



Council of the
European Union

Brussels, 7 April 2022
(OR. en)

Interinstitutional File:
2022/0100(COD)

8048/22
ADD 3

ENV 337
CLIMA 160
CODEC 471

COVER NOTE

From:	Secretary-General of the European Commission, signed by Ms Martine DEPREZ, Director
date of receipt:	6 April 2022
To:	Mr Jeppe TRANHOLM-MIKKELSEN, Secretary-General of the Council of the European Union
No. Cion doc.:	SWD(2022) 99 final
Subject:	COMMISSION STAFF WORKING DOCUMENT IMPACT ASSESSMENT REPORT Accompanying the document Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on substances that deplete the ozone layer and repealing Regulation (EC) No 1005/2009

Delegations will find attached document SWD(2022) 99 final.

Encl.: SWD(2022) 99 final



Strasbourg, 5.4.2022
SWD(2022) 99 final

COMMISSION STAFF WORKING DOCUMENT

IMPACT ASSESSMENT REPORT

Accompanying the document

Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on substances that deplete the ozone layer and repealing Regulation (EC) No 1005/2009

{COM(2022) 151 final} - {SEC(2022) 157 final} - {SWD(2022) 98 final} -
{SWD(2022) 100 final}

Table of contents

1.	INTRODUCTION: POLITICAL AND LEGAL CONTEXT.....	7
1.1.	The European Green Deal and the Paris Agreement on Climate Change.....	7
1.2.	The Montreal Protocol on substances that deplete the ozone layer.....	7
1.3.	The EU ODS Regulation (Regulation (EC) No 1005/2009).....	8
2.	PROBLEM DEFINITION	9
2.1.	What is the problem?.....	9
2.1.1.	Where the residual emissions come from	10
2.1.2.	Efficiency issues.....	15
2.1.3.	Incomplete monitoring and reporting	17
2.1.4.	Coherence and clarifications	18
3.	WHY SHOULD THE EU ACT?	20
3.1.	Legal basis	20
3.2.	Subsidiarity: Necessity of EU action.....	20
3.3.	Subsidiarity: Added value of EU action.....	21
4.	OBJECTIVES: WHAT IS TO BE ACHIEVED?	21
4.1.	General (review) objectives.....	21
4.2.	Specific (review) objectives	21
5.	WHAT ARE THE AVAILABLE POLICY OPTIONS?	22
5.1.	What is the baseline from which options are assessed?	22
5.1.1.	Baseline for environmental impacts	22
5.1.2.	Baseline for economic impacts.....	22
5.1.3.	Baseline for other impacts	24
5.2.	Description of the policy options	24
5.2.1.	Review objective A: Achieve a higher level of additional emission reductions	26
5.2.2.	Review objective B: Improve the efficiency of the Regulation while preserving the significant emission reductions achieved so far.....	27
5.2.3.	Review objective C: Ensure more comprehensive monitoring	29
5.2.4.	Review objective D: Improve coherence.....	30
5.3.	Measures discarded at an early stage.....	32
6.	WHAT ARE THE IMPACTS OF THE MEASURES IN THE POLICY OPTIONS?	32
6.1.	Achieve a higher level of additional emission reductions.....	32
6.2.	Improve the efficiency of the Ozone Regulation while preserving the significant emission reductions achieved so far	38

6.3. Ensure more comprehensive monitoring	41
6.4. Improve coherence and clarity	43
7. HOW DO THE OPTIONS COMPARE?	43
8. PREFERRED OPTION	47
8.1. REFIT (simplification and improved efficiency)	47
9. HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?.....	48
ANNEX 1: PROCEDURAL INFORMATION	50
ANNEX 2: SYNOPSIS REPORT OF STAKEHOLDER CONSULTATIONS	53
ANNEX 3: WHO IS AFFECTED AND HOW?	58
ANNEX 4: ANALYTICAL METHODS	62
ANNEX 5: DETAILED INFORMATION ON HALON BANKS.....	81
ANNEX 6: DETAILED INFORMATION ON FOAMS RECOVERY	84
ANNEX 7: LIST OF CLARIFICATIONS NEEDED IN REGULATION	95
ANNEX 8: MEASURES AND INTERVENTION LOGIC OF REGULATION (EC) NO 1005/2009	96
ANNEX 9: LIST OF DISCARDED OPTIONS	1
ANNEX 10: VISUAL AID SHOWING THE LINKS BETWEEN THE PROBLEMS IDENTIFIED, RELEVANT DRIVERS AND INDIVIDUAL MEASURES TO ADDRESS THE PROBLEMS.....	5

