting of several chemical components which are emitted simultaneously, like CO₂, SO₂, NO_x dust emission, etc. Therefore stricter air pollution, fuel and efficiency standards for industrial activities also help reduce greenhouse gas emissions. Solid fuel combustion (renewable or fossil based) generates nitrogen oxide (NO_x) emissions and dust emissions. For solid fossil fuels with relatively high sulphur input, in particular lignite, sulphur dioxide (SO₂) and heavy metals are other critical air pollutants. For gaseous fuels, NO_x is one of the most relevant air pollutants. The highest average damage costs for the main air pollutants are estimated to be linked to dust, expressed as PM10 (EU average damage cost at 66,700€/tonne), followed by SO₂ (28,600€/tonne) and NO_x (12,000€/tonne) ⁵.

A recent EEA study ⁶ found that stricter air pollution standards for large combustion plants (LCPs) triggered wider plant closures and fuel switching (in particular fossil fuel) due to stricter emission limits on air pollutants (in particular SO_x, where fossil fuels have high sulphur content such as heavy fuel oil and lignite). A third of the EU fossil fuel capacity does not comply with the updated environmental performance standards set for 2021 under the industrial emissions directive (2017 LCP BAT reference document (BREF) addressing the non-GHG air pollutants). This is due to derogation options for Member States when it comes to setting the ambition level to cut pollution at source or enforcing the required fossil fuel combustion phase-out prior to 2030.

The below examples for large combustion plants and iron and steel manufacturing provide a further illustration on how stricter pollution limits also drive CO₂ emission reductions.

Figure: Change in emissions and output of large combustion plants (left) and iron and steel manufacturing (right) ⁷



The graph on the >50MWth large combustion plants (left) shows a significant drop of SO₂, NO_x and dust emissions in 2008, which was the deadline for the stricter emissions limit values under the LCP-directive of 2001 and the Integrated Pollution Prevention and Control (IPPC) Directive 2006 LCP BREF, implemented in only a few Member States. A further, more linear, drop did occur from 2013 (entry into force) and 2016 (deadline) of stricter emissions limit values set by the IED. We expect further significant emissions reductions to occur at the latest by July 2020 (end of transitional derogations under the IED) and August 2021 (compliance deadline for the revised LCP BREF setting stricter standards), in particular for mercury. However, here, the graph also shows that CO₂ emissions have not significantly dropped over that period.

The graph on the steel plants (right), on the other hand, shows a significant drop in all pollutants, including CO₂, in 2009 in line with declining output levels and the adoption of the first iron and steel BREF under the IPPC directive, which contained requirements to control emissions on all air pollutants. The CO₂ emissions follow trends of other air pollutants driven by a potential shift to the Electric Arc Furnace Route and reduced operations of particularly polluting blast furnaces or coke oven plants. After the economic downturn in 2009, output levels stabilised while pollution levels slightly decreased, indicating a decoupling of production output from pollution levels. In 2012 the revised iron and steel BREF was adopted, with a compliance deadline ending in March 2016. That binding BREF contains stricter requirements on dust emissions, that required the fitting of more effective fabric filters to the sinter strands. However, only moderate emission reduction was achieved in NO_x and SO_x.

Though not mandatory for Member States to enforce under the IED, many best available techniques (BAT) conclusions contain performance-based energy efficiency standards. A 2012 study by the EU's Joint Research Centre ⁸ found that a gradual replacement of large combustion plant boilers, based on the 2006 BAT-based efficiencies set in the earlier LCP BREF of 2006, would translate into a saving of 756 million tons of oil equivalent (2011-2030), leading to primary energy saving of about 14-18%, with CO₂ savings of 2.7Gt compared to 2011 levels. Those standards have in the meantime evolved (see: 2017 LCP BREF) and energy efficiency benchmarks are now more ambitious (44% net for lignite, 46% hard coal and >60.5% net for gas combined cycle gas turbines). This means that significant energy saving and greenhouse gas mitigation potential in industrial and power sectors is available with current technologies. Unfortunately, neither the standards set by the IED - mostly due to their voluntary nature-, nor the ETS carbon price are enough to grasp this potential.

Stricter and mandatory performance-based standards for greenhouse gas pollution and energy efficiency would not only improve air quality but also lead to more efficient resource use and increased climate action. For example, if Germany followed the Dutch example and required its coal operators to meet binding BAT-based minimal energy efficiency levels, the German government could have forced a phase-out of its pre-1990 coal/lignite boilers much earlier.



Differences on the main approaches and principles between the EU ETS and the IED

While the industrial emissions directive and the EU emissions trading scheme both address industrial pollution, there are significant differences when it comes to their approaches and principles. Below we compare the four main principles that these laws are based on.

