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COVER NOTE

From:	Secretary-General of the European Commission, signed by Ms Martine DEPREZ, Director
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To:	Mr Jeppe TRANHOLM-MIKKELSEN, Secretary-General of the Council of the European Union
No. Cion doc.:	SWD(2022) 111 final
Subject:	COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the documents Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) and Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste and Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on reporting of environmental data from industrial installations and establishing an Industrial Emissions Portal

Delegations will find attached document SWD(2022) 111 final part 4/5.

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PART 4/5

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

Accompanying the documents

Proposal for a
DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
amending

Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) and Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste

and

Proposal for a
REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL
on reporting of environmental data from industrial installations and establishing an Industrial Emissions Portal

{COM(2022) 156 final} - {SEC(2022) 169 final} - {SWD(2022) 110 final} -
{SWD(2022) 112 final}

Annex 8: Impact of Shortlisted Measures – Industrial Emissions Directive

Problem area 4: The IED's contribution to reducing greenhouse gas emissions has been limited

There are four measures shortlisted to address the problems, drivers and consequences associated with this problem area. For example, the IED's design and implementation to date have not prioritised greenhouse gas emissions and, as a result, the IED has not been as effective as it could be in contributing to reducing GHG (Ricardo et al, 2020).

We have structured these measures based on the specific problems they are trying to tackle and provide a description, outline the requirements for implementation and a rapid assessment of their impacts. Following this, we provide an overview of the Economic, environmental, and social impacts supported by evidence.

Measure 27: Delete Article 9(2) that exempts (agro-) industrial installations from setting requirements relating to energy efficiency in respect of combustion units or other units emitting carbon dioxide on the site.

Description of the measure and requirements for implementation

This measure would ask operators of IED installations to develop a plan that would comply with energy efficiency requirements, where energy efficiency concerns the carbon emitting technical units rather than energy efficiency per ton of product.

The definition of energy efficiency is key for this measure from the outset, especially given the different ways in which energy efficiency is defined and considered in other EU legal instruments. If it were defined per ton of product, there could be barriers to implementation associated with confidential business information. Similarly, setting a range of energy efficiencies may get pushed back from industry.

Having considered this, energy efficiency in this proposed measure has been defined in terms of carbon emitting units.

Objectives:

The measure seeks to enhance the energy efficiency of IED installations. This measure will, therefore, contribute to the general objective of achieving carbon neutrality in the EU, and more specifically, support the decarbonisation of the (agro-)industrial sectors covered by the IED.

Implementation needs:

- EU to define energy efficiency for the purposes of this proposed measure and scope for carbon emitting technical units

- Authorities and operators to establish a monitoring and reporting / enforcement approach that is proportionate and effective, building e.g. on the approach used for EMS BAT conclusions
- Operators to follow through with the plan's implementation and engage in periodic discussions (during inspections or otherwise) with the competent authorities to review the conditions of the permits

Assessing impacts

Economic impacts

Overall, this measure is likely to have **weakly negative economic impacts** when compared to the baseline, depending on the number and ambition of additional energy efficiency plans developed as a result of this measure.

Operating costs and the conduct of businesses: **PO4-a-energy efficiency** will also lead to an increase in CAPEX and OPEX for IED operators, who would be required to increase decarbonisation and energy efficiency efforts. This, however, could lead to more carbon allowances becoming available for trading in the ETS, which could impact the carbon price and affect incentives for emissions reductions in other ETS sectors. The scale of impact will depend on whether are measures are taken to address potential impacts on the carbon price, e.g. through the Market Stability Reserve, the timing of measures, derogations allowed, speed of technological advancement, technology cost curves, and energy efficiency gains achieved. Subsequent to the initial investment, operators' life cycle costs would diminish. Given the evidence available and significant uncertainties, it has not been possible to quantify these impacts.

Administrative burden on businesses

This measure is likely to lead to **negative impacts** on administrative burden on businesses, primarily from the development of additional energy efficiency plans. The measure will require adjustments to the BREF and permitting processes, which are likely to increase the frequency and duration of administrative activities for businesses and public authorities.

A review of the evidence suggests that a marginal cost could be expected, since energy efficiency is already encouraged in certain BAT conclusions and around half of the installations may already have energy efficiency plans in place. This marginal administrative cost would, therefore, be incurred by approximately 26 000 IED installations, each of which may require time and resources to develop and implement these plans.

To estimate core planning costs for these installations, the Ecodesign Directive could be a starting point. The Ecodesign Directive provides rules for improving the environmental performance of products, setting increasing minimum mandatory requirements for the energy efficiency of these products. An energy efficiency plan under the IED could ensure that the Ecodesign requirements are better implemented and, therefore, allow more efficient forms of combustion when compared to the baseline. To estimate the impacts of energy efficiency requirements, two different industries can be taken as representative examples, that is the

industry for electronic displays[1] and the one for welding equipment[2]. In the first case, because of commercial interest, no administrative burden for the industry is expected. In the second example, the administrative costs associated with reporting and communication of energy and material efficiency data in the supply chain is very low with respect to expected revenues from the measure.

In the baseline, the costs to operators from engaging in these activities are estimated based on multiple sources outlined earlier in this Annex:

- One-off costs associated with permit reviews (once every 10 years)
- Costs associated with BREF reviews (once every 10 years per sector)
- Annual monitoring and reporting costs (once every year)
- Costs associated with supporting inspections (once every two years)

Upon the adoption of this measure and over a 20-year period, the additional effort required is uncertain although, based on expert judgement, it is assumed that it would lead to an addition of 10% over the baseline. As a result, over this period, additional administrative costs could range between €1 million and €44 million each year for operators, on average, with a central estimate of around €29 million each year.

Additional administrative costs would be incurred if this measure is implemented in isolation, especially as there would be a need for operators to expand their efforts with review permits, the BREF review process, receive and maintain more reported data, and support inspections and other enforcement-related activities.

Operating costs and conduct of business

This measure is likely to have **weakly negative impacts** on the costs of doing business. For those installations without an energy efficiency plan especially, this measure would be expected to require capital investments earlier than planned, bringing therefore costs forward. Further, operating cost impacts would depend on the measures implemented. Lower energy costs would be expected although further evidence could be sourced from the IA of Ecodesign Directive, considering the two industry examples mentioned above.

In particular, energy efficiency measures are estimated to create €66 billion in extra revenue for European companies per year[3].

For those industries for which no correlation is expected between the retail prices and the energy efficiency (such as for electronic displays), business revenues and jobs will not differ from the BAU scenario[4]. In addition, market competitiveness requires dynamic industries to invest in production, redesign, and test more efficient products, whose costs will be absorbed by the industry.

Differently, investments for energy and material savings are possible for welding equipment. However, initial investments by the industry and retail sector are compensated by the higher

[1] SWD/2019/0354 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0354
[2] SWD/2019/0340 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0340
[3] https://EU.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-EUodesign/about_en
[4] SWD/2019/0354 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0354

revenues generated[5]. As for the previous example, compliance and redesign costs are not expected to increase because they are a common practice in the industry.

Competitiveness and level playing field

This measure would likely lead to **limited to no impacts** on competitiveness and **weakly positive impacts** on levelling the playing field. The costs of the measure are unlikely to be significant to affect the competitiveness of EU businesses in a global context. The measure would require all installations across the EU to introduce energy efficiency plans and, therefore, would lead to a more level playing field when compared to the baseline.

Position of SMEs

This measure is likely to lead to **limited to no impacts** on the position of SMEs. The measure is not expected to affect small and large businesses differently.

In particular, considering the Ecodesign directive example, for some industries (e.g. electronic displays), SMEs do not work in the production chain and no impact is expected on SMEs retailers[6].

Innovation and research

This measure may have a **limited to no impact** on research and development, as it is not focussed on pushing the innovation frontier but rather implementing available techniques/ equipment. This said, this measure will likely encourage more investment in developing and testing innovative techniques and technologies, to help operators comply in a cost-efficient manner with potentially more stringent energy efficiency and GHG requirements,.

Setting ambitious mandatory minimum Ecodesign-style requirements would boost innovation in terms of energy efficiency, as currently there is no relevant Research and Development in the field of display-technology in the EU[7].

For welding equipment-like industries, the Ecodesign regulation with energy efficiency measures is not expected to lead to any significant structural increase in R&D budgets. Energy-efficient products are already commercially available on the market. However, SMEs may undertake investments to adapt the supply chain routes to the required power source technology change[8].

Public authority impacts

This measure will likely lead to **negative impacts** on public authorities.

A review of the evidence suggests that a marginal cost could be expected, since energy efficiency is already encouraged in certain BAT conclusions and around half of the installations may already have energy efficiency plans in place. This marginal administrative cost would, therefore, be incurred by approximately 26 000 IED installations, each of which may require time and resources to develop and implement these plans.

[5] SWD/2019/0340 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0340
[6] SWD/2019/0354 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0354
[7] SWD/2019/0354 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0354
[8] SWD/2019/0340 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0340

In the baseline, the costs to operators from engaging in these activities are estimated based on multiple sources outlined earlier in this Annex:

- One-off costs associated with permit reviews (once every 10 years)
- Costs associated with BREF reviews (once every 10 years per sector)
- Annual costs from engaging with information received from operators and maintaining systems (once every year)
- Costs associated with leading and managing inspections (once every two years)

Upon the adoption of this measure and over a 20-year period, the additional effort required is uncertain although, based on expert judgement, it is assumed that it would lead to an addition of 10% over the baseline. As a result, over this period, additional administrative costs could range between €2 million and €29 million each year for operators, on average, with a central estimate of around €21 million each year.

Additional administrative costs would be incurred if this measure is implemented in isolation, especially as there would be a need for public authorities to expand their efforts with review permits, the BREF review process, receive and maintain more reported data, and manage expanded inspections and other enforcement-related activities.

Environmental impacts

Overall, this measure is likely to have **weakly positive environmental impacts** when compared to the baseline, depending on the number and ambition of additional energy efficiency plans developed as a result of this measure.

Climate

This measure will likely lead to **weakly positive to positive impacts** on climate. This measure is expected to improve the energy efficiency of IED installations across the EU when compared to the baseline, and, as a result contribute to achieving EU Green Deal objectives[9]. The scale of this impact will likely vary by sector, with those operating bespoke energy systems such as iron and steel installations likely to see less savings than those sectors using a more standard energy boiler/ generator system, although the evidence is limited. This option should also have positive knock-on effects on air quality and other environmental categories via reduced fuel use and combustion.

Illustratively, the environmental impacts derived from energy efficiency measures can be estimated using the Ecodesign and the Energy labelling directives as a comparative example. Such pieces of legislation are estimated to bring energy savings of approximately 230 Mtoe by 2030[10].

More specifically, energy efficiency measures for electronic display-like industries under the Ecodesign directive are estimated to produce a cumulative decrease in GHG emissions with respect to baseline, from 22 to 98 Mt CO2 eq/a in the period 2021-2030. Similarly, EU

[9] https://carbonmarketwatch.org/publications/a-new-industry-framework-for-achieving-the-eu-green-deal-zero-pollution-goal/

[10] https://EU.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-EUodesign/about_en

electricity consumption would decrease between 64 and 277 TWh/yr with respect to baseline in the same period[11].

Energy efficiency measures for welding equipment-like industries under the Ecodesign directive are estimated to produce a cumulative decrease in GHG emissions with respect to baseline, from 1.73 to 3.03 Mt CO2 eq/a in the period 2019-2030. Similarly, EU electricity consumption would decrease between 6.18 and 10.3 TWh/yr with respect to baseline in the same period[12].

Air quality

This measure is likely to result in a **weakly positive** impact on air quality. Energy efficiency measures are expected to have a direct impact on reducing the emission of pollutants to air when compared to the baseline.

Other environmental impacts

This measure will likely have **limited to no impacts** on water quality and resources; soil quality and resources; waste production, generation and recycling; and the efficient use of resources.

Social impacts

This measure specifically is likely to result in a **limited to no impact** on employment, although some employment opportunities may arise from the development and implementation of the energy efficiency plans. No impact on EU employment is expected for products for which no correlation is expected between energy efficiency and retail price[13].

However, it should be noted that environmental impacts, especially the reduction on emissions to air, are likely to have positive impacts on public health in the EU, by reducing the risk of disease, especially respiratory disease, and leading to reductions in health and social care costs across the EU. Any reductions in GHG emissions would contribute to climate change mitigation.

Measure 28: Introduce a review clause of the interface between the IED and the ETS

Description of the measure and requirements for implementation

Article 9(1) of the IED prevents the setting of emission limit values in permits for GHG where those emissions are addressed under the EU ETS. This measure introduces an opportunity to review the coherence of the two directives and identify how to maximise synergies between them in achieving the EU's climate objectives.

Objectives:

[11] SWD/2019/0354 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0354
[12] SWD/2019/0340 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0340
[13] SWD/2019/0354 https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:52019SC0354

The measure will aim to consider ways in which to maximise the synergies between the IED and climate policy, in particular the ETS. This measure could, therefore, contribute to the general objective of achieving carbon neutrality in the EU, and more specifically, support the decarbonisation of the (agro-)industrial sectors covered by the IED.

Implementation needs:

- Competent Authorities to engage with stakeholders and consider whether the IED could better contribute to EU climate objectives more directly and in a way that maximise synergies with the EU ETS.

Assessing impacts

Economic impacts

This measure is likely to have **limited to no direct economic impacts**. The measure would have very limited administrative burden impacts, primarily on public authorities, although operators may be consulted, since a review would be carried out in the EU policy context.

Environmental impacts

This measure is likely to have **limited to no direct environmental impacts**. However, reviewing what steps may be most effective with regards to synergies between IED and ETS could help ensure that any potential conflicts with the ETS mechanism are avoided and, as result, maximise the potential positive benefits.

Social impacts

This measure is likely to result in **limited to no direct impacts** on employment across the EU.

Measure 29: Introduce a limit of 2035 ('sunset date') beyond which the exemption for (agro-) industrial plants from setting GHG ELVs requirements in permit conditions if they are regulated by the EU ETS will not apply.

Description of the measure and requirements for implementation

Article 9(1) of the IED prevents the setting of emission limit values in permits for GHG where those emissions are addressed under the EU ETS. This measure would seek to introduce ELVs for GHG into permit conditions for IED installations from 2035, as an alternative to the immediate deletion of Article 9(1) considered in the following section. 2035 was chosen as a point between the 2030's target of 55% emissions reduction and 2050's carbon neutrality goal. This would provide the industry with time to review and adjust their course of action so they can contribute to the EU's journey towards climate neutrality. Further, deferring the deletion of Article 9(1) would also provide time to consider further the interaction between the IED and the EU ETS to ensure coherence and effective implementation.

Objectives:

The measure will aim to address GHG emissions more directly as part of the IED permitting process. This measure will, therefore, contribute to the general objective of achieving carbon neutrality in the EU, and more specifically, support the decarbonisation of the (agro-)industrial sectors covered by the IED.

Implementation needs:

- Competent Authorities to consider actions to ensure coherence between the IED and EU ETS.
- All stakeholders involved in the BREF process would consider BAT-AELs for GHG emissions from 2035, although industry's implementation of any substantive actions may take an additional 5-10 years.
- Operators and Competent Authorities would consider these BAT conclusions in any new or updated permits.

Assessing impacts

Economic impacts

This measure is likely to have **limited to weakly economic impacts** in the period. The measure would have similar albeit delayed impacts associated with measure 30, which is an alternative.

Administrative burden on businesses

This measure is likely to lead to **weakly negative impacts** on administrative burden on businesses. Additional administrative costs would be incurred, especially as there would be a need to include GHG emissions as part of permit reviews, the BREF review process, monitor and report more data, and engage with inspections and other enforcement-related activities.

In the baseline, the costs to operators from engaging in these activities are estimated based on multiple sources, as outlined earlier in this Annex:

- One-off costs associated with permit reviews (once every 10 years)
- Costs associated with BREF reviews (once every 10 years per sector)
- Annual monitoring and reporting costs (once every year)
- Costs associated with supporting inspections (once every two years)

These additional costs would only affect IED installations from 2035 or thereafter. It is assumed that there would be a period longer than 5 years over which operators can adjust to the new requirements; and that around 13 000 installations may be affected by this measure within the period. Each of these operators will require time and resources to implement this measure. The additional effort required is uncertain although, based on expert judgement, it is assumed to be an additional 10% over the baseline for each of the activities outlined.

As a result, additional administrative costs for operators could reach between €0.7 million and €23 million each year over a 20-year period, on average, with a central estimate of around €15 million each year. These costs are averaged over the period for comparison in a context where implementation timings are generally uncertain and undefined, even though in this case they would be backloaded from 2035.

Having said this, Article 8 of the EU ETS states that Member States shall take the necessary measures to ensure that, where installations carry out activities that are included in Annex I to IED, the conditions and procedure for the issue of a GHG emissions permit are coordinated with those for the issue of a permit provided for in that Directive. This can reduce the administrative burden on IED installation operators for obtaining and managing permits where both Directives apply, although the magnitude of this impact is likely to be small albeit uncertain given the evidence available.

Operating costs and conduct of business

This measure is likely to lead to **weakly negative impacts** on the costs of doing business. Compliance costs could differ significantly by sector and would be incurred from 2035 and more likely within 5-10 years. However, stricter GHG requirements would likely result in changes to capital and operating expenditure. This may be explored further through the use of case studies.

This measure may also free up allowances and, as a result, business may invest in research and development to identify and introduce technologies and/or techniques that comply with a plausible EU's carbon neutrality pathway. The iron and steel roadmap developed by Eurofer can be used to identify an example of a potential pathway.

It is not feasible to estimate these costs without further evidence on how installations may expect to transform over the coming decades and associated costs when compared to the baseline.

Competitiveness and level playing field

This measure will likely lead to **limited to no impact** on competitiveness, and a **weakly positive impact** on levelling the playing field. Costs for businesses would increase albeit not significantly and, therefore, the position of EU businesses in the global context would not necessarily worsen as a result of this measure. It is also unlikely to benefit businesses, unless decarbonising relatively early could lead to a first-mover advantage and/or acquiring competitive advantage against businesses operating outside of the EU.

The measure will, however, likely lead to an increase in CAPEX and OPEX for IED operators, who would be required to increase decarbonisation and energy efficiency efforts. This, however, could lead to more carbon allowances becoming available for trading in the ETS, which could impact the carbon price and affect incentives for emissions reductions in other ETS sectors. The scale of impact will depend on whether are measures are taken to address potential impacts on the carbon price, e.g. through the Market Stability Reserve, the timing of measures, derogations allowed, speed of technological advancement, technology cost curves, and energy efficiency gains achieved. Subsequent to the initial investment, operators' life cycle costs would diminish. Given the evidence available and significant uncertainties, it has not been possible to quantify these impacts. It is notable that the measure would likely result in a more consistent approach across the EU (in terms of defining GHG ELVs in permit conditions).

Position of SMEs

The measure is **not expected to affect** businesses disproportionately depending on their size.

Innovation and research

This measure may have a **weakly positive impact** on research and development. A recent study on the wider environmental impacts of industry decarbonisation[14] by Wood reviewed new technologies that can address GHG emissions and considered their level readiness of readiness. One of the conclusions was that needing to comply with GHG ELVs was one of the drivers for why these technologies were being researched and developed. It is, therefore, expected that the (agro-)industry may seek to invest in research and development to identify, test and introduce technologies and/or techniques that would allow them to comply with new ELVs in a manner that is as cost-efficient as possible.

Public authority impacts

This measure is likely to have a **weakly negative impact** on public authorities. Additional administrative costs would be incurred, especially as there would be a need to include GHG emissions as part of permit reviews, the BREF review process, manage and maintain more complex information systems, and manage with inspections and other enforcement-related activities.

In the baseline, the costs to public authorities from engaging in these activities are estimated based on multiple sources outlined earlier in this Annex:

- One-off costs associated with permit reviews (once every 10 years)
- Costs associated with BREF reviews (once every 10 years per sector)
- Annual costs from engaging with information received from operators and maintaining systems (once every year)
- Costs associated with leading and managing inspections (once every two years)

These additional costs would only affect IED installations from 2035 or thereafter. It is assumed that there would be a period longer than 5 years over which operators can adjust to the new requirements; and that around 13 000 installations may be affected by this measure within the period. Public authorities will require time and resources to d implement this measure. The additional effort required is uncertain although, based on expert judgement, it is assumed to be an additional 10% over the baseline for each of the activities outlined.

As a result, additional administrative costs for public authorities could range between €1 million and €17 million each year over a 20-year period, on average, with a central estimate of around €11 million each year. These costs are averaged over the period for comparison in a context where implementation timings are generally uncertain and undefined, even though in this case they would be backloaded from 2035.

[14] Wood, Deloitte, IEEP (2021). Wider environmental impacts of industry decarbonisation.

Environmental impacts

This measure is likely to have **limited to weakly positive environmental impacts**, as these will primarily depend upon how this measure would affect the policy outcomes of the EU ETS.

Climate

IED#29 may result in GHG emission reductions at the specific installations, depending on the stringency of GHG emission limits derived under IED. Overall, the impacts on climate are unclear. The measure may also have other positive environmental impacts, such as on air quality and resource use, as decarbonisation techniques may have also positive impacts on overall depollution, and hence environmental protection. The IED #29 sunset clause regarding Article 9(1) may, however, delay potential positive impacts, compared to the immediate deletion of Article 9(1).

Coherence between potential changes to the IED and the EU ETS should be considered further to ensure that these potential negative impacts are mitigated (e.g. aligning these impacts with a reduction in carbon allowances). Any of these potential impacts would be deferred to 2035-2045.

Air quality

This measure is likely to result in **limited to weakly positive impacts** on air quality. This measure would encourage a more holistic approach towards all core polluting emissions, including GHG, which is likely to lead to actions that are more closely aligned with the EU's general objectives. However, considering the market interference with the EU ETS, the overall effects of deleting Article 9(1) are not clear. Any of these potential impacts would be deferred to 2035-2045. There are significant uncertainties that limit our ability to quantify these impacts reasonably.

Other environmental impacts

This measure will likely have a **limited to no impact** on water quality and resources; soil quality and resources; waste production, generation and recycling; and the efficient use of resources.

Social impacts

This measure specifically is likely to result in **limited to weakly positive impact** on employment. Additional employment might be required to comply with new obligations and produce and use additional information in the BREF process.

Measure 30: Delete Article 9(1) that exempts (agro-) industrial plants from setting GHG ELVs requirements in permit conditions if they are regulated by the EU ETS.

Description of the measure and requirements for implementation

Article 9(1) of the IED prevents the setting of emission limit values in permits for GHG where those emissions are addressed under the EU ETS. The legislation that transposes the IED in the majority of MS (21 out of 27) does not include emission or concentration limits for CO_2[15]. This measure would change this by deleting this provision, thereby allowing IED permits to contain GHG ELVs. Consequently, BREFs would set BAT-AELs for GHG emissions.

This provision was included in the IED to avoid unintended consequences or interference with the market mechanism employed under the EU ETS[16]. This potential interaction should be considered prior to implementation of this measure to limit any negative impact on the EU ETS mechanism.

It is proposed that this measure is implemented with an initial focus on sectors emitting relatively more GHG emissions. This may include gas refineries, combustion plants, production of cement, and iron and steel production.

This measure would be expected to lead to implementing some actions by operators from 2030, especially given the expected timings for updated/ revisions of pertinent BREFs by 2026, and the follow-on implementation of permits requirements by IED installation operators.

Objectives:

The measure will aim to address GHG emissions more directly as part of the IED permitting process. This measure will, therefore, contribute to the general objective of achieving carbon neutrality in the EU, and more specifically, support the decarbonisation of the (agro-)industrial sectors covered by the IED.

Implementation needs:

- Competent Authorities to consider actions to ensure coherence between the IED and EU ETS.
- All stakeholders involved in the BREF process would consider BAT-AELs for GHG emissions immediately, although industry's implementation of any substantive actions may take an additional 5-10 years.
- Operators and Competent Authorities would consider these BAT conclusions in any new or updated permits.

[15] https://www.eea.europa.eu//publications/application-of-the-european-union

[16] https://eeb.org/library/eeb-comments-to-the-european-commission-study-preliminary-determination-of-key-environmental-issues-kei-for-industrial-sEUtors-in-bref-reviews-under-the-ied/ argues that no double regulation would exist as a result of the different mechanisms by which emissions are addressed under the IED and EU ETS.

Assessing impacts

Economic impacts

Overall, this measure is likely to have **weakly negative Economic impacts** when compared to the baseline.

Administrative burden on businesses

This measure is likely to lead to **negative impacts** on administrative burden on businesses. Additional administrative costs would be incurred, especially as there would be a need to include GHG emissions as part of permit reviews, the BREF review process, monitor and report more data, and engage with inspections and other enforcement-related activities.

In the baseline, the costs to operators from engaging in these activities are estimated based on multiple sources outlined earlier in this Annex:

- One-off costs associated with permit reviews (once every 10 years)
- Costs associated with BREF reviews (once every 10 years per sector)
- Annual monitoring and reporting costs (once every year)
- Costs associated with supporting inspections (once every two years)

This measure would affect all of the existing 52 000 IED installations (and new ones) over the 20-year period. Each of these operators will require time and resources to implement this measure. The additional effort required is uncertain although, based on expert judgement, it is assumed to be an additional 10% over the baseline for each of the activities outlined. As a result, additional administrative costs for operators could reach between €2 million and €86 million each year over a 20-year period, on average, with a central estimate of around €56 million each year.

Having said this, Article 8 of the EU ETS states that Member States shall take the necessary measures to ensure that, where installations carry out activities that are included in Annex I to IED, the conditions and procedure for the issue of a GHG emissions permit are coordinated with those for the issue of a permit provided for in that Directive. This can reduce the administrative burden on IED installation operators for obtaining and managing permits where both Directives apply, although the magnitude of this impact is likely to be small albeit uncertain given the evidence available.

Operating costs and conduct of business

This measure is likely to lead to **weakly negative impacts** on the costs of doing business. Substantive compliance costs could differ significantly by sector. However, stricter GHG requirements would likely result in an increase in CAPEX and OPEX for IED operators, who would be required to increase decarbonisation and energy efficiency efforts. This, however, could lead to more carbon allowances becoming available for trading in the ETS, which could impact the carbon price and affect incentives for emissions reductions in other ETS sectors. The scale of impact will depend on whether are measures are taken to address potential impacts on the carbon price, e.g. through the Market Stability Reserve, the timing of measures, derogations allowed, speed of technological advancement, technology cost curves, and energy efficiency gains achieved. Subsequent to the initial investment, operators' life

cycle costs would diminish. Given the evidence available and significant uncertainties, it has not been possible to quantify these impacts.

Competitiveness and level playing field

This measure will likely lead to **limited to no impact** on competitiveness, and a **weakly positive impact** on levelling the playing field. Costs for businesses would increase albeit not significantly and, therefore, the position of EU businesses in the global context would not necessarily worsen as a result of this measure. It is also unlikely to benefit businesses unless decarbonising relatively early could lead to a first-mover advantage and/or acquiring competitive advantage against businesses operating outside of the EU.

The measure would likely result in a more consistent approach across the EU (in terms of defining GHG ELVs in permit conditions). However, issues could arise from market interference with the EU ETS. The carbon price would be impacted by imposing more ambitious objectives to reduce (agro-)industrial emissions, an environmental performance approach that contrasts with the EU ETS mechanism which allows the market to determine the appropriate price for carbon. More specifically, carbon allowances granted under the EU ETS to an IED-regulated sector could become available for trading i.e. increasing supply of allowances, thus deflating the CO_2 price.

Position of SMEs

The measure is **not expected to affect** smaller businesses disproportionately.

Innovation and research

This measure may have a **weakly positive impact** on research and development. A study on the wider environmental impacts of industry decarbonisation[17] by Wood reviewed new technologies that can address GHG emissions and considered their level of readiness.

One of the conclusions was that needing to comply with GHG ELVs was one of the drivers for why these technologies were being researched and developed. It is, therefore, expected that the (agro-)industry may seek to invest in research and development to identify and introduce technologies and/or techniques that would allow them to comply with new ELVs as efficiently as possible.

Public authority impacts

This measure is likely to have a **negative impact** on public authorities. Additional administrative costs would be incurred, especially as there would be a need to include GHG emissions as part of permit reviews, the BREF review process, manage and maintain more complex information systems, and manage with inspections and other enforcement-related activities.

In the baseline, the costs to operators from engaging in these activities are estimated based on multiple sources outlined earlier in this Annex:

- One-off costs associated with permit reviews (once every 10 years)

[17] Wood, Deloitte, IEEP (2021). Wider environmental impacts of industry decarbonisation.

- Costs associated with BREF reviews (once every 10 years per sector)
- Annual monitoring and reporting costs (once every year)
- Costs associated with supporting inspections (once every two years)

This measure would affect all of the existing 52 000 IED installations (and new ones) over the 20-year period. Public authorities will require time and resources to implement this measure. The additional effort required is uncertain although, based on expert judgement, it is assumed to be an additional 10% over the baseline for each of the activities outlined. As a result, additional administrative costs for public authorities could reach between €3 million and €55 million each year over a 20-year period, on average, with a central estimate of around €40 million each year.

Environmental impacts

This measure is likely to have **limited to weakly positive environmental impacts**, as these will primarily depend upon how this measure would affect the policy outcomes the EU ETS.

Climate

This measure will likely have **unclear impacts** on climate. Immediate deletion would likely result in GHG emission reductions at the specific installations, depending on the stringency of GHG emission limits derived under IED. This may also have other positive environmental impacts, such as on air quality and resource use, as decarbonisation techniques may have also positive impacts on overall depollution, and hence environmental protection.

There are significant uncertainties that limit our ability to quantify these impacts reasonably. For example, Carbon Capture and Storage (CCS) technologies can capture CO_2 emissions produced and/or associated with industrial processes[18]. CCS in industrial applications is projected to facilitate a reduction of CO_2 emissions by up to 4.0 Gt a year by 2050[19], approximately 9% of the global reductions needed to halve energy-related CO_2 emissions in 2050. Such an outcome would require the installation of CCS equipment in 20%-40% of industrial and fuel transformation plants by 2050[20]. These actions could be encouraged by introducing GHG ELVs.

According to Carbon Market Watch, this measure would enable a combined approach to GHG emissions[21]. "The prohibition in Art. 9(1) of the IED on including limits on GHG emissions in IED operating permits is unhelpful, and it unnecessarily restricts the options available to Member States with respect to undertaking measures that promote GHG emission reductions of industrial installations".[22] Forcing stricter performance-based standards for

[18] http://www.ccsassociation.org/what-is-ccs/

[19] http://www.iea.org/publications/freepublications/publication/TEUhnologyRoadmapCarbonCaptureandStorage.pdf

[20] The Role of Industrial Emissions Within the EU: Trends and Policy | Climate Policy Info Hub

[21] https://carbonmarketwatch.org/publications/a-new-industry-framework-for-achieving-the-eu-green-deal-zero-pollution-goal/

[22] https://carbonmarketwatch.org/publications/carbon-market-watchs-response-to-the-inception-impact-assessment-on-industrial-emissions-dirEUtive-revision/

GHG pollution and energy efficiency not only leads to incremental improvements for wider air pollution but also benefits resource consumption aspects as well as climate protection.

Air quality

This measure is likely to result in **limited to weakly positive impacts** on air quality. This measure would encourage a more holistic approach towards all core polluting emissions, including GHG, which is likely to lead to actions that are more closely aligned with the EU's general objectives. However, considering the market interference with the EU ETS, the overall effects of deleting Article 9(1) are not clear. There are significant uncertainties that limit our ability to quantify these impacts reasonably.

Other environmental impacts

This measure will likely have a **limited to no impact** on water quality and resources; soil quality and resources; waste production, generation and recycling; and the efficient use of resources.

Social impacts

The measure is likely to have a weak or insignificant impact on employment in the EU. Additional employment might be required to comply with new obligations (particularly with regard to new techniques to reduce GHG emissions); however, additional CAPEX/ OPEX expenditure by operators might result in some (possibly temporary) loss of jobs.

A clearer benefits is that the aforementioned associated positive environmental impacts, especially the reduction on emissions to air, are likely to have positive impacts on public health in the EU, by reducing the risk of disease, especially respiratory disease, and leading to reductions in health and social care costs across the EU. Any reductions in GHG emissions would also contribute to climate change mitigation.

Summary of problem area 4 measures

For the measures presented in problem area 4, **Table A8-20** summarises the Economic, environmental and social impacts of the measures using the qualitative ratings. Overall, these policy measures would generate weakly negative Economic impacts, weakly positive environmental impacts and limited social impacts at least in the shorter to medium term. This suggests that, as a response to these policies, IED operators may incur some Economic costs to improve their energy efficiency and/or carbon footprint, with associated by-product environmental benefits on air quality and others. The analysis primarily qualitative, and the benefits are especially uncertain as they depend on technological progress and investment decisions by operators.

Table A8-20: Summary of Economic, environmental and social impacts for measures in problem area 4

Policy measures	Economic impacts	Environmental impacts	Social impacts (employment focus)

Policy measures	Economic impacts	Environmental impacts	Social impacts (employment focus)
#27	✗	✓	O
#28	O/✗	O/✓	O
#29	✗	✓	✓
#30	✗	✓	✓

Table A8-21 similarly uses qualitative ratings to summarise costs and benefits for measures in problem area 4. Overall, expected benefits associated with measures 27 and 28 are likely to outweigh the costs. These measures would address some of the IED's limitations in contributing to the EU's climate objectives. There is uncertainty, however, associated with the cost and benefit balance of deleting Article 9(1) prior to an in-depth review that can ensure coherence with the EU ETS, especially for measure #30, which presents an unbalanced position due to the uncertainty around the potential benefits to GHG emissions in the EU-27.

Table A8-21: Summary of costs and benefits for measures in problem area 4, with central estimates of administrative costs for businesses and public authorities shown

Policy measure	Administrative costs – businesses (€m/yr)	Administrative costs – public authorities (€m/yr)	Overall costs	Overall benefits
#27	29	21	✗✗	✓✓
#28	No/limited	No/limited	O	O
#29	15	15	✗	✓
#30	56	40	✗✗	✓

Problem area 5: The IED does not regulate some highly polluting (agro-) industrial sectors

Introduction to Measures 31 to 33:

The first three measures considered in this section are inter-related. They are:

- **(31) Include cattle farming within the scope of the IED**. This measure needs to define a threshold for farm size above which the cattle farms would be considered within the IED. The capacity threshold could be set based on number of places or on the basis of livestock units (LSUs), a reference unit that facilitates the aggregation of livestock from various species and age. A threshold within the range of 50-150 Livestock Units (LSU) could mean that an additional 84 000-330 000 cattle farms could be regulated under the IED.
- **(32) Amend the capacity thresholds of the rearing of pigs and poultry (IRPP) considered under activity 6.6 of Annex I**. This measure seeks to consider lowering the current capacity thresholds to include the environmental impacts of slightly smaller farms. The thresholds could be set using number of places or based on LSUs. A threshold within the range of 50-150 LSU could mean that additional 77 000-187 000 poultry and pig farms could be regulated under the IED.
- **(33) Introduce a tailored regulatory framework for installations carrying out rearing of animals**. Around 40% of the existing IED installations are related to rearing of animals. The IED's scope expansion would include cattle farming and more poultry and pig farms, leading to around four to eleven times more installations that would be regulated by IED. This would translate into significant additional administrative and operational burden for businesses and public authorities and, therefore, a lighter administrative process is proposed for all installations rearing animals with this tailored regulatory framework.

The tailored regulatory approach as introduced above, would need to be introduced hand-in-hand with the measures to introduce cattle farms and to reduce the existing IRPP threshold, in order to avoid an overly burdensome regulatory cost to business and authorities. It is also important to note upfront that for both the cattle farms and the smaller IRPP farms, some Member States already regulate these activities (but from varying capacity thresholds) and so existing permitting approaches in these MS will be allowed to stay "as is" for MS who wish to apply it to IED installations covered by IRPP requirements or to cattle farms that are already regulated. The collective arrangements among these three measures will also likely need a revised BREF, in which the interactions and possibilities of the three measures described here will be examined in totality.

Measure 31: Include cattle farming within the scope of the IED

Description of the measure and requirements for implementation

Include cattle farming within the scope of the IED. A potential approach would be to include a capacity threshold expressed in animal places that is comparable to thresholds for similar environmental impacts for the IRPP sector. This similarity can be achieved by calculating the new threshold on the basis of the equivalent livestock units (LSUs), a reference unit which

facilitates the aggregation of livestock from various species and age. This means, for example, that thresholds expressed in animal places between cattle farming and the IRPP sector are similar in terms of livestock units, but are expressed as animal places in the Directive. Livestock units are derived from the definition used by Eurostat, which is considered applicable across all EU Member States. Using Livestock Units directly as a threshold is complex and not advised, as it may be too different from existing implementation of the IRPP BREF and national systems, causing additional administrative burden. However, it can be used as a guide in assessing the measure to ensure that the environmental protection between cattle, pig and poultry sectors is similar in ambition.

Applying the IED to cattle farming activities would require a new set of agricultural installations to comply with the general regulatory framework set out by the IED, such as the provisions regarding permits or inspections, detailed in Chapter II of the IED. This would also require a revised BREF document, which will describe the interactions and possibilities of measures 31, 32 and 33 together. Therefore, this measure should be read and considered in conjunction with the measure for introducing a tailored approach for regulating agricultural installations, and attempts are made to ensure alignment with changes in measure 32 on changes to the existing IRPP sector.

There will need to be a decision by the EU on how to introduce this activity into the scope of the IED. This will need to be considered in conjunction with the proposed measure for a tailored approach, as the choices for including this new activity will be affected by whether a tailored approach is used. The options could include:

- Inclusion of an additional activity under IED Annex I (e.g. 6.6(d))
- Inclusion as an activity under a new Annex of the IED, not under Annex I

The measure will need to be further defined with regards to the proposed wording and capacity threshold to be used for cattle rearing. A proposed capacity threshold within range of 50-150 LSU for cattle as well as for pigs and poultry. The cost-benefit analysis is favourable for all thresholds in the range of 50-150 LSU considered (further information on benefit/cost ratios are included in the section on Air Quality impacts below and presented in the analysis conducted by Ricardo in May 2021[23]). The analysis considered a range of possible thresholds, from 50 LSU, to 750 and above. The equivalent number of cattle to the LSU thresholds considered are included in the table below.

Total number of cattle farms within EU is 2 797 050. This covers farms including subsistence with the LSU below 10 (1 927 650) and farms above 10 LSU (869 400), based on Eurostat data.

[23] Ricardo Energy & Environment (2021) Updating of available information for undertaking the assessment of impacts for a possible modification of the IED with regard to aspects of intensive agriculture, available at: https://circabc.europa.eu/sd/a/c863480b-5fd5-41e9-93ee-9c68669d6511/Intensive%20Agriculture%20and%20IED%20Final%20Report%202021.pdf

Table A8-22: Cattle thresholds considered, expressed in LSU and with the equivalent average number of animals in heads or places, depending on the structure of the farm, and expected farm numbers. (source: Ricardo, 2021 and Eurostat)

Threshold (LSU)	Threshold (number of heads of cattle)	Approximate number of farms in the EU above this threshold
50	69	330 000
100	138	163 000
125	173	123 000
150	207	84 000
300	415	19 600
450	622	8 000
600	829	4 200

Objectives:

- Reducing the environmental impact of agro-industry across the EU-27, via the amendment/expansion of coverage of the IED.
- Levelling the playing field for installations across the EU.

Implementing needs:

- EU to make legislative change to the IED text
- EU to develop BAT conclusions for cattle
- Member States to transpose changes into national law
- Member States to regulate the cattle farms according to the new requirements, to the extent this requires changes from their existing regulatory approaches for cattle farms. This will require upfront and ongoing implementation actions.

Assessing impacts

Economic impacts

Overall, this measure is likely to have **strongly negative economic impacts** when compared to the baseline, though this will vary heavily by Member State. Some states may have very little to no required compliance costs and low administrative costs as a result of existing policy. These impacts are likely concentrated in a small number of Member States who have a majority of EU cattle farms, in particular those who would not be able to benefit as much from the tailored approach as EU Member States with more advanced existing regulation on cattle farming.

Administrative burden on businesses

This measure will have **negative impacts** on the administrative burden on businesses. This will be due to the farm operators being regulated when they were not previously regulated. For cattle, the administrative costs associated with the granting and enforcement of permits were estimated to be €102-401 m per year on the assumption of full IED chapter II requirements from 50 and 150 LSU, respectively (Ricardo, 2021; and further assessment). The adoption of a tailored approach for implementing cattle farming in the IED (Measure 18) could see these costs drop to €63 - €70m per year for 150 LSU, and to €249 – €281m per year for 50 LSU, which represents a reduction of 30 - 38%. The upper level of the ranges (€70 and

€281m/year) is based on a generic 20% reduction from reduced administrative requirements, plus information on known information from Member States from the stakeholder consultation on existing policy that would (partially) already take care of IED compliance. The lower level of the ranges (€63 and €249m/year) is based on making assumptions about existing policies already regulating the sector in Member States (assumptions made due to lack of information gained from consultation), assuming the Member States are likely to require some level of BAT already.

The calculation method for this reduction is explained under Measure 33. How these numbers could be expected to change based on higher thresholds are included in the table below. For higher thresholds, the tailored approach has slightly larger benefits (e.g. 33% at 300 LSU vs 30% at 150 LSU, for the upper level of the range for the Tailored Approach) because at higher levels a relatively higher proportion of animals would already be under some form of regulation, which the Tailored Approach would take into account.

The total expected administrative costs are shown in the table below[24]. Of the total expected cost of permitting, 50% of this cost is expected to be borne by the operator and 50% by the permitting authority. This is different from the original estimate in the 2007 IED IA, whereby the split was 1/3 for the operator and 2/3 for the authority. However, evidence from the focus group held on this topic with Member State authorities in 2021 confirmed that authorities are likely to pass on some of the cost to the farmer as part of the cost of applying for a permit. For example, one Member State stakeholder indicated to have a strict policy of charging the farmer for 50% of the personnel cost borne by the permitting authority, in exchange for use of an automated online application system that streamlines the application process for the operator. We do not expect this to be the case in all Member States, but from expert knowledge we do expect that costs for farmers are likely to be higher than 1/3 of the total permitting costs.

[24] These costs are lower than reported in Ricardo (2021). They are based on more recent data provided by Member States.

Table A8-23: Estimated total additional administrative costs for full chapter II requirements and under a tailored approach.

LSU	Administrative costs for business (€m/year) (full chapter II requirements)	Administrative costs for business (€m/year) (Tailored Approach)
50	401	249 - 281
100	198	123 - 139
125	150	93 - 105
150	102	63 - 70
300	25	14 - 16
450	11	4 - 7
600	6	3 - 4

It should be noted that the estimate for the costs under the tailored approach could be reduced further, as no comprehensive information on existing policies was provided by all Member States under consultation on the extension of the IED towards livestock. An important omission for example is detail on the impact of existing regulation of cattle farms in Spain, because it is estimated that about €14.5m of the €198 million of the full permitting administrative costs (for a threshold of 100 LSU) would accrue to farms in Spain, and it is not clear what the scope of the reduction could be in the tailored approach.

There will also be costs to industry for the development of BAT based requirements. The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). After apportioning the fraction of this cost for businesses, and annualising over a period of 20 years assuming two BREFs in this period, the annualised cost of the BREF process for businesses would be expected to range from €0.1m/year to €0.7m/year, with a central estimate of €0.2m/year. It could be expected that the costs of BAT based requirements would be on the lower end of this range due to the possibility to build on the existing IRPP BREF and having a simpler process.