Glossary

<i>Term or acronym</i>	<i>Meaning or definition</i>
2-BTP	2-bromo-3,3,3-trifluoroprop-1-ene (C ₃ H ₂ F ₃ Br); a halon replacement in fire-fighting equipment
Bank(s)	The amount of ozone-depleting substances (ODS) contained in existing equipment (e.g. refrigerators, foams, fire equipment), chemical stockpiles and other products, including after their end of useful life or recovered and stored ready for use
BAT	Best Available Technique (as relevant to the Industrial Emissions Directive)
CERTEX	IT system that allows to exchange data (“certificates”) on relevant ODS shipments between the central EU ODS licensing system and custom offices in the Member States directly; IT precursor of the European Single Window Environment for Customs
CDW	Construction and demolition wastes
CFCs	Chlorofluorocarbons. Group of ODS consisting only of chlorine, fluorine, and carbon. First generation of ozone-depleting substances banned by the Montreal Protocol. CFCs were commonly used as refrigerants, solvents, and foam blowing agents
CF3I	Trifluoroiodomethane: an ODS listed in Annex II
CO ₂ e(equivalent)	The quantity of a gas in metric tonnes multiplied by its associated global warming potential (GWP). This is used to compare the emissions from various greenhouse gases based upon their global warming potential
Consumption	The quantity of ODS produced plus imported, minus the quantity exported minus the quantity destroyed. Calculation of consumption under the Montreal Protocol excludes non-virgin bulk imports and exports, as well as substances intended for feedstock and process agent use
CTC	Carbon tetrachloride, also called tetrachloromethane (CCl ₄); commonly used as a raw material in many industrial uses, including the production of chlorofluorocarbons and as a solvent
DCM	Dichloromethane, also called methylene chloride (CH ₂ Cl ₂); used commonly as a solvent
EEA	European Environment Agency
E-PRTR	European Pollutant Release and Transfer Register
Feedstock	Any substance that undergoes chemical transformation in a process to synthesise other chemicals in which it is entirely converted from its original composition
F-gases	Fluorinated greenhouse gases as defined by Regulation (EU) No

	517/2014
F-gas Regulation	Regulation (EU) No 517/2014
GWP	Global warming potential: a metric for determining the relative contribution of a substance to climate warming. The GWP indicates how much (solar) energy the emissions of 1 ton of a gas will absorb (and thus contribute to climate warming) over a given period of time, e.g. 100 years for GWP ₁₀₀ , relative to the emissions of 1 ton of carbon dioxide (CO ₂).
Halons	Group of ODS containing bromine and fluorine and one or two carbons. Their production is banned, but existing (non-virgin) halons may still be placed on the EU market for “critical uses”, e.g. for fire-fighting on aircrafts and in other specialised applications
HCFCs	Hydrochlorofluorocarbons: group of ODS consisting of hydrogen, chlorine, fluorine and carbon. Second generation of ozone-depleting substances. They were used to replace chlorofluorocarbons due to their lower ozone-depleting potential (ODP, see definition later)
HCFC-22	Chlorodifluoromethane (CHClF ₂). The most common HCFC. used in refrigeration in the past, and still used as a feedstock chemical today
HFCs	Hydrofluorocarbons (, F-gases rather than ODS), consisting of hydrogen, fluorine and carbon. They have been used as replacements for ODS because they do not deplete the ozone layer. However, they are powerful greenhouse gases
HFC-23	Trifluoromethane
HTOC	Montreal Protocol’s Halons Technical Options Committee (sub-group of the Technology and Economic Assessment Panel (TEAP) of the Montreal Protocol)
ICAO	International Civil Aviation Organization
IED	Industrial Emissions Directive
ISG	European Commission Inter Service Group accompanying the impact assessment
Laboratory and analytical uses	Use of an ODS as a necessary component or part of a laboratory or analytical process. Decision IX/17 of the Montreal Protocol introduced an exemption for laboratory and analytical uses of ODS
(Montreal) Protocol	The Montreal Protocol on Substances that Deplete the Ozone Layer: an international treaty governing the protection of stratospheric ozone
New ODS	Substances listed in Annex II to Regulation (EC) No 1005/2009, whether alone or in a mixture, and whether they are virgin, recovered, recycled or reclaimed. These substances are not controlled under the Montreal Protocol