- **Best available techniques (BAT):** Under the IED, environmental permits are issued to installations on the basis of “best available techniques” (BAT). The objective of BAT is to identify techniques, be it design, or technology related, which would achieve the overall best environmental performance levels for a given industrial activity. They correspond to “best environmental performance standards”. Many BAT reference documents (BREF) highlight fuel choice as one of the techniques to prevent air pollution and set BAT on energy efficiency, which also has a direct impact on greenhouse gas emissions. The performance standards can be based on any reference plant commercially operating anywhere in the world, provided that this technique is reasonably available to the relevant industry sector in the EU. For promising techniques not yet established in the EU, the BREF contains an “emerging techniques” section. However, industrial operators are not obliged to apply these techniques that may not be readily available in Europe. The EU emissions trading scheme does not contain such performance-based standards.
- **Operating licence conditions and pollution prevention principle:** Under the IED, the principle is that pollution prevention shall be favoured over control and companies must comply with pollution limits. However, the real impact of this principle depends on the level of ambition within the BAT determination process as well as stringency of permit limits and enforcement. Indeed, the permit conditions set requirements on substitution obligations, process and fuel switching, etc. The EU ETS, on the other hand, does not set limits on emissions. As long as the operator buys European Union Allowances (EUA), the facility may emit the corresponding amount of greenhouse gas pollution. No pollution prevention obligations are laid down in that framework.
- **Polluter pays principle (PPaysP):** The polluter pays principle dictates that the costs of pollution should be borne by those who create it, and it is set out in the Treaty on the Functioning of the European Union (Article 191(2) TFEU). Under IED, there is no requirement to implement the PPaysP for environmental impacts or the use of resources. On the other hand, the EU ETS is based on the polluter pays principle, but covers greenhouse gas emissions only. Although the price of CO₂ is determined by the market rather than the true cost of carbon pollution, it is a beginning of an implementation of the PPaysP. However, while the market-based CO₂ price has proven effective in driving down emissions from the power sector, more than 90% of industrial greenhouse gas emissions are covered by free emissions allowances. Free allowances are allocated according to sectoral ETS benchmarks. Benchmark values are calculated on the basis of the performance of the 10% most efficient installations in the EU, and have yearly efficiency improvement rates, which are set between 0.2 % and 1.6% (art. 10a of the ETS Directive). The benchmarks are meant to strengthen the incentives for carbon emission reductions and innovation and reward the most efficient installations. However, the stagnating emissions from industrial installations make it clear that these benchmarks, and the associated allocation of free allowances, provide virtually no incentives to industries to reduce their emissions. This situation is aggravated by the fact that the issuance of free emissions allowances has led to significant windfall profits in the covered industrial sectors, amounting to over €25 billion during the 2008-2015 period ⁹.

According to a report of the High Level Commission on carbon prices, the explicit carbon price level consistent with achieving the Paris temperature target is at least US\$40–80/tCO₂ by 2020 and US\$50–100/tCO₂ by 2030. In order to fully account for the negative externalities caused by greenhouse gas pollution, and to fully implement the PPaysP, a price level of at least 100€/tonne GHG should be achieved ¹⁰.

In addition to the shortcomings explained above, the IED BREFs have so far focused on an end-of-pipe emissions control approach for a limited set of pollutants. However, they are not based on best technical achievable environmental performance levels that address all relevant impacts of a given industrial activity. This limitation is due to unclear legal provisions concerning the BAT determination but also due to its inadequate scope. Further, there is strong resistance by Member States and industry when it comes to restricting fuel choice, even if it is clear from the BAT criteria that certain fuels should not be used¹¹.

The IED and EU ETS both regulate industrial pollution. However, as shown in the table below, there are inconsistencies between how they address the above mentioned key principles. This undermines the great potential for synergy between the two.

		Best available techniques <i>(performance based)</i>	Emission limit values / other permit measures	Pollution prevention	Polluter pays
Non-GHG	IED	Yes	Yes	Yes, but limited if end of pipe approach is taken	Not implemented / no provisions on leftover emissions
	ETS	Exempted	Exempted	Exempted	Exempted
Direct GHG	IED	Exempted	Exempted	Exempted	Exempted
	ETS	Not performance-based but market price	EU-wide cap	No prevention obligation	Partly implemented - over 90% of industrial emission are allocated for free to industrial installations ¹¹
Indirect GHG <i>(e.g. fuel choice, energy efficiency)</i>	IED	Yes, but often indicative or leaving fuel choice option open	Optional for member states	Optional for member states	Optional for member states
	ETS	Exempted	Exempted	Exempted	Addressed in part (EUA price) incentivising fuel switch and energy efficiency
Resource use	IED	Yes	Yes	Yes, but limited if end of pipe approach is taken	Not implemented / no provisions on leftover emissions
	ETS	Not addressed	Not addressed	Exempted	Exempted



An illusion of duplication

The prohibition to include limits on greenhouse gas emissions in the IED operating permits is not in line with the EU climate commitments. It unnecessarily restricts the options available to Member States to promote GHG emission reductions from industrial installations.