Operating costs and conduct of business

This measure will have negative impacts on the operating costs and conduct of business. This will be due to farm operators needing to implement techniques to mitigate the environmental impacts as will be identified in a BAT conclusions document for the sector. Note that in some Member States, techniques are already applied as a result of national policy or their implementation of other EU Directives. For example, the Nitrates Directive may place limits on the amount of slurry that can be spread on land, which indirectly reduces NH_3 emissions to air as well. Further, the Habitats Directive and Birds Directive may place requirements on certain Member States or regions, based on observed concentrations of pollutants in environments near farms. The National Emissions reduction Commitments Directive may lead certain Member State to implement additional measures targeting the reduction of certain pollutants, including at farms. These farms may then be required to implement BAT in order to reduce observed concentrations and depositions of NH_3 to vulnerable natural areas.

When existing policy is driven by other EU legislation, "target driven" regulation (where the target is measured as environmental improvement, not direct emission reduction) can lead to implementation of BAT, which is implemented already in, for example, Member States such as Germany, the Netherlands, Denmark and Belgium (this is a non-exhaustive list). The addition of this sector to the Industrial Emissions Directive could lead to similar improvements and better ability of other regulations to reach higher levels of environmental protection, by mandating directly (command and control) what actions need to be taken at installation level to address the pollution at source. Through this policy implementation, the IED could be a shorter route towards the actions that need to be taken for environmental improvement. This is possibly in contrast to the route via the Nitrates and/or Habitat directives, which may be more complex since the implementation of BAT in those directives has to be linked to measurement and modelling of complex environmental variables; an example is that of estimating additional deposition of NH_3 in nearby natural habitats as a result of new projects, which is currently taking place in some Member States. This alternative example application of "BAT" (s.lato) may lead to increased administrative burdens in the permitting process compared to that of the IED.

Cattle farming is not presently included within Annex I of the IED, and is not currently considered by the IRPP BREF. In order to estimate the possible emission reductions introducing cattle within Annex I of the IED, assumptions have had to be deployed. In practice, the inclusion of an activity under the IED Annex I would lead to the need for a BREF, and consequent generating of BAT Conclusions relevant for the sector. It is difficult to anticipate the techniques that would be considered and the level of ambition the BREF would have (and hence also its potential, in terms of emission reductions, is also uncertain).

Ricardo (2021) identified two key environmental issues for the sector that could be quantified: the reduction of emissions to air of NH_3 and CH_4. That work estimated the techniques that could be necessary to be deployed across each Member State to reach an assumed level of ambition deemed to be BAT (without prejudice to possible determination of BAT through the BREF process). Based on Ricardo (2021) and further analysis. the total EU27 compliance costs estimated for introducing the cattle sector into the IED, from a threshold within the range of 69-207 heads (equivalent to 50-150 LSU) were estimated to be up to €112 - €441 million per year for applying abatement techniques tackling NH_3 and CH_4 emissions. How these numbers could be expected to change based on different specific thresholds are included in the table below. (For benefits vs. costs, please see the table in the air quality section).

Table A8-24: Estimated compliance costs for business for implementing techniques addressing NH_3 and CH_4 emissions at cattle farms

Threshold (LSU)	Compliance costs for business (€m/year)
50	441
100	217
125	165
150	112
300	50
450	30
600	21

The above costs are based upon the techniques already deployed at the farms, and what possible additional techniques could or would be necessary if additional farms and sectors were brought within the scope of the IED. The key source used has been GAINS 4[25], with the accompanying pollution control technologies included in the model's baseline scenario. The selection of which techniques to apply for Member States is based on the initial selection made by GAINS on what is used, supplemented by the information provided in the consultation. This estimate, therefore, does not attempt to replicate or suggest BAT, but serves as a guide of the potential level of cost to benefit.

These costs, when combined with administrative costs to form a total cost, remain favourable in terms of a benefit-cost ratio, when compared to the monetised benefits of NH3 and CH4 emissions reductions. The benefit-cost ratios are presented in the subsection on air quality.

[25] See: https://iiasa.ac.at/web/home/research/researchPrograms/air/GAINS.html

Box 1: Notes on the impact of existing emission reductions policy on the modelling performed

Note that the process for estimating the total business compliance costs has some uncertainties, reflected in the range of values presented in Table 25. The estimation process uses the GAINS model where all existing compliance is already assumed to be in the model baseline. The remaining uncertainty is due to unknown information about uptake rates of techniques at farms of smaller and larger sizes in some Member States. The GAINS model only provides the total number of animals and the share of those which are under different emission reduction regimes, not the distribution of farm sizes in which these animals are held. It is however more likely that larger farms employ more advanced emission reduction techniques, in particular as large point sources of NH_3 emissions create localised air pollution problems, for which authorities have more incentive to take action. If this is the case, then higher share of uncontrolled emissions from those Member States would be concentrated in smaller farms.

To explain why this is, the measure does not propose to regulate farms below 50 LSU ("small farms"). If in reality a country has a higher relative share of emissions per animal from small farms (because larger farms are already regulated to a degree), then overall potential emission reductions from the IED (and associated compliance costs) would be lower, compared to the case where there are similar emission reduction techniques applied to all farms, irrespective of size. An example of this is Germany, where it is known from stakeholder consultation that the country already requires farms above 450 LSU to use the "state of the art" in emission reductions technology (and it is therefore assumed the IED would not have an impact above 450 LSU). Therefore, the existing emissions reductions that the GAINS model baseline defines for Germany will be more concentrated in the farm size class above 450 LSU, where animals will have lower emissions than the average for Germany. Conversely, animals in farms of size class below 450 LSU will have a higher average emissions. As the proposed IED threshold is within the range of 50-150 LSU and the majority of animals is concentrated below 50 LSU, the net effect of this is that the potential for emission reductions when applying policy above 50 LSU is smaller than when the GAINS model data is not modified with this specific information on compliance by farm size.

This becomes an uncertainty because there is no complete information available at this time for all countries with significant cattle sectors, on how the cattle sector is currently regulated and at what farm size classes this applies to. For most countries, information was gathered on their existing policy thresholds and the modelling was modified accordingly. Notably though, there is an uncertainty on the policies in Spain and Italy, which have significant cattle sectors. In the scenario where Italy and Spain also behave like Germany, this could reduce the emission reduction benefits and associated compliance costs by up to 10%**.** It is not expected to impact the cost – benefit ratio as this uncertainty applies proportionally to both benefits and costs. This uncertainty is significant only to the smaller classes of regulated farms, from 100 to 450 LSU, given that most existing regulation applies to larger farms above 300 LSU, and ~ 80% of the animals that would be brought under regulation are in the class of 100 to 450 LSU.

Competitiveness and level playing field

This measure will have a **positive impact** on levelling the playing field. Introducing cattle farming within Annex I of the IED imposes a singular set of requirements towards these

newly introduced farms and operators. It therefore offers the potential to level the playing field by providing minimum criteria for all Member States, notably towards the use of emission limit values in permits standardised to BAT-AELs. This has largely been supported within the IED evaluation, where, for industry stakeholder surveyed, 69% agreed or strongly agreed with the statement 'the IED has contributed to achieving a level playing field in the EU for IED sectors by aligning environmental performance requirements for industrial installations'. This would be likely to also be the case for the farms newly regulated under this measure. Farms that employ specific unconventional techniques, such as a focus on Ecological farming, may still need a specific approach. The focus group held with selected Member State authorities within the context of the revision to the IED in June 2021 identified support from Member States to regulate cattle farming due to, among other things, the benefits to be gained from levelling the playing field.

This measure will have **mixed impacts** on competitiveness. For those cattle farms that are already regulated and for which no or little additional cost impacts would be seen, the relative competitiveness of these farms would be expected to increase. For those cattle farms that are not already regulated and which will see additional cost impacts, the relative competitiveness of these farms would be expected to decrease. The total costs of doing business, that is the costs of administrative burden and compliance combined, are thought to negatively impact upon cattle farms. The exact level, however, as noted in the above, is to be determined by the BREF process. If these costs cannot be passed on in the price of produce, these costs will be incurred by businesses, impacting upon profitability. As noted, however, the cost to benefit ratio remains favourable when environmental benefits are considered and monetised.

Position of SMEs

The measure will likely bring **additional impacts on SMEs**. No specific statistics on whether the cattle farms will be defined as SMEs or not were identified. No means to identify the costs per employee or businesses have been identified. The impact of this measure towards SMEs, therefore, remains unclear.

Innovation and research

This measure may have a **limited impact** on research and development. Provisions within the IED, such as Article 27 on emerging techniques, allow for research and development within the context of BAT. Each BREF includes a chapter on emerging techniques, which acts as an indication of future techniques that could in the future (i.e. 'if commercially developed') be considered as BAT. This pathway encourages the continual focus on further reducing the environmental impacts of industrial activities or innovating in ways to save costs when compared to existing BAT.

Public authority impacts

This measure will have **negative impacts** on public authority costs. The largest impact will be on permitting and inspecting authorities, due to a significant number of farms that would require an environmental permit where they either may not have one, or would not have one that is of the same level of requirements as under the IED, with requirements on BAT use and adherence to emission limit values.

Public authority impacts are calculated from evidence obtained from authorities on the total cost of permitting a farm over a 20 year permit, including:

- Permit application and granting
- Permit reconsiderations in response to BREF updates
- Inspections and enforcement activities

The costs of this are estimated to be between 1 000 to 2 000 EUR on average per year, recognising that most of the costs of an farming project occur at the beginning, at permit application and granting. It depends on the size of the project what the cost will be, as public authorities have indicated that larger projects generally have more costs to obtain a project permit. The average administrative costs is closer to the low bound of 1 000, as the vast majority of farms introduced through measure 31 and 32 are in the smaller LSU categories of 50 to 150 LSU and 150 to 300 LSU.

The 2007 IED IA estimated that of the total costs, 2/3 would be for public authorities and 1/3 would be for the operator, on average across all IED sectors. Stakeholder engagement has shown that this is not a correct assumption for the livestock sector, with evidence that the operator may incur more costs than the authority. There are a few reasons for this:

- Firstly, as the IED has been implemented already on pig and poultry farms, there is scope and opportunity for efficiency gains at the public authority level, who regularly process permits on a continued basis. This type of efficiency gains have been observed in some Member States that were part of the focus group and interviews, and have shown that this can reduce costs by 50% or more. Conversely, operators do not have as much opportunity to gain efficiency, as they usually only engage in the permitting process at granting or permit reconsideration.
- As mentioned earlier, the scope extension for the IED means the average installation size in the renewed scope is much smaller, with the majority of installations having less than 300 LSU. This means that the average project size is much smaller compared to other IED sectors, and this is reflected in lower complexity and lower expected costs for permitting and enforcement.

To reflect new evidence, the assumption was made that the total costs of permitting are shared equally between operator and public authority. From some Member States, there is evidence that the operator incurs a majority of the costs, due to large efficiency gains on the authority side and an increased need for external advisory services by farmers to handle the complexity of emission reduction measures. However, there is not enough evidence to assume this is the average situation across the EU, so the assumption of a 50 – 50 split is seen as a reasonable middle ground.

Table A8-25: Administrative costs for measure 31 with or without measure 33

Threshold (LSU)	Administrative costs for public authorities (€m/year) (Full IED Chapter II requirements)	Administrative costs for public authorities (€m/year) (Tailored Approach)
50	401	249 - 281
100	198	123 - 139

125	150	93 - 105
150	102	63 - 70
300	25	14 - 16
450	11	4 - 7
600	6	3 - 4

There will be the costs to the Commission for the development of a BREF (Livestock BREF). The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). After apportioning the fraction of this cost for public authorities, and annualising over a period of 20 years assuming two BREFs in this period, the annualised cost of the BREF process for public authorities would be expected to range from €0.3m/year to €1.4m/year, with a central estimate of €0.5m/year. It could be expected that the costs of an BAT based requirements would be on the lower end of this range due to the possibility to build on the existing IRPP BREF and having a simpler process.

There will be one-off costs to the Member States for transposition of new requirements, as well as ongoing regulatory costs. Further evidence gathered during the focus group with selected Member State authorities identified how several Member States are already regulating cattle farms to some degree, with variation between them on (1) the threshold from which they are regulating the farms, and (2) the approach taken to regulating them (i.e. whether permitting, or simpler registration / notification systems). No information has been identified however on the possible costs to Member States for transposing and implementing the requirements. The envisaged common IT format could lead to additional indirect benefits through facilitating reporting under the CAP, Nitrates Directive, and National Emission Ceilings Directive (NECD).

Environmental impacts

Climate

This measure will have **strongly positive impacts** on reducing greenhouse gas emissions. Estimates in Ricardo (2021) and based on further analysis suggest that with a threshold at the equivalent of between 50-150 LSU, approximately 185-360 kt of CH_4 could be mitigated per year, with c. 55% of these reductions estimated to accrue in France, Germany and Spain. These estimates are based on input from the model GAINS 4, and the accompanying pollution control technologies included in the model's baseline scenario.

Put more broadly in context, agriculture emissions of 463 Mt CO_2eq[26] represent 13 %[27] of the total EU-27 GHG emissions. This range of 185-360 kt of CH_4 represents in CO_2 equivalent terms 5.2-10.1 Mt CO_2eq, i.e. between around 1.1-2.2% of the EU27 agricultural sector GHG emissions. The achievement of these reductions depends on whether technologies to reduce emissions from enteric fermentation can successfully be implemented. If so, then the potential for CH_4 emission reductions is very large, as methane from enteric fermentation is ~

[26] EEA greenhouse gases data viewer https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer

[27] European Court of Auditors Special Report Common Agricultural Policy and climate

30% of EU agricultural GHG emissions[28]. This study has assumed a technique (nutrition based) can be applied that reduces emissions from enteric fermentation by up to 10%, which is a current accepted value and which is in line with academic research on various feed modifications that can be done. However, it is acknowledged that it is a conservative estimate as there are publications demonstrating a potentially higher methane emission reduction potential (36-50%)[29].

Further reductions beyond those estimated could be possible and would depend on the level of ambition of a BATC for cattle, as well as if N_2O emissions are accounted for.

These reductions would contribute to the EU Methane Strategy and would help to address the concerns flagged in the recent European Court of Auditors Special report 'Common Agricultural Policy and climate' which indicates that despite the Common Agricultural Policy funds injected to the agriculture sector, GHG emissions from the sector have not decreased since 2010, partly due to the process of concentration and intensification of the EU farmed animals in specific areas.

Air quality

This measure will have **strongly positive impacts** on reducing air pollutant emissions. Estimates in Ricardo (2021) and further analysis suggest that with a threshold at the equivalent of between 50-150 LSU, approximately 60-115 kt of NH_3 emissions could be mitigated per year, with c. 55% of this estimated to accrue in France and Spain. These estimates are based on input from the model GAINS 4, and the accompanying pollution control technologies included in the model's baseline scenario.

EU27 total NH_3 emissions were 3.6 Mt in 2018, of which 2.4 Mt/year were from livestock.[30] This reduction of 60-115 kt therefore represents around 2.5-4.8% of livestock sector emissions, or around 1.6-3.2% of total EU NH_3 emissions.

Using the latest work on damage cost functions by the EEA[31], the monetised benefits of these emission reductions are estimated to be around €6 633 million per year for a threshold of 50 LSU, and €3 399 million per year for a threshold of 150 LSU. Across the different considered farm size thresholds, the ranges of benefit-cost ratios, of all costs combined (administrative

[28] Eurostat (2010), Agri-environmental indicator – greenhouse gas emissions https://EU.europa.eu/eurostat/statistics-explained/index.php?title=Agri-environmental_indicator_-_greenhouse_gas_emissions&oldid=110348

[29] Publications concerning CH4 emission reduction potential:

- How to reduce on-farm enteric methane production (Josef van Wyngaard, Robin Meeske, Lourens Erasmus) - How to reduce on-farm enteric methane production (journals.co.za)
- Can enteric methane emissions from ruminants be lowered without lowering their production? (C. Grainger, K.A. Beauchemin) - Can enteric methane emissions from ruminants be lowered without lowering their production? | Request PDF (researchgate.net)
- Bark-dwelling methanotrophic bacteria decrease methane emissions from trees (multiple authors) - Bark-dwelling methanotrophic bacteria decrease methane emissions from trees | Nature Communications

[30] EEA air pollutant emissions data viewer https://www.eea.europa.eu/data-and-maps/dashboards/air-pollutant-emissions-data-viewer-3

[31] Unpublished draft EEA (December 2020) "Costs of air pollution from European industrial facilities 2008–2017"

and compliance costs), remains positive and favourable. The benefit-cost ratio decreases with a lowering of the IED farm size threshold down to 50 LSU (equivalent to around 69 heads of cattle), as administrative costs become a larger relative burden at these lower thresholds.

The variation in these values by LSU threshold is shown in the following table.

Table A8-26: Monetised benefits of climate and air quality impacts, and benefit-cost ratio (based on total costs summing administrative and compliance costs)

LSU	Monetised benefits (€m/year) (NH_3)	Monetised benefits (€m/year) (CH_4)	Ratio of total benefits divided by costs
50	3 980	2 653	**7**
100	3 096	1 980	**11**
125	2 628	1 610	**12**
150	2 100	1 299	**14**
300	1 064	607	**25**
450	710	378	**30**
600	540	269	**32**

Reductions in other air pollutants would also be expected, both directly (e.g. PM) and indirectly (e.g. PM, ozone) leading to further benefits which have not been quantified.

Water quality and resources

This measure should provide **weakly positive impacts** on water quality and resources. The integrated approach of the IED and the range of environmental issues that could be covered by a cattle sector BREF and BAT Conclusions would be expected to lead to tighter controls on a range of environmental issues from cattle. The analysis conducted by Ricardo in May 2021 did not cover releases to water. Other data sources, such as the E-PRTR, similarly to the IED, do not consider cattle farming within its scope and therefore do not hold data on the activity. The extent of the activities impact, or the potential for the reduction of this environmental impact is uncertain.

Soil quality

This measure should provide **weakly positive impacts** on soil quality. The integrated approach of the IED and the range of environmental issues that could be covered by a cattle sector BREF and BAT Conclusions would be expected to lead to tighter controls on a range of environmental issues from cattle. The analysis conducted by Ricardo in May 2021 did not cover releases to land. Other data sources, such as the E-PRTR, similarly to the IED, do not consider cattle farming within its scope and therefore do not hold data on the activity. The extent of the activities impact, or the potential for the reduction of this environmental impact is uncertain.

Waste production, generation, and recycling

This measure should provide **positive impacts** on waste production. The integrated approach of the IED and the range of environmental issues that could be covered by a cattle sector

BREF and BAT Conclusions would be expected to lead to tighter controls on a range of environmental issues from cattle. Measures that limit manure spreading are common among Member States, and it is likely that a BREF for the cattle sector would include requirements on ammonia application to land, but it is unclear what the influence of the IED can be on this factor, as these concern emissions that transcend the farm gate boundary (i.e. IED installation boundary), even if they do originate from the farm.

No means of assessing the volume or type of waste has been identified. However, regulation of the sector through the IED may further benefit the management of waste, through provisions such as Article 11, which requires installations are operated within the principles of the waste hierarchy, as laid out in the Waste Framework Directive (Directive 2008/98/EU).

Efficient use of resources

Unclear impacts. No means of assessing the efficient use of energy or water have been identified, however regulation of the sector through the IED may further benefit resource efficiency, with resource efficiency featuring within the Sevilla Process.

Social impacts

This measure has **unclear social impacts**. This measure will incur costs towards business and operators. If these costs cannot be passed on within the price of produce, these costs will impact upon profitability and could therefore impact upon employment. No formal assessment has been carried out, but the impacts are thought to be negative.

Measure 32: Amend the capacity thresholds of the rearing of pigs and poultry considered under activity 6.6 of Annex I.

Description of the measure and requirements for implementation

Revise the capacity thresholds for the rearing of pigs and poultry considered under activity 6.6 of Annex I of the IED. Currently, activity 6.6 is split into three activities, with definitions reflecting different capacity thresholds for different livestock types, in turn reflecting different levels of environmental impact.

The measure will need to be further defined with regards to the proposed wording and capacity threshold to be included in Annex I, and whether a tailored approach is taken forward (see measure 33). A proposed revised capacity threshold is within the range of 50-150 livestock units (LSU), or the equivalent in places/heads for each livestock type[32].

The cost-benefit analysis is favourable for all thresholds in the range of 50-150 LSU as per the analysis conducted by Ricardo in May 2021[33] and further analysis. Note that the analysis

[32] LSU is a reference unit which facilitates the aggregation of livestock from various species and age. Using this unit would invoke the need for a framework for calculation of LSUs from poultry and pigs of different varieties. This may, in turn, require a new set of agricultural installations to comply with the general regulatory framework set out by the IED, such as the provisions regarding permits or inspections, detailed in Chapter II of the IED.

[33] Ricardo (2021) Updating of available information for undertaking the assessment of impacts for a possible modification of the IED with regard to aspects of intensive agriculture, available at:

by Ricardo (2021) has since been updated, in particular with respect to the administrative costs, which the analysis of May 2021 may have overestimated based on outdated information from the 2007 IED IA on permitting administrative burdens. Further analysis was also conducted and a range of possible thresholds, from 50 LSU, to 750 and above, is presented.

The equivalent number of **additional** pigs and poultry included under the LSU thresholds considered are included in the table below. The IED farm size threshold of 50 LSU is equivalent to approximately either 65 sows or 170 production pigs, whilst the size of a threshold of 150 LSU equates to approximately 195 sows or 500 production pigs. To reiterate, the number of farms and animals below covers only those that are not yet covered by the existing IRPP thresholds.

If all pig farms are mixed pig farms following a farrow-to-finish model, then the real IED threshold is the sum of the grey and red bars in Figure A8-21, at a maximum. The average of this for the EU-27 is 893 LSU (which has been approximated to 900 LSU). If all farms are specialised, then the average LSU is 588 (which has been approximated to 600 to align with the groupings available). The differences between Member States are governed by the ratio of the number of sows to the number of production pigs. Generally, the more sows there are, the more a country is able to use mixed "farrow to finish" farms, which results in a larger number of animals on farms not subject to IED regulation.

Evidence from the focus group of the IED Impact Assessment has noted that it is unlikely for large to medium sized farms to adopt a farrow-to-finish model. This is because Specialisation is generally seen as more profitable. Therefore, it is most likely that most Member States are closest to the specialised farm threshold and not to the mixed farm threshold.

Total number of pig farms within EU is 2 230 850. This covers farms including subsistence with the LSU below 10 (1 955 640) and farms above 10 LSU (275 210), based on Eurostat data. Under current IED threshold there are 11 100 pig farms covered (EU registry).

Total number of poultry farms within EU is 4 291 490. This covers farms including subsistence with the LSU below 10 (3 972 880) and farms above 10 LSU (318 610), based on Eurostat data. Under current IED threshold there are 12 000 poultry farms covered (EU registry).

Table A8-27: IRPP thresholds considered, expressed in LSU and with the equivalent average number of animals in heads or places, depending on the structure of the farm, and expected farm numbers. (source: Ricardo, 2021 and further analysis)

Threshold (LSU)	Threshold (number of pigs)	Approximate number of pig farms in the EU above this threshold and below current IRPP thresholds	Threshold (number of poultry)	Approximate number of poultry farms in the EU above this threshold and below current IRPP thresholds
50	170 p.p., 65 sow	91 000	2 400	95 800

https://circabc.europa.eu/sd/a/c863480b-5fd5-41e9-93ee-9c68669d6511/Intensive%20Agriculture%20and%20IED%20Final%20Report%202021.pdf

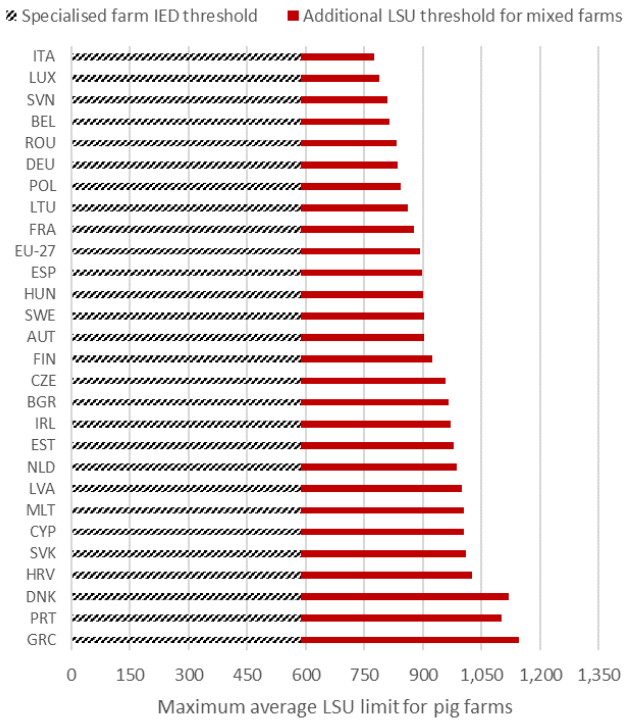
100	330 p.p., 130 sow	58 500	4 800	59 700
125	420 p.p., 160 sow	48 000	6 000	49 700
150	500 p.p., 195 sow	37 400	7 200	39 700
300	1 000 p.p. 390 sow	18 700	14 400	20 800
450	1 500 p.p. 585 sow	9 700	21 600	11 400
600	2 000 p.p.** 780 sow	3 700	28 800	5 300
750	-	-	36 000	2 200

** Pig farms between 600 and 900 LSU may or may not be installations already covered by the IED. This coverage depends on the level of Specialisation of the farm, as follows:*

- *Specialised farms that only keep production pigs, or only keep sows raising piglets are simpler to identify as being within or outside IED scope. Such Specialised farms are included in the IED above about 600 LSU (as 600 LSU corresponds to 2 000 production pigs, or ~780 sows).*
- *'Farrow to finish' farms that raise sows and production pigs together are subject to the IED only if either the number of sows or the number of production pigs exceeds the IED thresholds (750 sows or 2 000 production pigs). These 'mixed farms' will have LSU higher than about 600. The following text justifies our suggestion that this upper threshold may be around 900 LSU.*

In relation to the regulation of mixed livestock farms hosting both pigs and poultry in the same installation, there is a potential need to also consider whether an additional activity of 'mixed livestock farm' should also be included in Annex I activity 6.6. This could be defined either using the summation of various thresholds that are all based on LSU units, or could be defined using a percentage of other thresholds basis as compared to a total of 100%.

Figure A8-21: Maximum additional LSU that pig farms can have by adopting a mixed "farrow-to-finish" model, as opposed to only specialisation, per Member State.



Objectives of the measure:

- Reducing the environmental impact of industry across the EU-27, via the amendment/ expansion of coverage of the IED in Annex I.
- Levelling the playing field for installations across the EU.

Implementation needs:

- EU to make legislative change to the IED text
- EU to extend IRPP BAT conclusions
- Member States to transpose changes into national law
- Member States to regulate the smaller IRPP farms according to the new requirements, to the extent this requires changes from their existing regulatory approaches for smaller pig and poultry farms. This will require upfront and ongoing implementation actions.
- (EU to consider the possibility for applying a tailored approach (measure 33) for IRPP installations)

Assessing impacts

Economic impacts

Administrative burden on businesses

This measure will have **negative impacts** on the administrative burden on businesses. This will be due to the farm operators being regulated when they were not previously regulated.

For pigs and poultry, the associated administrative costs associated with the granting and enforcement of permits were estimated to be €94.6 m and €99.6 m respectively per year from 50 LSU; and €38.9 m and €41.3 m per year from 150 LSU on the assumption of full IED permitting (Ricardo, 2021 and further analysis). The adoption of a tailored approach for IRPP in the IED (measure 33) could see these permitting costs drop by c. 40%, i.e. to €55.1 m and €57.9 m per year respectively from 50 LSU; and to €22.6 m and €24.0 m per year respectively from 150 LSU. How these numbers could be expected to decline based on higher thresholds are included in **Table A8-28** below. This table shows the total costs for including farms above this threshold at each level. The values in the columns should not be added together, as they are already a cumulative total of all farms that would be included at the threshold.

The methodology for deriving the costs for the tailored approach is described in Measure 33. The cost reduction is slightly higher at higher farm thresholds, because more Member States already regulate some of the larger classes of farms compared to smaller farms. That means that for example for poultry farms above 600 LSU, the reduction in the tailored approach is 37%. For farms above 750 LSU, as the sample of farms is so small, individual differences among Member States again reduces the benefit, as it appears that a considerable number of these farms close to the existing IED threshold, are located in countries where less significant emission reduction policies were identified.

Table A8-28: Administrative costs for businesses, pigs and poultry, at different LSU thresholds

Threshold (LSU)	Administrative costs for pig business	Administrative costs for poultry

	(€m/year)		business (€m/year)	
	Full IED Ch.2 requirement (€m/year)	Tailored approach (€m/year)	Full IED Ch.2 requirement (€m/year)	Tailored approach (€m/year)
50	94.6	55.1	99.6	57.9
100	60.9	35.4	62.1	36.1
125	49.9	29.0	51.6	30.1
150	38.9	22.6	41.3	24.0
300	19.4	11.3	21.6	12.6
450	10.1	5.9	11.9	6.9
600	3.8	2.2	7.8	4.5
750	-	-	3.3	2.2

There will be costs to industry of the further development of the BREF (Livestock BREF). The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). After apportioning the fraction of this cost for businesses and annualising over a period of 20 years assuming two BREFs in this period, the annualised cost of the BREF process for businesses would be expected to range from €0.1m/year to €0.7m/year, with a central estimate of €0.2m/year. It could be expected that the costs of an BAT based requirements would be on the lower end of this range because it would be building on the existing IRPP BREF by way of expanding its scope to smaller farms and a simpler process could be used.

Operating costs and conduct of business

This measure will have **negative impacts** on the operating costs and conduct of business. This will be due to farm operators needing to implement techniques to mitigate the environmental impacts as will be identified in an extended BAT conclusions document for the sector.

Pig and poultry farms smaller than the existing IED threshold and down to sizes as small as 50 LSU are not currently considered by the IRPP BREF. In order to estimate the possible emission reductions from introducing these smaller farms into the IED, assumptions have had to be deployed in the absence of identified BAT for the part of the sector. It is difficult to anticipate the techniques that would be considered and the level of ambition the BREF would have (and hence also its potential, in terms of emission reductions, is also uncertain).

Ricardo (2021) identified two key environmental issues for the sector: the reduction of emissions to air of NH_3 (for pigs and poultry) and CH_4 (for pigs). That work estimated the techniques that could be necessary to be deployed across each Member State to reach an assumed level of ambition deemed to be BAT (without prejudice to possible determination of BAT through the BREF process). The total EU27 compliance costs for reducing the IED IRPP thresholds to 50 LSU were estimated to be €222 m/year and €150 m/year for pig and poultry farms respectively for applying abatement techniques tackling NH_3 and CH_4 emissions. In the case of a threshold at 150 LSU, these compliance costs were estimated to be €91 m/year and €62 m/year. How these numbers could be expected to decline based on higher thresholds are included in the table below.

Table A8-29: Estimated compliance costs for business for implementing techniques addressing NH3 and CH4 emissions at pig and poultry farms.

Threshold (LSU)	Compliance costs for pig farm business (€m/year) for applying techniques tackling NH_3 and CH_4	Compliance costs for poultry farm business (€m/year) for applying techniques tackling NH_3
50	222	150
100	143	93
125	117	78
150	91	62
300	64	41
450	41	25
600	16	11
750	-	5

Note that CH_4 techniques were not considered for poultry, as the EU-wide source data from the GAINS model v4 (2020) did not yet contain the baseline information required to perform this assessment. In the GAINS model, CH_4 abatement techniques are limited to anaerobic digestion which is assumed to have a net zero abatement cost (whereby the investment is paid back to a zero NPV over time due to benefits from energy recovery). This means that the cost data in

Table A8-29 are entirely from NH_3 reduction measures. For pigs and poultry, there is no CH_4 element from enteric fermentation, which is an emissions source with associated reduction techniques that can lead to compliance costs for cattle in measure 31.

These costs, when combined with administrative costs to form a total cost, remain favourable (positive) in terms of a benefit-cost ratio, when compared to the monetised benefits of NH_3 and CH_4 emissions reductions. The benefit-cost ratios are included in the air quality assessment section.

The above costs are based upon the techniques already deployed at the farms, and what possible additional techniques could or would be necessary if additional farms and sectors were brought within the scope of the IED. The key source used has been GAINS 4, with the accompanying pollution control technologies included in the model's baseline scenario. The selection of which techniques to apply for Member States is based on the initial selection made by GAINS on what is used, supplemented by information provided in the consultation. This estimate, therefore, does not attempt to replicate or suggest BAT, but serves as a guide of the potential level of cost to benefit.

Competitiveness and level playing field

This measure will have a **positive impact** on levelling the playing field. Introducing smaller pig and poultry farms into the IED imposes a singular set of requirements towards these newly introduced farms and operators. It therefore offers the potential to level the playing field by providing minimum criteria for all Member States, notably towards the use of emission limit values in permits standardised to BAT-AELs (measure 31 already reminded the finding of the IED evaluation that inclusion of an activity in the IED leads to a levelling of the playing field). This would be likely to also be the case for the farms newly regulated under this measure. Specific care will need to be given to farms that employ specific unconventional techniques, such as a focus on Ecological farming. The focus group held with selected Member State authorities on Livestock rearing (17th June 2021) within the context of the revision to the IED in June 2021 identified support from Member States to regulate smaller pig and poultry farming due to, among other things, the benefits to be gained from levelling the playing field.

This measure will have **mixed impacts** on competitiveness. For those smaller pig and poultry farms that are already regulated and for which no or little additional cost impacts would be seen, the relative competitiveness of these farms would be expected to increase. For those farms that are not already regulated and which will see additional cost impacts, the relative competitiveness of these farms would be expected to decrease. The total costs of doing business, that is the costs of administrative burden and compliance combined, are thought to negatively impact upon farms. The exact level, however, as noted in the above, is to be determined by the BREF process. If these costs cannot be passed on in the price of produce, these costs will be incurred by businesses, impacting upon profitability. As noted, however, the cost to benefit ratio remains favourable when environmental benefits are considered and monetised.

Position of SMEs

The measure will likely bring additional impacts on SMEs. No specific statistics on whether the farms will be defined as SMEs or not were identified. No means to identify the costs per employee or businesses have been identified. The impact of this measure towards SMEs, therefore, remains unclear.

Innovation and research

This measure may have a limited impact on research and development. Provisions within the IED, such as Article 27 on emerging techniques, allow for research and development within the context of BAT. Each BREF includes a chapter on emerging techniques, which acts as an indication of future techniques that could in the future (i.e. 'if commercially developed') be considered as BAT. This pathway encourages the continual focus on further reducing the environmental impacts of industrial activities or innovating in ways to save costs when compared to existing BAT. If this measure was adopted, such activities would be subject to the Sevilla Process, with emerging techniques considered within the eventual BREF.

Public authority impacts

This measure will have **negative impacts** on public authority costs.

Similarly to measure 31 for cattle, the administrative cost for authorities is expected to be the same as for operators, whereby total administrative costs for granting and enforcement of permits is split 50-50 between farmer and permitting authority. The reasoning for this split is explained in the public authority impacts for Measure 31, as the same processes and logic applies. The data is shown in the following table.

Table A8-30: Administrative costs for public authorities in the expanded scope for pig and poultry farms, in the baseline situation of full IED Chapter 2 requirements, and under the tailored approach.

Threshold (LSU)	Administrative costs for public authorities from permitting pig farms		Administrative costs for public authorities from permitting poultry farms	
	Full IED Ch.2 requirement (€m/year)	Tailored approach (€m/year)	Full IED Ch.2 requirement (€m/year)	Tailored approach (€m/year)
50	94.6	55.1	99.6	57.9
100	60.9	35.4	62.1	36.1
125	49.9	29.0	51.6	30.1
150	38.9	22.6	41.3	24.0
300	19.4	11.3	21.6	12.6
450	10.1	5.9	11.9	6.9
600	3.8	2.2	7.8	4.5
750	-	-	3.3	2.2

There will be the costs to the Commission/ EU overall in developing BAT based requirements. The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). After apportioning the fraction of this

cost for public authorities, and annualising over a period of 20 years assuming two BREFs in this period, the annualised cost of the BREF process for public authorities would be expected to range from €0.3m/year to €1.4m/year, with a central estimate of €0.5m/year. It could be expected that the costs of developing BAT based requirements would be on the lower end of this range because of the limited scope to extending the scope of the existing IRPP BREF to smaller farms, and the possibility of having a simple process.

There will be one-off costs to the Member States for transposition of new requirements, as well as ongoing regulatory costs. Further evidence gathered during the focus group with selected Member State authorities identified how several Member States are already regulating smaller pig and poultry farms to some degree, with variation between them on (1) the threshold from which they are regulating the farms, and (2) the approach taken to regulating them (i.e. whether permitting, or simpler registration / notification systems, i.e., the Tailored Approach [see Measure 33) – next section]. No information has been identified however on the possible costs to Member States for transposing and implementing the requirements.

Environmental impacts

Climate

This measure will have **strongly positive impacts** on reducing greenhouse gas emissions. Estimates in Ricardo (2021) and further analysis suggest that with a threshold at the equivalent of 50-150 LSU, approximately 77-101 kt of CH_4 could be mitigated per year, with c. 40% of this estimated to accrue in Spain. These estimates are based on input from the model GAINS 4, and the accompanying pollution control technologies included in the model's baseline scenario. To place this value in context, CH_4 emissions reported from activities relating to pigs reported to the E-PRTR (activities 7a(ii) and 7a(iii)), average around 570 kt between 2017 and 2019. These emissions are approximately 0.04% to 0.06% of GHG emissions relative to the baseline scope of the IED.

However, more broadly in context, agriculture emissions of 463 Mt CO_2eq [34] represent 13 %[35] of the total EU-27 GHG emissions. This 77-101 kt of CH_4 represents in CO_2 equivalent terms 2.1-2.8 Mt CO_2eq, i.e. around 0.4-0.6% of the EU27 agricultural sector emissions.

Further reductions beyond those estimated could be possible, and would depend on the level of ambition of a BATC for smaller pig farms, as well as if N_2O emissions are accounted for.

These reductions would contribute to the EU Methane Strategy, and would help to address the concerns flagged in the recent European Court of Auditors Special report 'Common Agricultural Policy and climate' which indicates that despite the Common Agricultural Policy funds injected to the agriculture sector, GHG emissions from the sector have not decreased since 2010.

[34] EEA greenhouse gases data viewer https://www.eea.europa.eu/data-and-maps/data/data-viewers/greenhouse-gases-viewer

[35] European Court of Auditors Special Report Common Agricultural Policy and climate

Air quality

This measure would have **strongly positive impacts** on reducing air pollutant emissions. Estimates in Ricardo (2021) and further analysis suggest that with a threshold at the equivalent of 50 LSU, approximately 25 kt and 45 kt of NH_3 emissions could be mitigated per year for pigs and poultry respectively; and approximately 19 kt (pigs) and 37 kt (poultry) at a threshold of 150 LSU. These estimates are based on input from the model GAINS 4, and the accompanying pollution control technologies included in the model's baseline scenario.

To place these values within context, both poultry and pigs are large sources of NH_3 emissions. The NH_3 emissions from pigs represent approximately 45% of NH_3 emissions relative to the scope of the IED, and the corresponding value for poultry is 28%. Combined they represent approximately 72% of all NH_3 emissions reported by IED activities in E-PRTR. EU27 total NH_3 emissions were 3.6 Mt in 2018, of which 2.4 Mt/year are from livestock.[36] This combined pigs and poultry reduction of 70 kt/year (50 LSU) therefore represents around 2.9% of livestock sector emissions, or around 1.9% of total EU NH_3 emissions. At the threshold of 150 LSU, the combined reduction of 56 kt/year represents around 2.3% of livestock sector emissions, or around 1.6% of total EU NH_3 emissions.

As was already mentioned in the discussion on measure 31, for some Member States the very large number of animals concentrated in a small geographical area, has led to Member States enacting policies to address these emissions sources, in order to meet objectives under other EU rules, such as the Nitrates Directive, Habitats Directive and Birds Directive.

Using the latest work on damage cost functions by the EEA[37], the monetised benefits of these emission reductions (NH3 and CH4) for the range of 50-150LSU are estimated to be around €1 075-1 409m/year for pigs and €974-1 195m per year for poultry. Across the different considered farm size thresholds, the ranges of benefit-cost ratios, of all costs combined (administrative and compliance costs), remains positive and favourable, ranging from 4.3 to 9.3 for pigs, and from 4.5 to 11.8 for poultry. The benefit-cost ratio decreases with a lowering of the IED farm size threshold down to 50 LSU, as administrative costs become a larger relative burden at these lower thresholds.

The variation in these values by threshold is shown in the table below. There are considerable CH_4 emission reductions estimated here for the pig sector, which come from a strong application of anaerobic digestion at manure processing facilities. It is recognised that this technique may have significant investment costs and long payback periods. In the long term, this technique is expected to be cost positive by the GAINS model. It was considered to be too optimistic an assumption, and we have reduced the net Economic cost to 0 for pig and poultry manure, also because anaerobic digestion often requires a co-substrate to function and can therefore not always be applied to every situation of high manure supply. If the IED is not the appropriate instrument to incentivise investment in anaerobic digestion, then many of

[36] EEA air pollutant emissions data viewer https://www.eea.europa.eu/data-and-maps/dashboards/air-pollutant-emissions-data-viewer-3

[37] Unpublished draft EEA (December 2020) "Costs of air pollution from European industrial facilities 2008–2017"

these CH_4 benefits may not be realised. However, the benefit cost ratios will remain positive even at 0 CH_4 benefits, relying entirely on NH_3 reduction measures.

For the poultry sector, due to lack of baseline data on the application and practice of anaerobic digestion on poultry manure, this assumption was not made and no data is shown on the potential impact of this CH_4 measure for the poultry sector at this time.

Table A8-31: Monetised benefits and associated benefit-cost ratios

	Threshold (LSU)	Monetised benefits (€m/year) (NH_3)	Monetised benefits (€m/year) (CH_4)	Benefit-cost ratio
Pigs	50	690	719	**4.3**
	100	628	654	**6.0**
	125	578	601	**6.7**
	150	524	551	**7.9**
	300	344	376	**8.2**
	450	220	241	**8.6**
	600	98	106	**9.3**
Poultry	50	1 195	-	**4.5**
	100	1 125	-	**6.8**
	125	1 050	-	**7.6**
	150	974	-	**8.9**
	300	657	-	**9.7**
	450	419	-	**10.4**
	600	222	-	**11.5**
	750	96	-	**11.8**

Reductions in other air pollutants would also be expected, both directly (e.g. PM) and indirectly (e.g. PM, ozone) leading to further benefits which have not been quantified. These will also be included when updating the BREF and BAT conclusions, but no accurate baseline of this information from recent years was obtained as the main modelling system for the baseline (IIASA GAINS 4) did not yet contain full information about other pollutants outside of ammonia and methane.

The estimated costs are much smaller than the total monetised benefits of NH_3 and CH_4 emissions reductions estimated. Across the different considered farm size thresholds, the ranges of benefit-cost ratios, of all costs combined (administrative and compliance costs), therefore, remains positive and favourable, ranging for pigs from 4.3 to 9.3 for pig farms. This is showing that the relative benefits to costs are lowest for pig farms. This is in line with the expectations, as pig farms already have the lowest farm size threshold included within the IED scope, at an estimated 750 LSU, but near 600 LSU for Specialised farms. This means that already a large proportion of very large farms are captured, and those are the farms with the highest potential benefit-cost ratio, and there is more limited potential for economies of scale.

The benefit-cost ratio decreases linearly with a lowering of the IED farm size threshold to 50 LSU (which is equivalent to either 65 sows or 170 production pigs) due to increased total administrative costs.