Non-Article 5 countries	“Developed” countries, i.e. Parties to the Montreal Protocol not operating under its Article 5 (the latter defines the “developing countries”)
ODP	Ozone-depleting potential: the amount of ozone depletion caused by a substance. More specifically, it is the ratio of global loss of ozone due to a given substance and global loss of ozone due to trichlorofluoromethane (CFC-11) of the same mass. CFC-11 is assigned an ODP value of 1. The ODP values of the different ODS range from close to 0 to 10. The higher the ODP value, the more the substance depletes the ozone layer
tODP	Metric tonnes of a substance multiplied by its ozone-depleting potential, resulting in ODP-weighted tonnes. As an example, 1 metric tonne of HCFC-22 equals 0.055 tODP, while 1 metric tonne of halon-1301 equals 10 tODP-t. This is because halon-1301 depletes the ozone layer considerably more than HCFC-22
ODS	Ozone-depleting substances, i.e. substances that lead to a deterioration of the stratospheric ozone layer by photochemical reactions releasing reactive halogens (bromine, chlorine atoms) that lead to the breakup of ozone molecules
Ozone hole	A large area of the stratospheric ozone layer with very low amounts of ozone
Ozone layer	Region of the upper atmosphere containing relatively high concentrations of ozone molecules. It protects humans and other living things from harmful UV radiation from the sun
Ozone layer depletion	Chemical destruction of ozone molecules in the ozone layer leading to low concentrations of ozone and more UV radiation reaching the Earth’s surface
Placing on the market	Supplying or making available to third persons within the European Union for the first time, for payment or free of charge
Process agents	Substances used in chemical reactions in industrial processes but, contrary to feedstock, do not undergo chemical transformations themselves during the process. The applications where ODS are allowed to be used as process agents are listed in Annex III to Regulation (EC) No 1005/2009
Reclamation	Reprocessing of a recovered ODS in order to meet the equivalent performance of a virgin substance, taking into account its intended use
Recovery	Collection and storage of ODS from products and equipment or containers during maintenance or servicing or before disposal

Recycling	Reuse of a recovered ODS following a basic cleaning process
REIO	Regional Economic Integration Organization. The EU is considered a REIO pursuant to Article 1(6) of the Vienna Convention for the Protection of the Ozone Layer
RSB	Regulatory Scrutiny Board
PCE	Perchloroethylene (also called Tetrachloroethylene or –ethene, C ₂ Cl ₄); used commonly e.g. in dry cleaning
SAP	Scientific Assessment Panel (of the Montreal Protocol)
Single Window	European Single Environment for Customs; https://ec.europa.eu/taxation_customs/general-information-customs/electronic-customs/eu-single-window-environment-for-customs_en
TARIC	TARIC = Integrated tariff of the EU
TFE	Tetrafluoroethylene (or –ethene, C ₂ F ₄); used commonly in the production of fluoro-polymers
UV radiation	Ultraviolet radiation: Portion of the electromagnetic spectrum with wavelengths shorter than visible light. When the ozone layer becomes thin, more UV radiation from the sun reaches Earth’s surface and may have hazardous effects on the biosphere including humans
UNEP	United Nations Environment Programme, now UN Environment
Use of ODS	The utilisation of ODS in the production, maintenance or servicing (including refilling), of products and equipment or in other processes
Virgin ODS	Newly produced ODS that have not previously been used
VSLs	Very Short-Lived Substance
WFD	Waste Framework Directive

1. 1. INTRODUCTION: POLITICAL AND LEGAL CONTEXT

1.1. 1.1. The European Green Deal and the Paris Agreement on Climate Change

The European Green Deal¹ aims at preventing climate change and protecting, conserving and enhancing the EU's natural capital as well as protecting the health and well-being of citizens from environment-related risks. Emissions from ozone-depleting substances (ODS) are resulting both in the formation of a **'hole' in the ozone layer**, as well as in contributing to climate warming. Consequently, preventing such emissions is key to preventing adverse health effects from a damaged **ozone layer** and **for reaching the objective of the *Paris Agreement on Climate Change***. This report is an impact assessment of options that aim at improving the EU's policy to reduce such emissions.

ODS are man-made chemicals that frequently reach the upper atmosphere after emission. The so-called "hole" in the ozone layer was discovered in the 1980s. It is now on the way to recovery² which is preventing any further significant adverse impacts on our health and the biosphere, as well as having widespread economic implications. Most ODS are also very strong greenhouse gases. Global action to eliminate ODS has already achieved significant climate-related benefits, e.g. the positive climate impacts from saved ODS emissions for the period 1988 to 2010 were 5-6 times higher than those achieved during the Kyoto Protocol's first commitment period.³

The climate relevance of ODS emissions is not included in the EU's climate target to reach at least 55% emission reductions by 2030. Thus, any action to reduce ODS emissions further would result in additional savings⁴ for the climate and contribute to reaching climate neutrality by 2050.

1.2. 1.2. The Montreal Protocol on substances that deplete the ozone layer

In 1987, the international community adopted the Montreal Protocol on Substances that Deplete the Ozone Layer⁵ (hereafter: the Protocol), which phases out the production and consumption⁶ of substances that contribute to ozone depletion in the stratosphere. The Protocol covers nearly 100 substances, e.g. groups⁷ of chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and halons. Each ODS has a specific ozone-depleting

¹ https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

² Expected for the second half of the century

³ UNEP (2011). A critical link in protecting the climate and the ozone layer.