Unlike hinted in the IED directive, there is no duplication of regulation vis-a-vis the ETS, because the two frameworks are complementary and follow different approaches. Further, the provision in Art. 9(2), which leaves the energy efficiency performance or fuel choice requirements “optional”, is counter-productive both to the IED and the ETS goals. It is also inconsistent with the BAT criteria to use energy and other resources efficiently. BAT-Associated Energy Efficiency / Performance Levels (BAT-AEE(P)Ls) have been laid down in BREFs but Member States are free to ignore them. Energy efficiency reduces all pollutants as well as costs and is therefore in the interest of both the operators and the environment.

Example of successful “double regulation”

A parallel can also be drawn from the Montreal Protocol / F-Gas regulation aiming to replace certain gases that have a global warming potential and/or are ozone depleting substances. Recent BREF BAT conclusions, such as the Food Drink and Milk (FDM) BREF as well as the Slaughterhouses BREF currently under review, aim to go beyond the Montreal Protocol on substituting refrigerants that show a global warming potential or are ozone depleting substances.

These BAT conclusions are another example on how the IED is contributing to climate protection through substitution obligations on the use of refrigerants. In this case, industry has argued about potential “double-regulation” with the Montreal Protocol and F-Gas regulation, similarly to what is occurring with the regulation of greenhouse gases between the EU ETS and the IED.

New commitment by the industry:

In the ‘Masterplan for a competitive transformation of EU Energy Intensive Industries enabling a climate neutral, circular economy by 2050’¹². The High-Level Group on Energy Intensive Industries (EII) recently committed to the following:

- Energy-intensive industry associations will give strong support to the development of policies to enable the transition to a climate-neutral economy by 2050, whilst keeping industry competitive.
- ***“The Industrial Emissions Directive permitting process should be adapted to support GHG abatement measures in energy intensive installations throughout the transition. The low carbon emission technologies under development should be assessed as potential emerging techniques during the BREF drawing and reviewing process.”*** (Own emphasis added, see page 34.)



Conclusions and policy recommendations

Although coherence is officially part of the EU's Better Regulation initiative, many sectoral instruments, such as the industrial emissions directive and the EU emissions trading system still fail to exploit synergies and efficiency gains.

Replacing carbon-intensive industrial processes or energy sources with carbon-neutral ones is paramount. The IED is the only legislative tool based on performance-based standards, which are periodically reviewed to take account of innovation and progress. If the IED is to be made fit for the future, it will need to work hand in hand with other policy instruments and will need to reinforce the market-based approach under the EU ETS.

This way the polluter-prevention (in BAT) and polluter-pays (in EU ETS) principles will be properly implemented. Correcting the inconsistencies shown above would make the EU policy instruments more effective as a whole.

The industrial emissions directive is unique in its “integrated approach”, striving to prevent all environmental impacts from industrial activities. However, the fact that it explicitly excludes greenhouse gas emissions from its scope, prevents it from achieving its full potential.

The foreseen revision of the industrial emissions directive is an opportunity to include greenhouse gas emissions within its scope. In this context, the EU Commission should propose to:

- Delete IED Art. 9.1 and amend the ETS directive to enable a combined approach to greenhouse gas emissions;
- Introduce minimal binding energy efficiency standards based on best in class solutions within a given industrial activity (e.g. electricity, heat generation);
- Introduce GHG performance standards or Emission Performance Factor (EPF) to achieve a complete 2030 coal phase-out in Europe, and industrial decarbonisation in line with achieving climate neutrality by 2040;
- Delete IED Art 31 on desulphurisation rate which benefits low-grade lignite combustion, the most carbon intensive fuel, with immediate effect and tighten the minimal binding air pollution limits set in Annex V of the IED for large combustion plants.

Furthermore, in order to ensure that all industrial pollution is effectively addressed and that industry is firmly set on a zero pollution pathway, the overall legislative framework should be improved. To this aim, we propose the following improvements:

- The EU “Best Available Technique” concept should be redesigned to yield the best environmental outcome for a given industrial activity and be dependent on the product or service this industry produces. The European Commissions should prioritize the following sectors: energy production, water quality and supply, protein production, resource management, substitution of hazardous chemicals ¹³;
- The prevention first principle should be rigorously enforced and take precedence over end-of pipe pollution reduction;
- BAT standards should be set on the basis of technically achievable performance levels that provide the best overall environmental protection outcomes.