For poultry, the estimated costs are also much smaller than the monetised benefits of NH_3 emissions reductions. Across the different considered farm size thresholds, the benefit-cost ratio of all costs combined (administrative and compliance costs) ranges from 4.5 to 11.8 for poultry farms. The benefit-cost ratios for the poultry sector therefore are lower than those for cattle, but higher than those for pigs. This is in line with the expectations as the current IED farm size threshold for poultry is relatively higher than for pigs, when expressed in LSU (approximately equivalent to 900 vs 750), but lower than for cattle, which has no current regulation under the IED at all. Similar to the analysis for pigs, the benefit-cost ratio decreases linearly with a lowering of the IED farm size threshold to 50 LSU (2 400 poultry places) due to the increased weight of administrative costs. Lastly, a very important factor that significantly increases benefit-cost ratios for cattle is the potential for CH_4 emission reductions from enteric fermentation.

Water quality and resources

This measure should provide **weakly positive impacts** on water quality and resources. The integrated approach of the IED and the range of environmental issues that could be covered by an integrated Livestock sector BREF and BAT Conclusions would be expected to lead to tighter controls on a range of environmental issues from pigs and poultry. The analysis conducted by Ricardo in May 2021 did not cover releases to water.

However, according to E-PRTR data, nitrogen releases reported between 2017 and 2019, from IRPP totalled between 0.5 – 0.9%, relative to the baseline scope of the IED. Phosphorus releases reported for 2018 and 2019 from IRPP totalled between 3.3 – 5.1%, relative to the baseline scope of the IED.[38] Similarly, with the above statistics, these are often based on a single site reporting, indicating that the majority of farms are below the Annex II reporting thresholds within the E-PRTR Regulation for these pollutants. This makes assessing the potential impact of the measure, towards water quality, problematic using this data source. The extent of the activities' impacts, or the potential for the reduction of this environmental impact is uncertain.

Soil quality or resources

This measure should provide **weakly positive impacts** on soil quality. The integrated approach of the IED and the range of environmental issues that could be covered by an Livestock sector BREF and BAT Conclusions would be expected to lead to tighter controls on a range of environmental issues from pigs and poultry. The analysis conducted by Ricardo in May 2021 did not cover releases to land. However, according to E-PRTR data, phosphorus releases reported between 2017 and 2018 from IRPP totalled between 63 – 100%, relative to the baseline scope of the IED. No 2019 releases of phosphorus were reported. These figures are often based on a single site reporting, indicating that the majority of farms are below the

[38] 2017 releases of phosphorus from IRPP reported in E-PRTR appear to be spurious, owing to the reporting of one site.

Annex II thresholds within the E-PRTR Regulation for these pollutants. This makes assessing the potential impact of the measure, towards soil quality, problematic.

Waste production, generation, and recycling

This measure should provide **weakly positive impacts** on waste production. The integrated approach of the IED and the range of environmental issues that could be covered by an Livestock BREF and BAT Conclusions would be expected to lead to tighter controls on a range of environmental issues from pigs and poultry. No means of assessing the volume or type of waste has identified, however regulation of the sector through the IED may further benefit the management of waste, through provisions such as Article 11, which requires installations are operated within the principles of the waste hierarchy, as laid out in the Waste Framework Directive (Directive 2008/98/EU).

Efficient use of resources

Unclear impacts. No means of assessing the efficient use of energy or water have been identified, however, regulation of the sector through the IED may further benefit resource efficiency, with resource efficiency featuring within the Sevilla Process.

Social impacts

This measure has unclear social impacts. This measure will incur costs towards business and operators. If these costs cannot be passed on within the price of produce, these costs will impact upon profitability and could therefore impact upon employment. No formal assessment has been carried out, but the impacts are thought to be negative.

Measure 33: Introduce a tailored regulatory framework for installations carrying out rearing of animals.

Description of the measure and requirements for implementation

The possible widening of the IED scope for IRPP (measure 32), and inclusion of the cattle sector (measure 31), may cause significant increase of workload for the competent authorities and farmers considering the number of installations possibly concerned. With this in mind, and due to the fact that the concerned processes and emissions patterns are relatively simple in comparison with other IED activities, agro-industrial activities may not require the full extent of the IED regime as laid out in 2010/75/EU. Therefore, for such activities it is appropriate to consider a specific tailored approach (TA).

The assumption is that the tailored approach is needed for the IED to better address the specificities of livestock rearing. This would apply both to IRPP installations already covered by the IED and additional IRPP and cattle installations. No other IED activities are being considered for this measure.

The tailored approach would seek to minimise impact on the already established MS permitting systems. This would be done by defining the tailored approach as minimum requirements that MS could implement within their national permitting / registration systems. MS may then opt for keeping current IRPP installations under the full IED regime (i.e.

without change) or could choose to change the way existing IRPP installations are regulated by switching to the tailored approach. It is noted that many MS have found ways to modify (simplify) permitting within the IED for IRPP (e.g. linked to certification systems that exist for other agricultural obligations, and/or using general binding rules) which is already achieving flexibility, so it will be important to understand the extent of existing practices here.

The tailored approach and its expected effect on public authorities and businesses is comprised of two pillars:

1. Measure design
2. Alignment with existing permitting systems and application of BAT

Pillar 1: Tailored Approach measure design: reducing overall IED requirements

The first pillar on measure design aims to reduce the general administrative burden on all farms within the revised scope of the IED by reducing the requirements for operators. The possible reduction in requirements would include:

- Review the applicability and monitoring requirements for ELVs on air and water. Feedback was received from Member State authorities that direct monitoring requirements of air and water ELVs may not be suitable for this type of installation, as in the majority of cases, monitoring is done by estimation of emission factor based on the techniques that are applied. Further, emissions to air and water are often very indirect, via animals that are grazing, or via the choices made by the farmer on application of manure, which is already regulated via the Nitrates Regulation and related water regulations. The inclusion of minimum ELVs, required resource management techniques and other provisions (e.g., monitoring requirements and compliance rules) will be determined in a subsequent dedicated Commission implementing decision, that will adopt a proportionate approach regarding the pollution risks, and the requirements of farms to demonstrate that BAT has been applied, and that required results have been achieved.
- Simplification of the Environmental Management System, where feasible, whilst still retaining a high degree of environmental protection. Similar to the above, an Environmental Management System is a measure designed for large industrial installations and may not need to be as comprehensive for especially smaller livestock farms. Often in permitting, the relevant environmental emissions are already controlled for via the permitting conditions and the conditions on the farm, day by day, do not change to the point where intensive environmental management may be necessary throughout the year. The following elements of the IRPP EMS could therefore be removed:

    - Independent internal or external auditing to determine if the EMS conforms to planned arrangements. (this is because farming EMS implementation and monitoring thereof is often not to a complexity that an external auditor would be required)

- Consideration for the environmental impacts from the eventual decommissioning of the installation at the stage of designing a new plant (environmental impact from decommissioning are negligible compared to use-phase impacts)
- Application of sectoral benchmarking on a regular basis (Farming systems do not change or evolve as rapidly as other, more technology-intensive industries, and farming systems are often heterogeneous across a Member State. Therefore, this action is more appropriate as a sector-wide effort than on the individual farms).

- The IRPP BREF also contains techniques whereby the operator can make a choice for one or more to select. However, this may not be as relevant to all types of techniques. In particular, nutrition research is rapidly evolving and locking in certain techniques to be used on this front introduces inflexibility. A simplification would be to determine that farms may use one of the techniques described (in for example BAT 3), or may use a different technique provided it has been demonstrated (and evidenced by the permitting authority to the EU) that this technique achieves the same level of impact reduction, in terms of reaching the BAT-associated excrement levels. This can be done because many Member State authorities maintain their own BAT documents that are often more detailed than what is in the IRPP BREF, and those documents could be validated by an EU entity as "compliant" with the IED, at which point it can be used in combination with local regulation as evidence of compliance to a BAT requirement and the associated ELV. This means no additional burden would be introduced above existing regulations based on these other techniques. This may have some administrative burden at the start of the implementation of the BAT based requirements, but this would only happen once, and not every time per farm permit process.
- Removal of the need for baseline reports under Article 22, as the environmental impacts of a farm are not often felt on the site of the farm itself but relate more to soil in the surrounding environment, not the soil on the site of the farm.
- Reduction in the frequency of inspections to e.g. every 5 years as a default, or being triggered by complaints or compliance. Farms are already subject to monitoring and reporting to other regulations, and operating conditions do not change very rapidly.
- Registration rather than permitting for smaller farms (threshold of what denotes "smaller" to be determined)
- Inclusion of minimum ELVs, resource management techniques and monitoring/ compliance requirements in a Commission decision.

Pillar 2: Tailored approach permitting: Alignment with permitting systems

In addition to the core tailored approach provisions to be integrated in the IED, the Commission may issue guidelines for MS, recommending minimum requirements that MS registration/permitting systems should include, and providing an application template (for operators) and a permit template (for authorities). An ideal implementation of this would allow Member States to evidence compliance with the IED via existing policy

implementations. This could substantially reduce the impacts on the measure for Member States who have already implemented (some level of) environmental permitting with (some level of) BAT.

To support pillar 2 of the tailored approach, 'tailored BATC' may be needed to support this approach through which a specific Implementing Act (IA) /Delegated Act (DA) could be used to lay down minimum environmental requirements for installations under a permitting regime. As national implementation of such conclusions would most likely not comprise a through site-by-site revision of permits, the act would have to be either directly applicable (EU regulation) or subject to translation by Member States in general binding rules or permits, where applicable. The Livestock BREF/ 'tailored BATC':

1. would cover current IRPP and additional installations from the cattle sector and poultry and pigs below current IED thresholds
2. would be started as a priority as soon as consensus emerges on the overall IED revision, associated scope change(s) and the tailored approach
3. should include technical requirements (ELVs, requirements for environmental management, monitoring provisions, and BAT requirements) whose implementation does not necessarily need to be verified directly via full permitting. Instead, it should allow Member States to gather and present evidence of existing regulations that would (partially) fulfil the requirements.

Point 3 of the above is where the tailored approach to permitting differs from the classic approach of the IED. Instead of ensuring compliance via direct control requirements on environmental permits, the EU would set up an evidence gathering system that allows Member States to submit evidence that IED requirements are already (partially) met via implementation of national legislation. This national legislation may in turn be in response to other EU legislation, but the initial driver for regulation on livestock farms is not consequential.

It is generally not considered feasible to use compliance evidence of other EU Directives or Regulations as evidence for being below IED ELVs. This, because other relevant EU Directives are controlling the destination of pollutants (e.g. concentrations in air, water and soil, or pollutant deposition fluxes), not the emissions source. Therefore, Member States may have already controlled emissions from farms in order to reduce concentrations of pollutants in the air, water or soil. However this is not evidence that the farms causing this pollution are using BAT and/or are operating below ELVs, as the final concentrations of pollutants also heavily depend on the number of farms and animals in any local area as well as other pollution sources.

Therefore, it is only relevant for the Commission to understand whether or not farms are already regulated by restricting emissions per farm (expressed as emissions per animal place) and if the implementation of national legislation has ensured application of (partial) BAT to do so, not what the original driver was for that existing regulation.

To enable this, for the tailored approach, there needs to be a method for Member States to submit evidence that existing permitting regimes/general binding rules *ensure compliance* with the IED, by providing evidence that their existing permitting regimes/general binding

rules can only be complied with by farms that are below the suggested IED BAT based ELVs, and/or can only be complied with by farms that use BAT. To gather this evidence, a suggestion is for each Member State to implement a national online register for farm operators and authorities, which can be used to gather the relevant evidence that would be required by the Commission to ensure compliance with the IED:

- The online register would use the Livestock BREF and relevant EU secondary legislation (via an IA/DA mechanism) for environmental aspects;
- The Commission would support Member States, by issuing guidelines, to facilitate creation and usage of online registers;
- Member States could decide whether authorities would need to check all of the applications put into the online register, or if random checks could be performed;
- Member States could decide if the online register would be applicable for installations that require a permit and/or those requiring notification only.

Objectives:

The aim of such a tailored approach would be to facilitate effective implementation of the IED in Member States in terms of achieving a high level of protection of the environment as a whole, while minimising administrative burden. Given the variation across Member States for regulating smaller farms - below current IED thresholds - which are being considered for potential inclusion in the IED, this provision of an EU-wide tailored approach would also help in levelling the playing field for farms across the EU.

Implementation needs:

- EU to specify which requirements to include in a tailored approach, which will need to be determined with the input of competent authorities, from the perspective of implementation. It would also require inputs from the sector itself, from a technical point of view.
- EU to make amendment to the IED to bring agriculture activities outside the scope of Chapter II and Annex I and to provide a separate Article and associated Annex with the requirements for Member States to regulate these activities using the tailored approach.
- EU to develop BAT based requirements
- Member States to implement the tailored approach to the extent needed to provide its minimum requirements, depending on the extent of the legislation and approaches already implemented in the Member State.
- Development of a common reporting system facilitated by a common IT format, that would enable data between Member States on implementation to be utilised for reporting on the IED, via channels such as the EEA EU Registry and other agricultural-related databases (such as Eurostat agricultural indicators).

Economic impacts

Six specific categories of Economic impacts were selected for an in-depth assessment of the policy options for the revision of the IED. These include administrative burden on businesses,

operating costs and conduct of businesses, competitiveness of businesses and levelling the playing field, the position of SMEs, innovation and research and public authority impacts.

Administrative burden on businesses

This measure is likely to lead to **strongly positive impacts** on administrative burden on businesses. The possible administrative costs of permitting agriculture installations under the IED have been based on those in the study from Amec (2012), and adjusted to 2020 EUR prices, as well as additional information received through consultation as part of the IED revision. These costs are shown in **Error! Reference source not found.**; they represent a full permitting regime, and apply to all additional farms brought under IED control with a lowered threshold, or a new threshold in the case of cattle. Note that these are average costs, and reflect the current average size of IED installations. The "Central" estimate uses data from Amec (2012), divided by two to show only the share that is a cost to businesses. The 2007 IED IA originally estimated that 2/3 of the total administrative burden would be for public authorities and 1/3 for farmers. We have revised this to ½ for authorities and ½ for farmers. This is based on stakeholder inputs and knowledge of permitting implementation, which has shown that:

- Farmers make additional costs that are not accounted for in the IED IA, to acquire the required information needed for a permit for which external advisors may need to be hired.
- Public authorities often charge farmers a share of their permitting costs, and this charge can be dependent on the time spent by desk officers on the permit.

The "Central" estimate here reflects the original central estimate from Amec (2012). The "Higher" estimate reflects a more inefficient permitting regime, whereby more time is spent on the permitting process (duration: > 1 year) and the farmer has to engage with multiple public institutions. The "Lower" estimate reflects a very efficient permitting regime, that is enabled by central IT systems which some Member States have already developed in a response to implementing the IED for their many pig and poultry farms above the thresholds, which results in shorter durations (< 1 year) elapsing for permit applications and more clarity for the farmers on the exact information requirements for them.

Table A8-32: Administrative costs (sources: Amec 2012, Stakeholder evidence from focus groups, and Ricardo estimation for costs for Tailored Approach)

Range	Administrative costs per installation (2012) – full permitting – previous IED IA scope	Administrative cost for newly covered installations (2020 prices) – full permitting – evidence from focus group and stakeholder interviews	Administrative cost for newly covered installations - Tailored Approach (2020 prices)
Lower	2 450 EUR/ year	1 000 EUR/year	700 EUR/year
Central	4 250 EUR/ year	1 500 EUR/year	1 150 EUR/year
Higher	15 000 EUR/ year	2 000 EUR/year	1 450 EUR/year

It should be noted that the administrative cost is an average expected increase across all installations that would be newly subject to IED requirements where they were not before.

The lowest cost are envisioned for farms *already under a permitting regime driven by existing (national) regulation*, as the tailored approach would represent the most savings there.

A tailored approach would lead to a reduced administrative cost for businesses (farms) as compared to implementing full IED chapter II requirements. The amount this would be reduced will depend on which requirements are placed on installations in the tailored approach. It is expected that the tailored approach via Pillar 1 (reducing requirements) could reduce cost up to 20%. Second, it is further expected that for Member States who already implement environmental permitting with some level of BAT, the tailored approach could reduce administrative burdens by an up to an *additional* 40%. These reductions are applied to Member States dependent on information that has been received through the various consultations (including focus group). Various levels of existing permitting approaches exist:

- Registration and/or notification systems. These are not permits but may enable the competent authority to have the information required to intervene should they choose to do so. No additional burden reduction is estimated from having this in place, as it does in no way replace an IED permitting requirement.
- Evidence of a permitting system in place, but no knowledge about its requirements on environmental protection, and no evidence of a requirement to apply BAT. **This would reduce the burdens by an additional 5% for these Member States**, as some synergy can be expected, for example via the IED allowing the existing permitting authorities at municipal level to remain and reduce disruption to existing IT systems / processes within a Member State.
- Evidence of a permitting system in place with some requirements on environmental protection via either BAT or requirements on farming practices. This would reduce burdens by up to 20%, as this means the permitting system in place is already similar with the main pathways through which compliance with the IED should be implemented, and these existing systems / processes could be used. This would reduce the potential additional administrative cost by 20%.
- Finally, if there is evidence of a permitting system with full requirements on farmers to use BAT for a wide range of environmental issues, then it is expected that these farms will already be compliant or near-compliant. Efforts taken by the Commission to align and seek evidence from Member States who have implemented this should allow for a further 20% reduction in administrative burdens.

Table A8-33 below sets out how these different scenarios could play out for Member States with different baselines in terms of environmental permitting. The maximum assumed reduction from the tailored approach is 60% compared to the baseline. This is a conservative approach, as there is not enough knowledge available yet on how the Commission would ensure that national permitting systems are not disrupted, and how the Commission would gather evidence from Member States to validate their compliance.

Table A8-33: Approach to estimating the reduction in administrative burdens from implementing a tailored approach.

Base reduction in tailored approach from Pillar 1: Reduction in requirements	Additional reduction based on existing environmental permitting system	Second additional reduction based on existing environmental permitting system with full implementation of BAT	Cumulative level of reduction in administrative burdens achieved for different baseline situations.
20% for all operators and permitting authorities	**0%** (no evidence of a permitting system. Registration systems are not considered valid)	N/A	20%
	5% (evidence of a permitting system but no evidence of BAT)	N/A	25%
	20% (evidence of a permitting system with some level of BAT, but with confirmation from the MS that BAT requirements are more limited than likely required under the BAT based requirements)	**20%** (evidence of a permitting system with full implementation of BAT)	40% - 60%

The administrative burden for farms already regulated under the IED under activity 6.6 could also potentially be reduced. If Member State competent authorities chose to implement a tailored approach for those already regulated, then costs for existing IRPP operators would be lowered for these farms in the EU27 by € 19m/year (with a reduction of 20% from pillar 1 of the Tailored Approach, which is €2 300/year per installation, with ~20 500 installations). If the MS authorities chose to remain with the existing regulatory approach for the current IRPP farms then no saving would occur. So, the cost saving (benefit) would be within the range of €0 to €19m/year.

For the impact of this measure on the administrative costs of the additional farms being considered for inclusion (measures 31 and 32), the counterfactual scenario would not have these farms regulated. The administrative costs of including these additional farms is only to be considered using the tailored approach. The potential administrative costs of this are considered within measures 31 and 32.

Operating costs and conduct of business

The tailored approach is intended to reduce administrative burdens without compromising the application of BAT to reduce emissions. It does so by taking advantage of existing policy already in place (Pillar 2), as well as by not requiring some Chapter II requirements that may

not add to emission reductions for the vast majority of livestock farms (Pillar I). Therefore, this is not expected to change compliance costs already incurred by businesses, except in cases where the tailored approach helps avoid overlapping regulations with similar goals, but conflicting requirements.

Competitiveness and level playing field

Introducing a tailored approach would impose a singular set of minimum requirements towards agricultural installations and operators. It offers, however, an opportunity to alter these requirements to reflect the specificity of animal husbandry, in a manner which may not be needed for other activities found within Annex I of the IED. It therefore continues to level the playing field by providing minimum criteria for all Member States. This has largely been supported within the IED evaluation, where, for industry stakeholder surveyed, 69% agreed or strongly agreed with the statement 'the IED has contributed to achieving a level playing field in the EU for IED sectors by aligning environmental performance requirements for industrial installations'. Participants from Member States in the focus group consulted on this matter continued to support the need for ensuring a level playing field, since livestock farming was considered to be a global industry.

Position of SMEs

Farm operators that are SMEs would stand to benefit from the reductions in administrative burden discussed above. There are no means to identify how this measure may impact on SMEs, but it is evident that any reduction in administrative burden would serve to aid the costs faced by these businesses. The impact of this measure towards SMEs, therefore, is positive but unclear.

Innovation and research

This measure will not impact innovation and research.

Public authority impacts

There will be one-off adoption costs for the authorities to implement a new tailored approach. These administrative costs for public authorities will vary by Member State, depending on the extent to which the existing practices in the Member State already have adopted a tailored permitting approach for livestock farms. The measure as described will allow Member States to utilise their existing approaches already implemented, as long as they meet the minimum requirements. The IED evaluation suggested that IED implementation costs for one Member State were ~€250 000/year. This would be on a scenario of having no policy in place and full implementation of IED requirements. There would be some complexity involved at the Member State side, to set up a process which enables the Member State to provide evidence of compliance with the IED via implementation of existing regulations. At this point in time, it is not feasible to speculate as to the exact costs of this process.

There will also be ongoing costs of implementation of the tailored approach, including the means to assess public authority impacts have been identified, and the predicted number of new installations that may be introduced within the scope of the IED, requiring regulation via

the lowering of the capacity threshold within Annex I of the IED, cannot be readily determined from available data sources.

Environmental impacts

No environmental impacts are expected by this measure, which is aimed to reduce administrative burden.

Social impacts

The introduction of a tailored approach to an optimised "permitting" system will likely reduce administrative burden, reducing costs faced by operators. This reduction in costs may positively impact upon profitability and upon employment. No formal assessment has been carried out, but the impacts are thought to be positive.

Measure 34: Extend the current sectoral coverage to also include battery production within the scope of the IED

Description of the measure and requirements for implementation

The measure is to include battery production (lithium-ion and related technologies) within the scope of the IED. Battery production (specifically of lithium-ion batteries) is expected to grow in the EU and, although the possible evolution is uncertain, evidence suggests that the EU27 may host between 45-95 'gigafactories' by 2040 (CIC Energi, 2021)[39]. According to the High-Level Meeting of the European Battery Alliance up to 111 major battery projects are being developed across EU Member States, with the total level of investment along the entire value chain amounting to €127 billion[40]. Battery production will play a critical role in the transition of the EU economy to climate neutrality as it is the key enabling technology for zero-emission mobility and energy storage. This is a gap-filling extension of scope, as much of the batteries value chain is already covered by IED (non-ferrous metals and processing, chemicals, production of chemicals, waste treatment).

Lithium-ion batteries (LIBs) have been extensively employed in portable electronics, electric vehicles, and grid storage due to a number of valuable qualities such as their high energy density, high power density and long cycle life[41]. Other types of batteries have been and are continued to be researched and developed, including solid-state batteries (SSBs), sodium-ion batteries, lithium-sulphur batteries, lithium-air batteries, and multivalent batteries, and they might be involved in the route to achieving lower prices. However, LIBs are expected to continue dominating the market for at least the next decade.

Objectives of the measure

- Reducing the environmental impact of industry across the EU-27, via the expansion of coverage of the IED in Annex I.

[39] CIC energiGUNE, Gigafactories: Europe´s major commitment to economic recovery through the development of battery factories, available at: https://cicenergigune.com/en/blog/gigafactories-europe-commitment-economic-recovery-battery-factories

[40] https://ec.europa.eu/commission/presscorner/detail/en/IP_22_1256

[41] Current and future lithium-ion battery manufacturing - ScienceDirect

- Levelling the playing field for installations across the EU.

Implementation needs

- EU to make legislative change to the IED text.
- EU to develop BAT conclusions.
- Member States to transpose changes into national law.
- Member States to regulate the installations according to the new requirements. This will require upfront and ongoing implementation actions.

Further evidence and activity data

The battery industry is usually divided in three main areas: electric mobility, stationary energy storage systems and consumer electronics. In terms of total energy storage capacity, this substantial growth is primarily attributable to the electrification of transport which will account for most of the battery demand in 2030[42]. While the market share of batteries for electric mobility have rapidly increased and continue to show a steady rising trend, other industries such as portable electronic or electrical equipment batteries are already very developed, and they present a slower growing tendency.

In 2020, around 3 million new electric automobiles were registered. This year, for the first time, Europe led global electric-car sales with around 1.3 million new registrations, and it is predicted to do so again in 2021[43]. China followed with 1.2 million new vehicles and then the United States with 295 000 new registrations[44]. The IEA estimates electric vehicles might account for 15 to 30% of all vehicle sales by 2030.

A number of reasons have contributed to the increase in electric car registrations. On a total cost of ownership basis, EVs are becoming more competitive in several countries, and numerous governments have increased or extended fiscal incentives to help electric car customers weather the market downturn (France, Germany, United Kingdom, etc.). Despite the economic recession, Europe saw a spike in EV registrations in 2020. According to the IEA, this might be related to two governmental initiatives. First, the European Union's CO_2 emissions limits, which limit new car's average carbon dioxide (CO_2) emissions per kilometre driven, were set to expire in 2020. Second, as part of stimulus packages to counter the pandemic's effects, numerous European governments extended EV subsidy programmes.

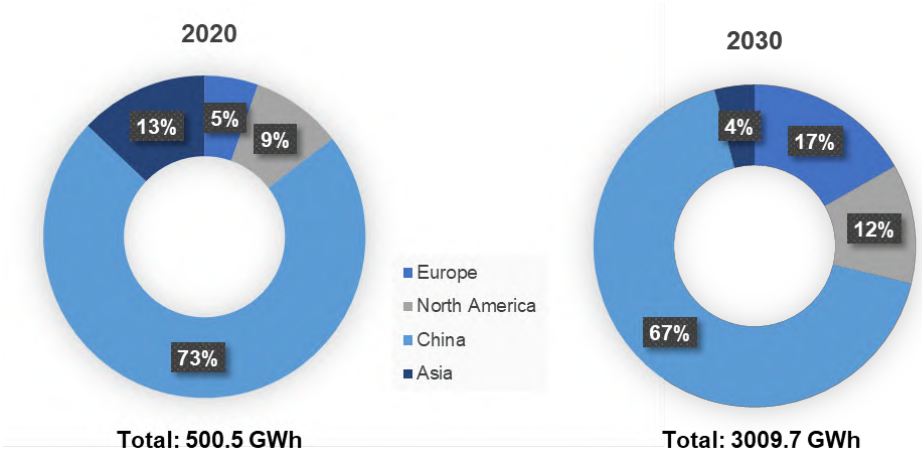
However, the European battery demand continues to outstrip supply. Hence, the path to build a battery supply chain rapidly and efficiently is underway across the continent, fuelled by European and national government funding and solid investment plans.

In this context, the global demand for batteries is expected to increase from 185 GWh in 2020 to over 2000 GWh by 2030[45]. BloombergNEF estimates that Europe could see its share of global battery production increase from a 7% in 2020 up to 31% by 2030[46], while Benchmark Mineral Intelligence expects that production capacity (GWh) to rise from 5.4% in 2020 to

[42] Projected global battery demand by application | Statista
[43] The Next Electric-Car Battery Champion Could Be European
[44] Trends and developments in electric vehicle markets – Global EV Outlook 2021 – Analysis - IEA
[45] Projected global battery demand by application
[46] The Next Electric-Car Battery Champion Could Be European

16.7% in 2030 as show in the figure below. The European Union's climate-neutral target includes an objective of at least 30 million zero-emission cars on the road by 2030[47], and the ambition of European companies meeting more than 90% of the demand for batteries.

Figure A8-22: Lithium-ion battery cell capacity in 2020 and planned for 2030.



Source: Benchmark Mineral Intelligence

Lithium-ion battery production is currently growing at an exponential rate, mainly due to the 41% increase in global electric car registrations and a constant average battery capacity of 55 kWh for BEVs (battery electric vehicles) and 14 kWh for PHEVs (plug-in hybrid electric vehicles)[48]. Over the following decade, global supply is predicted to expand fivefold, from 297 GWh per year in 2018 to 1.6 TWh per year in 2028[49].

In 2017, the European Commission formed the European Battery Alliance (EBA)[50] to develop a complete, sustainable and globally competitive battery value chain in the EU. The objective was to ensure that the EU would become a global centre for battery production, recycling and innovation and to ensure greater resilience in the single market for this strategic sector.

The current European annual production capacity is around 35 GWh but announced capacity might reach 400 GWh by 2025[51]. Poland and Hungary are now home to the main continent's battery plants. Many new battery factories were announced or under development in Europe in 2020, with financing support from Member States, the European Investment Bank, private investment among others.

The following map from CIC energiGUNE[52] provides an overview of the current and projected large-scale battery factories in Europe, the main companies involved and their estimated (minimum and maximum, when available) capacity.

[47] EU to target 30 million electric cars by 2030 - draft | Reuters
[48] Trends and developments in electric vehicle markets – Global EV Outlook 2021 – Analysis - IEA
[49] Faraday_Insights-2_FINAL.pdf
[50] ABOUT EBA250 - European Battery Alliance
[51] Trends and developments in electric vehicle markets – Global EV Outlook 2021 – Analysis - IEA
[52] Gigafactories: Europe´s major commitment to economic recovery through the development of battery factories | CIC energiGUNE

Figure A8-23: Map of the current and projected large-scale battery factories in Europe (2021)



Source: CIC energiGUNE

From these European battery factories, the table below lists only those already installed in the EU-27 and their estimated minimum and maximum capacities. The lowest maximum capacity of the existing large-scale battery factories is 2.5 GWh. The maximum capacities of the projected factories in the EU-27 starts from 2.5 GWh up to 70 GWh.

Table A8-34: Existing large-scale battery factories in EU-27

Company	Year	City	Country	Capacity (GWh)	
				Min	Max
LG Energy solution	2018	Wroclaw	Poland	15	65
Samsung	2018	Göd	Hungary	10	15
Faam Research Center	2018	Teverola	Italy	10	15
Microvast	2021	Brandenburg	Germany	1,5	6
Leclanché Energy Storage Solutions	2020	Willstätt	Germany	1	2,5
Nothvolt	2021	Skelleftea	Sweden	32	40

Considering the battery factories listed above, the total capacity in the EU ranges between 69.5 and 143.5 GWh. However, data from the IEA annual report on *Trends and developments on electric vehicle markets*[53] and studies from Benchmark Mineral Intelligence[54] have estimated the European capacity to be around 35 and 27 GWh, respectively.

This is an area where there are still information gaps, as not all the large-scale battery factories listed above are fully built and operating at the planned capacity range. According to information provided by RECHARGE, precise statistics/figures on each plant's current and final maximum capacity may not be available publicly due to market strategies and R&D investment in this industrial sector.

Existing legislation currently regulates a number of activities related to battery production. EU policies and directives for battery technology and other connected and dependant fields[55], include:

- New batteries regulation: Proposal for a Regulation on batteries and waste batteries
- Batteries directive: DIRECTIVE 2006/66/EC
- Ecodesign directive: DIRECTIVE 2009/125/EC
- REACH regulation: REGULATION (EC) No 1907/2006
- Strategic Action Plan on Batteries: COM(2018) 293 final – Annex 2
- List of critical raw materials: COM(2017) 490 final

For the inclusion of battery production within the scope of Annex I of the IED, battery production installations will be required to comply with the general regulatory framework set out by the IED, such as the provisions regarding permits or inspections, detailed in Chapter II of the IED. This will need to recognise battery compound production (i.e., chemicals, non-ferrous metals) is already covered within the IED's present scope; alongside battery disposal and recovery (to the extent already covered by activity 5.1).

Currently, the IED does include a number of activities that are thought to partially overlap with battery production, identified via analysis of the E-PRTR dataset, which includes a

[53] Trends and developments in electric vehicle markets – Global EV Outlook 2021 – Analysis - IEA
[54] EU to target 30 million electric cars by 2030 - draft | Reuters
[55] EU LEGISLATION & DIRECTIVES - European Battery Alliance

categorisation of facilities by NACE code '27.2 - 'Manufacture of batteries and accumulators'. The Annex I activities associated most commonly with these sites were IED activity 4.2 on production of inorganic chemicals. Similarly, IED Annex I activity 5.3a on disposal of non-hazardous waste with production a capacity exceeding 50 tonnes per day (or 5a in Annex I of the E-PRTR Regulation) or activity 5.3b on recovery, or a mix of recovery and disposal, of non-hazardous waste with a capacity exceeding 75 tonnes per day for those installations including battery recycling among their activities, and activity 5.1 on disposal or recovery of hazardous waste with a capacity exceeding 10 tonnes per day (or 5a in Annex I of the E-PRTR Regulation) is listed for some plants. It therefore appears that the IED does cover multiple aspects of the value chain of battery production, just not explicitly with regards to the phrasing of Annex I.

The key environmental impacts from battery production appear to be already covered by the IED, referring most of them to the electrode manufacturing step and relating to the use of chemical substances. Other elements from the production process might not be currently covered by the IED, such as those associated to the cell assembly or the battery assembly processes. However, their environmental impact might not be considered as relevant as other parts of the process. For example, Northvolt's environmental assessment of the process considers that the environmental impacts of the battery pack assembly process are insignificant. The final impact of all elements of the battery production chain, however, is strongly dependent on the production scale of the installation.

Assessment of impacts

Economic impacts

The sector is growing as stated above and the number of production installations is expected to be c. 20-25 sites by 2030 and c. 45-95 by 2040. Implementing the measure would be unlikely to lead to large increases in operating and capital expenditure costs. Economic spill over effects from positive environmental impacts, such as positive effects on reducing sickness, healthcare costs and improving productivity, are captured within the environmental impacts section.

Administrative burden on businesses

The measure would likely lead to **weakly negative impacts** on the administrative burden on businesses.

Resources will be required for the permitting process, primarily depending on the number of installations potentially covered by the IED and the type of permitting framework that would be introduced. There will be costs to industry of the development of a BREF.

A range of 20-95 is employed, with a central estimate of 25 sites, to develop an average view of the likely annual average costs of including 'gigafactories' in the IED. Based on the estimated number of installations for this sector and the assumptions of unit costs for the main requirements for operators, administrative burden on businesses has been estimated between €0.1m/year to €3m/year, with a central estimate of €0.6m/year, on average over the period of 20 years from adoption. This wide range is due to the uncertainty in unit

administrative costs and the number of installations. These costs are not expected to represent a significant burden on the sector.

Input from industry via the Targeted Stakeholder Survey, indicated that, for 14 industry respondents for 'battery production', who supplied a definitive response, 5 would anticipate their costs to be increase by between 5-15%, whilst 7 respondents expect costs greater than 15%. The vast majority of industry respondents chose not to respond, which may be because they had no particular thematic expertise.

For 'battery disposal and recovery', out of the 13 industry respondents who supplied a definitive response, 5 would anticipate their costs to be increase by between 5-15%, whilst 4 respondents expect costs greater than 15%. Similarly, to the above, the vast majority of industry chose not to respond.

Operating costs and conduct of business

This measure will have **negative impacts on compliance costs**, that is to assume that there will be costs to achieve BAT, but the exact level is to be determined by the BREF process. There is uncertainty as to what would be considered BAT for each process, and the degree of environmental pollution risk, and associated protection measures, already in place via the activity's partial inclusion within other activities under Annex I. Such uncertainty means compliance costs cannot be readily determined.

Competitiveness and level playing field

The total costs of doing business, that is the costs of administrative burden and compliance combined, are thought to negatively impact upon businesses within the battery industry. The exact level, however, as noted in the above, is to be determined by the BREF process. Administrative costs have been estimated and are thought to be small relative to the size of the sector, which some projections forecast a value of €250 billion by 2025.[56] If these costs cannot be passed on in the price of products, these costs will be incurred by businesses, impacting upon profitability.

Inclusion of battery production, disposal, and recovery within the Annex I of the IED imposes a singular set of requirements towards installations and operators. It therefore offers the potential to level the playing field across the EU by providing minimum criteria for all member states, notably towards the use of emission limit values. This has largely been supported within the IED evaluation, where for industry stakeholders surveyed, 69% agreed or strongly agreed with the statement 'the IED has contributed to achieving a level playing field in the EU for IED sectors by aligning environmental performance requirements for industrial installations'. This is likely to continue to be the case under new sectors adopted, including for battery production, disposal, and recovery, as in the case of this measure.

The measure therefore can be seen as creating a level playing field as this crucial industry further develops.

[56] Oliver Wyman (2019) Battery manufacturing in Europe

Position of SMEs

The limited information available suggests this measure will bring additional impacts to SMEs. However, this is unlikely given that it is expected that 'gigafactories' will be operated by larger enterprises.

Innovation and research

This measure will have **no or limited impact** on innovation and research.

Provisions within the IED, such as Article 27 on emerging techniques, allow for research and development within the context of BAT. Each BREF includes a chapter on emerging techniques, which acts as an indication of future techniques that could in the future (i.e. 'if commercially developed') be considered as BAT. This pathway encourages the continual focus on further reducing the environmental impacts of industrial activities or innovating in ways to save costs when compared to existing BAT. If this measure was adopted, such activities would be subject to the BREF Process, with emerging techniques considered within the eventual BREF. The activities partial inclusion to date, owing to similar activities within Annex I, may have had an indirect effect.

In the baseline, there is significant support from EU instruments and funds to support the development of the EU battery manufacturing industry. Specifically, through the Important Projects of Common European Interest (IPCEI) instrument which supports two major pan-European battery projects. In terms of European research, all battery-related issues have been grouped under the new Horizon Europe framework programme, and a battery partnership with the industry and other relevant stakeholders has been established (BATT4EU). The European Investment Bank also significantly contributes to the funding of battery-related projects in the European Union. Furthermore, several R&D centres have also been incorporated in the development programmes for battery manufacturers, such as LG Chem and Northvolt.

Public authority impacts

This measure may have a **weakly negative impact** on public authorities. This measure would impact upon the costs to competent authorities. Competent authorities would primarily need to engage with the permitting process, permit reconsiderations and updates, maintain information systems and gather evidence provided through monitoring and reporting, lead inspections, and participate in the BREF process.

Based on the estimated number of installations for these sectors and the assumptions of unit costs for the main requirements for public authorities, additional administrative costs have been estimated between €0.3m/year to €3m/year, with a central estimate of €0.8m/year, on average over the period of 20 years from adoption. This wide range is due to uncertainty in unit administrative costs and the number of installations. These costs, in isolation, are not expected to represent a significant burden on public authorities.

Input from both national and regional member state authorities, via the Targeted Stakeholder Survey for the revision of the IED, indicated that, for the 6 local/regional respondents for 'battery production', who supplied a definitive response, 2 would anticipate their costs to be

increase by between 5-15%, whilst 1 respondent expect costs greater than 15%. 3 would anticipate a variation of + or – 5% or little to no impact. The same results the 9 national respondents for 'battery production', who supplied a definitive response, 1 would anticipate their costs to be increase by between 5-15%, whilst 3 respondents expect costs greater than 15%. 5 would anticipate a variation of + or – 5% or little to no impact. The vast majority of respondents chose not to respond.

For the 7 local/regional respondents for 'battery disposal and recovery', who supplied a definitive response, 2 would anticipate their costs to be increase by between 5-15%, whilst 2 respondents expect costs greater than 15%. 3 would anticipate a variation of + or – 5% or little to no impact. The same results the 13 national respondents for 'battery production', who supplied a definitive response, 1 would anticipate their costs to be increase by between 5-15%, whilst 4 respondents expect costs greater than 15%. 8, however, would anticipate a variation of + or – 5% or little to no impact. Similar to the above, the vast majority of respondents chose not to respond, perhaps not having particular thematic expertise.

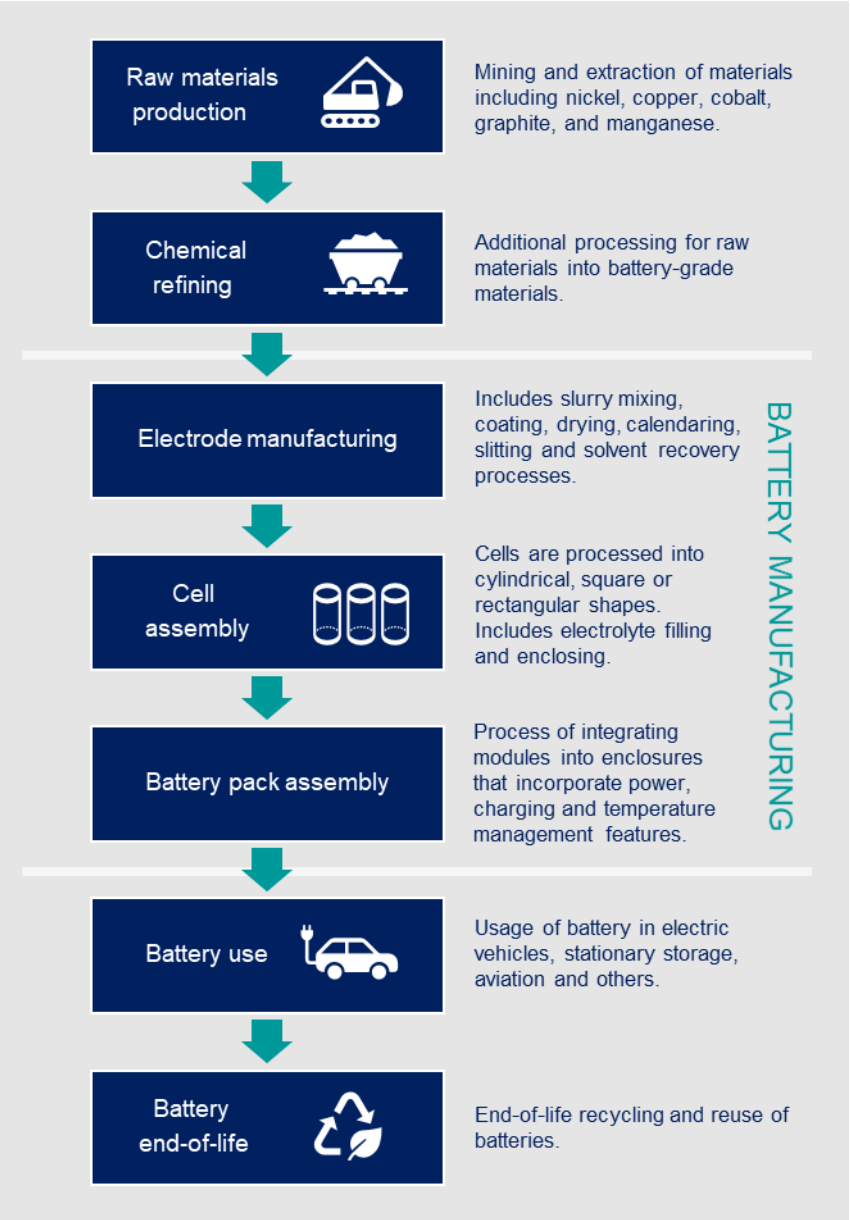
Environmental impacts

The environmental profile of a battery manufacturing facility is directly related to the process or processes covered, as not all battery factories include all three steps of the manufacturing process (electrode manufacturing, cell assembly and battery pack assembly).

The battery manufacturing supply chain begins with the extraction of basic materials. The battery ingredients are then processed to make them battery-grade ready. After the manufacture and integration of battery cells in modules, battery packs are integrated with a battery management system, a cooling system, and a battery case.

An outline of the battery supply chain is shown in the figure below.

Figure A8-24: Battery supply chain.