<https://www.unep.org/resources/report/hfcs-critical-link-protecting-climate-and-ozone-layer>

⁴ Current annual EU ODS emissions are about as large as Sweden's emissions

⁵ Text of the original Montreal Protocol, see

<https://treaties.un.org/doc/publication/unts/volume%201522/volume-1522-i-26369-english.pdf>.

⁶ Consumption is calculated based on import, export, production and destruction.

⁷ For instance within the group of CFCs there are 15 types of CFCs, e.g. CFC11 and CFC217

potential (ODP) value assigned to it. Conversely, the climate impact of each ODS, i.e. its global warming potential (GWP)⁸, is not mentioned in the Protocol.

The Protocol and subsequent decisions of its 197 Parties have created a global legal framework for controlling ODS. The EU and its Member States are legally bound to phase-out schedules of production and consumption for the different groups of ODS. All phase-out dates are now in the past. The latest was reached in 2020 for the group of HCFCs, leaving only a few exempted uses of ODS in developed countries still remaining (see below). Other compulsory obligations under the Protocol include the need to have a licensing system and yearly reporting on ODS trade and use. **The EU has taken a leading role both through its positive contribution to the international negotiations and legal framework, but also by setting policies at EU level that often go beyond the requirements of the Protocol**, e.g. the EU completed the HCFC consumption phase-out already in 2010.

1.3. 1.3. The EU ODS Regulation (Regulation (EC) No 1005/2009)

Regulation (EC) No 1005/2009⁹ (hereafter: the Regulation) is the main EU instrument to ensure that the EU **fulfils its obligations under the Protocol**. It also has the self-standing objective to achieve a **high level of ambition for protecting the ozone layer and contributing to climate change mitigation** in the EU. The scope of the Ozone Regulation covers, in Annex I, the ODS that are identical to the scope of the Protocol, as well as the products and equipment using them. In addition, it covers, in Annex II, new substances (“new ODS”) that are not (yet) controlled by the Protocol. Except for halon-1202, the new ODS are currently only monitored in order to recognise any emerging issues.

To achieve its objectives, the Regulation generally prohibits the production, trade and use of ODS (Annex I) while exempting only a few specified uses where alternatives were not available at the time of its adoption (2009). Consequently, all traditional uses of ODS, e.g. in cooling, aerosols (i.e. in spray cans) and foams are no longer allowed. The remaining exempted uses today are:

- Use as **feedstock chemical**¹⁰ in the chemical production to produce a number of high-value, indispensable goods including polymers, plastics, pesticides and pharmaceuticals,
- Use of three ODS as **process agents**¹¹ in five old chemical plants for specific chemical production processes,

⁸ The **ODP** of a substance refers to its relative amount of **ozone depletion** caused by it compared to the impact of a similar mass of CFC-11 (ODP = 1), e.g. Halon 1301 has an ODP of 10, so for the same amount based on weight Halon-1301 is 10 times worse than for CFC-11. The **GWP** of a substance refers to its relative contribution to **climate warming** compared to the impact of a similar mass of carbon dioxide (CO₂), e.g. CFC11 has a GWP of 4660, so its “climate forcing” is almost 5000 times worse than the same mass of CO₂ (GWP used here is based on the impact over 100 years).

⁹ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32009R1005>

¹⁰ In feedstock use, the chemical undergoes chemical transformation in a process to synthesise other chemicals during which it is entirely converted from its original composition

¹¹ In process agent use, the ODS is facilitating or inhibiting a chemical reaction in an industrial process, and contrary to feedstock use, the ODS remains intact (is not being chemically transformed)

- Use by **laboratories and for analytical purposes**, and
- **Critical uses of halons related to fire protection** of specific parts of aircraft and military equipment.

In addition to the above, there exists the possibility of the emergency use of methyl bromide¹² as an effective killing agent for some agricultural pests.¹³ Destruction and reclamation of ODS is also still allowed. In addition, to prevent illegal activities and to comply with licencing and reporting obligations under the Protocol, the Regulation foresees strict measures to control and monitor the remaining uses of ODS. An overview over the individual measures and the logical framework is given in Annex 8.

The Commission decided to submit the Regulation to a REFIT evaluation in 2017 to check if it was fit for purpose. On the basis of the evaluation¹⁴ completed in 2019 (hereafter “the evaluation”), it was decided to proceed with a revision of the Regulation in the Commission Work Programme for 2021.

The Regulation has close links to other EU legislation, notably Regulation (EU) 517/2014 on fluorinated greenhouse gases, as these gases have replaced ODS in many of their original uses and the two Regulations apply similar measures to reduce the substances controlled and their emissions. Both Regulation are being reviewed in parallel. There are also close links to, *inter alia*, waste¹⁵ and chemical¹⁶ policies, and customs and market surveillance legislation.