The EU can also not afford to not address the rising greenhouse gas pollution from agricultural sources. In Europe, food production alone – up to the farm gate – is responsible for at least 15% ¹⁴ of total net GHG emissions. This does not even include the considerable emissions embedded in the livestock feed and other agricultural inputs imported every year.

Therefore, in the context of the IED review, the EU Commission should consider:

- replacing the Intensive Rearing of Pigs and Poultry BREF with a BREF on protein production and soil fertility;
- addressing environmental impacts of other animal rearing activities e.g. cattle.

Industrial impacts from mining activities should also be adequately covered. Waste-related aspects of mining activities are addressed, at least in part, by the Management of Waste from Extractive Industries BREF developed under the Mining Waste Directive ¹⁵. However, this does not set rules on how to prevent emissions from underground hard coal mining and landfills, which are the highest sources of methane emissions from the PRTR activities.

Therefore, in the revision of the IED, the EU Commission should also consider tackling methane emissions from underground hard coal mining and landfills.

Energy and resource intensive industries will play a key role in Europe's efforts to reach climate neutrality in line with the EU Green Deal. Different policy instruments such as the industrial emissions directive and the EU emissions trading scheme must be made complementary so that they can work together to achieve best possible outcomes for climate and the environment. We need to deploy all the means at our disposal in order to drive the necessary clean industrial transformation.

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For further related reading material, see the following publications:

- **Avoiding A Carbon Crash: how to phase out coal and strengthen the EU ETS**
<https://carbonmarketwatch.org/publications/cracking-europes-hardest-climate-nut/>
- **Cracking Europe's hardest climate nut – How to kick-start the zero-carbon transition of energy-intensive industries?**
<https://carbonmarketwatch.org/publications/avoiding-a-carbon-crash-how-to-phase-out-coal-and-strengthen-the-eu-ets/>
- **Carbon Market Watch input to the inception impact assessment on Industrial Emissions Directive revision**
<https://carbonmarketwatch.org/publications/carbon-market-watches-response-to-the-inception-impact-assessment-on-industrial-emissions-directive-revision/>
- **Destination: Climate Neutrality**
<https://eeb.org/library/destination-climate-neutrality/>
- **EEB input to consultation on the EU Climate Law**
<https://eeb.org/library/response-to-consultation-on-the-eu-climate-law/>
- **Industrial Transformation for a More Resilient Future**
<https://eeb.org/library/industrial-transformation-for-a-more-resilient-future/>

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3. Livestock: Impacts of European livestock production: nitrogen, sulphur, phosphorus and greenhouse gas emissions, land-use, water eutrophication and biodiversity.
4. Manure: For more information please visit <https://meta.eeb.org/2020/04/02/the-big-stink-europes-lockdown-uncovers-a-surprising-source-of-air-pollution/> and <https://eeb.org/publications/62/air-quality/1078/clearing-the-air-a-critical-guide-to-the-new-nec-directive.pdf>
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6. A recent EEA study: EEA report 2019 “Assessing the effectiveness of EU policy on large combustion plants in reducing air pollutant emissions” <https://www.eea.europa.eu/publications/effectiveness-of-eu-policy-on/download>.
7. Source: European Environmental Bureau

Data source of graphs:

Data sources: E-PRTR (activities 1.(c) and 2.(b), respectively), EMBER database for electricity production (including biomass) and PRODCOM for steel production. The left figure on large combustion plants shows a peak in dust emissions in 2011, which seems to be due to a factor 10 reporting error on the Estonian Narva LCP (Eesto Energia Narva Elektriijaamad AS, PRTR code EE051174: 20800 tonnes! of PM 10 emissions have been reported for 2011. The levels were 6073tonnes in 2011 and 2850 in 2012. The steel graph is missing data for some major facilities: e.g. 2017 from Voestalpine Stahl Linz (AT), missing 2016 +2017 air emissions data for the Redcar (UK) integrated steel site Sahaviriya Steel Industries UK limited, Teeside. Manual corrections were made for 2016+2017 Scunthorpe integrated steel site (UK) and for 2016 data for Salzgitter Flachstahl (DE)

8. JRC study: <https://setis.ec.europa.eu/sites/default/files/reports/Analysis-of-energy-saving-potentials-in-energy-generation.pdf>
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12. Master plan HLGEII: <https://ec.europa.eu/docsroom/documents/38403/attachments/1/translations/en/renditions/native>
13. Hazardous: See related briefings by the EEB on wider aspects linked to IED review and EU industrial Strategy
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15. Mining waste directive: http://publications.jrc.ec.europa.eu/repository/bitstream/JRC109657/jrc109657_mwei_bref_-_for_pubsy_online.pdf

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