Source: Ricardo PLC

There are numerous lithium-ion battery chemistries and cell designs. However, many of these use comparable manufacturing procedures, as different ways of cutting and stacking cell layers result in distinct cell designs. There are a variety of lithium-ion battery (LIB) technologies available, each with a different chemical composition for different uses and varying degrees of power and energy density.

The table below lists the primary environmental impacts and their principal sources during the battery manufacturing process.

Table A8-35: Environmental impacts for lithium-ion battery manufacturing process.

Environmental impacts	Type of emissions	Major sources	Measures - normal operation	Expected values after measures
ENVIRONMENTAL IMPACT ON THE OPERATIONAL PHASE				
Energy consumption	Large amounts of energy used in the manufacture of batteries.	Equipment operation and auxiliary energy consumption	- Energy efficiency designs. - Energy management system - Identification of sources of waste heat	Depends on the scale of the factory. However, according to data for current battery manufacturing, the energy use lies between 350 and 650 MJ/kWh[57].
Waste	Residual waste	Production process	Residual waste is usually sorted to the waste station while monitoring quantities, spills and gas formation.	Depends on the scale of the factory.
	Organic solvent (NMP)	Production process	Recovered by condensation to be returned to the process.	Depends on the scale of the factory.
	Non-hazardous waste for external disposal: - metal (from magnets) - waste aluminium foil - waste graphite powder - waster copper foil - waste nickel-plated steel - sodium sulphate (Na2SO4)	Discarded intermediate products	Minimum waste is expected when operating under normal operation conditions[58]. However, due to maintenance and other than normal operations, waste is expected to be produced at a rate of 1-5% of annual production.	1-5% of annual production. E.g., Norhvolt expected values[82] expressed in approx. weight (kg/day): - metal: 100 kg/day - aluminium foil: 100 kg/day - graphite powder: 750 kg/day - copper foil: 200 kg/day - nickel-plated steel: 700 kg/day - See section dedicated to Na2SO4 (emissions to water).

[57] The Life Cycle Energy Consumption and Greenhouse Gas Emissions from Lithium-Ion Batteries

[58] Information from Northvolt's Environmental and Social Impact Assessment (ESIA).

Environmental impacts	Type of emissions	Major sources	Measures - normal operation	Expected values after measures
	Hazardous waste for external disposal: - Cathode production.: LiNiCoO, LiOH, NMP, cathode (discarded) - Anode production: CBC, SBR, anode (discarded). - Electrolyte mixture: ingredient chemicals, electrolyte (discarded). - Capsule manufacturing: PCE, etc - Propagation: damaged cells. - Other: sludges from water treatment, residual oils, chemical residues	- Cathode production - Anode production - Electrolyte mixture - Capsule manufacturing - Propagation (damaged cells) - Other	Minimum waste is expected when operating under normal operation conditions[59]. However, due to maintenance and other than normal operations, waste is expected to be produced at a rate of 1-5% of annual production.	E.g., Norhvolt expected values[82] expressed in approx. weight (kg/day): - Cathode production: ~1650 kg/day - Anode production: ~100 kg/day - Electrolyte mixture: ~200 kg/day - Capsule manufacturing: ~35 kg/day - Propagation: ~500 kg/day
Emissions to air	GHG	It is not always easy to determine which emissions occur from what stage in the production. Most common is that the emissions from the battery components are presented (anode, cathode etc) but that it is not divided between material mining and refining and further processing.	Information under development.	The results differ quite drastically. In general, it appears that most articles are non-transparent and there are usually information gaps in the goal and scope reporting[60].
	Dust in form of metal particles (nickel, cobalt, manganese, lithium).	- Drying of active material at cathode manufacturing. - Other production steps.	Purification techniques. E.g., ceramic filter or textile barrier filter followed by HEPA	Max. emissions[82]: 103 kg/year Air flow: 13200 Nm3/h

[59] Information from Northvolt's Environmental and Social Impact Assessment (ESIA).
[60] The Life Cycle Energy Consumption and Greenhouse Gas Emissions from Lithium-Ion Batteries

Environmental impacts	Type of emissions	Major sources	Measures - normal operation	Expected values after measures
			filters.	
	PCE (VOC)	Cathode production	Purification techniques. E.g., carbon filter.	Max. emissions[82]: 160 kg/year Air flow: 1000 Nm3/h
	Ammonia	Recycling of ammonia that ends up in the process effluent after ammonia has been used for precipitating a metal slurry.	Purification techniques. E.g., scrubber for venting from stripper.	Max. emissions[82]: <1 kg/year Air flow: 50 Nm3/h
	Non-metal containing particles: graphite, CBR and SBR	Production process	Purification techniques. E.g., condensation trap followed by textile blocking filter.	Max. emission[82]s: 900 kg/year Air flow: 23100 Nm3/h
	NMP (VOC)	Production process	Purification techniques. E.g., condensation followed by carbon filter.	Max. emissions[82]: 1120 kg/year Air flow: 71700 Nm3/h
	Hydrogen	During combustion, only water is formed.	Purification techniques. E.g., torch.	Max. emissions[82]: 230 tons Air flow: 30 kg/h
Emissions to water	Sodium sulphate (Na2SO4)	Process wastewater	Conventional drainage technology (evaporation, membranes, decants, etc.)	Depends on the production range of the battery factory.
	Ammonia	Process wastewater	Recycled in stripper (exclusively dedicated to ammonia).	

Environmental impacts	Type of emissions	Major sources	Measures - normal operation	Expected values after measures
Aquatic environment	- Arsenic and the metals chromium, zinc and copper - Mercury and PBDE the flow of process wastewater is estimated to be approximately 120 m3/h (0.03 m3/s)	- Ni-Co-Mn oxide preparation in cathode production - Refinement step in cathode production - Cell assembly - Washing water	Purification steps as part of the process.	E.g., Norhvolt expected values[82] expressed in maximum concentration in the measuring points: - Nickel: 20 g/l - Cobalt: 20 g/l - NH4 - N: 40 mg/l - Na2SO4: 2 g/l - Lithium: 0.2 mg/l - Organic pollutants: 20 g/l - NaOH: 9 (pH)
	Water temperature	Outgoing water having too high temperature.	Heat exchanges and cooling water tower.	Information not available.
Noise and vibration	Noise	Normal production process. Specially those steps related to: - Mechanical process steps - Loading and unloading of materials - Increased transport density in near roads (e.g., number of trucks)	- Facility's design. - Major noise sources placed in closed areas. - Installation of local screens. - Selection of equipment.	40 dBA - 80 dBA
	Vibration	Information under development.	Information under development.	< 0.4mm/s

Lithium-ion battery production is an energy-intensive process and entails a number of complex manufacturing procedures.

In several LCAs of battery electric vehicle (BEV) technologies, battery manufacturing is found to be the source of the greatest amount of energy consumption and associated environmental effects during the manufacturing stage. Depending on the approach taken and the electricity generation source, it is estimated a range from 10% to 75% of manufacturing energy and 10 to 70% of manufacturing greenhouse gas (GHG) emissions (e.g., coal-fired, natural gas-fired, or renewable)[61].

The source of the energy used to manufacture batteries has a significant impact on their environmental footprint, as the largest part of the energy use in the production of lithium-ion batteries comes from electricity use. Due to this, the electricity mix used is a critical factor for the GHG emissions from production, as it is stated to account for 62% of the total emissions, implying that manufacturing accounts for 107 kg CO_{2eq}/kWh.

Manufacturing cells in facilities powered solely by renewable energy sources is currently the most efficient way to reduce GHG emissions from battery production.

Climate

The measure is expected to have **limited or no impacts on greenhouse gas emissions**. Including the sector within the IED would lead to the development of BAT Conclusions for the sector, which may identify options for improving energy efficiency at the sites, but such options may be taken up by industry under business as usual.

The 2017 E-PRTR data indicates no emissions of CH4, CO2 or N_2O from plants categorised by NACE code '27.2 - 'Manufacture of batteries and accumulators'. It is thought, therefore, that the battery production, at least at its current levels, has limited GHG emissions in the EU.

Other research reports do indicate battery manufacturing to lead to GHG emissions, but clearly these are not being reported to E-PRTR perhaps because they are not occurring in Europe. The ICCT (2018) conducted a meta-analysis of various battery manufacturing studies and identified only one study estimating battery production GHG intensity based on European manufacturing, which had GHG emissions 56 kg CO2e / kWh. That said these estimates may be taking a lifecycle approach rather than an installation level approach. The ICCT study, and others, have noted several trends suggesting these may drop over time, as they are mainly influence by the source of the energy used for the battery manufacturing.

Air quality

This measure could have **positive impacts on air quality**. However, the extent of this is uncertain and would depend on the ambition level of future BAT Conclusions. The 2017 E-PRTR data indicates that only lead emissions were reported from plants categorised by NACE code '27.2 - 'Manufacture of batteries and accumulators'. This may not simply be due to the fact these are the only emissions associated with the activity, but rather, these emissions exceed the pollutant thresholds in Annex II of the E-PRTR Regulation. The addition, these lead emissions is equivalent to 0.002% of EU27 reported lead emissions,

[61] Environmental Effects of Battery Electric and Internal Combustion Engine Vehicles (fas.org)

relative to the baseline scope of the IED. It is considered that the E-PRTR data source limitations are affecting the conclusions that can be drawn.

According to available information provided from the Environmental and social impact assessments (ESIA) for a number of battery manufacturing projects in the EU, the main environmental impacts related to emission to air are those including dust from metal particles (nickel, cobalt, manganese and lithium), ammonia, non-metal dust (graphite, CBR and SBR), organic solvent NMP and hydrogen emissions.

Water quality and resources

This measure could have **positive impacts on water quality**. However, the extent of this is uncertain and would depend on the ambition level of future BAT Conclusions. By comparison, the US EPA has developed Battery Manufacturing Effluent Guidelines and Standards (40 CFR Part 461). The regulated pollutants include cadmium, chromium, cobalt, copper, cyanide, iron, lead, manganese, mercury, nickel, oil & grease, silver and zinc.

According to available information provided from the Environmental and social impact assessments (ESIA) for a number of battery manufacturing projects in the EU and LCA studies on the battery electric vehicle (BEV) technologies, the main environmental impacts related to emission to water are those including sodium sulphates, ammonia, nickel, cobalt, lithium, and organic compounds.

Soil quality

No releases to soil have so far been identified.

Waste production, generation, and recycling

This measure could have **positive impacts on waste**. However, the extent of this is uncertain and would depend on the ambition level of future BAT Conclusions. According to available information provided from the Environmental and social impact assessments (ESIA) for a number of battery manufacturing projects in the EU, waste production is mainly related to residual waste from the production process, organic solvent (NMP) from the cathode production, and non-hazardous and hazardous waste for external disposal related with several steps of the battery manufacturing process, such as cathode and anode production, electrolyte mixture and propagation.

However, regulation of the sector through the IED may further benefit the management of waste, through provisions such as Article 11, which requires installations are operated within the principles of the waste hierarchy, as laid out in the Waste Framework Directive (Directive 2008/98/EC).

Efficient use of resources

The impacts on the efficient use of resources are unclear. The regulation of the sector through the IED may further benefit resource efficiency, with resource efficiency featuring within the Sevilla Process.

Social impacts

The inclusion of battery production sector within Annex I of the IED will incur costs towards business and operators. If these costs cannot be passed on within the price of products, these costs will impact upon profitability and, therefore, potentially upon employment. There is limited evidence available to quantify these impacts, but they are expected to be negative.

Measure 35: Extend the current sectoral coverage to also include shipbuilding (other than coating) and ship dismantling within the scope of the IED

The measure is to include shipbuilding (other than coating) and ship dismantling within the scope of Annex I of the IED.

NB: Although the impacts of this measure have been assessed, it was decided to discard the measure at a later stage in the assessment of the PO5 measures. The rationale for discarding the measure is as follows:

- **Shipyards** are already partly covered under IED Activity 6.7, for the coating activity (being one of the main environmental pressures from the activity). The IED includes any activity in which a single or multiple application of a continuous film of a coating is applied to, which includes the surfaces of ships. Shipbuilding and repair installations that carry out coating activities with an organic solvent consumption capacity of more than 150 kg per hour or more than 200 tonnes per year are included in the scope of the IED. By comparison, E-PRTR includes in its scope facilities for the building of, and painting or removal of paint from ships, with a capacity for ships 100 m long (EC, 2006).
- In the context of **ship dismantling and recycling**, there is already a set of minimum requirements for ship recycling facilities across the EU due to the EU Ship Recycling Regulation (regulation (EU) No 1257/2013, based on the Hong Kong Convention (2009) on transboundary movements of hazardous wastes and their disposals to the ship recycling industry). This is argued to already provide a (minimum) level playing The main environmental pressures from this activity are addressed by existing EU and national policies.

Measure 36: Extend the current sectoral coverage to also include forging presses, cold rolling with capacity exceeding 10 t/h, and wire drawing with capacity exceeding 2 t/h within the scope of the IED (e.g. via Annex I, activity 2.3).

Description of the measure and requirements for implementation

Include forging presses, cold rolling with capacity exceeding 10 t/h, and wire drawing with capacity exceeding 2 t/h within the scope of the IED (e.g. via Annex I, activity 2.3).

The **production of forged materials** can be carried out using open/closed die or cold forging techniques. In open die forging, the preheated metal (materials are typically forgeable at

temperature above 60% of their melting temperature) is compressed between multiple dies that do not completely enclose the material. The open die forging is less suitable for the production of complex finished shapes than closed die, and machining is typically required afterwards in order to achieve the desired dimensions. The open die forging process can be performed by using presses and hammers. Close die forging is more suitable for producing complex geometries. In close die forging, it is often not possible to achieve the final shape with one set of dies, and hence multiple forging with various dies would be required to achieve the final quality. The available published information does not distinguish between the stand-alone and integrated operations with those of primary/secondary steelmaking or the application of presses and hammers in closed or open die forging.

Cold rolling is a process by which hot rolled strip steel products are compressed between rollers with no prior heating in order to adjust and improve the surface, thickness, mechanical, and metallurgical properties of the product. The stand-alone operation of such mills is referred to installations where the hot rolling of strip products is occurred outside of the facility, and hence the steel feedstock used for the cold rolling processes are imported into the installation. The cold rolling process is performed on hot rolled steel products. The hot rolling operations with a capacity exceeding 20 tonnes of crude steel per hour is already covered in the IED, whilst the operation of stand-alone cold rolling mills is not currently included in the scope.

The **wire drawing** process is carried out on wire rod coils produced in wire rod mills. The wire rod mill processes billets that are produced from primary/secondary steelmaking routes. The size of wire rods is reduced in wire drawing mills by pulling them through a single or series of drawing dies. There are many applications for such products including, cables, electrical wiring, structural components, etc. The wire drawing process in part of the scope of the FMP BREF. However, its stand-alone operation is not currently part of the scope of the IED.

Therefore, this measure would ensure that certain loopholes in the scope of the IED are closed.

Objective(s):

The following objectives apply:

- Levelling the playing field for installations across the EU.
- Reducing the environmental impact of industry across the EU-27, via the amendment/expansion of coverage of the IED in Annex I.

Implementation needs:

The following actions will need to be taken to implement the measure:

- EU to amend the IED to bring the activities inside the scope of the IED, primarily by including the activities in Annex I.
- EU to make legislative change to the IED text.
- Member States to transpose changes into national law.

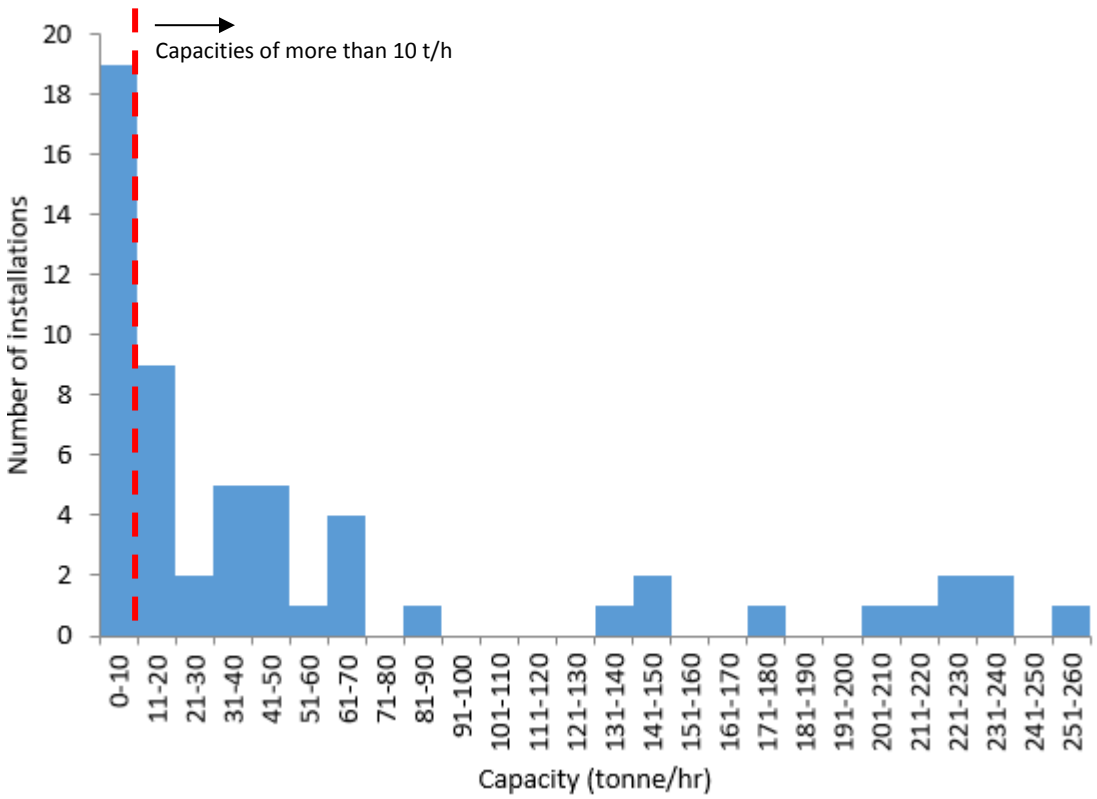
- Member States to regulate the activities according to the new requirements, to the extent this requires changes from their existing regulatory approaches. This will require upfront and ongoing implementation actions.

Further evidence and activity data

The number of plants with operational **forging presses** is estimated to be around 400 in EU 27 (assumptions based on EUROFORGE data and split between operations of presses and hammers). The majority of the production of forged materials in Europe is performed by using closed die operations. Apart from closed die forging that has been in decline during the period, the rest of the categories of production show little change.

There are estimated to be 140 **cold rolling plants** in EU 27 with total capacity of 63 060 ktonne per annum. The stand-alone cold rolling plants are estimated to be 93 with total annual capacity of 21 652 ktonnes. The capacity distribution of the installations for stand-alone cold rolling plants is provided in the figure below. It can be seen that if a production capacity of more than 10 tonnes/hour is introduced for inclusion in the IED, this would affect ~35 installations. This amount equates to about 65% of the total number of stand-alone cold rolling installations in EU 27.

Figure A8-25: The capacity distribution of stand-alone cold rolling installations across EU 27.



As part of the FMP BREF review, there have been 7 wire drawing plants that have reported data, out of which 3 were standalone plants with permitted capacity exceeding 2 tonnes/hour. A survey carried out by the Wire Drawers Association indicated that there are 12, 35, 5 and 11 stand-alone installations in Germany, Poland, Netherlands and Sweden, respectively. There was no data available at the time of reporting on the number of such installations in

other Member States. The total number of such installations, based on the production figures, can however be estimated to be around 260 in EU 27.

Assessing impacts

Economic impacts

Six specific categories of economic impacts were selected for an in-depth assessment of the policy options for the revision of the IED. These include administrative burden on businesses, operating costs and conduct of businesses, competitiveness of businesses and levelling the playing field, the position of SMEs, innovation and research and public authority impacts.

The data obtained as part of the complementary study supporting the impact assessment of the IED revision[62] have indicated the total number of forging installations in EU 27 to be around 400. The estimation of the exact number of such plants that exceed a certain pressing capacity, for instance 10 000 kN with calorific value of more than 5 MW, has not been possible.

The data collated for the development of the revised 'ferrous metals processing industry' BREF, indicates that a capacity threshold of 10 t/h would be appropriate for standalone cold rolling plants, capturing 8 out of the 9 known plants. The supporting study has found approximately 35 standalone installations in EU27 that are estimated to operate at capacities of higher than 10 t/h. For the Wire Drawing (WD) sector, the data collection did not include many plants. Only 7 WD plants reported data, out of which 3 were standalone plants with permitted capacity > 2t/h. The supporting study has estimated the total number of WD plants to be approximately 260 in EU27. No data was found to provide an estimate on the exact number of standalone WD installations, however, this number is expected to be far lower than the standalone cold rolling installations in Europe.

Administrative burden on businesses

This measure is likely to lead to **weakly negative impacts** on administrative burden on businesses.

Businesses would primarily need to engage with the permitting process, permit reconsiderations and updates, monitoring and reporting, host inspections, and participate in the BREF process.

The number of installations that would be covered by this extension in scope is uncertain. Currently estimates suggest that there might be 250-400 sites, and likely closer to the upper end estimate.

Based on the estimated number of installations for these sectors and the assumptions of unit costs for the main requirements for operators, administrative burden on businesses has been estimated between €0.6m/year to €11m/year, with a central estimate of €6m/year, on average over the period of 20 years from adoption. This wide range is due to the uncertainty in unit

[62] Trinomics, Ricardo, Wood, 2021. Gathering of complementary evidence for assessing the impacts of extending the scope of the IED to additional sectors. Draft final report

administrative costs and the number of installations. These costs are not expected to represent a significant burden on the sector.

It should however be noted that there is uncertainty about the current regime of regulations across the EU with regards to the emissions from the aforementioned sectors. Among the respondents to the survey carried out in this study Sweden and Austria have indicated that they currently have a permitting system in place for such installations. It would however be unclear for instance that if IED is extended to include forging presses of or above certain capacity, that what level of BAT-AELs would be required from the industry to adhere to.

Input from industry via the Targeted Stakeholder Survey, indicated that, for 26 industry respondents for 'downstream ferrous metal processing activities', who supplied a definitive response, 6 would anticipate their administrative costs to be increase by between 5-15%, whilst 19 respondents expect costs greater than 15%. 1 respondent anticipated administrative costs to decrease by 5-15%. The vast majority of industry respondents chose not to respond, perhaps not having particular thematic expertise.

"Administrative costs for installations considered for inclusion in the scope of the IED (e.g. smitheries below the current IED threshold, downstream ferrous metal processing activities – ***Q2-5***) would increase significantly due to additional requirements (e.g. environmental inspections, additional reporting, and creation of the baseline report). Most of these installations are small and the costs incurred by the additional burden would be disproportionate compared to the expected environment benefit."

Operating costs and conduct of business

Compliance costs are thought to be negative, that is to assume that there will be costs to achieve BAT, but the exact level is to be determined by the BREF process. There is uncertainty as to what would be considered BAT for each process. Such uncertainty means compliance costs cannot be readily determined. The SF BREF do not discuss BAT for forging presses and hammers in detail, and therefore establishment of the baseline would not be possible at this stage. This is while the FMP BREF provides environmental benchmark for cold rolling and wire drawing processes that could be extended to stand-alone operations.

Sweden and Austria were among the few Member States that provided a response with regards to the current regulatory framework for forging presses, stand-alone cold rolling and wire drawing installations in their Member States. They have stated that these plants are currently being regulated under the General Binding Rules. Therefore it would not be possible to estimate how many of the potentially eligible plants for the IED scope extension across EU 27 would need to make upgrades to their current abatement systems in order to achieve the BAT-AELs stated in the FMP BREF for cold rolling and wire drawing.

Competitiveness and level playing field

The total costs of doing business, that is the costs of administrative burden and compliance combined, are thought to **negatively impact upon businesses**. The exact level, however, is to be determined by the BREF process. If these costs cannot be passed on in the price of products, these costs will be incurred by businesses, impacting upon profitability.

Inclusion of these activities within the Annex I of the IED imposes a singular set of requirements towards installations and operators. It therefore offers the potential to level the playing field by providing minimum criteria for all member states, notably towards the use of emission limit values. This is likely to continue to be the case under new sectors adopted, including for downstream ferrous metal processing, as in the case of this measure.

Position of SMEs

The exact impact of this measure towards SMEs remains **unclear**, especially due to gaps in the evidence available. According to EUROFORGE, an association for the forging industry in Europe, more than 90% of the forging industry is operated by SMEs. The picture is somehow different for the cold rolling industry where the majority of the production capacity across EU 27 is expected to be operated by large enterprises[63]. There is not much data available about the role of SMEs in the wire drawing industry.

Innovation and research

Including downstream ferrous metal processing within Annex I of the IED may have a **limited impact** on research and development. Provisions within the IED, such as Article 27 on emerging techniques, allow for research and development within the context of BAT. Each BREF includes a chapter on emerging techniques, which acts as an indication of future techniques that could in the future (i.e. 'if commercially developed') be considered as BAT. This pathway encourages the continual focus on further reducing the environmental impacts of industrial activities or innovating in ways to save costs when compared to existing BAT. If this measure was adopted, such activities would be subject to the Sevilla Process, with emerging techniques considered within the eventual BREF.

Public authority impacts

This measure is likely to have **weakly negative impacts** on public authorities. Competent authorities would primarily need to engage with the permitting process, permit reconsiderations and updates, maintain information systems and gather evidence provided through monitoring and reporting, lead inspections, and participate in the BREF process.

Based on the estimated number of installations for these sectors and the assumptions of unit costs for the main requirements for public authorities, additional administrative costs have been estimated between €0.5m/year to €7m/year, with a central estimate of €4m/year, on average over the period of 20 years from adoption. This high and wide range is due to the uncertainty in unit administrative costs and the uncertainty on the number of installations. These costs, in isolation, are not expected to represent a significant burden on public authorities.

Input from both national and regional member state authorities, via the Targeted Stakeholder Survey, indicated that, for the 8 local/regional respondents for the activity, who supplied a definitive response, 3 would anticipate their costs to be increase by between 5-15%, whilst 2 respondents expect costs greater than 15%. 3 would anticipate a variation of + or – 5% or little to no impact. The same results the 12 national respondents, who supplied a definitive

[63] Based on Ricardo's analysis of plant facts provided by Boston Consulting Group

response, 4 would anticipate their costs to be increase by between 5-15%, whilst 4 respondents expect costs greater than 15%. 4 would anticipate a variation of + or – 5% or little to no impact. The vast majority of respondents chose not to respond, perhaps not having particular thematic expertise.

Environmental impacts

Forging operations are typically associated with the following environmental pressures:

- Emissions to air: The key sources of emissions to air are from the reheating furnaces (e.g. NOx) and diffuse dust from material storage and handling.
- Noise and vibrations: Noise emissions and vibrations are expected from forging presses and hammers. As an indication, an average A-weighted Leq values are of the order of 108 dB for hammer operators and 99 dB for press operators.
- Energy consumption: The estimated net specific energy consumption for smitheries operating with hammers is in the range 1000-5000 kWh/t of input material. The net specific energy consumption for presses is expected to exceed 5000 kWh/t[9].

The Key Environmental Issues (KEI) for the **cold rolling processes** are identified to be[64]:

- Emissions to air:
  - HCl, H_2SO_4, SO_2, NO_x and HF emissions from the respective pickling and acid regeneration processes;
  - emulsion fumes from rolling operations; and
  - NO_x and SO_2 from combustion heat treatment processes such as annealing. The SO_2 emissions are typically associated with the fuel type, for instance on integrated iron and steelmaking sites, Blast Furnace Gas (BFG) and Coke Oven Gas (COG) are captured and stored for combustion applications. The application of such gases is not however expected in stand-alone operations.
- Emissions to water:
  - COD/TOC from pickling operations;
  - TSS and HOI from rolling processes;
  - Pb, Hg, Cd and Cr (VI) and fluoride emissions in pickling of stainless steel; and
  - Fe, Crtot, Ni, Zn from pickling and rolling.

The KEI for the **wire drawing processes** are identified to be:

- Emissions to air:
  - HCl, H_2SO_4, SO_2, NO_x and HF emissions from pickling operations;
  - Dust, NO_x and SO_2 emissions from heat treatment processes (e.g. annealing, patenting);
  - Pb and TVOC from lead bath heat treatment operations.
- Emissions to water:
  - HOI emissions from the use of lubricants in wet drawing;
  - Pb emissions from water quenching baths;
  - Cr^{VI} from pickling of stainless steel;

[64] FMP BREF data collection, EIPPCB, 2021

- TSS from wet drawing operations.

The European Wire Drawers Association believe that the majority (more than approximately 70%) of the wire drawing operations by output in Europe is for production of meshes that do not require any of the pre-treatment, heat treatment or galvanisation processes, and would therefore have relatively limited environmental impacts in comparison to operations that do require such pre or post treatments of wire rods.

Climate

This measure is likely to have **unclear or limited positive impacts** on the climate. The evidence available is limited by it suggests that the introduction of these activities within the scope of the IED could reduce GHG emissions as a by-product to improving their environmental performance.

Air quality

The measure is likely to have **weakly positive impacts** on air quality.

The data collated as part of the current project indicate at least 35 standalone cold rolling installations with capacities of more than 10 t/h. The estimation of the exact number of forging and standalone wire drawing plants that would fall under a revised IED was not possible at the time of preparation of this report. It is expected that there are 400 of such plants across EU 27 that may fall under the new regulation as the result of the revised IED implementation. These plants may have an outsized contribution towards air pollution

Water quality and resources

The measure is likely to have **positive impacts** on water quality and resources.

Cold rolling plants generally consume greater quantities of water than hot rolling. Including the large standalone cold rolling plants, detailed above, within the IED, would therefore consider this increased water consumption within its remit.

Soil quality or resources

No releases to soil have been identified.

Waste production, generation, and recycling

The measure is likely to have **positive impacts** on waste production, generation and recycling.

Regulation of the sector through the IED may further benefit the management of waste, through provisions such as Article 11, which requires installations are operated within the principles of the waste hierarchy, as laid out in the Waste Framework Directive (Directive 2008/98/EC).

Efficient use of resources

The measure is likely to have **positive impacts** on efficient use of resources.

Regulation of the sector through the IED may further benefit resource efficiency, with resource efficiency featuring within the Sevilla Process.

Social impacts

The measure is likely to have **limited social impacts**.

The sectors will increase the costs of doing business. If these costs cannot be passed on through the price of services or products, they may affect profitability and, therefore, potentially impact on employment. There is limited evidence available to quantify these impacts, but they are expected to be negative.

Measure 37: Extend the current sectoral coverage to also include finishing activities with the existing capacity thresholds in activity 6.2 (pre-treatment or dyeing of textile fibres or textiles

Description of the measure and requirements for implementation

Revise the activity definition for activity 6.2, to include finishing activities, in addition to pre-treatment or dyeing. The capacity threshold would remain unchanged. A revised wording would be 'Pre-treatment (operations such as washing, bleaching, mercerisation) dyeing or finishing of textile fibres or textiles where the treatment capacity exceeds 10 tonnes per day'. This will encompass a larger proportion of the sector's emissions and impacts, particularly from waste water impacts.

Objective(s):

The following objectives apply:

- Levelling the playing field for installations across the EU.
- Reducing the environmental impact of industry across the EU-27, via the amendment/expansion of coverage of the IED in Annex I.

Implementation needs:

The measure will need to be further defined with regards to the proposed wording to be included in Annex I, however wording and capacity thresholds in this case are already substantiated by prior research. For example, according to the data collected for the review of the Textiles BREF, 76 (out of 106) IED plants reported at least one type of functional finishing of textiles.

Further evidence and activity data

Textile manufacturers are typically small and highly specialised businesses[65]. Companies in the textile finishing sector usually specialise in one type of process. However, there are companies with several different production processes and integrate other textile activities as part of the production process. The following type of companies in the finishing sector can be distinguished, according the TXT BREF:

- Commission or merchant yarn dyers
- Commission or merchant fabric dyers
- Commission or merchant yarn printers

[65] The changing profile and map of the EU textile and clothing industry

- Integrated companies

The textile finishing industry in the European Union is currently led by four countries (Italy, Germany, Spain and Portugal), which together account for almost 72% of the market share for the entire EU, according to data from Eurostat[66]. However, Italy is by far the leading European textile finishing producer, followed by Germany and Spain.

The main processes involved in the textile finishing industry include softening, finishing, water-/oil-/soil-/repellent finishing, flame-retardant finishing, antistatic finishing, easy-care finishing, biocidal/fungicidal/mothproofing finishing and shrink-proof finishing. Functional finishing processes require consideration since these are the processes with the greatest potential for pollution. Functional finishing includes processes that further enhance the performance properties of the fabric and/or potentially add new desired qualities[67]. Many such finishes add more than one property to a fabric, and some are more common for certain types of fibre (e.g., easy-care finishes for cotton, antistatic treatment for synthetic fibres and mothproofing and anti-felt treatments for wool). Other finishes have a broader application, such as softening, as detailed in the TXT BREF (D1, 2019).

A number of textiles activities (pre-treatment or dyeing) are already covered by the European legislation under Article 6.2 of the IED[68]. According to E-PRTR, there are currently 132 installations covered under this IED Article in the EU[69].

Using this information and data from Eurostat, it is estimated that the measure would cover an additional 50-100 installations.

Although there are no figures on the sizes of stand-alone functional finishing installations, it is plausible to assume that the majority of these sites are SMEs according to information provided by experts from EURATEX and the German Textile and Fashion Association (Gesamtverband Textil und Mode e.V.). Therefore, in the context of the European trend in the textile finishing industry of moving away from intermediate sectors and towards the production of final products, the production capacities of stand-alone installations may typically fall below the capacity IED threshold of 10 tonnes per day, while the majority of these activities are already incorporated as part of integrated plants and covered under the IED as directly associated activities.

On the other hand, the Belgian associated FEDUSTRIA also provided qualitative information regarding the high variability on the size of the different textile companies, primarily distinguishing between commissioning companies, which are solely dedicated to finishing processes, and integrated companies, which include a variety of manufacturing processes, including finishing.

[66] Eurostat - Data Explorer (europa.eu)
[67] Functional Finish - an overview | ScienceDirect Topics
[68] L_2010334EN.01001701.xml (europa.eu)
[69] Installations by country: 33 DE, 26 SP, 17 FR, 15 BE, CZ 12, NL 10, BU 7, RO 4, SW 3, PL 2.

Assessing impacts

Economic impacts

Six specific categories of economic impacts were selected for an in-depth assessment of the policy options for the revision of the IED. These include administrative burden on businesses, operating costs and conduct of businesses, competitiveness of businesses and levelling the playing field, the position of SMEs, innovation and research and public authority impacts.

Administrative burden on businesses

This measure is likely to have **weakly negative impacts** on administrative burden. Businesses would primarily need to engage with the permitting process, permit reconsiderations and updates, monitoring and reporting, host inspections, and participate in the BREF process. In this case, there is already some baseline activity across Member States, suggesting that there might already be some permitting. The data is very limited. However, it is assumed that only 50% of baseline permitting and baseline report costs would be incurred. The rest of the core baseline costs are included in full, that is, permit reconsiderations and updates, monitoring and reporting, hosting inspections and BREF contributions.

The number of installations that would be covered by this extension in scope is uncertain. Current estimates suggest that there might be 50-100 sites, with a central estimate of 75.

Based on the estimated number of installations for these sectors and the assumptions of unit costs for the main requirements for operators, administrative burden on businesses has been estimated between €0.2m/year to €3m/year, with a central estimate of €1.4m/year, on average over the period of 20 years from adoption. This high and wide range is due to the uncertainty in unit administrative costs and the number of installations. These costs are not expected to represent a significant burden on the sector.

Input from industry via the Targeted Stakeholder Survey, indicated that, for 7 industry respondents for Textiles, who supplied a definitive response, 4 would anticipate their administrative costs to increase by between 5-15%, whilst 1 respondent expect costs greater than 15%. 1 respondent anticipated administrative costs to decrease by 5-15% and another respondent expected little to no impact. The vast majority of industry respondents chose not to respond, perhaps not having particular thematic expertise

Operating costs and conduct of business

Compliance costs are thought to be **negative**, that is to assume that there will be costs to achieve BAT for the activities, but the exact level is to be determined by the BREF process. There is uncertainty as to what would be considered BAT for each process. Such uncertainty means compliance costs cannot be readily determined.

Competitiveness and level playing field

The total costs of doing business, that is the costs of administrative burden and compliance combined, are thought to negatively impact upon businesses. The exact level, however, is to be determined by the BREF process. If these costs cannot be passed on in the price of products, these costs will be incurred by businesses, impacting upon profitability.

Inclusion of these activities within the Annex I of the IED imposes a singular set of requirements towards installations and operators. It therefore offers the potential to level the playing field by providing minimum criteria for all member states, notably towards the use of emission limit values.

Position of SMEs

No means to identify the costs per employee or businesses have been identified. The impact of this measure towards SMEs, therefore, remains unclear.

Innovation and research

Revising the activity definition for textiles within Annex I of the IED may have a limited impact on research and development. Provisions within the IED, such as Article 27 on emerging techniques, allow for research and development within the context of BAT. Each BREF includes a chapter on emerging techniques, which acts as an indication of future techniques that could in the future (i.e. 'if commercially developed') be considered as BAT. This pathway encourages the continual focus on further reducing the environmental impacts of industrial activities or innovating in ways to save costs when compared to existing BAT. If this measure was adopted, such activities would be subject to the Sevilla Process, with emerging techniques considered within the eventual BREF.

Public authority impacts

This measure would have weakly negative impacts on public authorities. Competent authorities would primarily need to engage with the permitting process, permit reconsiderations and updates, maintain information systems and gather evidence provided through monitoring and reporting, lead inspections, and participate in the BREF process. As with businesses, an assumption that only 50% of baseline costs from new permitting and baseline reports would be incurred due to already existing administrative activity.

Based on the estimated number of installations for these sectors and the assumptions of unit costs for the main requirements for public authorities, additional administrative costs have been estimated between €0.3m/year to €2.7m/year, with a central estimate of €1.3m/year, on average over the period of 20 years from adoption. This wide range is due to the uncertainty in unit administrative costs and the number of installations. These costs, in isolation, are not expected to represent a significant burden on public authorities.

Input from both national and regional member state authorities, via the Targeted Stakeholder Survey, indicated that, for the 7 local/regional respondents for the activity, who supplied a definitive response, 3 would anticipate their costs to be increase by between 5-15%, 4 would anticipate a variation of + or – 5% or little to no impact. The same results the 13 national respondents, who supplied a definitive response, 4 would anticipate their costs to be increase by between 5-15%, whilst 3 respondents expect costs greater than 15%. 6 would anticipate a variation of + or – 5% or little to no impact. The vast majority of respondents chose not to respond, perhaps not having particular thematic expertise.

Environmental impacts

Finishing processes are considered one of the most pollutant aspects of textiles. The main environmental issues and concerns in the textile finishing industry are those related to the amount of polluted water discharged and the chemical load it carries, including organic compounds. Moreover, the textile finishing sector consumes high rates of energy, water and chemicals. Other relevant issues to consider in this sector are those related to air emissions, solid wastes and odours, which can be of significant nuisance in certain treatments.

However, likewise to other finishing treatments such as dyeing, emissions are highly dependent on the chemical treatment employed and whether the manufacturing process is continuous or discontinuous.

Climate

The measure will likely lead to **limited to weakly positive impacts** on climate.

E-PRTR data indicates no emissions of CH_4, CO_2 or N_2O from E-PRTR Annex I activity 9a, 'Plants for the pre-treatment (operations such as washing, bleaching, mercerisation) or dyeing of fibres or textiles'. It is thought, therefore, that the activity has a limited impact towards GHG emissions.

Air quality

The measure will likely lead to **limited to weakly positive impacts** on air quality.

Data for E-PRTR Annex I activity 9a, 'Plants for the pre-treatment (operations such as washing, bleaching, mercerisation) or dyeing of fibres or textiles' is associated with emissions of NMVOC, NO_X and SOx. Comparing the totals for this activity with the E-PRTR industrial totals for the EU27, comparable in scope to the E-PRTR, indicates that the activity contributes at most 0.03% towards totals (SOx in 2018). This indicates that emissions from this activity, at least at the industrial and EU scale, as thought to be minimal. This minimal contribution suggests a limited potential for the IED to further reduce the environmental impact. Though the measure represents a minor change in the activity definition to encompass all processes thought to occur at these installations, this is unlikely to change the overall magnitude or importance of emissions.

Water quality and resources

This measure is likely to have limited to weakly positive impacts on water quality and resources. The main environmental issues and concerns in the textile finishing industry are those related to the amount of polluted water discharged and the chemical load it carries, including organic compounds, as these contain substances which might be hazardous, persistent and/or bio accumulative.

Additionally, data for E-PRTR Annex I activity 9a, 'Plants for the pre-treatment (operations such as washing, bleaching, mercerisation) or dyeing of fibres or textiles' is associated with a range of heavy metal releases to water, including arsenic, cadmium, copper and nickel has been associated with water discharges from these processes. These releases equate, at their maximum, to 0.4% of the total release to water for any one of these pollutants, relative to the

baseline scope of the IED. They are therefore, a relatively minor contributor. Nevertheless, adjusting the activity definition within the IED to capture all processes occurring within textile manufacturing may help ensure these processes reduce these releases, albeit with a minor impact.

Soil quality or resources

The measure will likely lead to **limited to weakly positive impacts** on soil quality.

Waste production, generation, and recycling

The measure will likely lead to **limited to weakly positive impacts** on waste production, generation and recycling.

Regulation of the sector through the IED may further benefit the management of waste, through provisions such as Article 11, which requires installations are operated within the principles of the waste hierarchy, as laid out in the Waste Framework Directive (Directive 2008/98/EC). Any impact is likely to be minor, as there are already a range of baseline legislation that regulate waste production and management.

Efficient use of resources

The measure will likely lead to **limited to weakly positive impacts** on climate, air quality, waste production, generation and recycling; soil quality; efficient use of resources.

Regulation of the sector through the IED may further benefit resource efficiency, with resource efficiency featuring within the Sevilla Process.

Social impacts

Public health impacts would be spill over effects from the environmental benefits already captured within the previous section of this assessment. Further, this measure may result in an increase in costs towards business. If these costs cannot be passed on through changes in prices of products sold, they may impact profitability and, therefore, employment. There is limited evidence available to quantify these impacts, but they are expected to be negative.

Measure 38: Extend the current sectoral coverage to also include smitheries of 20 kilojoule per hammer with no threshold for the calorific power or reduce the capacity threshold for the calorific value to > 5 MW in activity 2.3(b) (from the current limit of 50 kilojoule per hammer and where the calorific power used exceeds 20 MW).

Description of the measure and requirements for implementation

The measure is to revise IED Annex I activity 2.3b to include smitheries of 20 kilojoule per hammer with no threshold for the calorific power or reduce the capacity threshold for the calorific value to > 5 MW in activity 2.3(b) (from the current limit of 50 kilojoule per hammer and where the calorific power used exceeds 20 MW).

The smithery operations can be as stand-alone or an integrated part of steelmaking/foundry operations with forging hammers being used to shape ingots. The hammers are used in forging installations in both closed and open die configurations.

The operation of smitheries with hammers with the energy of more than 50 kJ per hammer, where the calorific value of the associated preheating operations exceeds 20 MW is currently included in the scope of the IED. This measure is to include operations where the capacity of such hammers is below this limit.

Objective(s):

The following objectives apply:

- Levelling the playing field for installations across the EU.
- Reducing the environmental impact of industry across the EU-27, via the amendment/expansion of coverage of the IED in Annex I.