An effective ODS policy that is preventing ODS emissions to the extent feasible **remains crucial for the Green Deal**, notably for achieving full recovery of the ozone layer and contributing to climate neutrality and staying below the 2 or 1.5 degrees Celsius target of the Paris Agreement on Climate Change. ODS emission savings **will be additional to the min. 55% reductions from other sectors by 2030.**

2. 2. PROBLEM DEFINITION

2.1. 2.1. What is the problem?

The evaluation found that the Regulation ensures compliance with the Protocol and exerts a positive influence on third countries to do likewise. It has safeguarded a high environmental ambition by eliminating the majority of past ODS uses, while also ensuring a level playing field for concerned industries and undertakings among Member States. **Thus, most of the**

¹² On a permit from the European Commission only, based on a request from a competent authority of a Member State.

¹³ This possibility has not been used in the EU since 2010.

¹⁴ EVALUATION of Regulation (EC) No 1005/2009 of the European Parliament and of the Council of 16 September 2009 on substances that deplete the ozone layer {SWD(2019) 407 final} https://ec.europa.eu/clima/sites/default/files/ozone/docs/swd_2019_406_en.pdf

¹⁵ E.g. Regulation (EC) No 1013/2006 on transboundary waste shipments, the Waste Electrical and Electronic Equipment Directive 2012/19/EU and the Waste Framework Directive (Directive 2008/98/EC).

¹⁶ E.g. REACH (Regulation (EC) Nr 1907/2006), the Industrial Emissions Directive (Directive 2010/75/EU) and the European Pollutant Release and Transfer Register (ePRTR) Regulation (EC) No 166/2006.

obligations and measures of the current Regulation are fit for purpose and should therefore remain in place (see intervention logic in Annex 8).

However, the design of the Regulation could be slightly improved:

- i. Some measures are not sufficiently **efficient**;
- ii. There are minor gaps in **monitoring**; and
- iii. There is a need for **clarity and coherence** with other rules.

As most uses are now prohibited, effective control needs to be maintained in the long run. Furthermore, in light of the Green Deal and the goal of reaching climate neutrality by 2050, **any remaining emissions of ODS should be scrutinised** to determine if further emission reductions would be technically feasible at proportionate costs. The drivers for these issues and developments are described below.

This review seeks to **step up ambition** without questioning the overall concept, approach and measures of the Regulation, as it was generally deemed to be fit for purpose. It also explores how the **design of the Regulation can be fine-tuned** to improve efficiency of existing measures and maintain effective control. Many suggested changes will result in minor improvements without other impacts.

2.1.1. 2.1.1. Where the residual emissions come from

The main emissions (over 98% both ozone and climate effect¹⁷) are a result of ODS banks¹⁸, in particular from insulation foams¹⁹. Additionally, some emissions result from production and the exempted uses of ODS (listed in Annex I); production and the use of new ODS (listed in Annex II); and ODS not listed in the Ozone Regulation, see Table 1.

Table 1. 2019 emissions of ODS from different sources and recent trends of emissions factors

ODS source		2019 Emissions	
Raw materials	Production of ODS (Annex I)	10* ODPt	& 0.06 Mt CO ₂ e
	Production of Annex II substances	<i>Not reported, estimated as 4 tODP based on emission factors established for Annex I substances as above</i>	
(Exempted) Use of ODS	Feedstock – Annex I	35 ODPt	& 0.20 Mt CO ₂ e
	Feedstock – Annex II	18 ODPt	& 0.010 Mt CO ₂ e
	Process agents – Annex I	4 ODPt	& 0.014 Mt CO ₂ e
	Laboratory use – Annex I	< 1 ODPt	& ca 0 Mt CO ₂ e***

¹⁷ Any amount of emissions in terms of mass has both a value in tODP and in tCO₂e. It is calculated by taking the weight of emissions in tons from each substance and multiplying it by its ODP and its GWP. Then the respective results in tODP and tCO₂e from all substances are added up. To make the calculation, the respective amounts of the individual substances must be known.

¹⁸ ODS banks: The amount of ODS contained in existing equipment and products (e.g. refrigerators or insulation foams), including after their end of useful life, and chemical stockpiles; or recovered and stored ready for use

¹⁹ Old cooling equipment with ODS (e.g. refrigerators) are not in use anymore, but those already present in landfills and where the ODS was not removed and destroyed, contribute to these emissions.