Implementation needs:

The measure will need to be further defined with regards to the proposed wording and capacity threshold to be included in Annex I, however wording and capacity thresholds in this case are already substantiated by prior research. For example, research by the German Industrial Association for Solid Forming (Industrieverband Massivumformung), indicates that there are currently only 3 smitheries operating hammers in Germany that are above the current IED criteria, out of a total of 200.

Further evidence and activity data

The latest data from the European Pollutant Release and Transfer Register (E-PRTR) for 2019 show 213 entries that are associated with Activity 2.3 (b) of the IED. There are 197 entries for France, followed by five for Germany and the rest for Czech Republic, Estonia, Denmark, Hungary, Poland, Romania and Spain[70].

During the last two decades, a change of the forming unit from hammer to forging press has occurred in the European industry (based on the information submitted in the frame of initial positions for the review of the SF BREF – April 2019).

Information from Germany (April 2019) shows that from a total of 200 smitheries (data includes both hammers and forging presses of all sizes), only 3 are IED relevant (fulfil the criteria of point 2.3 (b) of IED Annex I). It is estimated that about 25 smitheries in Europe (out of 400 to 500) are currently IED relevant.

The data collected during the SF BREF data collection process indicates a range of 25 to 630 kJ per hammer. The calorific value of these plants was shown to range from 3 850 to 15 206 kW_{th}[71].

It is expected that the environmental relevance of smitheries with hammers with a lower threshold than the current IED threshold is nearly the same regarding emissions to air and

[70] Note: The provided number of entries appear to be excessive, particularly for France. We will investigate this by getting in touch with the European Environment Agency.
[71] SF BREF development, EIPPCB, Oct 2021

water. The energy consumption might be lower due to a lower threshold of hammers and lower total calorific power required for carrying out such activities. However, regarding the information from EUROFORGE, new developments of light materials (in weight) that will be used in future to meet the requirements of the customers might result in a higher energy consumption compared to the current situation.

The main environmental impacts from forging hammers include:

- Emissions to air (e.g. NO_x, CO, dust, diffuse emissions, noise and vibration),
- Emissions to water from cleaning procedures, storage areas, possible from cooling processes (however, mostly closed cooling circuit applied). These are however expected to be minor emissions compared to emissions to air.
- Residues: process residues (recycling/reuse), packaging materials,
- Energy consumption.

Typical pollutants emitted or KEIs (Key Environmental Issues) for smitheries include NO_x and CO emissions as well as noise and vibration[72]. Others would include material, water and energy consumption.

Assessing impacts

Economic impacts

Six specific categories of economic impacts were selected for an in-depth assessment of the policy options for the revision of the IED. These include administrative burden on businesses, operating costs and conduct of businesses, competitiveness of businesses and levelling the playing field, the position of SMEs, innovation and research and public authority impacts.

Administrative burden on businesses

This measure is likely to have **weakly negative impacts** on administrative burden. Businesses would primarily need to engage with the permitting process, permit reconsiderations and updates, monitoring and reporting, host inspections, and participate in the BREF process.

The number of installations that would be covered by this extension in scope is uncertain. Current estimates suggest that there might be 400-500 sites, with a central estimate of 450. It should however be noted that there is uncertainty about the current regime of regulations across the EU with regards to the emissions from the smitheries with hammers sector. Among the respondents to the survey carried out in this study Sweden and Austria have indicated that they currently have a permitting system in place for such installations. It would however be unclear for instance that if IED is extended to include forging hammers at lower capacity, that what level of BAT-AELs would be required from the industry to adhere to.

Based on the estimated number of installations for these sectors and the assumptions of unit costs for the main requirements for operators, administrative burden on businesses has been estimated between €0.8m/year to €13.5m/year, with a central estimate of €7.1m/year, on average over the period of 20 years from adoption. This high and wide range is due to the

[72] Kick-off meeting (KoM) conclusion of the SF BREF review, EIPPCB, Sep 2019

uncertainty in unit administrative costs and the number of installations. These costs are not expected to represent a significant burden on the sector.

A different pattern was shown for smitheries. For the 19 industry respondents for the activity, who supplied a definitive response, 5 would anticipate their administrative costs to increase by between 5-15%, whilst 12 respondents expect costs greater than 15%. 1 respondent anticipated administrative costs to decrease by 5-15% and another respondent expected little to no impact. Similar to the above, the vast majority of industry respondents chose not to respond, perhaps not having particular thematic expertise.

Operating costs and conduct of business

It is expected that to achieve BAT, operators would need to incur additional compliance costs, directly and indirectly. The evidence available to estimate the scale of these costs is, however, limited.

Sweden and Austria were among the few Member States that provided a response with regards to the current regulatory framework for forging hammer installations in their Member States. They have stated that these plants are currently being regulated under the General Binding Rules. Therefore it would not be possible to estimate how many of the potentially eligible plants for the IED scope extension across EU 27 would need to make upgrades to their current abatement systems in order to achieve the required BAT-AELs.

Competitiveness and level playing field

The total costs of doing business are **likely to increase** when compared to the baseline. The extent to which these affect the sector's competitiveness is unclear, given the evidence available.

Revising the activity definition for textiles and lowering the capacity threshold for smitheries, within the Annex I of the IED imposes a singular set of requirements towards these newly introduced installations and operators. It therefore offers the potential to level the playing field by providing minimum criteria for all member states, notably towards the use of emission limit values. This has largely been supported within the IED evaluation, where, for industry stakeholder surveyed, 69% agreed or strongly agreed with the statement 'the IED has contributed to achieving a level playing field in the EU for IED sectors by aligning environmental performance requirements for industrial installations'. This is likely to continue to be the case under these new installations, as in the case of this measure.

Position of SMEs

The impact of this measure towards SMEs is likely to be **weakly negative**, as evidence suggests that smaller players in the smitheries sectors may be disproportionately impacted. According to EUROFORGE, an association for the forging industry in Europe, more than 90% of the forging industry is operated by SMEs.

Innovation and research

This measure is likely to have a **limited positive impact** on research and development. Provisions within the IED, such as Article 27 on emerging techniques, allow for research and

development within the context of BAT. Each BREF includes a chapter on emerging techniques, which acts as an indication of future techniques that could in the future (i.e. 'if commercially developed') be considered as BAT. This pathway encourages the continual focus on further reducing the environmental impacts of industrial activities or innovating in ways to save costs when compared to existing BAT. If this measure was adopted, such activities would be subject to the BREF Process.

Public authority impacts

This measure would have weakly negative impacts on public authorities. Competent authorities would primarily need to engage with the permitting process, permit reconsiderations and updates, maintain information systems and gather evidence provided through monitoring and reporting, lead inspections, and participate in the BREF process.

Based on the estimated number of installations for these sectors and the assumptions of unit costs for the main requirements for public authorities, additional administrative costs have been estimated between €0.6m/year to €8m/year, with a central estimate of €4.9m/year, on average over the period of 20 years from adoption. This high and wide range is due to the uncertainty in unit administrative costs and the number of installations. These costs, in isolation, are not expected to represent a significant burden on public authorities.

Input from both national and regional member state authorities, via the Targeted Stakeholder Survey, indicated that, for the 7 local/regional respondents for the activity, who supplied a definitive response, 3 would anticipate their costs to be increase by between 5-15%, whilst only 1 respondent expect costs greater than 15%. 3 would anticipate a variation of + or – 5% or little to no impact. The same results the 11 national respondents, who supplied a definitive response, 2 would anticipate their costs to be increase by between 5-15%, whilst 3 respondents expect costs greater than 15%. 6 would anticipate a variation of + or – 5% or little to no impact. The vast majority of respondents chose not to respond, perhaps not having particular thematic expertise.

Environmental impacts

Climate

The measure will likely lead to **limited impacts** on climate.

Activity 2(c)ii, 'Smitheries with hammers' is associated with emissions of GHGs, and equates to 0.0004 – 0.0006% of GHG emissions, relative to the baseline scope of the IED. This data is partial, however, arising from a single site. This minimal contribution suggests a limited potential for the IED to further reduce the environmental impact.

Air quality

The measure will likely lead to **positive impacts** on air quality.

Data for E-PRTR Annex I activity 2(c)ii, 'Smitheries with hammers' is associated with a wider array of pollutants, with emissions of NMVOC, NO_X, SO_x and PM_{10}. The comparison of emission profiles from the model plants with those reported in E-PRTR for activity 2 (c)ii (smitheries with hammers) indicate a potential total contribution of 199 to 662 tonnes per

annum of NO_x as the result of inclusion of 500 operational smitheries with hammers in EU 27 within the scope of the IED. This indicates an average of 0.4 to 1.3 tonnes of NO_x per smitheries installation. This is in comparison to the current report of 1.5 tonnes of NO_x per installation from a single installation that reported to E-PRTR in 2019. This figure could also be compared with an average installation for the processing of ferrous metals (activity 2 (c)) that has reported 154 tonnes of NO_x emissions per annum for 2019.

Water quality and resources

The measure will likely lead to **positive impacts** on water quality and resources.

Data for E-PRTR Annex I activity 2(c)ii, 'Smitheries with hammers', suggests the activity is not associated with releases to water, above the thresholds specified in Annex II of the E-PRTR Regulation. As such, efforts to reduce the capacity threshold, introducing new installations within the scope of the IED, would likely have a limited impact towards releases to water, and thus water quality.

Soil quality or resources

No releases to soil have been identified.

Waste production, generation, and recycling

The measure will likely lead to **limited to weakly positive impacts** waste production, generation and recycling.

Regulation of the sector through the IED may further benefit the management of waste, through provisions such as Article 11, which requires installations are operated within the principles of the waste hierarchy, as laid out in the Waste Framework Directive (Directive 2008/98/EC).

Efficient use of resources

The measure will likely lead to **positive impacts** on efficient use of resources.

Regulation of the sector through the IED may further benefit resource efficiency, with resource efficiency featuring within the Sevilla Process.

Social impacts

The revision of the capacity threshold for smitheries within Annex I of the IED will incur costs towards business and operators. If these costs cannot be passed on within the price of products, these costs will impact upon profitability and therefore upon employment. There is limited evidence available to quantify these impacts, but they are expected to be negative.

Measure 39: Facilitate the adoption of BAT conclusions for activity 5.4 landfills.

Description of the measure and requirements for implementation

Landfills are currently considered under the IED with the following being defined under Activity 5.4 of Annex I:

Landfills, as defined in Article 2(g) of Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste (1) OJ L 182, 16.7.1999, p. 1. receiving more than 10 tonnes of waste per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste.

Although BATC exist for 'waste treatment' covering those activities under 5.1, 5.3, 5.5 and 6.11 of Annex I of the IED, no BATC exist for landfills, considered under activity 5.4. This is owing to the coverage of this activity under Council Directive 1999/31/EC, the Landfill Directive.

The Landfill Directive aims to protect both human health and the environment. In particular, it aims to prevent, or reduce as much as possible, any negative impact from landfill on surface water, groundwater, soil, air and human health. It does this by introducing rigorous operational and technical requirements[73]. The Landfill Directive applies unless Members States have declared this not applicable to either:

1. landfill sites for non-hazardous waste with total capacity not exceeding 15 000 tonnes or with annual intake not exceeding 1 000 tonnes serving islands.
2. landfill sites for non-hazardous waste or inert waste in isolated settlements.

Alongside defining waste that can be accepted in different classes of landfill (Article 6), the Landfill Directive also defines

- waste acceptance procedures (Article 11 – including checking documentation, visual inspection at entrance, keeping a register of quantities and characteristics, etc.), and
- control and monitoring procedures in the operational phase (Article 12 – including carrying out a control and monitoring programme (covering collection of emission and groundwater data), notifying competent authorities of any significant adverse effects, reporting, and quality control of analytical operations).

Recital 16 to the Landfill Directive intimates that measures should be taken to reduce the production of methane from landfills (amongst other things to reduce global warming) through a reduction in the landfilling of biodegradable waste and requirements to introduce landfill gas control. The general design and operational requirements for all classes of landfills are set out in Annex I of the Landfill Directive. They require the following gas control measures:

- appropriate measures must be taken in order to control the accumulation and migration of landfill gas;
- landfill gas must be collected from all landfills receiving biodegradable waste and the landfill gas must be treated and, to the extent possible, used;
- landfill gas which cannot be used to produce energy must be flared;
- the collection, treatment and use of landfill gas must be carried on in a manner, which minimises damage to or deterioration[74].

Currently the Landfill Directive provisions are deemed to constitute BAT (Art 1(2) of Directive 1999/31). This measure considers amendments to allow the adoption of BAT

[73] https://ec.europa.eu/environment/topics/waste-and-recycling/landfill-waste_en
[74] https://www.sepa.org.uk/media/28986/guidance-on-the-management-of-landfill-gas.pdf

conclusions for landfills covered by the IED (IED Annex I activity 5.4). That said, some stakeholders (EEB) disagree with this understanding of the Landfill Directive's provisions constituting BAT, given this provision was adopted prior to the revision of the IPPC-Directive and the IED.

The EU has also published guidance on landfill gas control which is non-binding and aims to:

- help competent authorities improve methane collection through the enforcement of the Landfill Directive requirements
- provide clarity on landfill gas control requirements within the context of the technical and regulatory requirements of the landfill directive
- set out the most important criteria in ensuring effective collection, treatment and use of landfill gas.

Objectives:

An updated BREF and BATC for landfill would allow the consideration of techniques that are nowadays more prevalently used in the sector, such as methane capture. BAT conclusions would cover the key environmental issues for which BAT has evolved since the 1990s, including methane capture. Adopting BATC could also maximise the circular economy aspects of landfill operation.

Implementation needs:

While pollution can be captured and well-regulated by setting up suitable BAT AELs, so far, the other environmental goals of the Directive are only addressed by the weaker narrative BAT conclusions and non-mandatory BAT AEPLs respectively. It is necessary to add appropriate provisions and BAT-based requirements. BATC for landfill would need to be defined.

Further evidence and activity data

A 2018 report by the European Commission (EC, 2018) highlighted that amounts of landfilled municipal waste have steadily fallen in the EU as a whole, dropping by 18% during the 2013-2016 period (although the average landfilling rate for municipal waste in the EU still stood at 24% in 2016).

Large differences across the EU persist: in 2016 10 Member States still landfilled over 50% of municipal waste, while five reported rates above 70%. This is supported by data from the European Parliament, which notes: "*Landfilling is almost non-existent in countries such as Belgium, the Netherlands, Denmark, Sweden, Germany, Austria and Finland). Here incineration plays an important role alongside recycling. Germany and Austria are also the EU's top recycling countries. The practice of landfilling remains popular in the eastern and southern parts of Europe. Ten countries landfill half or more of their municipal waste. In*

Malta, Cyprus and Greece this is more than 80%. In Croatia, Romania, Bulgaria and Slovakia it is more than 60%, while it is also half or more in Spain and Portugal"[75].

The 2018 European Commission report also noted that despite the closures of non-compliant landfills reported by the Member States, the number of facilities that are not in line with the requirements of the Directive remains a matter of concern, **perhaps suggesting that the ambition set out in the Landfill Directive is not necessarily being achieved**. A study by Milieu in 2017 (EC, 2017) found: "*significant problems of compliance (...) across the Member States. These include improper transposition of pre-treatment provisions, the persistent practice of landfilling significant amounts of untreated waste, and inadequacy of separate collection systems. In some Member States, the lack of sufficient pre-treatment infrastructure hinders compliance with pre-treatment requirements".*

In 2018, the EU-27 produced 2 170 Mtonnes of waste, of which 834 Mtonnes went to landfill. In 2016, there were 5 076 landfill disposal facilities reported in Eurostat across the EU-27 (of which 296 were for hazardous waste, 2 568 for non-hazardous waste and 2 585 for inert waste).

The E-PRTR Waste transfer dataset provides varying data over three years from 2017-19. This may reflect changes in the actual number of sites, or simply variance in data collection. Taking the largest numbers as an upper bound, this suggests there were around 2 950 landfill sites in the EU-27 in 2018 (excluding those handling inert waste) – see Table A8-36. This is consistent with the EU Registry reporting which includes 2 944 landfill installations in 2018.

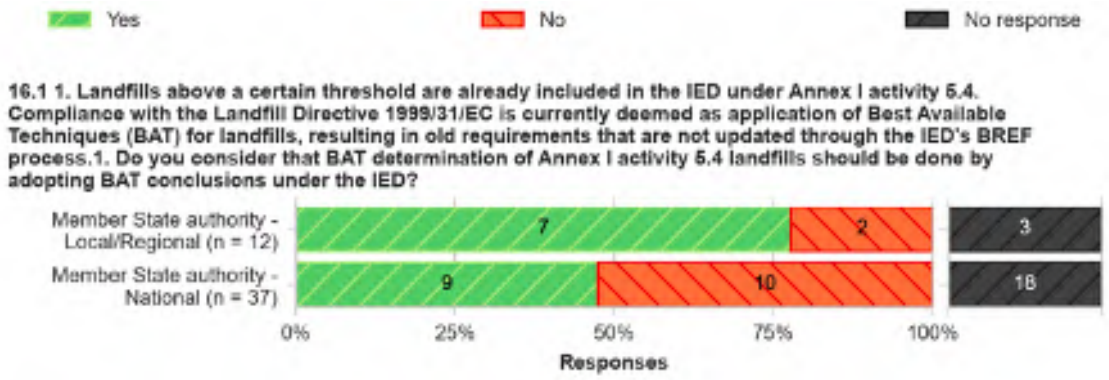
Table A8-36: E-PRTR waste transfer data for landfill sites (EU-27)

	2017	2018	2019
Total waste quantity (tonnes)	18 544 012	22 880 827	18 670 696
Number of facilities	2 916	2 950	2 675

Stakeholders are broadly supportive of the development of BATC for landfills (Figure A8-26). Based on the TSS, generally speaking most (77%) of the local and regional Member State authorities believe that the BAT determination of Annex I activity 5.4 landfills should be done by adopting BAT conclusions under the IED. However, the national Member State authorities show a higher level of contrasting opinions with a split majority (47/53%) showing more resistance to the adoption of BATC under the IED. Stakeholder engagement for this report did not provide any further evidence for this reasoning.

[75] https://www.europarl.europa.eu/news/en/headlines/society/20180328STO00751/eu-waste-management-infographic-with-facts-and-figures

Figure A8-26: Distribution of responses to question 16.1 to the targeted stakeholder survey: "Do you consider that BAT determination of Annex I activity 5.4 landfills should be done by adopting BAT conclusions under the IED?



Assessing impacts

Economic impacts

The key economic impacts are expected to be **weakly negative impacts** on business due to the additional administrative and possible compliance costs of this measure. However, these are expected to be small due to the existing requirements already in place through the Landfill Directive. Nevertheless, a formal BAT conclusions document will still need to be developed and agreed.

Administrative burden on businesses

This measure is likely to lead to **weakly negative impacts** on administrative burden on businesses.

As landfills already fall under the scope of the IED (with the exception that no BATC are developed under the IED), it is unlikely to pose an increase in administrative burden towards businesses, beyond the current system already imposed by the IED. That said, there may be a transitional cost to the revision of permits, should new BATC be developed which go beyond the existing requirements as defined in the Landfill Directive, but it would be expected that permit revisions for landfills would be occurring as a matter of course in the baseline.

There will be costs to industry of the development of a Landfill BREF and BATC. The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). Around a third of these costs are likely attributed to businesses. Therefore, assuming two BREFs are carried out over a period of 20 years, average annual costs of the BREF process for businesses would range from €0.1m/year to €0.7m/year, with a central estimate of €0.2m/year.

In response to the stakeholder engagement, the majority of MS authorities stated that no impact or only a slight impact would be seen from this measure. Of note in an open text response, the MS National German Environment Agency (German UBA) highlighted that the cost of the landfill, and therefore the acceptance fees for the waste to be deposited, will be

higher if the administrative requirements for operating the landfill are increased. This suggests that even if a greater burden is placed on businesses, this could be somewhat (or wholly) passed on.

Operating costs and conduct of business

This measure is likely to lead to **weakly negative impacts** on total operating costs. The costs of the measure will depend on the BATC proposed. At this stage there is uncertainty as to what would be considered BAT for each process.

The Landfill Directive already defines requirements that landfills should meet, including collection and treatment of gases. For an illustrative reference, these measures appear to be broadly in line with the measures set out for other sectors – for example gas treatment in the Chemicals sector in the CWW BREF, and in the Waste Treatment BREF. As such it is questionable whether more ambitious BATC would be defined if included in the IED.

Where BAT Conclusions are defined that go beyond existing requirement of the Landfill Directive, compliance costs will be negative – there will be costs to achieve BAT. But the exact level is to be determined by the BREF process. Such uncertainty means compliance costs cannot be readily determined.

In response to the TSS, the majority of MS authorities stated that no impact would be seen from this measure. The overall consensus from Local/Regional MS was that economic impacts would be still dependent on the Landfill Directive 1999/31/EC in conjunction with Council Decision 2003/33/EC. That said, some MS stakeholders stated that if the BAT conclusions are stricter than current legislation then there would be some additional economic impacts. In an open text response, Italian National MS - Ministero della transizione ecologica highlighted the economic impacts could be significant.

Competitiveness and level playing field

This measure is likely to lead to **weakly negative impacts** on competitiveness. The total costs of doing business, primarily compliance costs, will increase for landfill operators where BAT Conclusions goes beyond the existing requirements of the Landfill Directive. The exact level, however, as noted in the above, is to be determined by the BREF process. If these costs cannot be passed on in the price of waste management services, these costs will be incurred by businesses, impacting upon profitability. Given the nature of the operation, landfill is deemed not to be at significant risk from international competition.

However, where landfill operators face additional costs, this may favour other operators in the waste stream (e.g. those involved in recycling operations). Hence landfilling may become less competitive with these alternative waste stream activities. But to that end, these measures could also serve to encourage these alternative means of waste treatment within the waste hierarchy, achieving additional (indirect) environmental impacts. On balance of these impacts, we would expect the small negative effects could outweigh the small positive effects.

Factual evidence and stakeholder opinion have been limited for contributing to analysis of this impact.

Position of SMEs

This measure is likely to lead to **limited impact** on the position of SMEs. Given the threshold for inclusion of landfills in the existing IED definition, this should limit impacts on SMEs. That said, there is limited evidence and no means to identify the costs per employee of businesses have been identified. Hence, the impact on SMEs remains uncertain.

Innovation and research

This measure is likely to lead to **weakly positive impacts** on innovation. Provisions within the IED, such as Article 27 on emerging techniques, allow for research and development within the context of BAT. Each BREF includes a chapter on emerging techniques, which acts as an indication of future techniques that could in the future (i.e. 'if commercially developed') be considered as BAT. This pathway encourages the continual focus on further reducing the environmental impacts of industrial activities or innovating in ways to save costs when compared to existing BAT. If this measure was adopted, emerging techniques considered within the eventual BREF may add to the current state of innovation and research. That said, given the nature of the process, the potential for innovation is deemed more limited relative to other sectors.

Factual evidence and stakeholder opinion have been limited for contributing to analysis of this impact.

Public authority impacts

This measure is likely to lead to **weakly negative and weakly positive impacts** on public authorities**.** The addition of an additional set of BATC for landfill could introduce an additional requirements (if new BATC go beyond existing requirements of the Landfill Directive) to be reflected in permits and monitored, and the potential for additional derogation cases, all of which may add to the costs of implementation for public authorities.

That said, there could also be positive impacts: inclusion of BATC for landfill could improve coherence with the way BATC are defined for environmental permits in other sectors, making things easier for permitters; and it would enable more regular reviews of BATC in the sector as part of the BREF cycle.

There will be the costs to public authorities of the development of the Landfill BREF and BATc. The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). Around two thirds of these costs are likely incurred by public authorities. Therefore, assuming two BREFs are carried out over a period of 20 years, average annual costs of the BREF process for businesses would range from €0.3m/year to €1.4m/year, with a central estimate of €0.5m/year. It could be expected that the costs of a landfill BREF would be on the lower end of this range if requirements from the Landfill Directive can be built upon.

Environmental impacts

Overall, the key environmental issues relate to releases to water, soil and air (GHG and air pollutants). The existing requirements of the Landfill Directive are not shown to be out of date and may still represent state-of-the-art. Therefore, it is unclear as to whether shifting the definitional authority to the IED would lead to mitigation of the key environmental issues through IED-defined BAT conclusions implemented in IED permits.

Climate

This measure is likely to lead to **limited or weakly positive impacts on climate.**

Landfills remain an important source of GHG emissions: E-PRTR Activity 5(d), which refers to landfills as defined by the Landfill Directive and aligned with the capacity threshold currently contained in Annex I of the IED, is associated with emissions of GHGs, equating to 1.6% – 2.4% of GHG emissions, relative to the baseline scope of the IED.

The Landfill Directive already defines BAT for landfill and has driven broad environmental improvements. Where new BATC go beyond the existing requirements of the Landfill Directive, this could drive further benefits. That said, BREFs typically focus on environmental pressures other than emission of GHGs. Furthermore, comparison to other BREFs (CWW, WT) suggests that the existing requirements of the Landfill Directive may be broadly in line with those that may be defined under the IED. The impact of the measure towards climate is uncertain and dependent upon the eventual BREF and therefore cannot be readily assessed.

Stakeholders have identified that small benefits could be gained by raising the bar for certain subsectors (e.g. organic wastes). In response to the TSS (Q16.3) '*What impacts would you expect of an amendment to move the definition of BAT for landfills from the Landfill Directive to the IED*?' stakeholders had mixed responses to whether the measure to move the definition of BAT for landfills from the Landfill Directive to the IED would be beneficial for emission reductions. However, it should be noted that the majority of the 'yes' answers were circumstantial to if the BAT was stricter than the Landfill Directive. Overall, the consensus from stakeholders was that these environmental impacts are already covered in the Landfill Directive. However, it was noted that any environmental impacts that are missed in the Landfill Directive will be regulated, which would be an important additional benefit.

In an open text response, the National MS German Environment Agency (German UBA) stakeholder provided a detailed response and explanation. It was highlighted that the requirements for landfills defined in the Landfill Directive 1999/31/EC in conjunction with Council Decision 2003/33/EC on waste acceptance still represent the state of the art. This would not change by shifting the definitional authority to the IED. The existing requirements for the geological barrier, liners, and leachate collection and treatment protect the soil and groundwater below and in the vicinity of the landfill from contamination. The existing requirements for landfill gas capture, treatment and recovery protect the atmosphere from emissions including greenhouse gases. In addition, EU law already stipulates that no waste collected separately for recycling and waste that can be recycled may be accepted at the landfill from 01.01.2024 at the latest. In addition, from 01.01.2035, the disposal of municipal

waste in landfills may only amount to a maximum of 10% of the total volume of municipal waste. However, an improvement in the environmental impact is achievable if there were stricter requirements for the landfilling of residual organic waste. The stakeholder provided a context-specific example that: in some MS, not in Germany, a relevant share of organic waste is still landfilled resulting in gas formation (GHG, methane emissions). This, however, would not require any displacement of the necessary regulations to the IED, but the inclusion of such additional regulations in Council Decision 2003/33/EC would suffice, e. g. the limitation of TOC (Total Organic Carbon). Such a limitation would require additional treatment of the residual waste before it is deposited, e.g., mechanical-biological or thermal, and permanently prevent the formation of methane as a climate-relevant gas in the landfill.

In addition, it was noted from an open text response that it would be useful to consider integrating the Landfill Directive in the IED with an annex as a safety net. Vlaamse Overheid (Belgium, Local/Regional MS) thought a BREF on landfills might propose BAT for existing activities and potentially diminish emissions (CH_4, odour, dust) and the inclusion of Landfill mining activities in this BREF could be an option.

Air quality

This measure is likely to lead to **limited or weakly positive impacts on air quality.**

Landfill remains an important source of air pollution: Data for E-PRTR Annex I activity 5(d), which refers to landfills as defined by the Landfill Directive, is associated with emissions of NH_3, NMVOC, NO_X, PM_{10} and SOx. Comparing the totals for this activity with the E-PRTR industrial totals for the EU-27, comparable in scope to the E-PRTR, indicates that the activity can, for some pollutants, moderately contribute to overall pollutant totals. For example, the activity contributes on average 1.3% of total NMVOC, relative to the baseline scope of the IED for the years available. Similarly, the activity contributes 1.9% towards NH_3 totals across available years, and 1.4% for SOx.

The Landfill Directive already defines BAT for landfill and has driven broad environmental improvements. Where new BATC go beyond the existing requirements of the Landfill Directive, this could drive further improvements. However, the impact of the measure on air quality is uncertain and dependent upon the eventual BREF and therefore cannot be readily assessed. Stakeholder opinion on air quality was summarised in 'Climate' impact above.

Water quality and resources

This measure is likely to lead to **limited or weakly positive impacts on water quality.**

Landfill remains an important source of water pollution. Data for E-PRTR Annex I activity 5(d), which refers to landfills as defined by the Landfill Directive, is associated with releases to water (leachate) of several heavy metals, including cadmium, zinc and chromium. These releases, relative to the baseline scope of the IED, can be sizeable, e.g. 4.7% – 9% of cadmium releases are associated with this activity. Depending on the degree of containment, small releases through leakage may end up in groundwater and/or surface water. Collected leachate can be subject to dedicated treatment prior to release to sewage systems.

The Landfill Directive already defines BAT for landfill and has driven broad environmental improvements, e.g. the collection and recirculation of leachate to prevent contamination of land, groundwater and waterways, as well as requiring the monitoring of potential water releases in pathways and receptors during and after landfill closure. Where new BATC go beyond the existing requirements of the Landfill Directive, this could drive further improvements. However, the impact of the measure towards water quality is uncertain and dependent upon the eventual BREF and therefore cannot be readily assessed. Stakeholder opinion on water quality was summarised in 'Climate' impact above.

Soil quality or resources

This measure is likely to lead to **limited or weakly positive impacts on water quality.**

Similar to the above detail on releases to water, E-PRTR data indicates that the activity is also associated with releases to land, including multiple heavy metals, such as arsenic, zinc, and lead.

The Landfill Directive already defines BAT for landfill and has driven broad environmental improvements. Where new BATC go beyond the existing requirements of the Landfill Directive, this could drive further improvements. However, the impact of the measure towards soil quality is uncertain and dependent upon the eventual BREF and therefore cannot be readily assessed. Stakeholder opinion on soil quality was summarised in 'Climate' impact above.

Waste production, generation, and recycling

This measure is likely to lead to **limited or weakly positive impacts** on waste production/generation**.** As discussed under economic impacts above, any increase in costs for landfill operators, which may be passed through to gate fees will increase the incentive to direct waste to other treatments and/or reduce waste overall. Furthermore, regulation of the sector through the IED may further benefit the management of waste, through provisions such as Article 11, which requires installations are operated within the principles of the waste hierarchy, as laid out in the Waste Framework Directive (Directive 2008/98/EC). However, the size of the impact will depend on the BATC set out.

Efficient use of resources

This measure is likely to lead to **unclear or limited impacts** on resource use. Water and energy use is not a key environmental impact of landfill. BATC such as methane capture could positively impact indirectly on energy use in other sectors. Furthermore, regulation of the sector through the IED may further benefit resource efficiency, with resource efficiency featuring within the Sevilla Process. However, factual evidence and stakeholder opinion have been limited for contributing to analysis of this impact.

Social impacts

This measure is likely to lead to **limited impacts** on employment. The drawing up of a BREF for landfills and the associated BAT conclusions will incur costs towards business and operators. If these costs are significant and cannot be passed on within the price of waste management services, these costs will impact upon profitability and could therefore impact

upon employment. Given the existing BAT requirements of the Landfill Directive, these costs and impacts are considered to be limited. Factual evidence and stakeholder opinion have been limited for contributing to analysis of this impact.

Measure 40: Revise the capacity threshold in Annex I for activity 5.4 landfills.

Description of the measure and requirements for implementation

This measure proposes to lower the capacity threshold for activity 5.4, landfills, with Annex I of the IED. This, in turn, will require a number of landfills across the EU-27, that are smaller in size or capacity, to comply with the general regulatory framework set out by the IED, such as the provisions regarding permits or inspections, detailed in Chapter II of the IED.

The EU wants to promote the prevention of waste and the re-use of products as much as possible. If this is not possible it prefers recycling (including composting), followed by using waste to generate energy. The most harmful option for the environment and people's health is simply disposing of waste, for example on landfill, although it is also one of the cheapest possibilities.

From 2005 to 2021 the average amount of municipal waste as measured per capita declined in the EU. However, trends vary by country. For example, while municipal waste generation per capita increased in Greece, Malta and the Czech Republic, it decreased in Bulgaria, Spain, Hungary, Romania and the Netherlands (European Commission, 2021). Future trends indicate that with increased stringency and uptake in policy developments, increased recycling and circular waste management are expected to contribute to declining landfilling activities.

Objective:

The follow objectives apply:

- Levelling the playing field for installations across the EU.
- Reducing the environmental impact of industry across the EU-27, via the amendment/ expansion of coverage of the IED in Annex I.

Implementation needs:

The measure will need to be further defined with regards to the proposed wording and/or capacity threshold to be included in Annex I. Currently, the IED includes activity 5.4, which details that '*Landfills, as defined in Article 2(g) of Council Directive 1999/31/EC of 26 April 1999 on the landfill of waste receiving more than 10 tonnes of waste per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste'* are to be considered. Article 2(g) of Council Directive 1999/31/EC refers to the legal definition of a landfill within the Landfill Directive and is not anticipated to be amended.

Both the receiving rate and total capacity are to be amended, however the specific values will need to be determined with stakeholders, as currently there is no means or existing data sources identified through which an appropriate capacity threshold could be defined. This

could be solved if more specialist data on the size or financial performance of smaller landfill sites could be obtained.

A local/regional Member State authority (County Administration Board, Sweden) highlighted in the TSS that it is important to keep the Landfill Directive (for landfills) below the IED Annex I threshold, in particular where a BREF and BATC will be developed under the revised IED, for landfills above a certain threshold (see measure 39 above). One option would be to align the threshold in the IED with that in the Landfill Directive.

As the IED introduced a system of regulation, it is also important to ensure that any associated costs of compliance with the IED are practical for these smaller landfill sites, adding to the need to define the threshold with stakeholder input.

Further evidence and activity data

Very limited data could be found regarding the distribution of landfills by capacity size, which limits the ability to assess impacts of this measure.

Data compiled by EURELCO suggests the number of landfills in the EU not covered by the IED could be much higher than the number of landfills reported to the EU Registry and described in measure 39 (~2 950 landfill sites). EURELCO record: "*The figure for the total amount of landfills in Europe is most likely even bigger than initially thought. With a reasonable safety level, we can now state that Europe hosts more than 500 000 landfills. 90% of those landfills are in reality non-sanitary landfills, predating the Landfill Directive (1999). In most cases non-sanitary landfills lack the required environmental protection technologies and will eventually require costly remediation. The Landfill Directive is therefore rather irrelevant for at least 450 000 landfills*[76]. Excluding those landfills that pre-date the Landfill Directive and removing landfills in the UK (24 000), and assuming around half of the remaining landfills handle inert waste (based on Eurostat data, assuming that inert waste sites continue to be excluded from the IED), that suggests there may be around 23 800 landfills in the EU which do not pre-date the Landfill Directive, handling non-inert waste. This is a much larger figure than the 2 950 registered in Eurostat in 2018. However, it is unclear what the distribution across capacities is.

Some data from SEPA in Scotland, whilst outside of the EU, suggests that most landfills are above the 25 000 tonnes capacity threshold of the IED (all 63 out of 63 landfills registered in 2019 were above the threshold).[77]

For the TSS question (16.2) *'should the threshold of Annex I activity 5.4 for inclusion within the scope of the IED be reduced, to what level?*' the majority of MS stakeholders were strongly against reducing the threshold of Annex I activity 5.4 for inclusion within the scope of the IED. The consensus was that they are already set so low that they are exceeded by practically all landfills that meet the requirements of the Landfill Directive 1999/31/EC in conjunction with Council Decision 2003/33/EC and are also operated economically and affordably (German UBA). Below the thresholds, only landfills on islands or isolated settlements are conceivable, for which the Landfill Directive already allows exemptions from

[76] https://eurelco.org/2018/09/30/data-launched-on-the-landfill-situation-in-the-eu-28/
[77] https://www.sepa.org.uk/data-visualisation/waste-sites-and-capacity-tool/

the requirements. In an open text response, a MS National stakeholder response from the National Environmental Protection Agency (Romania) stated they were against the measure, as European and national policies already encourage prevention or reduction of waste generation.

Assessing impacts

Economic impacts

Overall, this measure is expected to have only rather limited impacts because of the limited number of additional sites this measure would be likely to affect, given the existing requirements of the Landfill Directive. The overall economic impacts may be limited or weakly negative, with the key costs of this measure anticipated to be the administrative burden on businesses and authorities for the new sites brought into scope, and because these would be smaller landfills, there is the potential for this measure to disproportionately impact SMEs.

Administrative burden on businesses

This measure is likely to lead to **limited or weakly negative impacts** on the administrative burden on businesses, although the evidence is **unclear**. No robust assessment of administrative burden can be made as the number of sites affect cannot be readily determined from available data sources.

The Landfill Directive already places requirements on sites with a capacity above 15 000 tonnes. Hence some sites (those between 15 000 and 25 000 tonnes) may see only very marginal impacts. More significant burden will be placed on smaller sites (those < 15 000 tonnes) that come into scope not covered by the Landfill Directive. That said, based on stakeholder feedback, the number of sites relative to those already covered may be fairly small.

Operating costs and conduct of business

This measure is likely to lead to **limited impacts** on operating costs. Assuming that the measure IED#39 is not introduced in parallel, the key costs of this measure are anticipated to be administrative burden on new sites brought into scope of the IED rather than additional compliance costs. This is because BAT Conclusions would not apply to these additional sites if IED#39 is not implemented, and landfills are only required to perform broader monitoring and reporting under the current IED.

Competitiveness and level playing field

This measure is likely to lead to **weakly negative impacts** on competitiveness. As discussed above, there is unlikely to be additional compliance costs for business, but the total costs of doing business could increase for landfill operators as a consequence of an additional administrative burden. If these costs cannot be passed on in the price of waste management services, these costs will be incurred by businesses, impacting upon profitability.

Given the nature of the operation, landfill is deemed not to be at significant risk from international competition. However, if landfill operators face additional costs, this may

favour other operators in the waste stream (e.g. those involved in recycling operations). Hence landfilling may become less competitive with these alternative waste stream activities. But to that end, these measures could also serve to encourage these alternative means of waste treatment, achieving additional (indirect) environmental impacts.

Furthermore, given larger landfill operators already fall under the scope of the IED, any additional costs will only fall on smaller operators. Although technically this harmonises the set of requirements across a wider array of installations and operators and proposes a more level playing field (the IED evaluation confirmed that industry stakeholders perceived in general that inclusion of a sector in the IED contributed to achieving a level playing field in the EU for IED sectors by aligning environmental performance requirements for industrial installations), given that these costs fall solely on smaller operators will place a greater burden on entering the market and their ability to grow. This will impact on the ability of small operators to provide competition for larger operators.

Factual evidence has been limited for contributing to analysis of this impact.

Position of SMEs

This measure is likely to lead to **uncertain or weakly negative impacts** on the position of SMEs**.** Reduction of a threshold will bring smaller operators solely into scope. The Landfill Directive already places requirements on sites with a capacity above 15 000 tonnes. Hence some sites may see on very marginal effects.

More significant burden will be placed on smaller sites that come into scope not covered by the Landfill Directive. That said, the number of operators affected in anticipated to be small (stakeholder feedback). Given the lack of data on number of sites in each capacity bound (and on what the resulting threshold might be), the impact of this measure towards SMEs, therefore, remains uncertain.

Factual evidence and stakeholder opinion have been limited for contributing to analysis of this impact.

Innovation and research

This measure is likely to lead to **negligible impacts** on innovation. Assuming no BATC are implemented alongside the threshold change, there is no key driver to innovate. The smaller operators that come into scope are only required to comply with wider monitoring and reporting requirements.

Factual evidence and stakeholder opinion have been limited for contributing to analysis of this impact.

Public authority impacts

This measure is likely to lead to **weakly negative impacts** on public authorities. The expansion of scope to smaller landfill operators could introduce an additional burden for public authorities, as a larger number of permits need to be defined / amended (where these already reflect the requirements of the Landfill Directive) and enforced, as well as remaining IED Chapter II requirements. However, the Landfill Directive already places requirements on

sites with a capacity above 15 000 tonnes. Hence some sites may see on very marginal effects.

This report has found no means to assess public authority impacts. This is because the predicted number of new installations that may be introduced within the scope of the IED, requiring regulation via the lowering of the capacity threshold within Annex I of the IED, cannot be accurately determined from available data sources. Stakeholder opinion has also been limited for contributing to analysis of this impact.

Environmental impacts

This measure is likely to lead to **negligible environmental impacts**. Assuming no BATC are implemented alongside the threshold change, smaller operators that come into scope are only required to comply with wider monitoring and reporting requirements which have no significant direct impact.

Climate

E-PRTR Activity 5(d), which refers to landfills as defined by the Landfill Directive and aligned with the capacity threshold currently contained in Annex I of the IED, is associated with emissions of GHGs, equating to 1.6 – 2.4% of GHG emissions, relative to the baseline scope of the IED. However, it is assumed that the emissions from smaller landfill sites would be lower.

This measure is likely to lead to **negligible impacts** on climate. Assuming no BATC are implemented alongside the threshold change, smaller operators that come into scope are only required to comply with wider monitoring and reporting requirements which have no direct impact.

Air quality

Data for E-PRTR Annex I activity 5(d), which refers to landfills as defined by the Landfill Directive, is associated with emissions of NH_3, NMVOC, NO_X, PM_{10} and SOx. Comparing the totals for this activity with the E-PRTR industrial totals for the EU-27, comparable in scope to the IED, indicates that the activity can, for some pollutants, moderately contribute to overall pollutant totals. For example, the activity contributes on average 1.3% of total NMVOC, relative to the baseline scope of the IED for the years available. Similarly, the activity contributes 1.9% towards NH_3 totals across available years, and 1.4% for SOx. However, it considered unlikely that this data captures emissions from smaller sites given the number reporting in the E-PRTR.

This measure is likely to lead to **negligible impacts** on air quality. Assuming no BATC are implemented alongside the threshold change, smaller operators that come into scope are only required to comply with wider monitoring and reporting requirements which have no direct impact.

Stakeholder opinion has been limited for contributing to analysis of this impact.

Water quality and resources

Data for E-PRTR Annex I activity 5(d), which refers to landfills as defined by the Landfill Directive, is associated with releases to water of several heavy metals, including cadmium, zinc and chromium. These releases, relative to the baseline scope of the IED, can be sizeable, e.g. 4.7 – 9% of cadmium releases are associated with this activity. However, it considered unlikely that this data captures emissions from smaller sites given the number reporting in the E-PRTR. Depending on the degree of containment, small releases through leakage may end up in groundwater and/or surface water. Collected leachate can be subject to dedicated treatment prior to release to sewage systems.

This measure is likely to lead to **negligible impacts** on water resources. Assuming no BATC are implemented alongside the threshold change, smaller operators that come into scope are only required to comply with wider monitoring and reporting requirements which have no direct impact.

Stakeholder opinion has been limited for contributing to analysis of this impact.

Soil quality or resources

Similar to the above detail on releases to water, E-PRTR data indicates that the activity is also associated with releases to land, including multiple heavy metals, such as arsenic, zinc, and lead. However, it considered unlikely that this data captures emissions from smaller sites given the number reporting in the E-PRTR.

This measure is likely to lead to **negligible impacts** on soil quality. Assuming no BATC are implemented alongside the threshold change, smaller operators that come into scope are only required to comply with wider monitoring and reporting requirements which have no direct impact.

Stakeholder opinion has been limited for contributing to analysis of this impact.