	Halon for critical use	23.7 ODPt & 0.015 Mt CO ₂ e
Total Annex I	Total exempted uses & production	74 ODPt & ca 0.3 Mt CO₂e
Total Annex II	Feedstock use & production	22 ODPt & ca 0.01 Mt CO₂e
Banks	Insulation Foams	Ca. 6000** ODPt & ca. 37 Mt CO₂e

* Extrapolated value based on available data for 10% of the total production

** Value based on data from SKM Enviros (2012)²⁰

*** Composition not known but climate effects will be < 0.01 MtCO₂e

2.1.1.1.2.1.1.1. Continuing emissions from ODS foam banks

(i) Status quo of the issue

The main source of current and future emissions are from certain building materials containing foams blown with ODS²¹. ODS emissions occur when buildings using such foams are renovated or demolished and the foams are crushed or shredded (releasing the ODS gas from the foam). In addition, significant emissions occur if relatively intact foams from construction and demolition waste (CDW) are landfilled without treatment, as the remaining ODS gases will slowly leak out over time. Annual emissions from all foam banks are estimated to be ca. 6000 tODP or 37 Mt CO₂e today.

(ii) Drivers

The Regulation only requires recovery when it is technically and economically feasible. This is open to interpretation and results in little recovery activity in most Member States²², given the weak legislative requirement to recover only *if technically and economically feasible*. This requirement places the burden of proof on authorities and would require rather strong enforcement efforts to ensure that the right judgement call is made each time ODS foams are being crushed or shredded. In practice, the technical and economic feasibility to recover ODS depends on the type of foam (e.g. panels, boards, spray or block; see Annex 6), and where it is installed.

Large quantities of ODS foams will enter the waste stream each year until 2050, with peak amounts reached only after 2030 (see Fig. A6.1 in Annex 6). As it is often more costly to separate, transport and destroy the ODS contained in the foam, standard disposal via landfilling without ODS recovery is common practise. Rising prices of raw materials and

²⁰ SKM Enviros (2012) "Further Assessment of Policy Options for the Management and Destruction of Banks of ODS and F-Gases in the EU". In their study for the Commission, SKM developed a revised banks model using bottom-up data from the insulation sector. As one of the main findings, the SKM study highlighted the dominant role of CFCs in old building insulation products. The data was confirmed by the stakeholder consultations carried out for the Evaluation. Given that no more ODS were used in new foams after 2003 in the EU-28, the banks estimations from the 2012 are considered still accurate.

²¹ ODS were used in the manufacturing of foams in the past: ODS were injected into a liquid, creating bubbles that provide the insulating capabilities. The hardened foam consist of a matrix and enclosed ODS gas bubbles.

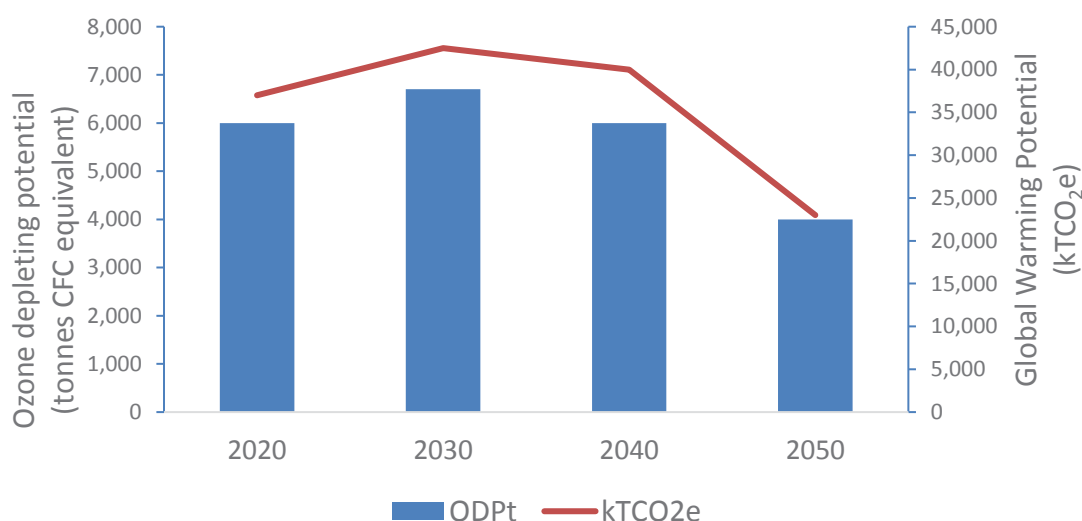
²² SKM Enviros (2012) "Further Assessment of Policy Options for the Management and Destruction of Banks of ODS and F-Gases in the EU".

costs of landfilling are expected to encourage some more recycling and recovery of foams in the future.