Waste production, generation, and recycling

This measure is likely to lead to **weakly positive impacts** on waste production. As discussed under economic impacts above, any increase in costs for landfill operators (in this case just administrative burden), which may be passed through to gate fees will increase the incentive to direct waste to other treatments and/or reduce waste overall. Furthermore, regulation of the sector through the IED may further benefit the management of waste, through provisions such as Article 11, which requires installations are operated within the principles of the waste hierarchy, as laid out in the Waste Framework Directive (Directive 2008/98/EC). However, the size of these impacts is likely to be small, in particular given the number of sites is likely to be limited.

Factual evidence and stakeholder opinion have been limited for contributing to analysis of this impact.

Efficient use of resources

This measure is likely to lead to **unclear or limited impacts** on resource use. Water and energy use is not a key environmental impact of landfill. Furthermore, assuming no BATC

are implemented alongside the threshold change, smaller operators that come into scope are only required to comply with wider monitoring and reporting requirements which have no direct impact.

Social impacts

This measure is likely to lead to **limited impacts** on employment. Some smaller landfill operators may face additional costs associated with monitoring and reporting. If these costs cannot be passed on within the price of waste management services, these costs will impact upon profitability and could therefore impact upon employment. However, such impacts are likely to be small, in particular considering only a limited number of sites are affected. Factual evidence and stakeholder opinion have been limited for contributing to analysis of this impact.

Measure 41: Include minerals extraction activities (E-PRTR Annex I activities 3a and 3b) within the scope of the IED

Description of the measure and requirements for implementation

The measure consists of including mineral extraction activities within the scope of the IED. The measure relates to the non-energy extractive sector[78], to the extraction and treatment of metallic, industrial, and construction minerals. This, in turn, will require the mining activities to comply with the general regulatory framework set out by the IED, such as the provisions regarding permits or inspections, detailed in Chapter II of the IED.

Mining activities are covered by the E-PRTR (E-PRTR Annex I activities 3a and 3b), including mining activities for energy and for non-energy purposes. For activities under 3a ('underground mining and related operations') no capacity threshold is applicable, in other words all facilities are subject to reporting (for pollutants above the Annex II threshold for releases). While, for activities under 3b ('opencast mining and quarrying'), operators are subject to reporting when the surface of the area effectively under extractive operation equals 25 hectares.

As far as environmental risks are concerned, the overarching legislation applied at the EU level to minerals extraction activities stems from Environmental Impact Assessment (EIA) according to the EIA Directive (2011/92/EU) and, in relation to extractive waste, the Extractive Waste Directive (EWD, 2006/21/EC). In accordance with the EWD (pursuant to Article 21(3)), a BREF for the Management of Waste from Extractive Industries is published (MWEI BREF, 2018), which presents data and information on the management of waste from extractive industries, including information on BAT, associated monitoring and developments in them. Furthermore, other relevant EU environmental legislation includes, inter alia, the Water Framework Directive (WFD) and the Birds and Habitats Directives.

[78] Exploration and production of oil and gas is covered under measure IED#43; other energy related mining (coal) is excluded from measure #41 as one of the main environmental issues (methane emissions) is addressed by DG ENER initiatives under the methane strategy.

The assessment indicates, as outlined below, that given the higher number of quarries (extraction of aggregates) in the EU, compared to the mining of metallic and industrial minerals, there would be significantly more permits to issue/review for these types of activities. Furthermore, it is considered that quarrying is associated with fewer environmental issues compared to the other types of extraction activities. Therefore, it is concluded that the measure, the related **BAT requirements and their implementation in permits need to focus on the most significant sources of emission of pollutants** (extraction and processing of metallic and industrial minerals).

Objective(s):

The following objectives apply:

- Levelling the playing field for installations across the EU.
- Improving the environmental effectiveness of the IED, via the expansion of coverage of the IED in Annex I. The measure is anticipated to result in the reduction of emissions to air, water, and soil. The extent of this reduction is contingent upon the level of BAT conclusions reached during the BREF process with respect to the minerals extraction activities.

Implementation needs:

The measure will need to be further defined with regard to the proposed wording and capacity threshold (or lack of) to be included in Annex I.

In addition to further defining the scope and wording of the IED, the following actions will need to be taken to implement the measure:

- EU to amend the IED to bring minerals extraction activities inside the scope of the IED, primarily by including the activities in Annex I.
- Mining operators to engage in the BREF process and take steps to ensure that BAT conclusions are met.
- EU to make legislative change to the IED text.
- EU to develop BAT conclusions for minerals extraction activities.
- Member States to transpose changes into national law.
- Member States to regulate minerals extraction activities according to the new requirements, to the extent this requires changes from their existing regulatory approaches. This will require upfront and ongoing implementation actions.

Further evidence and activity data

Extraction sites and minerals

Minerals extraction activities involve the extraction (surface or subsurface mining) and primary treatment of metallic, industrial or construction minerals (see table below).

Table A8-37: Overview of minerals extraction activities and type of minerals

	Type of mineral	Extraction method	Treatment methods
Mining	**Metallic minerals**: Base metals (Cu, Ni, Pb, Sn, Zn); Precious metals (Ag, Au, Pt); Iron ores and others (Fe, Co, Mn, Mo, V, W, ilmenite or titanium minerals or Ti); Bauxite. **Industrial minerals**: Limestone and gypsum; Kaolin; Potash; Feldspar; Phosphate rock; Other industrial minerals (e.g. magnesite).	• Surface; • Subsurface; • Borehole mining; • Solution mining	• Comminution (size reduction, e.g. crushing and grinding); • Size control (screening, mineral sorting and classification); • Beneficiation (physical separation - chemical separation - biological separation); • Upgrading (dewatering, sedimentation, drying).
Quarrying	**Construction and ornamental stones** **Aggregates** (gravel, sand, clay, etc)	• Surface; • (subsurface)	• Comminution (size reduction, e.g. crushing and grinding); • Size control (screening, mineral sorting and classification); • Beneficiation (physical separation); • Upgrading (dewatering, sedimentation, drying).

Under E-PRTR, there were in total 1 706 facilities in the EU27 registered in 2018 falling under the mining activities, split as follows:

- Activity 3(a) - Underground mining and related: 579 facilities; and
- Activity 3(b) - Opencast mining and quarrying: 1 127 facilities.

Quarrying and mining data from Eurostat Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E)[79], split by sector, are presented below for the EU27 overall. This addresses specifically the **number of enterprises** operating in the sector (Note: this data is also available, split by Member State in some cases).

Table A8-38: Number of enterprises – Mining and quarrying (source: Eurostat, NACE Rev. 2, B-E)

Activity/sector	Number of enterprises EU27 (2018)
Mining of metal ores (iron and non-ferrous metal ores)	382
Mining and quarrying n.e.c.	1 574
Quarrying of stone, sand and clay	12 261
Mining and quarrying (total)	**14 217**

Whilst general extractive activities are spread across a number of Member States, when considering specific types of mining activity – namely metals and other industrial chemicals – the number of Member States concerned changes rather dramatically, with ES, RO, SE, FI, PT, PL, BG, GR and FR in particular containing a number of enterprises involved in these

[79] [SBS_NA_IND_R2__custom_1220764]

activities and a large number of the remaining Member States containing no or a small number of enterprises within their territory.
Furthermore, the MWEI BREF presents an estimate of the number of mines in the EU28 compiled using different comprehensible databases and sources of information. In summary, for the EU27, the estimates of mineral resources extraction sites in 2012 were as follows (non-energy minerals)

Table A8-39: Estimates of mineral resources extraction sites in the EU-27 in 2012 (based on MWEI BREF, 2018)

Mineral resource	Estimated number of extraction sites
Aggregates	24 869
Industrial and other construction minerals	2 961
Bauxite, alumina, magnesite, ilmenite	46
Cu, Ni, Pb, Sn, Zn ores	52
Fe, Co, Cr, Mn, Mo, V, W ores	22
Ag, Au, Pt ores	106
Other metalliferous ores	7
Total	**28 063**

The draft final report of the study for the European Commission 'Study supporting the development of general guidance on the implementation of the Extractive Waste Directive' (2021) included a description of the extractive sectors. A summary of the number of sites per category of mineral in the EU is presented in the table below. A more detailed overview of this data is available in the study supporting the impact assessment of the IED revision (per type of mineral)[80]. The study indicates that the number of production sites per mineral commodity is difficult to ascertain with absolute precision as it not always being clear whether the reported numbers relate to individual mining sites or to mining companies. However, the data presented below is considered to be the most comprehensive dataset available.

[80] Trinomics, Ricardo, Wood, 2021. Gathering of complementary evidence for assessing the impacts of extending the scope of the IED to additional sectors. Draft final report

Table A8-40: Number of non-energy mineral extraction sites in the EU-27, split by sub-sector[81]

Member State	Number of extraction sites		
	Aggregates and construction minerals	Industrial minerals	Metallic minerals
AT	1 363	27	2
BE	112		
BG	295		14
CY	25		1
CZ	387	70	1
DE	2 733	148	1
DK	417		
EE	300		
EL	198		32
ES	1 874	214	10
FI	2 140	18	11
FR	2 822		
HR	225	5	
HU	525	7	1
IE	430		1
IT	2 800		
LT	210		
LU	13		
LV	105		
MT	10		
NL	295		
PL	2 786	35	9
PT	247	125	4
RO	1 120	27	2
SE	1 391	15	14
SI	153	33	
SK	270	20	1
EU-27 total	**23 246**	**744**	**104**

[81] Based on EC (2021). Study supporting the development of general guidance on the implementation of the Extractive Waste Directive. Draft Final Report.

The aggregates sector represents the bulk of the non-energy extractive industries. Almost 2.7 billion tons of aggregates are produced and used in Europe annually based on European Aggregates Association (UEPG) data.

The EU mining industry produces mainly basic metals (copper, lead, iron ore), bulk commodities, specialty commodities, industrial minerals and precious metals (gold, silver, and platinum group metals)[82]. Industrial minerals are used mostly in the manufacture of mineral products (e.g. glass, cement) or chemicals (e.g. mineral fertilisers, plastic additives, pharmaceuticals).

Industrial minerals extraction represents a total amount of c. 160 Mt (in 2016). Potash (33 Mt), chalk (10 Mt), rock salt (22 Mt), gypsum (24 Mt), lime (29 Mt) and kaolin (10 Mt) sum up to 79% of the exploited amount of industrial minerals in the EU in 2016. Bentonite (2 Mt), potash dolomite (9 Mt), feldspar (6 Mt), magnesite (2 Mt), quartz (5 Mt) and sulfur (2 Mt) counts for another 17%. Germany is by far the biggest producer of industrial minerals, with potash (32 Mt), gypsum (4 Mt) kaolin (5 Mt) and rock salt (6 Mt) as the largest contributors.

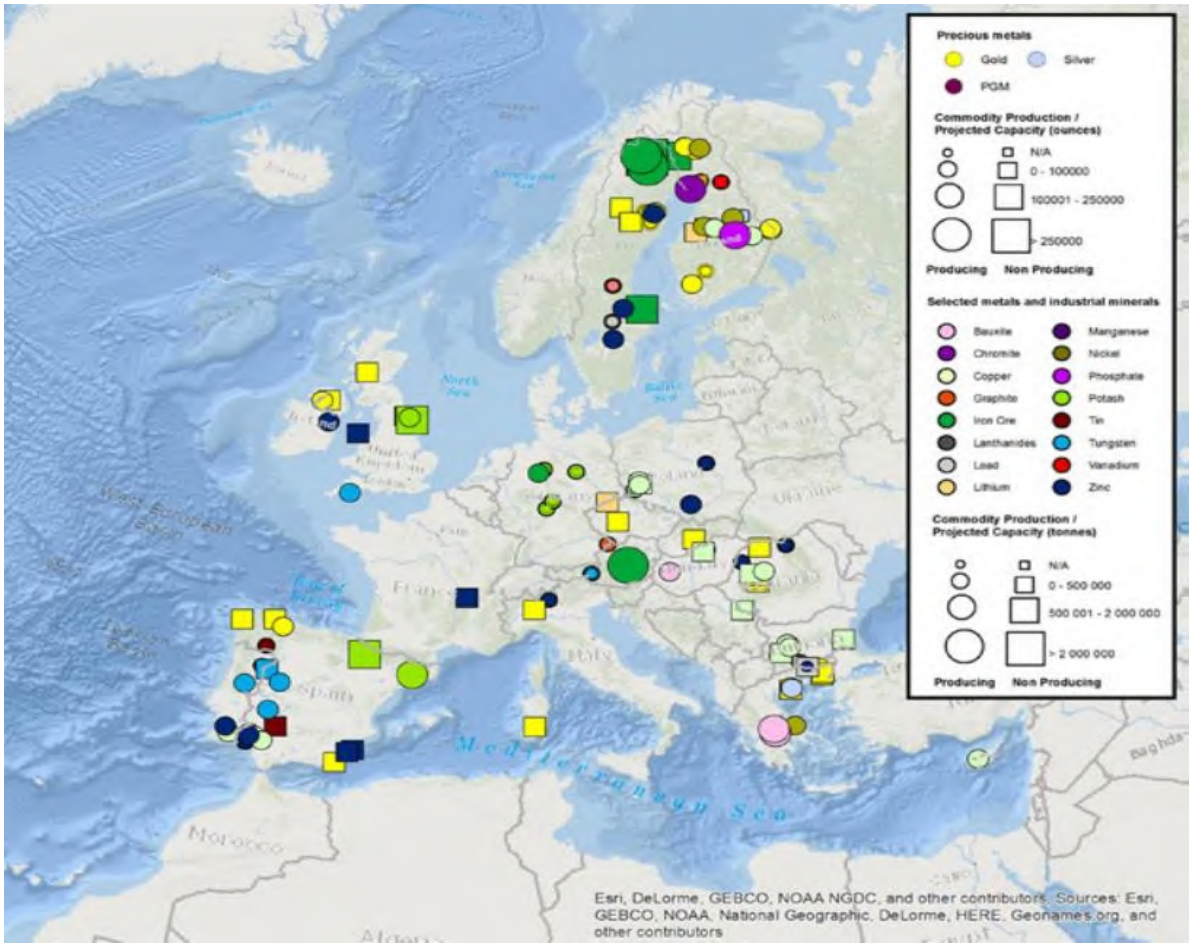
Europe's contribution to world metal ore production is limited to the following metals: aluminum/bauxite, copper, lead, zinc, chromium, nickel, iron, and tungsten. There is also production to a lesser extent of precious metals (gold and silver), cobalt, manganese, and tin. In the EU-27 (2017) 70 active metallic mineral mines (including the treatment of mineral resources with integrated mine location, operated as a complete entity, where one operator excavates material from more than one site), with 104 active metallic mineral excavation sites have been identified, which are located in Austria, Bulgaria, Cyprus, Finland, France, Greece, Hungary, Ireland, Poland, Portugal, Romania, Slovakia, Spain, and Sweden. Additionally, 11 projects have been identified that are under development or in an exploration stage.

Based on all data collected for the period 2015 – 2017 under the study supporting the development of general guidance on the implementation of the Extractive Waste Directive, it has been estimated that all metallic mineral extraction sites together produced about 223,000 Kt of ore per year. The annual production of copper sulfide and polymetallic copper ore in the period 2015 – 2017 amounted to 132,500 Kt, and iron extraction produced about 38,000 Kt of ore. Together, they amount to almost 80% of the metallic mineral ores produced in the EU. The annual production of nickel ore was about 15,000 Kt, of lead-zinc ore 11,500 Kt and of gold ore 10,500 Kt.

The figure below gives an idea of the importance of the mining sector for metals and selected industrial material in each MS in 2017.

[82] European Commission (2021). Raw Materials Scoreboard 2020 https://op.europa.eu/en/publication-detail/-/publication/eb052a18-c1f3-11eb-a925-01aa75ed71a1/language-en/format-PDF/source-233015861

Figure A8-27: Mining production of metals and selected industrial material



Source: EC, 2021. Raw Materials scoreboard 2020.

Employment in the sector

The table below shows the Eurostat data on the number of **full-time employees** employed in the Mining of coal and lignite, Mining of metal ores, Other mining and quarrying sub-sectors for 2018. For completion the persons employed in all mining and quarrying sub-sectors from Eurostat are presented.

Table A8-41: Number of persons employed in each subsector per Member State and relative share of the total (Eurostat, data for 2018)

Member State	Mining and quarrying total (incl. energy activities)	Mining of iron ores	Mining of non-ferrous metal ores	Quarrying of stone, sand and clay	Mining and quarrying n.e.c.*	Support activities for other mining and quarrying	Share of mining of iron ores over total mining and quarrying	Share of non-ferrous metal ores over total mining and quarrying	Quarrying of stone, sand and clay over total mining and quarrying	Mining and quarrying n.e.c. over total mining and quarrying	Support activities for other mining and quarrying over total mining and quarrying
AT	6,825	c	c	4,296	710	c	c	c	63.0%	10.4%	c
BE	2,160	0	0	c	c	c	0.0%	0.0%	c	c	c
BG	21,663	0	6,634	4,173	497	582	0.0%	0.0%	19.26%	2.3%	2.7%
CY	538	0	c	c	0	0	0.0%	c	c	0.0%	0.0%
CZ	24,237	0	c	5,254	249	c	0.0%	c	21.68%	1.0%	c
DE	47,392	c	0	27,715	4,750	387	0.0%	0.0%	58.48%	10.0%	0.8%
DK	5,073	0	0	687	329	19	0.0%	0.0%	13.54%	6.5%	0.4%
EE	4,200	0	0	721	808	33	0.0%	0.0%	17.17%	19.2%	0.8%
EL	7,703	c	c	4,372	712	32	c	c	56.76%	9.2%	0.4%
ES	17,751	66	2,185	10,606	3,024	805	0.4%	0.4%	59.8%	17.0%	4.5%
FI	7,281	c	c	1,651	2,244	1,091	c	c	22.68%	30.8%	15.0%
FR	12,723	c	c	10,207	1,000	77	c	c	80.22%	7.9%	0.6%
HR	4,040	0	0	1,895	154	39	0.0%	0.0%	46.9%	3.8%	1.0%
HU	3,979	0	3	2,682	121	583	0.0%	0.0%	67.4%	3.0%	14.7%
IE	4,113	c	c	c	c	c	c	c	c	c	c
IT	17,716	0	2	11,937	1,953	0	0.0%	0.0%	67.4%	11.0%	0.0%

Member State	Mining and quarrying total (incl. energy activities)	Mining of iron ores	Mining of non-ferrous metal ores	Quarrying of stone, sand and clay	Mining and quarrying n.e.c.*	Support activities for other mining and quarrying	Share of mining of iron ores over total mining and quarrying	Share of non-ferrous metal ores over total mining and quarrying	Quarrying of stone, sand and clay over total mining and quarrying	Mining and quarrying n.e.c. over total mining and quarrying	Support activities for other mining and quarrying over total mining and quarrying
LT	2,734	0	0	1,489	1,104	0	0.0%	0.0%	54.5%	40.4%	0.0%
LU	286	0	0	286	0	0	0.0%	0.0%	100.0%	0.0%	0.0%
LV	3,186	0	0	1,032	2,116	26	0.0%	0.0%	32.4%	66.4%	0.8%
MT	202	0	0	c	0	c	0.0%	0.0%	c	0.0%	c
NL	8,439	0	0	870	1,383	c	0.0%	0.0%	10.3%	16.4%	c
PL	144,917	0	c	18,835	2,667	12,587	0.0%	c	13.0%	1.8%	8.7%
PT	9,497	21	1,950	6,701	380	430	0.2%	0.2%	70.6%	4.0%	4.5%
RO	24,313	28	1,990	7,761	2,113	153	0.1%	0.1%	31.9%	8.7%	0.6%
SE	7,898	c	c	1,914	129	79	c	c	24.2%	1.6%	1.0%
SI	2,355	0	0	922	c	3	0.0%	0.0%	39.2%	c	0.1%
SK	6,777	0	c	1,740	1,169	118	0.0%	c	25.7%	17.3%	1.7%

*Note: *Mining and quarrying activities n.e.c. includes:- mining and quarrying of various minerals and materials: • abrasive materials, asbestos, siliceous fossil meals, natural graphite, steatite (talc), feldspar etc. • natural asphalt, asphaltites and asphaltic rock; natural solid bitumen • gemstones, quartz, mica etc.*

c indicates confidential information.

Among the non-energy related activities – quarrying of stone, sand, and clay seems to be the most important activity in the EU. The mining of metal ores (i.e. iron and non-ferrous metal ores) seems to occur especially in Portugal, Romania, Spain, Sweden, Finland, Greece, Poland and Bulgaria. However, a lot of information is confidential, so the above cannot be stated with certainty.

Future developments and policy action

The nature of the mineral industry in the EU is expected to change in coming years to address climate aspects in terms of i) considerable reduction of carbon footprint in extraction and processing, ii) higher circularity and increased recovery of minerals and metals (including CRMs) from mining waste, iii) and increased production of critical raw materials through extraction. In its assessment 'Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition'[83] the World Bank noted that a low-carbon future will be very mineral intensive because clean energy technologies need more materials than fossil-fuel based electricity generation technologies. In particular, graphite, lithium and cobalt will need to be ramped up by more than 450 percent by 2050 from 2018 level to meet demand for energy storage technologies. The International Energy Agency states that the energy sector's overall needs for critical minerals could increase by as much as six times by 2040, depending on how rapidly governments act to reduce emissions[84]. In some cases, extraction will venture into areas for which the EU has limited experience, particularly in the case of lithium mining, where there is only one mine presently in existence in Portugal, and cobalt mining, for which Finland operates the only EU cobalt extraction activities in four mines. In the case of lithium extraction for example, the expected growth is illustrated by plans to extract the mineral in western Serbia. Those reports estimate that over the expected 40-year life of the mine, 2.3m tonnes of battery-grade lithium carbonate would be produced, a mineral critical for large-scale batteries for electric vehicles and storing renewable energy[85].

In its Communication 'Critical Raw Materials Resilience Charting a Path towards greater Security and Sustainability'[86], the Commission has set forward a number of actions to increase EU resilience with regard to mineral needs to feed the green and digital transformations. In this respect a number of actions have been identified. A description of the Actions and their progress to date is indicated below.

[83] Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition, 2020. The World Bank.
[84] The Role of Critical Minerals in Clean Energy Transitions, 2021. International Energy Agency.
[85] https://www.theguardian.com/global-development/2021/nov/19/rio-tintos-past-casts-a-shadow-over-serbias-hopes-of-a-lithium-revolution
[86] COM(2020) 474

Table A8-42: Status of actions under the Commission Communication COM(2020) 474

• Action number and description	• Progress (reported in October 2021)
• Action 1 – Launch an industry-driven European Raw Materials Alliance in September 2020, to build resilience and open strategic autonomy for the rare earths and magnets.	• Completed
• Action 2 – Develop sustainable financing criteria for the mining, extractive and processing sectors in Delegated Acts on Taxonomy by end 2021 (Platform on Sustainable Finance, Commission).	• Expected mid-2022
• Action 3- Launch critical raw materials research and innovation in 2021 on waste processing, advanced materials and substitution, using Horizon Europe, the European Regional Development Fund and national R&I programmes.	• Work ongoing
• Action 4 - Map the potential supply of secondary critical raw materials from EU stocks and wastes and identify viable recovery projects by 2022.	• Work ongoing.
• Action 5 - Identify mining and processing projects and investment needs and related financing opportunities for critical raw materials in the EU that can be operational by 2025. In collaboration with Member States and promoted by the European Raw Materials Alliance.	• Work ongoing.
• Action 6 – Develop expertise and skills in mining, extraction and processing technologies, as part of a balanced transition strategy in regions in transition from 2022 onwards (Commission, industry, trade unions, Member States and regions);	• Work ongoing.
• Action 7 - Deploy Earth-observation programmes and remote sensing for resource exploration, operations and post-closure environmental management (Commission, industry). The Commission is promoting an Earth Observation platform for Raw Materials.	• Work ongoing.
• Action 8 – Develop Horizon Europe R&I projects on processes for exploitation and processing of critical raw materials to reduce environmental impacts starting in 2021 (Commission, R&I community).	• Work ongoing.
• Action 9 - Develop strategic international partnerships and associated funding to secure a diversified and sustainable supply of critical raw materials, including through undistorted trade and investment conditions, starting with pilot partnerships with Canada, interested countries in Africa and the EU's neighbourhood in 2021 (Commission, Member States, industry and third country counterparts);	• Partnerships with Canada, Ukraine: completed. Partnerships with countries in Africa, Serbia: work ongoing.
• Action 10 - Promote responsible mining practices for critical raw materials through the EU regulatory framework (proposals in 2020-2021).	• Work ongoing. The Commission published the EU principles for sustainable raw materials in September 2021.

The above Communication also identifies the main locations of both critical raw materials as well as EU battery raw material resources, highlighting those Member States that have currently been identified as having the greatest potential for increases in mining activity in the future.

Mineral extraction activities are primarily addressed at the EU level in relation to environmental impact and mitigation and health and safety of operations. As far as environmental risks are concerned, the overarching legislation applied at the EU level to mining and quarrying activities stems from Environmental Impact Assessment (EIA) according to the **EIA Directive** (2011/92/EU) and, in relation to extractive waste, the **Extractive Waste Directive** (EWD, 2006/21/EC). The scope of the EWD includes energy fuels, metals ores, industry minerals and constructive minerals. Furthermore, other relevant EU environmental legislation includes, inter alia, the Water Framework Directive (WFD), the Birds and Habitats Directives, the Environmental Liability Directive, the Directive 2008/50/EC on ambient air quality and its fourth daughter Directive 2004/107/EC and the Waste Framework Directive.. The application of these pieces of legislation to extraction activities is not considered commensurate with the requirements of the IED as a result of:

- The fact that the EIA process does not explicitly set permit conditions – rather it looks to mitigate environmental effects before an activity is undertaken or when significant changes are made to the operation during the lifetime of an installation. The EIA process also looks at the compliance with other legislation. The results of assessments are generally implemented through planning controls rather than an operational permit that evolves over time to take into account changes in BAT as is the case under IED. Furthermore, in the absence of common emission levels at the EU level for emissions from the extractive sector it is likely that with further examination of the conditions set for the extractive sector across different Member States that the conditions set would vary significantly. This issue was identified in the Commission report of 2009 on the application and effectiveness of the EIA Directive that noted that the EIA Directive lays down essentially procedural requirements; it does not establish obligatory environmental standards. The ability to make valid decisions depends on the quality of the information used in the EIA documentation and the quality of the EIA process. Quality is therefore a crucial element for the effectiveness of the Directive and in this respect many Member States have pointed out that the lack of sufficient quality in the information used in the EIA documentation is a problem. There are major differences in the quality of EIA documentation, not only between different Member States but also within Member States themselves.
- The Extractive Waste Directive focusses on waste management on extraction sites and does not consider other operational activities on site that may also have an impact on the environment (such as emissions to air, water and soil). Legal coherence between the EWD and the IED will need to be ensured when including mining and quarrying activities under the IED.

GHG from non-fossil fuel extractive installations are excluded from the EU ETS. The Effort Sharing Regulation sets emission reduction targets for each MS based on the principles of

fairness, cost-effectiveness and environmental integrity for those sectors not covered by the EU ETS. Therefore, MS are responsible to set **national policies and measures to regulate the mining sector**. For example, potash mines are subject to extensive permitting and inspection systems in Spain and Germany – the only MS with such mines[87].

An important aspect on which national legislation intervene – at country, regional, and local level – is the land use change due to extractive activities. Member States may set an absolute ban, conditional clauses, or protective provisions in relation to extractive activities under national or regional regimes. In addition, 3D spatial planning is a common practice and part of the regulation in some MS[88].

Additional legislation has also been designated by some Member States for the protection of habitat and species, in cases not covered by EU law.

An examination of the approaches to permitting of the extractive sector by Member State was performed in the study supporting the impact assessment of the IED revision[89], using materials gathered under the Minlex study on the Legal framework for mineral extraction and permitting procedures for exploration and exploitation in the EU. The detailed overview is provided in the supporting study. In general it can be concluded that all Member States appear to have a permitting regime in place for extractive activities taking place within their territory. Secondly, it is apparent that Member States generally maintain provisions in relation to environmental legislation for mining, albeit a large majority of the legislation is the transposing law for EU Directives and Regulations. However, there are examples of permitting approaches that go beyond EU law, for example in Germany where a BAT-based approach is applied to extractive permits.

Furthermore, there is significant variation in the permitting approaches of Member States in relation to the environment, ranging from single mining permits addressing all operational aspects of a site, to separation of environmental permits by theme (e.g. waste, water, air). In case where permitting approaches are subject to separate applications and authorisations it is less likely that an integrated consideration to environmental protection from extractive activities is being applied, albeit this is impossible to determine with absolute certainty without examining the permits issued. It is not apparent from the legislation examined how the key environmental impacts of the extractive sector are specifically addressed and for dust emissions in particular, as an example, it is difficult to see the manner in which national law currently specifies techniques for mitigating those emissions. This need for a more coherent approach is also illustrated by the one of the Commission's priority actions in 2022, i.e. streamlining permitting procedures for battery raw material projects in Member States, in line with highest environmental standards.

[87] European Potash Producers Association position paper attached to the OPC on the Revision of the Industrial Emissions Directive

[88] Hamor, T., Vidal Legaz, B., Zampori, L., Eynard, U. and Pennington, D. (2021), A review of European Union legal provisions on the environmental impact assessment of non-energy minerals extraction projects, JRC. https://publications.jrc.ec.europa.eu/repository/handle/JRC125111

[89] Trinomics, Ricardo, Wood, 2021. Gathering of complementary evidence for assessing the impacts of extending the scope of the IED to additional sectors. Draft final report

Assessing impacts

Economic impacts

The costs of including the minerals extraction activities under the IED will depend, inter alia, on the BAT eventually defined and its current uptake.

Administrative burden on businesses

This measure will likely have **weakly negative impacts** on the administrative burden on businesses.

Annual additional administrative costs would be incurred if this measure is implemented, especially as there would be a need to review permits, expand business engagement in the BREF review process, monitor and report more data, and engage with inspections and other enforcement-related activities. These costs are unlikely to deviate significantly from the permitting costs applicable to the likes of cement and lime activities, given that these are the closest current IED activity to minerals extraction activities (they involve extraction and on-site processing so for metal ore extraction are likely to represent a good proxy).

Consideration also needs to be given to the nature of the extractive activities themselves. Quarries undertaking extraction of aggregates and construction minerals are generally deemed to be less of an environmental risk than extraction of industrial minerals and metallic minerals due to the generally inert nature of the materials extracted and the processing undertaken on site. The full application of IED permitting to quarries involved in aggregate and construction minerals is, therefore, unlikely to be proportionate to the benefits achieved via IED. Given the higher number of quarries (extraction of aggregates) in the EU (approximately 23 000 – 27 000 sites), compared to the mining of metallic and industrial minerals, there would be significantly more permits to issue/review for these types of activities. There would be an additional burden for an industry that consists of over 90% SMEs, with an average of 7-8 people working in every site. This is an important finding to be taken into account in order to ensure that the measure, related BAT requirements and their implementation in permits focus on the most significant sources of emission of pollutants.

By focussing the measure on the **extraction of metallic and industrial minerals** it is estimated that, based on the estimates above, **c. 800-900 minerals extraction installations** would be regulated under the IED (c. 750 industrial mineral extractive sites and 100 metallic mineral sites).

Based on the estimated number of installations for these sectors and the assumptions of unit costs for the main requirements for operators, administrative burden on businesses has been estimated between €1m/year to €19m/year, with a central estimate of €12m/year, on average over the period of 20 years from adoption. In this case, this range is due to the uncertainty in administrative burden (see earlier sections) since there is one central estimate of the number of installations. These costs are not expected to represent a significant burden on the sector.

Operating costs and conduct of business

This measure will have **negative impacts on the operating costs** and conduct of business. This will be due to operators needing to implement techniques to mitigate the environmental

impacts as will be identified in a BAT conclusions document for the sector. Note that in some Member States, techniques are already applied as a result of national policy. The measure's impacts on operating costs and conduct of business in the mining sector are unclear. The magnitude of these costs would be primarily dependent upon the BREF process.

There is uncertainty as to what would be considered BAT, for each process and type of mineral. There is variation between the types of extraction and treatment processes and minerals, which creates uncertainty when calculating the abatement costs.

The JRC Science for Policy Report on available techniques for the prevention or reduction of environmental impacts in non-energy extractive industries (NEEI) [90], indicates a number of techniques are used within the sector to minimise environmental impacts across stages of extractions, transport, treatment and storage, but no formal evaluation of the measured effectiveness or cost of these techniques has taken place.

Competitiveness and level playing field

Inclusion of minerals extraction activities within the Annex I of the IED imposes a singular set of requirements towards mining sites and operators in the EU. It therefore offers the **potential to level the playing field** by providing minimum criteria for all Member States through BAT Conclusions. The measure would therefore likely lead **to weakly positive impacts** on level playing field.

This measure will have **weakly negative impacts on competitiveness**. Mining sites, depending on the existing requirements, could see additional cost impacts, and the relative competitiveness of these sites would be expected to decrease. The total costs of doing business, that is the costs of administrative burden and compliance combined, are thought to negatively impact upon the sites. The exact level, however, is to be determined by the BREF process.

Position of SMEs

Looking at the number of persons employed in each MS in the mining industry and the number of enterprises, there can be a considerable number of mining sites defined as SME. As stated above, the majority of extraction sites in the EU correspond to small mines with a relatively limited number of employees (less than 10 workers). This is particularly the case for the extraction of aggregates.

By focussing the measure on the extraction of metallic and industrial minerals it is estimated that the measure will likely have **weakly negative impacts on SMEs**. Focussing on industrial minerals and metallic mineral extractive sites is likely to still impact on some SMEs, but the size of sites is likely to be significant higher in terms of number of employees than for the aggregates and construction sector.

Innovation and research

[90] Garbarino, E., Orveillon, G., Hamor, T., Saveyn, H.G.M., Eder, P., Collection of available techniques for the prevention or reduction of environmental impacts in non-energy extractive industries (NEEI), EUR 30827 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-41493-3, doi:10.2760/622092, JRC125247.

This measure may have a **limited impact** on research and development. Provisions within the IED, such as Article 27 on emerging techniques, allow for research and development within the context of BAT. Each BREF includes a chapter on emerging techniques, which acts as an indication of future techniques that could in the future (i.e. 'if commercially developed') be considered as BAT. This pathway encourages the continual focus on further reducing the environmental impacts of industrial activities or innovating in ways to save costs when compared to existing BAT. If this measure was adopted, such activities would be subject to the Sevilla Process, with emerging techniques considered within the eventual BREF.

Public authority impacts

This measure will have **negative impacts on public authority costs**. The largest impact will be on permitting and inspecting authorities, due to a significant number of mining sites that would require (a review of) an environmental permit, with requirements on BAT use and adherence to emission limit values.

There will be the costs to the Commission for the development of a BREF. The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). After apportioning the fraction of this cost for public authorities, and annualising over a period of 20 years assuming two BREFs in this period, the annualised cost of the BREF process for public authorities would be expected to range from €0.3m/year to €1.4m/year.

There will be one-off costs to the Member States for transposition of new requirements, as well as ongoing regulatory costs.

Based on the estimated number of installations for these sectors (c. 800-900, excluding extraction of aggregates and construction minerals) and the assumptions of unit costs for the main requirements for public authorities, additional administrative costs have been estimated between €1m/year to €12m/year, with a central estimate of €8m/year, on average over the period of 20 years from adoption. In this case, this range is due to the uncertainty in administrative burden. These costs, in isolation, are not expected to represent a significant burden on public authorities.

Environmental impacts

According to the JRC EIA report[91], the upstream activities of the non-energy extractive sector (i.e. extraction and primary processing) generate relatively low quantities of GHG emissions, as the energy intensive processing occurs off the mining sites. Given the nature of the activity, emissions to air during extractive practices are represented by dust and particles,

[91] Hamor, T., Vidal Legaz, B., Zampori, L., Eynard, U. and Pennington, D. (2021), A review of European Union legal provisions on the environmental impact assessment of non-energy minerals extraction projects, JRC. https://publications.jrc.ec.europa.eu/repository/handle/JRC125111

which are easily dispersed by the wind[92]. Such emissions differ substantially based on the techniques used and the composition of the ore, even within subsectors[93].

Sources of air pollution during mining and quarrying activities include mobile sources like vehicles for excavation, as well as movement of materials on site. The main sources of emissions to air from the extractive sector vary somewhat for opencast and underground mining. Opencast activities result in emissions from digging, drilling and blasting, material processing such as crushing, screening and transfer, internal transport, material handling including loading and unloading and wind erosion from stockpiles. Underground mining is subject to less direct air emissions from digging, drilling and blasting, with any emissions taking place emitted through ventilation shafts whose primary purpose is to maintain the health and safety of workers underground. However, similar overground activities such as processing, transport, loading and unloading and erosion from stockpiles are likely to take place once materials have been brought up to the surface from underground extraction.

Additionally, noise pollution, vibrations, odours, light pollution, heat anomalies that can have an impact on the local climate, ionizing radiation because of the common presence of naturally occurring radioactive materials, and toxic heavy metals[94] are also emitted during mining and quarrying activities.

Extractive activities are placed where the natural resources exist, with no or very limited possibilities to be relocated. In some cases, they involve high concentrations of certain elements due to natural background levels and/or diffuse pollution. If suitable measures are not implemented, mining activities can affect freshwater ecosystems in different ways through changes in the groundwater and surface water hydrology, or through the release of chemicals and/or sediments in water. Impacts on water will depend on the type of mineral, mining practices, substances used at the processing stage, and the way mining waste is handled[95].

The figure below presents a summary of the Key Environmental Issues (KEI) for about 25.000 extraction sites in the EU-27[96]. The figure differentiates the category of minerals (construction, industrial, and metallic) and presents a relative impact of the extraction and treatment activities on the environmental issues studied, i.e. the structural, physical, and chemical stability, emissions to soil, water, and air, noise, vibration, odour, biodiversity and

[92] Hamor, T., Vidal Legaz, B., Zampori, L., Eynard, U. and Pennington, D. (2021), A review of European Union legal provisions on the environmental impact assessment of non-energy minerals extraction projects, JRC. https://publications.jrc.ec.europa.eu/repository/handle/JRC125111

[93] European Potash Producers Association position paper attached to the OPC on the Revision of the Industrial Emissions Directive

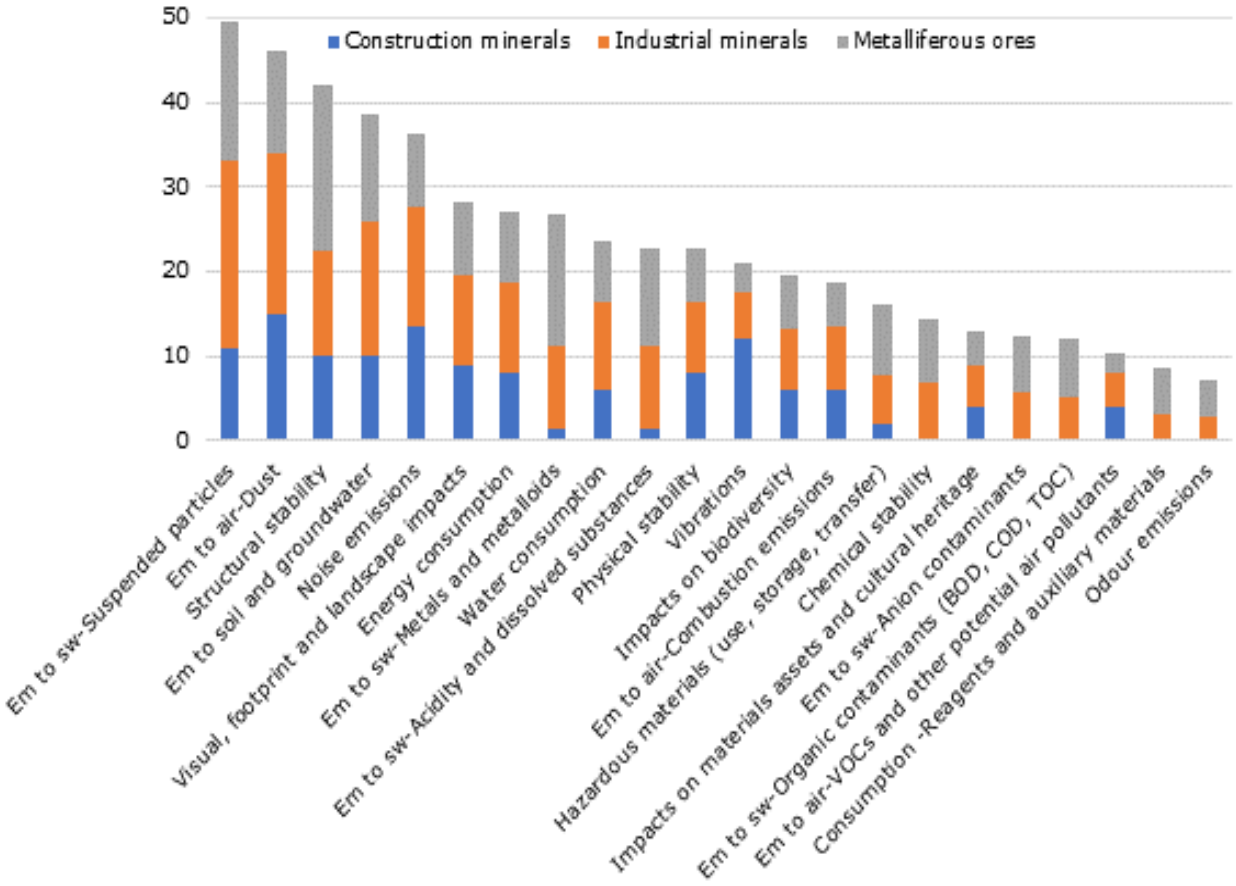
[94] Hamor, T., Vidal Legaz, B., Zampori, L., Eynard, U. and Pennington, D. (2021), A review of European Union legal provisions on the environmental impact assessment of non-energy minerals extraction projects, JRC. https://publications.jrc.ec.europa.eu/repository/handle/JRC125111

[95] SWD(2019) 439 final

[96] Garbarino, E., Orveillon, G., Hamor, T., Saveyn, H.G.M., Eder, P., Collection of available techniques for the prevention or reduction of environmental impacts in non-energy extractive industries (NEEI), EUR 30827 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-41493-3, doi:10.2760/622092, JRC125247.

land use, energy, water, and material consumption, and hazardous materials[97]. Metallic minerals have the highest aggregated impact, followed by industrial and construction minerals. Among the KEI, the strongest impacts across all mineral categories can be seen on structural and physical stability, emissions to soil and groundwater, and the discharge of suspended particles and metals in surface water. Differences across mineral categories on the most relevant KEI are related to the extraction methodology (e.g. the use of explosive leads to nitrate emissions, vibrations, and odour).

Figure A8-28: Relative environmental impact of each mineral category where on the Y axis the distribution of the impact is represented, while on the x axis each environmental issue is shown.



The benefits of including the non-energy extractive sector under the IED corresponds to BAT that can be implemented to prevent or reduce the KEI listed and to ensure a level playing field in the EU. The BREF would thus contribute to the mitigation of the KEI identified. It would also provide the basis to build a data frame displaying a more representative picture of the size of the (non-energy) minerals extraction sector in the EU27, and of the related emissions.

Stakeholders, in their opinion on the matter, collected in the TSS, on average attributed the most significant impact to water, followed by land and air, in the form of fugitive dust.

[97] The JRC study does not include extractive waste among the environmental issues studied, as it is detailed explored in the MWEI BREF.