(iii) How the problem will evolve

Very significant amounts of emissions, in particular in climate terms, are expected to continue from the lack of recovery of ODS from foams during the refurbishment and demolition of buildings. Annual emissions will increase to ca. 6700 tODP or 43 million tCO₂e (between 2030-35), about half of the total amounts entering the waste stream each year. After 2035 this trend will reverse, but the potential emissions still remain at ca. 4000 tonnes tODP or 23 million tCO₂e even in 2050 (Fig. 1). This is due to the growing contribution of long-term leakage from landfilled ODS foams, even though the amount of ODS foams entering the waste stream will already have been significantly reduced by 2050. The main sources of ODS emissions from insulation foams are metal-faced panels and laminated boards, with smaller contributions from block foam and spray foam (see Fig. A6.1 in Annex 6).

Figure 1. Expected EU annual emissions from foam banks



2.1.1.2.2.1.1.2. Continuing emissions from production and (exempted) uses of ODS (Annex I), new ODS (Annex II) and ODS not listed

(i) Status quo of the issue

The magnitude of these emission is much smaller than that of foam banks:

- Total annual emissions from the **exempted uses of Annex I ODS, including their production**, are estimated to be ca. 74 tODP or 0.3 Mt CO₂e (2019 data). Emission rates (emissions divided by the quantities used), where available²³, have generally declined in

²³ There are some indications, e.g. from data reported under the E-PRTR, that these emission rates might be higher than stated here.

recent years (2010 to 2019, see Table A4.2 in Annex 4). However, the quantities used as feedstock in chemical production continue to be significant (ca. 39,000 tODP used in 2019, other exempted uses are 1-2 magnitudes lower; see Table A4.1 in Annex 4). While these few exempted uses persist for the sole reason that suitable alternatives are difficult to find, there appear to be alternatives to the use of ODS in two feedstock processes²⁴ and for the use of halons in some military equipment²⁵.

- Total annual emissions from **production or feedstock use of ODS listed in Annex II** is estimated at 22 tODP or 0.01 Mt CO₂e (2019 data). Feedstock uses in chemical production processes are significant (20,500 tODP). However, emission rates are estimated (in the absence of comprehensive reporting data) to be as low as those of Annex I feedstock use. For other uses of Annex II ODS (only about 1% of total quantities used) or for ODS not listed, emissions and use data is not known in detail. ODS not currently listed²⁶ have lower ODPs and GWPs, but recent research results indicate that some of them may be relevant for ozone depletion nonetheless.

(ii) Drivers

- **Annex I exempted uses: In practice the Regulation does not require further reductions of the quantities used for the exempted uses²⁷**, although there are some measures in the Regulation targeting these uses (quota system for import and production; total limits and limits per installation on process agent use in 5 remaining chemical plants²⁸ and an upper limit for laboratory uses). These limits are not very restrictive and often far exceed the actual needs. Tightening limits without possibly restricting vital economic activities is not straightforward, as for most exempted uses, suitable alternatives are not available (yet). Still, the Regulation does require undertakings to take all precautionary measures practicable to prevent emissions during use. Furthermore, it is possible to regulate ODS emissions, e.g. from chemical production and feedstock use, under the Industrial Emissions Directive (Directive 2010/75/EU, IED). To do so would require identifying them as a key environmental parameter in Best Available Techniques (BAT) relevant for installations in order to obtain operation permits. This has rarely been the case so far, however.
- **For the use of halons to service a few remaining types of critical appliances, the Regulation stipulates a phase-out schedule up to 2040.** These uses depend on existing stocks of halons and halons reclaimed from old equipment, as production of new halons

²⁴ These processes are the use of (i) HCFC-22 to produce tetrafluoroethylene (TFE) and (ii) carbontetrachloride (CTC) to produce perchloroethylene (PCE).

²⁵ These uses are for fixed fire protection systems of (i) engine compartments on military ground vehicles, and (ii) normally unoccupied engine spaces on military surface ships. Alternatives are also available for the inerting of fuel tanks on aircraft and in lavatory waste receptacles, but remaining quantities used are very low for the latter two uses.

²⁶ Besides other ODSs where the uses, sectors or emission sources are completely different (such as N₂O) and therefore not considered to be regulated by the Regulation.