The analysis also indicates that quarrying, i.e. the extraction of aggregates, has typically fewer environmental issues compared to the more complex extraction and treatment of metallic and industrial minerals. Extraction of aggregates mainly lead to (diffuse) emissions of dust, noise and vibrations, whilst the other minerals have also a high potential for emissions to water, soil and impacts on the (chemical, structural, physical) stability.

Through the BAT conclusions for the sector, the measure could be effective in addressing the KEIs, including emissions to air (dust and other pollutants), pollution of surface water, groundwater and soil, noise and vibrations.

Climate

This measure should provide **weakly positive impacts** on reducing greenhouse gas emissions. A benefit of introducing the non-energy extractive sector under the IED is related to the tonnes of GHG emissions that can be regulated and potentially avoided. However, precise data on the GHG emissions produced by the non-energy extractive sector are not currently available.

Air quality

This measure will have **positive impacts** on reducing air pollutant emissions. According to the JRC EIA report (2021)[98], sources of air pollution during minerals extraction activities include mobile sources like vehicles for excavation, processing as well as movement of materials on site. The main air pollutants related to all mining activities, as reported under E-PRTR activities 3a and 3b, were carbon dioxide and methane, followed by carbon monoxide, nitrogen oxides, sulphur oxides, and particulate matter. Particulate Matter would have expected to be significantly higher, being one of the primary substances produced during mining activities[99, 100].

Based on E-PRTR data, the sector appears to lead to substantial emissions of PM_{10}, equivalent to 4.4% of total industrial emissions covered by the IED in 2019. A similar degree of significance is observed for NO_X and SO_x, with a potential contribution of around 0.85% to 1% depending on the year assessed (2017-2019). NH_3 and NMVOC are not significant, with a maximum contribution of 0.17% of total industrial emissions covered by the IED. An examination of UNECE CLRTAP reported data also emphasises the importance of extractive activities in relation to dust emissions, with emissions for non-coal extraction contributing around 4.5% of total dust emissions in the EU.

[98] Hamor, T., Vidal Legaz, B., Zampori, L., Eynard, U. and Pennington, D., A review of European Union legal provisions on the environmental impact assessment of non-energy minerals extraction projects, EUR 30743 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-38988-0, doi:10.2760/705726, JRC125111.

[99] Patra et al. (2016). Emissions and human health impact of particulate matter from surface mining operation—A review https://www.sciencedirect.com/science/article/abs/pii/S2352186416300153

[100] Hamor, T., Vidal Legaz, B., Zampori, L., Eynard, U. and Pennington, D. (2021), A review of European Union legal provisions on the environmental impact assessment of non-energy minerals extraction projects, JRC. https://publications.jrc.ec.europa.eu/repository/handle/JRC125111

It appears, therefore, that there is significant potential to reduce emissions of PM from this activity by integrating it into the IED. That said, the size of impacts will depend on the outcome of the BREF process.

Water quality and resources

This measure should provide **positive impacts on water quality and resources.** The integrated approach of the IED and the range of environmental issues that could be covered by a BREF and BAT conclusions would be expected to lead to tighter controls on activities potentially affecting surface water quality and the use of water in extraction and treatment processes.

In particular, the extraction and treatment of metallic and industrial minerals have the potential of emissions to water. Different extracted materials have different impacts on the water quality and the quantity used[101]. Different pollutants can enter the surface water depending on the extraction activity. For example:

- sulphidic rocks and treatment chemicals may lead to acidity or extreme alkalinity in water pH and to sulphur-bearing compounds;
- suspended particles and sediments can enter in circulation;
- explosives can lead to deposits of nitrites, nitrates and ammonium;
- rocks, local fertilizers and flotation reagents introduce inorganic and organic phosphate species
- potash extraction is responsible for chloride.

The JRC assessment of the relative impact of the extraction and treatment activities per mineral category on the environmental issues studied,[102] indicates that the strongest impacts across all mineral categories can be seen on structural and physical stability, emissions on soil and groundwater, and the discharge of suspended particles and metals in surface water. Addressing these risks is likely to have a weakly positive impact on water pollution.

Soil quality or resources

This measure should provide **weakly positive impacts** on soil quality. Land is also affected by extractive activities. Land use change practices have numerous consequences, including the loss of soil functions and of biodiversity. Incidents can have severe consequences on the land, by damaging the surface and threatening its physical stability and integrity. The subsoil quality is also negatively affected because of the oxidation of the organic material[103].

[101] Hamor, T., Vidal Legaz, B., Zampori, L., Eynard, U. and Pennington, D. (2021), A review of European Union legal provisions on the environmental impact assessment of non-energy minerals extraction projects, JRC. https://publications.jrc.ec.europa.eu/repository/handle/JRC125111

[102] Garbarino, E., Orveillon, G., Hamor, T., Saveyn, H.G.M., Eder, P., Collection of available techniques for the prevention or reduction of environmental impacts in non-energy extractive industries (NEEI), EUR 30827 EN, Publications Office of the European Union, Luxembourg, 2021, ISBN 978-92-76-41493-3, doi:10.2760/622092, JRC125247.

[103] Hamor, T., Vidal Legaz, B., Zampori, L., Eynard, U. and Pennington, D. (2021), A review of European Union legal provisions on the environmental impact assessment of non-energy minerals extraction projects, JRC. https://publications.jrc.ec.europa.eu/repository/handle/JRC125111

Mining activities can cause the habitat degradation whose scale depends on the features of the extraction site and may result in the habitat loss. Similarly, certain species can be subject to significance disturbance because of noise, dust, and pollution affecting their ability to bread, feed, or rest. Significant disturbance can lead to species migration, changes in species composition, and the colonisation from invasive species[104].

The penetration in the subsoil during the extractive activities impacts surface and groundwater, changing its baseline condition, as well as polluting it in the presence of chemicals. As a result, changes in water quality and its physical status, water volume and balance, and water ecosystems can occur. Mitigation and control measures could avoid these impacts.

Waste production, generation, and recycling

This measure should provide **limited impacts on waste production**. The extraction sector produces important volumes of waste material in the form of extractive residues and extractive waste. The first is described as the part of the co-excavated material which ends up unsold or unprocessed. While the second is defined by the extractive waste directive[105] as the extractive waste resulting from excavation of mineral resources, such as waste rocks and tailings. The amount of extractive residues generated during the whole extractive process depends on the extracted commodity, the extraction method and the site-specific local conditions. As a result, this can vary between one unit per unit of final product to several hundred thousand units per unit of product[106]. Requirements for the management of waste in the extractive sector are already set under the MWEI BREF[107]. Therefore, unless stricter BAT and/or BAT-AEPLs would be set under a new BREF, including the mining activities under the scope of the IED would not lead to significant improvements in terms of waste generation and recycling. As noted above, legal coherence between the EWD and the IED will need to be ensured.

Efficient use of resources

Unclear impacts. No means of assessing the efficient use of energy or water have been identified, however, regulation of the sector through the IED may further benefit resource efficiency, with resource efficiency featuring within the Sevilla Process.

Social impacts

This measure has **unclear social impacts**. Public health impacts would be spillover effects from the environmental benefits already captured within the previous sections of this

[104] Hamor, T., Vidal Legaz, B., Zampori, L., Eynard, U. and Pennington, D. (2021), A review of European Union legal provisions on the environmental impact assessment of non-energy minerals extraction projects, JRC. https://publications.jrc.ec.europa.eu/repository/handle/JRC125111

[105] Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02006L0021-20090807

[106] JRC (2018). Best available techniques (BAT) reference document for the management of waste from extractive industries. https://op.europa.eu/en/publication-detail/-/publication/74b27c3c-0289-11e9-adde-01aa75ed71a1/language-en

[107] JRC (2018) Best Available Techniques (BAT) Reference Document for the Management of Waste from Extractive Industries in accordance with Directive 2006/21/EC https://eippcb.jrc.ec.europa.eu/sites/default/files/inline-files/jrc109657_mwei_bref_-_for_pubsy_online.pdf

assessment. Furthermore, this measure will incur costs towards business and operators. If these costs cannot be passed on within the price of produce, these costs will impact upon profitability and could therefore impact upon employment. There is limited evidence available to quantify these impacts, but they are expected to be negative.

Measure 42: Include aquaculture within the scope of the IED

Description of the measure and requirements for implementation

The measure seeks to include aquaculture (E-PRTR Annex I activity 7b) within the scope of Annex I of the IED. This, in turn, will require aquaculture installations to comply with the general regulatory framework set out by the IED, such as the provisions regarding permits or inspections, detailed in Chapter II of the IED.

Objectives:

The following objectives apply:

- Levelling the playing field for installations across the EU.
- Improving the environmental effectiveness of the IED, via the extension of coverage of the IED in Annex I.

Implementation need(s):

The Commission will need to further define the definition of an aquaculture installation and capacity threshold to be included in Annex I.

- Currently, the E-PRTR uses the following threshold and activity definitions: 7(b) – 'Intensive aquaculture', 'with a production capacity of 1 000 tonnes of fish or shellfish per year' (EC, 2006).

An option in the implementation of this measure is to adopt the E-PRTR definition in the Annex I of the IED, aligning the IED with the E-PRTR. However, the IED and the E-PRTR are associated with different levels of regulation. The IED subjects installations to a regulatory framework, whereas the E-PRTR is predominantly to collate environmental data. Therefore, it is not clear whether adopting the E-PRTR definition is appropriate when considering the system of regulation required under the IED. The capacity threshold, therefore, remains an evidence gap. Other options pertain to interviews or other means of determining an appropriate capacity threshold. There may be a basis in which a separate threshold for shellfish and fish is necessary, given the different environmental pressures that apply, i.e., whether only certain aquaculture systems warrant regulation.

In addition, to further defining the scope and wording of the IED, the following actions will need to be taken to implement the measure:

- EU to amend the IED to bring aquaculture activities inside the scope of the IED, primarily by including aquaculture in Annex I.
- EU to broaden the IRPP BREF to include aquaculture, and to produce BAT Conclusions for aquaculture installations.

- Aquaculture operators to engage in the BREF process and take steps to ensure that BAT Conclusions are met.
- EU/ Public institutions to establish a common reporting system that encompasses the aquaculture industry via channels such as the EEA EU Registry and other piscatorial-/ agricultural-related databases.
- Member States to monitor aquaculture operators to ensure compliance with IED.

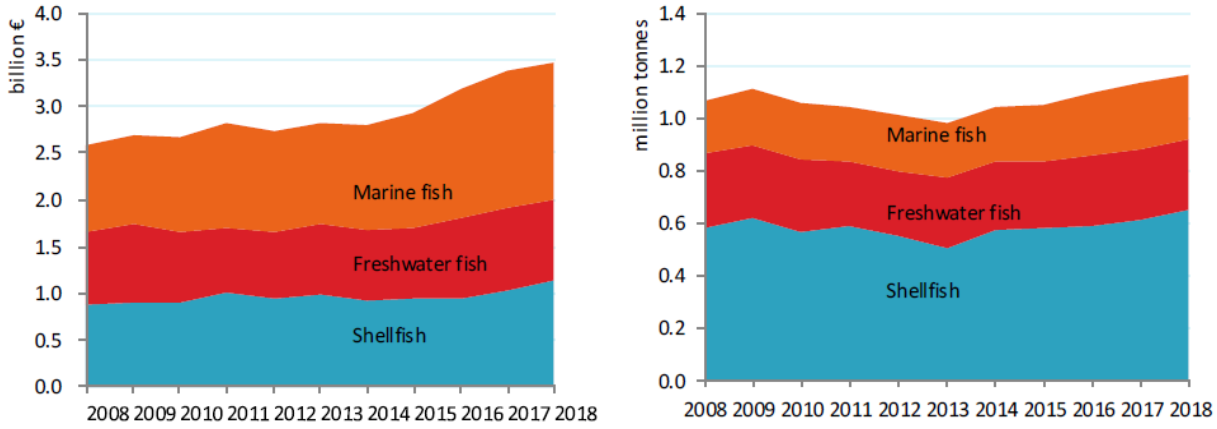
Further consideration of scope and baseline

The EU demand for fish is met by EU aquaculture (10%) and EU fisheries (30%),; the remaining 60% of wild and farmed fish consumed in the EU is imported from third countries (EC, 2016)[108]. In 2018, EU annual aquaculture production was 1.32 million tonnes[109], with a total value of €4.8 billion (EUMOFA, 2020). The EU represents 1.0% of the world aquaculture production in volume and 1.5% in value.

Between 2009 and 2018, gross annual production grew slightly (3%) while in real terms the value of this production grew significantly (36%) (EUMOFA, 2020), due to increased production of high value species and organic products as well as a rise in demand (EUMOFA, 2020).

The most important farmed species in the EU are mussels, oysters, salmon, trout, carp, seabass and seabream. Relatively small quantities of other species are also produced, for example turbot, Bluefin tuna, clams and catfish. The freshwater species (carp and trout) are reared in semi-intensive ponds and intensive recirculation systems, while marine finfish (salmon, seabass and seabream) are usually farmed in cages located in more protected inshore waters. In 2018, marine fishes, freshwater fishes and shellfish accounted for 21%, 23% and 56% of the EU production of aquaculture in terms of weight, respectively. In value terms, marine fishes, freshwater fishes and shellfish accounted for 42%, 25% and 33% of the production value (Figure A8-29).

Figure A8-29: Aquaculture production in the EU27, in value and weight, by subsector: 2008-2018.



Source: JRC, 2021 and FAO, 2021

[108] SWD(2016) 178 final

[109] Includes UK aquaculture produce

In 2018 there were about 15 000 EU companies involved in the aquaculture sector, employing 69 000 people and producing 1.2 million tonnes of produce in the same year (EC, 2021). In 2012, approximately 90% of aquaculture enterprises in the EU employed fewer than 10 people (FAO, 2015). In terms of sector forecasts, aquaculture sector and farmed fish production in the EU is set to remain stable with some estimating a slight increase. Using the number of installations which report to the E-PRTR as a proxy for the number of aquaculture installations which produce >1000 tonnes a year, there are 55-250 aquaculture installations in the EU. In 2018, 62 aquaculture installations (EU27) in operation, reported under the regime of the E-PRTR regulation.

According to the industry representative for FEAP, aquaculture production has stagnated. The value per tonne of fish produced has increased, however, gross output has fallen. The representative for FEAP argues strict environmental regulation has contributed to declining production rates. The representative for FEAP also noted that organic aquaculture, with the exception of salmon farming in Ireland, has been unsuccessful.

- According to the TSS, there are approximately 2 550 aquaculture installations. However, it is unclear whether the TSS respondents reported total aquaculture enterprises or only enterprises which produce >1000 tonnes a year. Therefore, this estimate does not appear to be reliable. Where respondents clarified whether their response referred to all enterprises in a Member State or only those which produce >1000t a year, the data has been used to inform this analysis.

- According to data collection and analysis conducted by Ricardo for the purposes of this Study, there may be around 12 000 aquaculture enterprises and/or aquaculture farm sites in the EU-27 (EC, 2019). Table A8-43 details the breakdown of the number of aquaculture enterprises in Member States. Unfortunately, Member State reporting does not always differentiate between enterprises and farms – an enterprise may represent several farms. This could explain the slightly lower total figure in comparison to EU analysis (EC, 2021), which suggests there are around 15 000 aquaculture farms in the EU.

Table A8-43: Output from aquaculture production for 2018 and 2019 and the number of aquaculture enterprises by Member State. Output data from EC (2019)**. Enterprise data from FAO (2015).**

Member State	Production output (tonnes in live weight)		Enterprises
	2018	**2019**	
EU27 Total (from 2020)	1 132 966	1 114 379	11 855
Austria	4 084	4 250	n/a
Belgium	111	86	n/a
Bulgaria	10 758	11 959	163
Croatia	19 680	20 444	174

Member State	Production output (tonnes in live weight)		Enterprises
Cyprus	7 347	8 079	10
Czech Republic	21 750	20 989	40
Denmark	32 167	40 221	127
Estonia	944	1 062	6
Finland	14 323	15 296	120
France	188 327	194 328	3 249
Germany	31 796	37 998	8
Greece	132 375	128 748	1 051
Hungary	17 900	17 315	279
Ireland	35 252	34 977	587
Italy	142 726	126 477	6
Latvia	828	626	n/a
Lithuania	3 450	3 775	n/a
Malta	19 291	13 823	n/a
Netherlands	53 004	45 750	115
Poland	36 806	39 731	840
Portugal	11 766	12 881	1 443
Romania	12 298		420
Slovakia	2 247	2 689	n/a
Slovenia	1 938	2 138	11
Spain	318 702	306 507	3 032
Sweden	13 094	11 600	174

- Using the data collected, it is possible to estimate the number of enterprises and/or farms, out of the ~11 000 identified, which align with the E-PRTR definition of aquaculture, that is, producing >1000 tonnes a year. According to the FAO, around 90% of aquaculture enterprises in Europe employ fewer than 10 people. Member State reports in the European Commission aquaculture report (2021) supports the FAO's findings. Based on quantitative and qualitative evidence from Member State reporting in the (2021) study, it is likely that between 1-2% of all aquaculture farms identified produce >1000 tonnes a year. This would mean that there are likely between 95 and 236 farms which produce >1000 tonnes a year across the EU-27. Complemented by a reported number of 55 installations in 2018, a range

between 55 and 250 aquaculture installations is proposed for the number that may covered by the IED if the E-PRTR definition is retained.

- There is a range of EU-level and national legislation focussed on mitigating the environmental impacts of aquaculture. This includes: the Water Framework Directive (WFD) (inland and coastal waters), the Marine Strategy Framework Directive (MSFD) (marine waters) and the 'SEA Directive'. The WFD and MSFD require all new aquaculture installations to apply for a permit to establish a farm. The permit includes a limit on production and emission limits for Nitrogen and Phosphorus, the main emissions from aquaculture installations. Emission limits are set at various distances in relation to the installation, such as, the sea floor, the immediate marine environment and downstream of the installation. According to a representative for the Federation of European Aquaculture Producers (FEAP), it takes 8 to 9 years to acquire a new permit. It is not clear how regularly permits are reviewed.

- Under the WFD and the Priority Substances or Environmental Quality Standards Directive, (EQSD), a variety of chemicals used in aquaculture practices – such as copper and zinc are already regulated. The WFD's objective for good chemical and ecological status is supported by other EU legislation, the Urban Waste Water Treatment Directive, the REACH legislation, the Biocidal Products Regulation, the Veterinary Medicines Directive, the Plant Protection Products Regulation and the Sustainable Use of Pesticides Directive, as well as the IED (EC, 2016). In addition, the Commission has set out new guidelines[110] seeking to help build an EU aquaculture sector that is competitive and resilient; ensures the supply of nutritious and healthy food; reduces the EU's dependency on seafood imports; creates economic opportunities and jobs; and, becomes a global reference for sustainability (EC, 2021). In order for the EU to reach these aims, the implementation of this measure could be essential for the better regulation of aquaculture facilities and fisheries.

Different approaches are used by Member States to issue permits to new facilities, conduct Environmental Impact Assessments and monitor environmental management within and across countries. In Germany, fish farms with a fish yield of more than >1000 tonnes per year are subject to an Environmental Impact Assessments. In France, aquaculture is covered under "Installations Classées pour la Protection de l'Environnement (ICPE)" classification 2130 (AIDA, 2021). The threshold here is 20 tonnes a year, in comparison to the E-PRTR threshold of >1000 tonnes a year. 180 installations are covered by ICPE authorisation in France. France does have installations above the E-PRTR threshold, such as Aquanord in Hauts-de-France, which produces 1 800 tonnes of finfish a year, or Acquadea in Corisca, which produces 1 000 tonnes of finfish a year. Additionally, French National MS authority MET stated in its response to Question 7 in the TSS that they would look to increase the current ICPE authorisation threshold from 20 to 100 tonnes a year in order to regulate fewer aquaculture installations.

Moreover,

[110] SWD(2021) 102 final

Table **A8-44** outlines the legislative framework for aquaculture for another three of the largest aquaculture-producing Member States, namely Italy, Spain and the Netherlands. The analysis demonstrates how aquaculture is affected by a wide range of regulation in Member States where the industry is well-established. The legislative frameworks examined are relatively similar, employing permits and Environmental Impact Assessments to control emissions. Aquaculture regulation is particularly well-established in the Netherlands, with different layers of regulation and harmonisation between regions. By contrast, there is a lack of harmonisation between different regions in other Member States, such as Spain or Italy.

Table A8-44: Illustration of legislative frameworks affecting aquaculture production in Italy, Spain and the Netherlands

Member State	Legal Area	Description
Italy	Basic Legislation	The National Fisheries and Aquaculture Plan for 2004 (Ministerial Decree of May 7th, 2004) sets out policy for competitiveness, associations and pooling, environmental sustainability, and products certification (FAO, 2021a).
	Guidelines	Reported in Commission Communication establishing a Strategy for the Sustainable Development of European Aquaculture (COM (2002) 511), registration in the scheme requires an organisation to adopt an environmental policy containing commitments to achieve continuous improvements in environmental performance and to comply with all relevant environmental legislation (FAO, 2021a).
	Water and Wastewater	Legislative Decree No.152 concerning the Protection of Waters against Pollution (1999, as amended in 2000) sets minimum environmental quality objectives for main waterbodies, and quality objectives for waterbodies intended for specific purposes, including fish and molluscs life, to be met by 2016 (FAO, 2021a). The legislation provides quality parameters and methods of analysis (FAO, 2021a).
	EIA	According to the Food and Agriculture Organisation, Italy lacks a systematic legislative framework for EIA (FAO, 2021a). Council Directive 85/337/EC, states that Member States decide whether aquaculture projects are subject to an EIA (FAO, 2021a). Italy has laws which provide for transitional procedural rules for the assessment of projects that are likely to significantly affect the environment (FAO, 2021a).
Spain	Code of conduct	Spain has established the following strategic priority for the development of aquaculture throughout period 2007–2013: "Establishment of methods or means of aquaculture exploitation that reduce adverse consequences or improve positive effects on the environment" (FAO, 2021b).
	EIA	The administrative procedure for the EIA in Spain varies among the Autonomous Communities (FAO, 2021b). An environmental impact assessment carried out by aquaculture producer should include the following information (FAO, 2021a): • General description of the project and foreseeable requirements in relation to the use of land and of other natural resources as

Member State	Legal Area	Description
		applicable • Analysis of technically feasible alternatives and justification of adopted solution • Assessment of the direct or indirect foreseeable effects of the project • Adoption of preventive and corrective measures; Environmental Monitoring Scheme • Summary of the study and its conclusions (FAO, 2021b).
	Authorisation System	The following administrative procedures are relevant to aquaculture (FAO, 2021b): • An application for occupation of the public zone • Identification of the applicant (person or company) • The works endorsed by a certified technician • A financial feasibility study • Scheme for the execution of the operation endorsed by a certified technician • Proof of payment of duties • The EIA and the sanitary requirements, as applicable.
Netherlands	Authorisation System	There are no specific authorisations required to engage in and set up an inland aquaculture farm (FAO, 2021c). Each business in the Netherlands must have a number of permits to be allowed to conduct its activities (FAO, 2021c). According to the Food and Agriculture Organisation (FAO), the Dutch system of permits, defined by various laws and controlled by different ministries, is elaborate and complex (FAO, 2021c). The permits mainly deal with environmental protection and are prescribed in different environmental laws (see below) (FAO, 2021c). In addition, the setting up of a farm should stroke with land use planning regulations (FAO, 2021c).
	EIA	The Environmental Management Act (1993, as amended) (Wet Milieubeheer) provides that certain business entities need an environmental protection act permit (EPA permit) (FAO, 2021c). These include entities engaged in aquaculture and entities engaged in the processing of fish and shellfish. The competent authority for these permits is the municipality (FAO, 2021c).
	Water and Wastewater	According to the Surface Waters Pollution Act (2002) every discharge of wastewater into a surface water (and in some listed cases into municipal sewers) requires a permit from the competent authority. All dischargers are liable to pay a pollution levy (FAO, 2021c).
	Aquaculture Investment	Priority is given to projects which boost employment including support for small enterprises and also for the processing and marketing of fisheries and aquaculture products (FAO, 2021c).

Finally, the new strategic guidelines for EU aquaculture set out the vision and an operational path to transform the industry[111]. They outline best practice actions that would ensure good environmental performance and encourage circular practices in aquaculture, for instance through environmental monitoring of sites and waste management. The action plan for the development of the organic food sector contains a number of initiatives specifically aimed at boosting organic aquaculture production in the EU (EC, 2021).

Outside the EU, nations have varying levels of regulation over aquaculture. Table A8-45 outlines the legislative frameworks for China and Vietnam. Vietnamese regulations for aquaculture have a strong legal baseline, definition, and authorisation system. Further, Vietnam has an integrated environmental management approach where regulatory powers are decentralised to below state-level, and environmental regulations in Vietnam are thus often seen as inclusive and effective. It should be noted that the farming of different species in Vietnam has seen varying extents of success; while shrimp farming is well regulated and maintains good standards of environmental protection, *pangasius* aquaculture has relatively poorer standards due to certification issues and high production costs (UNEP, 2016). In comparison, China – despite being the world's largest contributor towards aquaculture production – has relatively poor regulations for aquaculture. There is no legal definition for the sector, and there is no EIA process that specifically applies to aquaculture. China's environmental framework is often poorly enforced due to its macro-scalar nature, poor environmental legislative structure and ineffective policy enforcement at the provincial and municipal levels. Consequently, even where there are some regulations that cover aquaculture and environmental protection for the sector, their implementation is questionable.

Table A8-45: Legislation regulating the environmental impacts of aquaculture in Vietnam and China

Nation	Legal Area	Description
Vietnam	Basic Legislation	The basic legislation applicable to aquaculture is the Fisheries Law of 2003 (FAO, 2021d). Chapter IV is dedicated to the regulation of aquaculture, with 14 Articles that establish a master plan, rights and obligations for those practicing aquaculture, allocation and lease of land and area, feed and control of decease among others (FAO, 2021d). In addition, other legislation that has implications for aquaculture include: the Law on Land, the Law on Water Resources and the Law on Environment Protection (FAO, 2021d). There also exists secondary legislation, mainly decrees, adopted on the basis of these laws. The Ministry of Natural Resources and Environment (MONRE) and the Ministry of Agriculture and Rural Development (MARD) serve as the competent national authorities responsible for all related matters (FAO, 2021d).

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Nation	Legal Area	Description
	Legal Definition	There is no legal definition of the practice of aquaculture in the Fisheries Law (FAO, 2021d). However, Article 2 of that Law defines "aquaculture land", which includes land with inland water surface; coastal and riverine alluvial land, coastal sandy beaches; land used for farming economy purposes, non-agricultural land with water surface allocated and leased for aquaculture purposes, and "marine areas for aquaculture", which includes sea areas that are planned for aquaculture purposes (FAO, 2021d).
	Authorisation System	Chapter IV on Aquaculture in the Fisheries Law outlines the provisions for the access to land and marine areas for aquaculture purposes (FAO, 2021d). The basis for access and development decisions made by the ministry of fisheries is found in the master plan on aquaculture development, as established by Article 23 of the Law (FAO, 2021d).
	EIA Process	The Fisheries Law Chapter on Aquaculture establishes the general principle that individuals and organizations engaged in aquaculture activities must comply with the regulations relating to environmental protection (FAO, 2021d). There are two parts to the EIA process (FAO, 2021d): 1. The strategic environmental assessment, an analysis and forecast of the environmental impacts of a project are undertaken 2. The EIA reports are appraised by local government.
China	Basic Legislation	The Fisheries Law (1986, amended 2000) enhances the production, increase, development and reasonable utilization of the nation's fishery resources (FAO, 2021e). The law requires the state to adopt a policy that calls for simultaneous development of aquaculture, fishing and processing, with special emphasis on aquaculture (FAO, 2021e).
	Legal Definition	There is no legal definition of aquaculture in Chinese law.
	Authorisation System	According to the Fisheries Law and its implementing Regulation (1987), the government at or above the county level may grant licenses to state and collectively owned units to use state-owned water surfaces and tidal flats for aquaculture purposes. Natural spawning, breeding and feeding grounds of fish, shrimp, crab, shellfish and algae in state owned water surfaces and tidal flats as well as their major migration passages must be protected and cannot be used as aquaculture grounds (FAO, 2021e). Licences can be revoked if water surfaces and tidal flats are neglected for a period of 12 months without a proper reason (FAO, 2021e). The use of state-owned and collectively owned land is regulated under the Land Administration Law (1998) (FAO, 2021e). Units or individuals who wish to use designated aquaculture areas must apply for an aquaculture permit through the competent fisheries

Nation	Legal Area	Description
		administration at or above the county level, and the aquaculture permit will be granted by the government at the same level to allow using the area for aquaculture activities (FAO, 2021e).
	EIA	Provisions on EIA requirements can be found in various environmental laws. None of the laws refer specifically to aquaculture. The main body of China's environmental legislative framework is the Environmental Protection Law (1989). The State Environmental Protection Administration (SEPA), (ministerial status, under State Council) plays the lead role in overall environmental management. The environmental impact statement of construction projects – including large-scale aquaculture projects – should contain an assessment regarding the water pollution hazards the projects are likely to produce, including their impact on the ecosystem, and a description of measures for prevention and control. There is no mention of smaller-scale projects (FAO, 2021e).

Assessing impacts

Economic impacts

The analysis indicates the measure is likely to have **weakly negative** economic impacts additional to the baseline, which may already be burdensome for industry. The number of installations which would be subject to IED regulation (if the E-PRTR threshold and definition is used) would be very small. Therefore, there are limited overall economic impacts related to administrative burden. Consequently, implementing the measure would be unlikely to lead to large increases in operating and capital expenditure costs. Economic spill over effects from positive environmental impacts, such as positive effects on reducing sickness, healthcare costs and improving productivity, are captured within the environmental impacts section.

Administrative burden on businesses

The measure would likely lead to **weakly negative impacts** on the administrative burden on businesses. The analysis conducted by Ricardo estimates there are between 55 and 250 aquaculture installations which produce >1000t a year. The resources required for the permitting process and administrative activities required under the IED may range from €0.2 million to €7.1 million of additional administrative costs each year, with a central estimate of €1.8m/year, primarily depending on the number of installations potentially covered by the IED and the type of permitting framework that would be introduced. These estimates are based on adjusted assumptions from the 2007 IED IA and additional analysis carried out for this Study.

There will be costs to industry of the development of a BREF. The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). After apportioning the fraction of this cost for businesses, and annualising over a

period of 20 years assuming two BREFs in this period, the annualised cost of the BREF process for businesses would be expected to range from €0.1m/year to €0.7m/year, with a central estimate of €0.2m/year.

These ballpark estimates would, therefore, suggest, once again, that administrative burden from the proposed legislative change would not necessarily affect the sector in a significant way (based on the assumption that this affects 1-2% of aquaculture installations), although these marginal increase in burden would be additional to already burdensome legislative frameworks across EU Member States.

Industry stakeholders participating in the TSS suggested that their administrative costs may increase as a result of including aquaculture in the IED, as estimated. Moreover, Member State stakeholders from France's Ministry of Ecological Transition stated that they would expect **little to no impact** on administrative burden of business from the implementation of this measure. That said, anecdotal evidence suggests that France's legislative framework may already include burdensome requirements, including impact studies, waste control and monitoring.

Operating costs and conduct of business

The measure's impacts on operating costs and conduct of business in the aquaculture sector are **unclear**. The magnitude of these costs would be primarily dependent upon the BREF process. There is uncertainty as to what would be considered BAT, for each process and type of aquaculture system. There is variation between the types of processes and species farmed in aquaculture, which creates uncertainty when calculating the abatement costs. Aquaculture can take place in saltwater, freshwater and artificial environment. Aquaculture farms can be divided between open and closed systems. In open aquaculture systems, emissions are released directly into the natural environment. Closed aquaculture systems recycle water used, removing harmful emissions before they are discharged or reused. Many different species are farmed in aquaculture. According to FEAP, different species have varying environmental impacts and require varying technologies and approaches. Such uncertainty means that substantive compliance costs resulting from aquaculture's inclusion within the IED cannot be readily determined.

According to a representative from FEAP, the available abatement techniques in the aquaculture industry are the type of feed, the methods of feeding and the location of the ponds. The main source of pollution from aquaculture are emissions of Nitrogen and Phosphorus. Nitrogen and Phosphorus emissions originate from uneaten feed and fish faeces which are released in high concentrations into the surrounding environment. High quality feed can be used to reduce; the amount fish need to be fed, and the food's ability to leach into the natural environment. Suitable feeding patterns and processes can also reduce the amount of feed which is required. According to FEAP, the location of pens is the most significant determinant for a farm's environmental impact. Deep water and strong currents distribute emissions of Nitrogen and Phosphorus, allowing the nutrients to be recycled into the natural environment without causing eutrophication. Pens located in shallow water with no current will cause a higher build-up of Nitrogen and Phosphorus emissions than a farm located in deep water with a strong current.

According to the representative for FEAP, high quality feed is used consistently across producers. The FEAP representative could not comment on the costs of feed, or the costs of different feed distribution processes and technologies. Moving pens to locations where there is sufficient flow and depth of water would be highly disruptive to farms.

The representative for FEAP believed there were nascent technologies being trialled in Danish Fjords which trapped uneaten food and faeces. According to FEAP these technologies are not well-developed.

Analysis in the environmental impacts section of this measure suggests that aquaculture installations are potentially responsible for a considerable proportion of industrial releases to water of Nitrogen and Phosphorus (c. 3-5% of total industry releases, based on E-PRTR data). Therefore, a consequence of including aquaculture in the scope of the IED could be to improve environmental performance by investing and/or adjusting their operations to reduce Nitrogen and Phosphorus emissions to water.

Overall, therefore, this evidence could suggest that implementing the measure would be unlikely to lead to large increases in operating and capital expenditure by businesses, but this remains very uncertain.

Competitiveness and level playing field

Inclusion of aquaculture within the Annex I of the IED imposes a singular set of requirements towards installations and operators. It therefore offers the **potential to level the playing field** by providing minimum criteria for all Member States through BAT Conclusions. This would be supported by findings from the recent IED evaluation, where 69% of the industry stakeholder surveyed agreed or strongly agreed that 'the IED has contributed to achieving a level playing field in the EU for IED sectors by aligning environmental performance requirements for industrial installations." This is likely to continue to be the case under new sectors adopted, including for aquaculture, as in the case of this measure.

In the position paper submitted by the European Environmental Bureau, the E-NGO state a number of arguments in favour of including aquaculture in the scope IED based on improving harmonisation across Member States. The position paper argues that including aquaculture in the IED could help to define common standards for limits on emissions associated with marine and land-based aquaculture (e.g., use of antibiotics, use of chemicals and pesticides, escapees, water quality); lead to an integrated EU aquaculture license, easier to control and monitor with a centralised database and, Support the delivery of the Farm to Fork Strategy's goals in relation to aquaculture (which include a significant increase in organic aquaculture).

Position of SMEs

Limited analysis is available from data sources such as Eurostat on the nature of SMEs within the aquaculture industry. A 2020 EU call for economic data (JRC, 2021), however, identifies that, in 2017 and 2018, around 80% of all aquaculture enterprises are 'micro-enterprises' comprising of fewer than 10 employees, and are often 'family-owned', though use extensive production methods and systems. Further analysis of the data collated as part of the JRC 2021 survey of aquaculture in the EU further delineates by employment size class, with 80% of enterprises have less than 5 employees within the EU27, out of the survey sample (20 012 out

of the 25 164 enterprises surveyed in 2018). This underlines that the industry consists primarily of small enterprises, requiring consideration within the measure's design. If the measure were to use the E-PRTR's definition of an aquaculture installation (>1 000t a year production), this would exclude smaller aquaculture enterprises and, therefore, it would be **unlikely to affect the position of SMEs**.

Industry stakeholder FEAP stated in the TSS that aquaculture production is already subject to strict environmental permits, and further requirements will not provide extra benefits for the protection of the environment but will be an **extra burden for enterprises, including SMEs if applicable**, which comprise the industry.

Innovation and research

This measure may have a **weakly positive impact** on research and development. Provisions within the IED, such as Article 27 on emerging techniques, allow for research and development within the context of BAT. Each BREF includes a chapter on emerging techniques, which acts as an indication of future techniques that could in the future (i.e., 'if commercially developed') be considered as BAT. This pathway encourages the continual focus on further reducing the environmental impacts of industrial activities or innovating in ways to save costs when compared to existing BAT. If this measure was adopted, aquaculture would be subject to the BREF process, which will include the consideration of novel and emerging techniques.

Public authority impacts

This measure may have a **weakly negative impact** on public authorities. Member State competent authorities would be charged with implementing the IED nationally or sub-nationally, which will mean that they would have a greater number of installations under this measure. This will come with additional costs from a range of provisions within the IED, such as inspections under Article 23, or the facilitation of access to information requirements under Article 24. Based on current assumptions of enterprises that would be affected, the implementation of this measure will incur between €0.3 and €4.7 million per year of additional administrative burdens each year over a 20-year period, with a central estimate of €1.5m/year.

There will be the costs to the Commission of the development of a BREF. The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). After apportioning the fraction of this cost for public authorities, and annualising over a period of 20 years assuming two BREFs in this period, the annualised cost of the BREF process for public authorities would be expected to range from €0.3m/year to €1.4m/year, with a central estimate of €0.5m/year.

Environmental impacts

Aquaculture is a very diverse industry, and environmental impacts cannot be generalised across the sector (EC, 2015). Impacts vary with species, farming methods and management techniques, precise location and local environmental conditions and wildlife. An overview of the main aquaculture systems used in the EU is provided below (CEFAS, 2014).

Table A8-46: Aquaculture systems used in the EU

Cultivation system	Environment	Species group cultured
Net-pen systems	Freshwater & marine	Finfish
Flow-through land-based systems	Freshwater & marine	Finfish
Land-based recirculation systems	Freshwater & marine	Finfish (crustaceans)
Extensive and static water earth ponds	Freshwater	Finfish (crustaceans)
Lagoon & valliculture	Marine	Finfish
Rafts and longlines	Marine	Bivalves
Intertidal shellfish culture	Marine	Bivalves
Sub-littoral bottom shellfish culture	Marine	Bivalves

Source: CEFAS, 2014.

The research conducted for this measure indicates that aquaculture **may not contribute significantly to the emissions of pollutants regulated by the IED**, other than releases of nutrients. The main environmental issue caused by aquaculture which falls within the scope of the IED is nutrient loading, caused by excessive release of Nitrogen and Phosphorus into the natural environment (IEEP, 2006). Nitrogen and Phosphorus releases lead to eutrophication, ammonia foundation and formed solids. Aquaculture also contributes to environmental issues that may be regulated by other frameworks, issues such as, climate change, salinisation, nutrient pollution, pharmaceuticals contributing to antibiotic resistance, damaging wild fish populations by reducing genetic diversity, introduction of invasive species, and, finally, diseases. Resource efficiency, such as, using wild fish as feed for aquaculture and use of potable water are issues that could be addressed by BAT-AEPLs, especially if their legal status is strengthened through the revision of the IED.

Proponents of freshwater aquaculture argue that good practices lead to ecosystem benefits, ecosystem services and cultural values, including, water management, biodiversity, landscape management, education, and regional identities (EUMOFA, 2021). When best practices are used, freshwater aquaculture can contribute to control of water quality and biodiversity conservation. Currently, some freshwater fish farmers adopt voluntary Codes of Best Practice to maintain or improve environmental standards (EUMOFA, 2021).

Different techniques and processes in aquaculture have varying environmental impacts. For example, Recirculating Aquaculture System (RAS), which has seen a 25% increase in production volume between 2009 and 2018, allows more efficient control of inputs and effluents, as well as a reduction in water consumption (EUMOFA, 2021). However, the simulation of a marine or freshwater environment required in RAS facilities is energy and water intensive. Multifunctional pond farming is where pond farming is associated with other activities, such as ecosystem and tourist services (EUMOFA, 2021). There has been particular focus in this area in Central and Eastern Europe, where pond fish farming plays an important role in food supply and rural development. This approach makes farmers more economically resilient and places greater emphasis on preservation and improvement of the surrounding natural environment. As environmental regulations get stricter, the future points

to less production from traditional farms and more from model farms and RAS. The Danish model farms show that a transition of the sector is possible while keeping up with the environmental regulations and bureaucracy. The strategy of partial RAS farms in show that increased production can be achieved without increasing the environmental impact (EUMOFA, 2020b).

The Marine Strategy Framework Directive (MSFD) regulates the introduction of non-indigenous species (NIS), nutrients, organic matter, contaminants including pesticides and litter, the disturbance to wildlife, and the possibility for escape of farmed fish (EC, 2016). The role of the MSFD is becoming increasingly important to ensure that aquaculture activities provide long-term environmental sustainability. The table below outlines the potential interactions between aquaculture and the environment based on MSFD descriptors derived from impact statements from various Member States. Noticeably, all but one descriptors are categorised as having a small degree of interaction, with non-indigenous species having a large degree of interaction between aquaculture farms and the environment. This emphasises the range of potential environmental impacts posed by aquaculture farming. Out of this selection, the IED only regulates eutrophication, which mainly applies to Member States around the Baltic Sea and inland aquaculture farms.

Table A8-47: The potential interactions between aquaculture and the environment. Adapted from EC (2016)

Descriptor	Degree of interaction	Evidence and mitigation
1. Biodiversity	Small	If unmanaged, escapees, diseases and parasites may have localised effects on biodiversity. These should be addressed through the implementation of the EIA, SEA and Habitats Directives. Siting is a critical factor in reducing the potential impacts on biodiversity.
2. Non-indigenous species	Large	Aquaculture provides a potential route for introduction of NIS; introduction of alien species in aquaculture is regulated by Regulation 708/2007 requiring a specific authorisation for any introduction of alien species.
3. Commercial fish & shellfish	Small	If unmanaged escapees (gene flow), diseases and parasites may have localised effects on wild commercial fish and shellfish.
4. Foodwebs	Small	If unmanaged escapees (gene flow), diseases and parasites may have localised effects on foodwebs. Siting is a critical factor in reducing the potential impacts on foodwebs.
5. Eutrophication	Small	Some impact at local scale, but generally unlikely to occur at sufficient scale at present to have significant impact except in enclosed seas like the Baltic that already have significant nutrient inputs. In such cases, Member States may consider the application of nutrient-neutral schemes or other approaches that remove nutrients from the sea.
6. Sea-floor integrity	Small	Some impact at local scale due to siltation or scour, but unlikely to occur at sufficient scale at present to have significant impact. This can be mitigated

Descriptor	Degree of interaction	Evidence and mitigation
		by moving cages, by fallowing areas or by relocation to more energetic sea areas (areas with a greater circulation.
7. Hydrographical conditions	Small	Some impact at local scale due to formation of small scale features including eddies, but unlikely to occur at sufficient scale at present to have significant impact unless large scale facilities.
8. Contaminants	Small	Some impact at local scale due to contamination by hazardous substances and microbial pathogens, but unlikely to occur at sufficient scale at present to have significant impact. Mitigation comes from the regulatory limits set within food safety legislation. However, these regulatory limits, which are set to protect the health of consumers, are not specifically designed to protect the environment. Therefore, additional action may be necessary to ensure adequate environmental protection.
9. Fish & seafood contaminants	Small	Impacts are assessed using regulatory limits set within food safety legislation.
10. Marine litter	Small	Aquaculture may be a source of marine litter alongside urban discharges and fisheries.
11. Underwater energy (e.g. noise)	Small	Some impact at local scale close to cages, but unlikely to occur at sufficient scale at present to have significant impact. Little information available on potential mitigation.

In the position papers from E-NGOs, ClientEarth and the EEB highlight that environmental challenges associated with aquaculture which are not regulated under the IED. This includes escapes of non-native species into the environment impacts on marine and freshwater ecosystems.

ClientEarth also argue including aquaculture within the scope of the IED would support, more consistent environmental regulation of the aquaculture sector. In ClientEarth's response to Question 2A of the Targeted Stakeholder Survey, the E-NGO highlight that Regulation 1380/2013 of the Common Fisheries Policy aims to boost the development of aquaculture by having all Member States draw up multi-annual national strategic plans aimed at facilitating the sustainable development of aquaculture. However, they stated that there is no single EU aquaculture license and aquaculture permit systems are developed at the Member State level. Consequently, there are different regulatory regimes from one MS to another and therefore different levels of implementation for the same sector.

On the other hand, Fertilizers Europe commented in the TSS that aquaculture should be excluded from the revised IED scope, because there are already national and EU level legislation that focus on reducing harmful environmental impacts of these sectors and efforts should be made to avoid multiple regulations. Similarly, the aquaculture business association Federation of European Aquaculture Producers (FEAP) stated in the TSS that aquaculture production is already subject to strict environmental permits.

Further, stakeholders responding to the TSS had mixed views about the contribution of aquaculture to environmental pollution and/or emissions to air, water, soil and GHG emissions, energy use, resources and materials use, waste generation, and water use. E-NGOs noted high significance for all environmental pressures. Industry stakeholders noted a moderate significance for all pressures. Local and regional MS authority stakeholders stated a varying significance for environmental pressures with higher significance for emissions to water, energy use, materials and resource use, and waste generation.

Climate

The measure is likely to have **limited to no impact** on aquaculture's greenhouse gas emissions. If GHG were included in the scope of the IED, the measure may have some weakly positive impacts on emissions, although these are not expected to be significant. The latest available E-PRTR data indicates no emissions of CH_4, CO_2 or N_2O from activity 7b, on aquaculture. It is thought, therefore, that the aquaculture has no, or a limited, direct impact to GHG emissions.

Aquaculture may contribute to climate change indirectly. A life-cycle analysis of Asian aquaculture plants highlights that aquaculture feed production requires energy to grind and mix the raw materials, make the pellets and dry them (FAO, 2017).

In response to the TSS, the EEB stated that emissions of GHG arise during production of raw materials used for feed for the fish (for example, energy used by vessels that capture fish to produce fishmeal, and NOx emissions arising from crop cultivation), and during their subsequent processing and transportation.

In response to the TSS, Danish Industry stakeholder European Fishmeal (EFFOP) stated that CO_2 and SO_2 emissions depend on the species in fisheries. Salmon and mollusc rank lower than beef, chicken and pork on both CO_2-eq, whereas catfish rank higher on CO2-eq and roughly on par regarding CO_2-eq in comparison to beef (Hilborn, Banobi, Hall, Puclyowski, & Walsworth, 2018).

E-NGO stakeholder ClientEarth also stated in the TSS that when it comes to aquaculture the upstream supply chain (specifically the production of feed ingredients) can have a considerable emissions footprint and many sectors of the aquaculture industry rely heavily on soy, palm and other intensively grown crops with well-documented environmental impacts.

Air quality

This measure is likely to have **limited to weakly positive** impacts on air quality. The latest available E-PRTR data indicates emissions of ammonia, NH_3, but no other relevant emissions to air. Data for activity 7b on aquaculture, from the E-PRTR indicates that the addition of aquaculture would be equivalent to adding 0.01-0.02% to the total industry emissions of NH_3 within baseline scope of the IED.

Water quality and resources

This measure is likely to have **weakly positive** impact on water quality and resources. The latest available E-PRTR data indicates no releases to water of heavy metals, only data pertaining to nitrogen and phosphorus releases is reported. These data indicate that the

addition of aquaculture to the scope of the IED's Annex 1 included sectors could be equivalent to adding approximately 3% of total industry releases of nitrogen and approximately 5% of total industry releases of phosphorus for the industry sectors reporting under the E-PRTR, (data from 2018).

A study by CEFAS (CEFAS, 2014) suggests that these releases could lead to changes in water chemistry, leading to eutrophication within water bodies. By weight, the majority of aquaculture production is accounted for by shellfish, totalling 56% in 2018. However, these cultivation systems are likely less to be directly associated with effluent discharge into surrounding water bodies when compared to finfish cultivation (e.g. trout), even though this is the smaller activity by weight. Shellfish, according to the 2014 CEFAS study, may have many positive benefits to the surrounding aquatic ecosystem, such as the maintenance of nutrients. There exists, therefore, examples of certain co-cultivation aquaculture systems, such as finfish and shellfish or algae systems being located together to help manage the balance of excess nutrients[112], known as integrated multi-trophic aquaculture (IMTA). In terms of environmental impact, it would appear plausible that the releases of nitrogen and phosphorus, cited above, would originate primarily from finfish systems. Table A8-48 shows the quantity of pollutants released from aquaculture installations in the EU. The variation between the types of permit conditions makes it challenging to compare emissions between installations.

Table A8-48: Permits for aquaculture installations

MS	Farm/ Company name	Species	Annual limits on N	Annual limits on P	Annual production limits	Annual feed limits	Year
FR	Aquanord (GEORISQUES, 2008)	Sea bass & sea Bream	280 tonnes	10.7 tonnes	1,800 tonnes		2008
NO	Fredrikstad Seafoods AS (Norskeutslipp, 2019)	Salmon	72 tonnes	0.85 tonnes	800 tonnes		2019
NO	Aqua Gen AS (Fylkesmannen, 2018)	Rainbow trout, salmon and trout	216 tonnes	7 tonnes		300 tonnes	2018
NO	Profunda AS (Fylkesmannen, 2017)	Rainbow trout, salmon and trout	3.9 tonnes per 100 tonnes of feed	0.4 tonnes per 100 tonnes of feed		100 tonnes	2017
NO	Bjølve Bruk AS (Fylkesmannen,	Juvenile salmon & aura	35 tonnes per 100 tonnes of	4 tonnes per 100 tonnes of feed	788 tonnes	945 tonnes	2014

[112] European Commission (2015), FUTURE BRIEF: Sustainable Aquaculture, available at: https://ec.europa.eu/environment/integration/research/newsalert/pdf/sustainable_aquaculture_FB11_en.pdf

MS	Farm/ Company name	Species	Annual limits on N	Annual limits on P	Annual production limits	Annual feed limits	Year
	2014)		feed				
NO	Fishbase Group AS (Fylkesmannen, 2020)	Salmon, roe rainbow trout, gilthead seabream	45 tonnes	5 tonnes	<2,000 tonnes	<2,000 tonnes	2020
NO	Lerøy Vest AS (Fylkesmannen, 2020)	Juvenile salmon & aura	32 tonnes	3.3 tonnes	1,100 tonnes	1,100 tonnes	2020
NO	Havlandet Havbruk AS (Fylkesmannen)	Salmon	12 tonnes	0.27 tonnes	200 tonnes		2017
NO	Eidesvik Settefisk AS (Fylkesmannen, 2018)	Juvenile salmon & rainbow trout	66 tonnes	8 tonnes	<3,000 tonnes		2018
NO	Salmo Terra AS (RAS) (Fykesmannen, 2018)	Salmon & aura	175 tonnes	21 tonnes	<8,000 tonnes		2018
NO	Havlandet Havbruk AS (Fylkesmannen, 2019)	Salmon & aura	288 tonnes	12 tonnes	<10,000 tonnes	11,250 tonnes	2019

Heavy metal compounds copper and zinc are also released from aquaculture. Elevated levels of copper adversely affect fish and other aquatic life. For instance, it has found to reduce growth and reproduction levels in clams (Munari & Mistri, 2007[113]), damage gills of fish (Mochida et al., 2006[114]) and inhibit phytoplankton growth (Cid et al., 1995[115]; Franklin, Stauber & Lim, 2001[116]). Additionally, a 2007 study of a Scottish salmon farm found copper in sediment up to 300 meters away from the cages.[117] The highest concentration detected, 805 micrograms of copper per gram of sediment (µg g−1), was well above Scottish regulatory

[113] Munari, C. & Mistri, M. (2007) Effect of copper on the scope for growth of clams (*Tapes philippinarum*) from a farming area in the Northern Adriatic Sea. *Marine Environmental Research* 64 (3): 347–357.

[114] Mochida, K., Ito, K., Harino, H., Kakuno, A. & Fujii, K. (2006) Acute toxicity of pyrithione antifouling biocides and joint toxicity with copper to red sea bream (*Pagrus major*) and toy shrimp (*Heptacarpus futiliros- tris*). *Environmental Toxicology and Chemistry* 25 (11): 3058–3064.

[115] Cid, A., Herrero, C., Torres, E. & Abalde, J. (1995) Copper toxicity on the marine microalga *Phaeodactylum tricornutum*: effects on photosynthesis and related parameters. *Aquatic Toxicology* 31 (2): 165–174.

[116] Franklin, N.M., Stauber, J.L. & Lim, R.P. (2001) Development of flow cytometry-based algal bioassays for assessing toxicity of copper in natural waters. *Environ- mental Toxicology and Chemistry* 20 (1): 160–170.

[117] Dean, R.J., Shimmield, T.M. & Black, K.D. (2007) Copper, zinc and cadmium in marine cage fish farm sediments: an extensive survey. *Environmental Pollution* 145 (1): 84–95.

limits of 270 µg g−1 and indicates adverse benthic effects (EC, 2015). High levels of zinc can result in some fish accumulating zinc in their bodies, when they live in zinc-contaminated waterways.[118] When zinc enters the bodies of these fish, it bio-magnifies up the food chain. Both zinc and copper are covered as emissions in the IED. However, there are a range of other chemical discharges which are not covered by the IED, outlined in Table A8-49. Alongside the WFD, MSFD, and EQS Directive and a range of other regulations, the release of chemicals from aquaculture operations is typically tightly regulated nationally, with most Member States specifying what chemicals can be used as part of aquaculture operations and their maximum permitted discharge levels, irrespective of whether they are considered as river basin specific pollutants under the WFD.

Table A8-49: A list of chemicals used in aquaculture operations and their uses. Adapted from EC (2016).

Chemical	Aquaculture uses	Covered by the IED?
Zinc	Feed supplement and anti-foulant	Yes
Copper	Antifouling	Yes
Diflubenzuron	Sea lice treatment	No
Cybutryne	Sea lice treatment	No
Formaldehyde	Antiparaciticide and antifungal treatment	No
Azamethiphos	Sea lice treatment	No
Cybutryne	Antifouling	No
EDTA	Improve water quality	No

Aquaculture has also been linked with depletion and salinization of potable water. Furethremore, aquaculture also relies on antifouling chemicals, abeit this would not necessarily be addressed by the IED. These chemicals can contaminate seafloor sediment around farms. For example, a study of a Scottish salmon farm found copper in sediment up to 300 metres away from the cages (EC, 2015). The highest concentration detected, 805 micrograms of copper per gram of sediment (µg/g), was well above Scottish regulatory limits of 270 µg/g and indicates adverse effects (EC, 2015).

Use of antibiotics in aquaculture has been flagged as a particular concern in open aquaculture where they enter the surrounding marine environment via fish faeces and can persist for long periods in sediment (EC, 2015). In Europe, they are typically administered via medicated feed, but only a percentage is absorbed by the fish. For instance, it is estimated that 60–73% of the antibiotic oxytetracycline administered to sea bass on Greek farms is released to the

[118] https://www.greenspec.co.uk/building-design/zinc-production-environmental-impact/

environment via the fishe faeces (EC, 2015). High concentrations of oxytetracycline and florfenicol, both active against furunculosis in salmon, inhibit growth of the wild alga *Tetraselmis chuii*, an important food source for other marine organisms. Such studies are largely limited to short-term laboratory studies and the concerns they raise highlight the need to further investigate the effects of 'real-world 'chronic, low-level exposure to antibiotics on wild species. While data on the environmental and human health effects of antibiotics used in aquaculture is limited, concerns raised by research so far would further support their prudent use, as in other veterinary and human medicine applications.

Aquaculture can have positive impacts on water quality. Species, such as, bivalves, seaweed and shellfish can return nutrient quantities in water to healthy levels. 50–60 tonnes of mussels per hectare in a eutrophic Danish fjord per year can extract 0.6–0.9 tonnes of nitrogen and 0.03–0.05 tonnes of phosphorus per hectare (EC, 2015).

In response to the TSS, the EEB added that aquaculture contributes to nutrient build-ups in the case of open water aquaculture (cages), which can lead to eutrophication and/or nitrification from non-consumed feed, faeces, dead fish. Furthermore, depending on feed material, pharmaceutical products, growth promoters, antibiotics, and anti-algae biocides can leach into the surrounding aquatic environment, impacting other species, causing localised pollution and leading to anti-microbial resistance.

In the TSS, ENGO European Environmental Bureau (EEB) stated that aquaculture contributed significantly to emissions to water, GHG emissions, waste generation, and contributed slightly to moderately to emissions to air, soil, and energy use in answer to Question 2A. The organisation commented that the implementation of this measure would significantly reduce emissions to water and soil, in answer to Question 2B in the TSS.

ClientEarth added in their response to the TSS that the simulation of a marine environment on land is energy and water intensive. Land-based operators may still require feed and antibiotics and include additional chemical water treatments. Waste water from recirculating systems is discharged back into the marine environment, which can create a steady stream of environmentally damaging outputs, polluting soils, rivers and the ocean.

Soil quality or resources

The effects that this measure is likely to have on soil quality and resources is **unclear**. Releases to land from aquaculture are expected minimal, even though some aquaculture systems may be found on land.

Waste production, generation, and recycling

This measure is likely to have **negligible positive impact** on waste production, generation, and recycling. Analysis of the E-PRTR 2017 dataset for activity 7b on aquaculture, suggest that this industry may be responsible for minimal volumes of waste, equivalent to 0.0001% of the E-PRTR total for the non-hazardous waste destined for disposal. No other waste or treatment types were reported.

The generation of waste features in the IED through provisions such as Article 11, which requires installations are operated within the principles of the waste hierarchy, as laid out in

the Waste Framework Directive (Directive 2008/98/EC). The IED, therefore, can be seen to actively contribute towards the management of waste and circular economy principles.

This preliminary analysis suggests aquaculture generates a relatively limited volume of waste and, therefore, inclusion under the scope of the IED is unlikely to lead to any significant improvements on waste. The effectiveness of the IED, in this regard, however, is dependent on the BREF Process.

Efficient use of resources

The project team has not identified evidence to assess the efficient use of energy or water in this industry. However, regulation of the sector through the IED may further benefit resource efficiency, with resource efficiency featuring within the BREF Process.

One resource efficiency concern specific to aquaculture relates to the use of wild-caught fish as feed in aquaculture. According to the EC's 2015 report, *Sustainable Aquaculture*, the amount of fish used in feed to produce one unit of output should be reduced by at least 50% from current levels for aquaculture to be sustainable in 2050 (EC, 2015).

The EEB's position paper highlights that feed ingredients can also be heavily reliant on wild-caught fish. The paper highlights release of discards, so-called "ghost gear" from fishing vessels, and chemicals, waste water and organic waste from fishing vessels.

Social impacts

Public health impacts would be spillover effects from the environmental benefits already captured within the previous section of this assessment. Further, this measure may result in an increase in costs towards business. If these costs cannot be passed on through changes in prices of products sold, they may impact profitability and, therefore, employment. There is limited evidence available to quantify these impacts, but they are expected to be negative.

In some areas of the EU, freshwater fish consumption is often a key element in the way of life and tradition of communities living in wetlands areas, such as, Hungary, Poland, Romania, Finland and Lithuania (EUMOFA, 2021). Freshwater fish farming constitutes and important element of the long-standing cultural traditions in certain regions of these Member States. If the measure made aquaculture production economically unviable or caused a rise in prices such that produce was unaffordable, it is foreseeable that longstanding cultural practices could be harmed or changed.

Measure 43: Include upstream oil and gas industries within the scope of the IED.

Description of the measure and requirements for implementation

Include upstream oil and gas industries within the scope of Annex I of the IED. This, in turn, will require installations under a specific activity definition, and/or capacity threshold, to comply with the general regulatory framework set out by the IED, such as the provisions regarding permits or inspections, detailed in Chapter II of the IED. Currently, the IED does cover a range of downstream oil and gas activities, such as activity 1.2, 'refining of mineral

oil and gas', but does not cover explicitly upstream activities such as offshore or onshore exploration, prospecting and production.

The measure may need to be further defined with regards to the proposed wording and capacity threshold to be included in Annex I. There is no coverage of upstream oil and gas activities in E-PRTR to draw upon for this purpose. Reporting of GHG inventories under IPCC guidelines[119] includes category 1B2 to cover "*all [upstream] oil and natural gas activities*" with primary sources including "*fugitive equipment leaks, evaporation losses, venting, flaring and accidental releases*"; no capacity thresholds are specified due to GHG inventories needing to be comprehensive. Currently, no similar legislation or regulatory framework considers upstream oil and gas. There is therefore no former example of capacity thresholds upon which to draw.

The various sub-activities of the upstream oil and gas sector have been defined in more detail and in the context of BAT however. In 2015-2018, the European Commission initiated an information exchange to develop a Guidance Document on BAT in upstream hydrocarbon exploration and production. This resulted in the publishing of a Best Available Techniques Guidance Document on upstream hydrocarbon exploration and production, based on information provided by a Technical Working Group. This document set out non-binding guidance on best available techniques for organisations engaged in hydrocarbons activities and for regulatory authorities to draw upon.

The following activities were covered for **onshore** activities in the guidance document:

1. Site selection, characterisation, design and construction of surface activities
2. Handling and storage of chemicals
3. Handling and storage of hydrocarbons
4. Handling of drill cuttings and drilling muds
5. Handling of hydraulic testing water and of well completion fluids
6. Management of hydrocarbons and chemicals – Well stimulation using hydraulic fracturing
7. Energy efficiency
8. Flaring and venting
9. Management of fugitive emissions
10. Water resources management
11. Water resources management for hydraulic fracturing
12. Produced water handling and management
13. Environmental monitoring

The following activities were covered for **offshore** activities in the guidance document:

1. Handling of drill cuttings and drilling muds
2. Risk management for handling and storage of hydrocarbons
3. Risk management for handling and storage of chemicals

[119] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_4_Ch4_Fugitive_Emissions.pdf

4. Energy efficiency
5. Flaring and venting
6. Management of fugitive emissions
7. Produced water handling and management
8. Management of drain water
9. Risk management for facility decommissioning
10. Environmental monitoring

The guidance document does not include any indication of different sizes/capacities of sites that could give indication of any potentially useful thresholds to then be potentially used to specify installations that would be regulated by the IED.

On number of active installations in this sector (Table A8-50). Responses to the TSS were provided by authorities in 11 Member States estimating the possible numbers of installations in the upstream oil and gas sector. These summed to approximately 1 400 to 1 500 installations counting fields rather than drillings (see table below). It is unclear however how many of the these would be installations, since some of the responses to the TSS have provided the number of fields; Germany reported the number of drillings and the number of fields. Taking also the information from the OSPAR inventory, which details discharges, spills and emissions from offshore oil and gas installations (i.e. not onshore activities) in Denmark, Germany, Ireland, the Netherlands, and Spain (non EU Member States also in the agreement are Norway and the United Kingdom), this identified 179 installations in 2018 for four of the EU27 Member States listed (no data for Spain), the majority belonging to the Netherlands (Netherlands: 154 installations, Denmark 21 installations, Germany 2 installations and Ireland 2 installations). Regarding data relating to the Netherlands, the TSS indicates there are 5 fields offshore, while OSPAR indicates there are 154 installations offshore. It is unclear the extent to which these two numbers are in agreement.

Table A8-50: Numbers of installations reported in TSS and in OSPAR for on/offshore sector

Member State	Number of installations reported in TSS (onshore and offshore)	Number of installations reported in OSPAR (offshore only)
Austria	10 or 50 to 100, depending on definition	-
Croatia	45	-
Czech Republic	93	-
Denmark	-	21
France	~60	-
Germany	77 fields; 469 drillings	2
Ireland	-	2
Italy	200	-
Latvia	1	-

Member State	Number of installations reported in TSS (onshore and offshore)	Number of installations reported in OSPAR (offshore only)
Netherlands	250 natural gas fields on shore and 5 fields off shore	154
Poland	170-180	-
Romania	476	-
Slovenia	1	
Spain	-	No data
Total	**~1 433 (counting fields not drillings)**	**179**

There are also a large number of inactive (disused) or abandoned offshore installations. The OSPAR Convention reporting for 2018 estimates there to be ~1 700 of these in 2017. These would not be considered in scope of the measure.

Noting that many countries are considering the phasing out of new oil and or gas extraction which would imply installation numbers will be in decline. That said, as an example, Denmark with its own 2030 climate target, is planning to end oil and gas extraction in 2050 (not in 2030).[120]

Overall, combining the TSS data with the limited Member State submissions for OSPAR, as well as the consideration of future climate targets and phasing out of oil and gas use, a range of 1 000-2 000 installations is estimated.

Objectives:

The follow objectives apply -

- Levelling the playing field for installations across the EU, where there is currently variation in national regulations (See section on Administrative burden on businesses).
- Improving the environmental effectiveness of the IED, via the extension of coverage of the IED in Annex I. The measure is anticipated to result in the reduction of emissions to air, water, and soil.

Implementation needs:

EU to make legislative change to the IED text

- EU to review and consolidate the guidance BAT document to develop it into a BAT Conclusions document
- Member States to transpose changes into national law
- Member States to regulate the installations according to the new requirements, to the extent this requires changes from their existing regulatory approaches. This will require upfront and ongoing implementation actions.

[120] https://euobserver.com/nordic/150287

Assessing impacts

Economic impacts

The main Economic impacts of extension of the scope of the IED to cover upstream oil and gas are:

- Administrative burden impacts on businesses as well as public authorities from permitting costs under the IED, as well as administrative burden associated with ongoing monitoring and reporting.
- Potential increases in up-front investment costs as well as ongoing operating costs from the application of BAT in installations not already applying BAT

Administrative burden on businesses

This measure is likely to lead to **weakly negative impacts** on administrative burden on businesses. Administrative burden, in this context, can be defined as the costs of meeting a range of administrative activities under the IED for the purposes of wider compliance, that do not directly pertain to the installation of specific technologies (as might be needed for compliance against ELVs, or BATC) or the adoption of specific practices. Such administrative activities, in the context of the IED legal text, include:

- Preparation and **application for a permit** under Article 12,
- Assisting **permit reconsiderations** by the competent authority under Article 21(2),
- Preparation of a **baseline report** under Article 22, if applicable,
- Facilitating environmental **inspections** under Article 23,
- **Monitoring and reporting** requirement, as laid out by permit conditions under provisions in Article 16,
- Notifying competent authorities of 'any planned change in the nature or functioning, or an extension of the installation which may have consequences for the environment', as detailed in Article 20.

This also depends on the current level of regulation and associated administrative burden for the sector in Member States. Some Member States provided information in the TSS in relation to this. In Germany, under conditions set out in the Ordinance on the Environmental Impact Assessment of Mining Projects (UVP-V Bergbau), an environmental impact assessment is required for projects over certain size thresholds (500 t/d crude oil, 500 000 m^3/d natural gas), as well as operating in coastal waters. Reference to permitting appears to cover only the right to mine/extract and not, for example, prescribe BAT to minimise environmental impacts. In France, oil and gas extraction are subject to the Mining Code[121]. The latest climate bill in France did include the ambition to bring the Mining Code more in line with the Environment Code, which currently appears to only be referenced for public consultation prior to opening new sites[122]. In the Netherlands, air quality limits have been prescribed for combustion plants in offshore platforms.[123] There are permit obligations in

[121] https://www.legifrance.gouv.fr/codes/id/LEGITEXT000006071785
[122] https://www.legifrance.gouv.fr/codes/id/LEGISCTA000033038620/
[123] https://www.tweedekamer.nl/downloads/document?id=9c5cc436-d3cb-401a-9ef1-e0ae5b84e468&title=NOGEPA%20NOX%20REDUCTIE%20PROGRAMMA.%20EINDRAPPORT.pdf

Sweden which vary depending on geographic location.[124] There is therefore variation in how the sector is regulated between Member States. However, it appears that regulation mostly relates to the exploration and opening of new sites and does not include environmental inspections or prescription of BAT for environmental performance in most cases.

Based on the number of installations for this sector listed above in the introduction and applying the standard assumptions on the unit costs for the main requirements for operators, an estimate of the administrative burden on business is € 2m/year to €52m/yr , with a central estimate of €23m/year that could be added to the IED scope. This high and wide range is due to the large number of potential installations that could come into scope, and the high uncertainty on this number of installations.

This central estimate is equivalent to around 0.18% of GVA for the 'extraction of crude petroleum and natural gas'. As such, administrative burden is not expected to present a major impact to the sector.

There will also be costs to industry of the development of the BREF and BATc. The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). After apportioning the fraction of this cost for businesses, and annualising over a period of 20 years assuming two BREFs in this period, the annualised cost of the BREF process for businesses would be expected to range from €0.1m/year to €0.7m/year, with a central estimate of €0.2m/year. It could be expected that the costs of a BREF for this sector would be on the lower end of this range because of the existing non-binding BREF guidance document in place.

Operating costs and conduct of business

This measure is likely to lead to **weakly negative impacts** on operating costs. There will be costs to achieve BAT, but the exact level is to be determined by the BREF process (what would be considered BAT for each process), and in particular the degree of environmental protection already in place. Such uncertainty means compliance costs cannot be readily determined. The guidance document BREF for upstream oil and gas contains details of BAT to minimise the environmental impacts of the sector. However, it did not gather data on the cost of techniques.

Competitiveness and level playing field

This measure is likely to lead to **weakly positive impacts** on competitiveness and the level playing field. The total costs of doing business, that is the costs of administrative burden and compliance combined, are thought to negatively impact upon businesses within the upstream oil and gas sector. The exact level, however, as noted in the above, is to be determined by the BREF process. Administrative costs have been estimated and are thought to be small relative to the size of the sector. Compliance costs in the form of investment/operational costs are unknown but could be substantial. As this sector deals with a product that is a commodity, costs cannot be passed on in the price of products, and so the sector is particularly susceptible to large cost increases.

[124] Miljöprövningsförordning (2013:251) Svensk författningssamling 2013:2013:251 t.o.m. SFS 2021:731 - Riksdagen

Inclusion of upstream oil and gas within the Annex I of the IED imposes a singular set of requirements towards installations and operators. It therefore offers the potential to level the playing field by providing minimum criteria for all Member States, notably towards the use of emission limit values. This has largely been supported within the IED evaluation, where, for industry stakeholder surveyed, 69% agreed or strongly agreed with the statement 'the IED has contributed to achieving a level playing field in the EU for IED sectors by aligning environmental performance requirements for industrial installations'. This is likely to continue to be the case under new sectors adopted, including for upstream oil and gas, as in the case of this measure.

Position of SMEs

This measure is expected to lead to **limited to no impacts** on SMEs. There are expected to be few SMEs in the upstream oil and gas sector, as such no impacts are expected.

Innovation and research

Including upstream oil and gas within Annex I of the IED may have a **limited impact** on research and development. Provisions within the IED, such as Article 27 on emerging techniques, allow for research and development within the context of BAT. Each BREF includes a chapter on emerging techniques, which acts as an indication of future techniques that could in the future (i.e. 'if commercially developed') be considered as BAT. This pathway encourages the continual focus on further reducing the environmental impacts of industrial activities or innovating in ways to save costs when compared to existing BAT. If this measure was adopted, upstream oil and gas would be subject to the Sevilla Process, with emerging techniques considered within the eventual BREF.

Public authority impacts

The inclusion of upstream oil and gas within Annex I would have **weakly negative** impacts upon the costs to competent authorities. Based on the number of installations for this sector listed above in the introduction, and applying the standard assumptions on the unit costs for the main requirements for competent authorities, an estimate of the administrative burden on authorities is € 1.1m/year to €28m/yr, with a central estimate of €15m/year that could be added to the IED scope. This high and wide range is due to the large number of potential installations that could come into scope, and the high uncertainty on this number of installations.

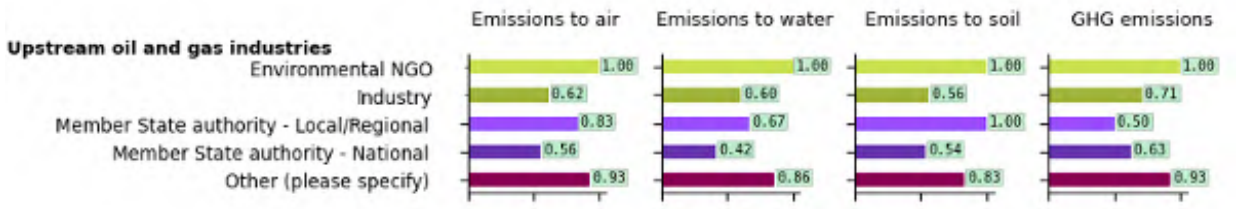
There will also be the costs to public authorities of the development of the BREF and BATc. The estimates in the IED evaluation for this one-off cost of a BREF development were €7.9m (range €3.6m to €20.7m). After apportioning the fraction of this cost for public authorities, and annualising over a period of 20 years assuming two BREFs in this period, the annualised cost of the BREF process for public authorities would be expected to range from €0.3m/year to €1.4m/year, with a central estimate of €0.5m/year. It could be expected that the costs of a BREF for this sector would be on the lower end of this range because of the existing non-binding BREF guidance document in place.

Environmental impacts

The upstream oil and gas non-binding BREF highlight the environmental impacts associated with each onshore and off-shore activity. Additionally, the BREF for the Management of Waste from Extractive Industries sets out the key environmental issues associated with extractive waste. These are outlined below.

Based on the TSS, overall, stakeholders agree that impacts from upstream oil and gas industries are significant for the following key environmental issues – greenhouse gases, and emissions to air, water, and soil (Figure A8-30). There is a very strong consensus amongst the Environmental NGOs and 'Other' stakeholders that there are significant environmental pressures resulting from emissions from oil and gas activities. There is a strong consensus from local and regional Member State authorities that these environmental pressures are significant for releases to soil and air. However, there is less certainty among these stakeholders in terms of emissions released to water and GHG. Regarding the industry and national Member State stakeholders there is a high level of uncertainty and variability among answers, with split majorities for every emission source.

Figure A8-30: TSS responses on impacts from upstream oil and gas industries



Climate

There are expected to be **weakly positive** impacts on climate from this measure. Hydrocarbons operations involve the separation and processing of reservoir fluid combinations of gas, oil and water, and incorporate flaring and venting to release gases to the atmosphere. Flaring and venting are a significant source of GHG emissions. Fugitive emissions are also a significant source of GHG emissions, most notably methane.

The OSPAR inventory, with details of discharges, spills and emissions from offshore oil and gas installations, includes 133 installations in 2017 for Member States within the EU27, the majority belonging to the Netherlands. These 133 installations emitted 12 700 tonnes of CH_4 in 2017, equivalent to around 1.6% of the E-PRTR total analogous to that of the IED. This analysis may be an underestimate, owing to onshore facilities and terminals, which do not feature in the OSPAR inventory.

The inclusion of upstream oil and gas activities within the scope of the IED, and thus making binding recommendations for BAT and BAT-AELs for the sector through a BAT Conclusions document would be expected to target methane releases as a key environmental issue of the sector. In this way, the measure would be expected to contribute to the EU's pending (currently being drafted) Methane Strategy; legislation specifically targeting

methane emissions from the energy sector is expected in the fourth quarter of 2021, as indicated in the "Fit for 55" package.

Air quality

There are expected to be **weakly positive** impacts on air quality from this measure. Flaring and venting are also a significant source of air pollution. LRTAP contains reported data from the EU27 on emissions associated with fugitive emissions from upstream oil and gas as well as emissions from venting and flaring. This shows that emissions in 2019 were 0.2 kt of PM2.5, 8.1 kt of NOx, 18 kt of SOx, and 102 kt of NMVOCs. The OSPAR inventory, with details discharges, spills and emissions from offshore oil and gas installations, includes 133 installations in 2017 for Member States within the EU27, the majority belonging to the Netherlands. These 133 installations emitted 8.3 kt of NO_X in 2018, 2.9 kt of NMVOCs, and 85 tonnes of SO_2. As a result, environmental benefits attained from regulation of the sector would be significant.

The MWEI BREF also sets out that emissions of particulates to air is a key environmental issue.

Water quality and resources

Handling and storage of chemicals is required for operations during both onshore and offshore exploration and production. The use of chemicals has potential to pose risks to the environment through planned discharges as well as accidental releases. Unintended releases can occur from loss of containment from handling chemicals to point of use, loss of containment during drilling, and spillages during routine operations. The BREF sets out BAT for site design as well as for operations, which includes the need for rEUord keeping, spill response, and routine inspections.

Unintended releases of hydrocarbons into the environment from failure of equipment, human error, or incidents/accidents can cause significant impact on water resources including surface waters and groundwater, however accidents are already regulated by the Seveso Directive.

The OSPAR Inventory includes rEUords of multiple accidental chemicals and oil spills (2 and 2 in 2018 respectively in the EU27), and with information on the quantity spilled as well as the composition relating to LC50/EU50, plonor list substances[125], LCPA and biodegradation. 20,566 tonnes of plonor list substances were spilled in 2018. A comparison to totals, such as those in the E-PRTR, and therefore an indication of their relative importance, compared to other Economic activities covered by the IED, is not possible. It serves, however, that inclusion within Annex I of the IED may serve to reduce the occurrence or impact of spills.

Extractive waste can contain chemical residues including nitrates, cyanides, xanthates and residues of caustic soda. Emissions of dissolved substances are also a KEI for the management of extractive waste, in the form of Acid/Neutral Rock Drainage and Saline Drainage, as well as discharge of extractive waste with high levels of salt content. These

[125] https://www.cefas.co.uk/data-and-publications/ocns/ocns-bulletin-board/new-plonor-list-issued/

issues can lead to high levels of metals and sulphates in drainage water, leading to potential impacts on acidification, bioaccumulation of metals, and subsequent impacts on ecosystems.

Soil quality or resources

The majority of impacts described for water quality and resources are also applicable to soil quality: Namely, planned and accidental releases of chemicals, chemical residues in extractive waste, unintended releases of hydrocarbons, and dissolved substances and chemical residues in extractive waste.

Waste production, generation, and recycling

The management of waste from upstream oil and gas is covered by the BREF on management of waste from the extractive industries (MEWI). Onshore activities generate waste including drill cuttings and drilling muds high in contaminants, which must be disposed of appropriately and managed to avoid accidental releases.

No means of assessing the volume or type of waste has identified, however regulation of the sector through the IED may further benefit the management of waste, through provisions such as Article 11, which requires installations are operated within the principles of the waste hierarchy, as laid out in the Waste Framework Directive (Directive 2008/98/EU).

Efficient use of resources

The hydrocarbons industry is energy-intensive, due to activities throughout drilling, hydrocarbon production and powering of utilities and auxiliary systems. Upstream hydrocarbon operations may need to use significant quantities of water and can have significant impacts on local water supply and demand.

No means of assessing the efficient use of energy or water have been identified; however, regulation of the sector through the IED may further benefit resource efficiency, with resource efficiency featuring within the Sevilla Process.

Social impacts

The inclusion of upstream oil and gas within Annex I of the IED will incur costs towards business and operators. If these costs cannot be passed on within the price of energy products, these costs will impact upon profitability and therefore upon employment. In the TSS, some Member States provided estimates of the number of employees in the upstream oil and gas sector. This showed that there are significant variations in the level of employment in this sector between Member States, with the Netherlands having by far the highest level of employment (

Table **A8-51**).

Table A8-51: TSS responses on number of employees in the upstream oil and gas sector

Member State	Number of employees
France	About 300 employees
Germany	<3 400
Italy	7 000
Netherlands	16 500
Romania	2 315

Measure 44: Establish a watch mechanism to identify and include emerging activites/ sectors of concern

Description of the measure and requirements for implementation

The descriptions and impact assessment of this measure have been necessarily abbreviated compared to other IED measures, owing to its future orientated and hypothetical status at the time of compiling the impact assessment.

Objectives and implementation needs

This measure comprises the establishment of a dynamic system to identify and include emerging activities/sectors of concern ("sunrise list"), according to the significance of production and attendant (already occurring, or risk of) pollutant emissions, and the IED's potential to address these issues. This would entail, for example, enabling the Commission to identify and include new activities in the future via delegated acts.

Assessing impacts

Economic impacts

Overall this measure is likely to have **weakly negative economic impacts**, as it will lead to a greater number of activities being captured under the scope of the IED in the future, and more installations being subject to the IED's permitting requirements and governance system. It is not known which further activities may be included in the future and thus it is not possible to assess the impacts that may be incurred.

Time would be required for the European Commission and/or the EEA to maintain the sunrise list and identify activities of emerging concern.

Administrative burdens on businesses

Overall impacts on administrative burdens for businesses are expected to be **weakly negative** for any new activities included in the future although the scale of such impacts are unclear at this stage. Operators in any new activities will have to obtain IED permits from the Competent Authorities, and submit required IED reporting data to these same Competent

Authorities as well as undergo IED controls and inspections. Some initial time would also be required to set up the appropriate data capture, calculation and reporting mechanisms.

Position of SMEs

Overall impacts on SMEs are expected to be **very limited**. Appropriate activity thresholds would need to be established for any new activities to ensure that smaller facilities (potentially including SMEs) would normally be exempt from the revised IED scope, except where the newly-included sector comprises highly polluting, energy-intensive or resource-intensive activities, in which case the intensity of the potential associated environmental impacts may require inclusion in the IED framework at relatively low activity thresholds.

Public authority impacts

Overall impacts on **public authorities** are expected to be **weakly negative**. This includes additional time for reporting of initial data as required, related to potential new activities to Member States' Competent Authorities.

The EEA and/or European Commission would incur some additional costs for maintaining the watch list/ sunrise list, and for the task of identifying and reviewing potential emerging activities. These costs have not been determined.

Once the potential need for a new activity to be included in the scope of the IED has been determined, that would require further assessment by the European Commission, eventually triggering the compilation of a BREF, the identification of BAT and the writing of BAT conclusions. As this scenario is presently hypothetical, these costs have not been determined. (In each case, these eventual costs would be at the level of the European Commission, and owing to the involvement of time and expertise of all stakeholders involved in the co-creation of BREFs in the activity-specific Technical Working Groups.)

Environmental impacts

Overall, this measure is likely to have **weakly positive environmental impacts** as it will increase the coverage of activities that are covered in the scope of the IED. It will ensure that the IED activity list can be updated as and when emerging activities are identified, helping to support the objectives of wider environmental policies, as supported by the E-PRTR reporting mechanism, and associated to wider air, water and soils legislation.

Increasing the activity coverage will help to improve the environmental performance of those activities being included, as it will enable an EU-wide level playing field, and better management and comparison of installations' pollution prevention and emissions control methods, energy and resource efficiency, application of circularity methods and environmental management systems' performance management, as captured by the revised IED scope. There will be associated environmental, ecological and health benefits from the measures applied. In addition, inclusion of a new activity within the IED scope will ensure

greater engagement of citizens in environmental decision-making (as a result of access to information, and participation in permitting decisions).

Social impacts

Overall, this measure is likely to have **weakly positive social impacts**. As discussed immediately above, increasing the number of activities and installations included in the IED could potentially help to improve environmental performance of those activities newly within scope, which would have positive impacts for health. Furthermore, including new activities improves public access to information, potentially enabling greater participation in IED-related environmental decision-making.

Summary of problem area 5 measures

It is difficult to understand the relative scale of the burden that could result from expanding the scope of the IED. Industrial installations new in scope differ in size and activity significantly, covering a wide range of industrial sectors. It is, therefore, not straightforward to pick one single installation that could represent the 'typical' (or modal) implications of the change. Estimates of the administrative burden per installation for the IED scope extension measures in the preferred policy package, are based on numerous assumptions.

There are eight measures that seek to bring new sectors into the scope of the IED. These sectors are not currently regulated by the IED and, therefore, do not have baseline regulatory costs.

The Table below sets out the outputs of this analysis for comparison. The baseline costs of the 'typical' installation were included in this comparison, as no uplift has been considered or introduced for PO5 measures to account for potential interactions with Policy Options 1 through to 4.

Table A8-52: Administrative costs per installation

Type of installation	Baseline IED framework and cost components (€/year)		
	Operator	Public Authority	Total
'Typical' installation baseline (central estimate), for reference, although this excludes new permit issuance and baseline reports	*11 533 €/year*	*8 286 €/year*	*19 819 €/year*
Cattle farm	1 215 €/year	1 215 €/year	2 430 €/year
IRPP farm	1 039 €/year	1 039 €/year	2 079 €/year
Gigafactories	24 507 €/year	31 551 €/year	56 058 €/year
Forging presses, cold-rolling and wiredrawing	15 958 €/year	11 205 €/year	27 163 €/year
Textile finishing	18 369 €/year	16 944 €/year	35 313 €/year
Smitheries	15 812 €/year	10 857 €/year	26 669 €/year
Landfill	None/limited	None/Limited	None/limited
Mining and quarrying	13 621 €/year	9 451 €/year	23 072 €/year

First, bespoke analysis was employed to estimate the burden associated with cattle and IRPP farms. This was based on existing evidence, expert and stakeholder elicitation.

Secondly, for the rest of the scope extensions, the baseline assumptions outlined in Table 3 were employed. The reason for different administrative costs per installation across the sectors stems from BREF costs, which were assumed to be always the same, independent to the number of installations covered by the sector. This is unlikely to be the case. For example, costs closer to lower bound estimates of BREF costs are likely for sectors that may affect fewer installations (e.g., gigafactories).

Finally, if BREF costs are excluded, the per installation administrative costs for the scope extensions (excl. cattle farm and IRPP) would be around 15 300 €/year per installation for operators and 9 640 €/year per installation for public authorities over a period of 20 years. Costs per installation for mining and quarrying would be slightly lower based on assumptions about the ongoing baseline activity in the sector.

Table A8-53 summarises the economic, environmental and social impacts of the measures using the qualitative ratings. Table A8-54 similarly uses qualitative ratings to summarise costs and benefits for measures in problem area 5, with central estimates of administrative costs for businesses and public authorities also shown.

Table A8-53: Summary of economic, environmental and social impacts for measures in problem area 5

Policy measures	Economic impacts	Environmental impacts	Social impacts (employment focus)
#31	✗✗✗	✓✓✓✓✓✓	✗
#32	✗✗✗	✓✓✓✓	✗
#33	✓✓✓	O	✓
#34	✗	✓	O
#35	Measure discarded in late Impact Assessment considerations		
#36	✗	✓	O
#37	✗	✓	O
#38	✗✗	✓	O
#39	✗	✓✓	O
#40	✗	✓	O
#41	✗✗	✓✓✓	O
#42	✗	✓	✗
#43	✗✗	✓	✗
#44	U	U	U

Table A8-54: Summary of costs and benefits for measures in problem area 5, with central estimates of administrative costs for businesses and public authorities shown

Policy measure	Administrative costs – businesses (€m/yr)	Administrative costs – public authorities (€m/yr)	Overall costs	Overall benefits
#31	102-401	102-401	✗✗✗✗	✓✓✓✓✓✓
#32	80-194	80-194	✗✗✗✗	✓✓✓✓✓
#33	-63-232(benefit)	-63-232 (benefit)	**O**	✓✓✓✓
#34	1.0	1.0	✗	✓
#35	Measure dicarded at a late stage in Impact Assessment evaluation			
#36	5.0	3.0	✗	✓
#37	1.0	1.0	✗	✓
#38	7.0	5.0	✗	✓
#39	0.2	0.5	✗	✓
#40	No/limited	Not estimated	✗	✓
#41	12.0	8.0	✗	✓
#42	2.0	2.0	✗	✓
#43	23	15	✗	✓
#44	No/limited	Not estimated	**U**	**U**

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