²⁷ Except use of halons in critical equipment (see further below)

²⁸ Commission Decision 2010/372/EU, updated by Commission Decision 2014/8/EU

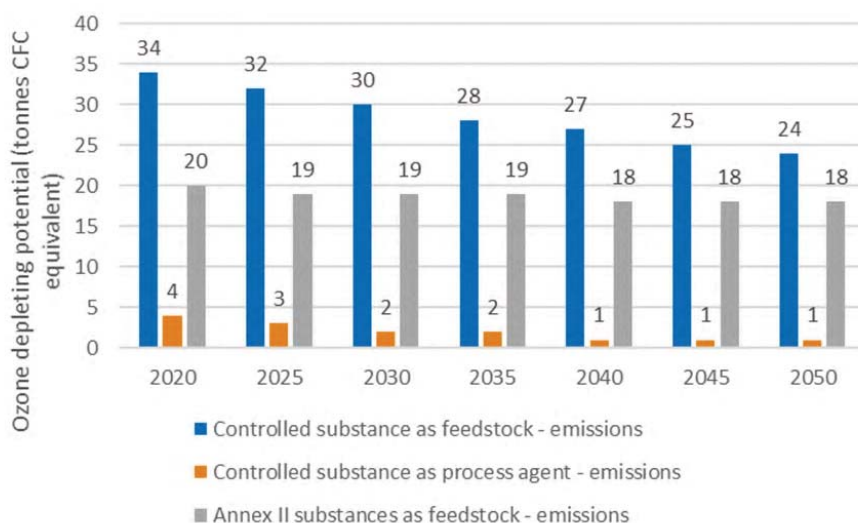
for these uses is prohibited globally under the Protocol²⁹. Recent assessments carried out by the Protocol's Halons Technical Options Committee (HTOC) indicated that non-virgin halon stocks for critical uses might not be sufficient to meet the needs from 2030 onwards at global level. If future demand for halons cannot be met (including at the global level), **new production of halons could become necessary which would result in additional emissions.**

- **The use of Annex II ODS is not restricted by the Regulation³⁰.** Their future use will depend, to a large degree, on growth in the sectors using them as feedstock and therefore on the general economic situation. There are also some emissive uses (e.g. as solvents) and a potential use of trifluoroiodomethane (CF₃I) in blends used for refrigeration and air conditioning appliances.

(iii) How the problem will evolve

Emissions from the use of ODS in chemical production (production, feedstock, process agents) of both Annex I & II ODS are expected to continue but may slowly decline over the next decades (see Fig. 2). Emissions from EU production of ODS are also expected to be sustained with a slow decline in the long run (see Table 4.4 in Annex 4). In addition, very small emissions (< 1 tODP) from laboratory and analytical use are assumed to be constant over time, as confirmed by stakeholders.

Figure 2. Baseline emissions of ODS-using chemical production processes in tODP (controlled substances = Annex I)



Halon emissions in tODP are estimated to decline by 40% until 2040³¹ and to fall to zero thereafter, as all equipment must be halon free by then according to the Regulation. However, this does not take into account that additional emissions of halons with very high ODPs and GWPs may occur if new production of halons becomes necessary. An important rationale for

²⁹ And therefore also by the Regulation

³⁰ Except for Halon 1202 listed in Annex II(A) to which similar restrictions apply as for Annex I ODS

³¹ It is possible that emissions reduce more quickly if equipment is replaced ahead of phase-out dates.

the strict EU phase-out schedule for all halon-using equipment has been to drive the development of alternatives, and avoid that production would risk to be permitted again at global level.

2.1.2. 2.1.2. Efficiency issues

The evaluation concluded that the Regulation has been efficient overall, but for some measures the costs incurred have been more significant than originally foreseen, and some costs for companies persist even though they may no longer be necessary for effective control now the traditional uses have been phased out and the focus is mostly on strictly controlling the exempted uses. In particular, the evaluation showed that the following could be improved:

- The licensing system for imports and exports, and more efficient control of illegal trade,
- The registration system for laboratories,
- The quota systems for import and production of exempted uses,
- One prohibition date for halon use aboard aircraft that is infeasible and leading to costs.

(i) Status quo of the issue

- **The current licensing system creates a high burden for EU-level administration and unnecessary costs for industry.** Providing effective control of trade with third countries at reasonable effort is extremely important to prevent illegal activities. To this end, licensing of imports and exports is required by the Montreal Protocol and an EU-wide ODS licensing system is in operation. However, there are costs linked to the manual granting of licenses at shipment level and the need for economic operators to apply for licenses for each shipment in addition to declaring at customs. At the same time, the European Commission has set up an IT system (CERTEX) that allows the exchange of data (“certificates”) on relevant ODS shipments between the central EU ODS licensing system and custom offices in the Member States directly. The Commission proposal for a Regulation establishing the *EU Single Window Environment for Customs*³², currently being negotiated with legislators, makes the use of this system obligatory in all Member States. Due to the linking of the two IT systems, the information in the customs declaration information will be automatically transferred for *each shipment* to the ODS licensing system to be checked and stored, and customs offices will be advised on how to proceed with the shipment.
- **Stakeholders, in particular in the chemical industry, have recently expressed great concerns about the growing importance of illegal trade**³³. It seems that rogue traders are using e.g. special customs procedures (temporary storage, transit etc.) to illegally place ODS on the market. The current ODS rules, notably the licensing system in combination

³² https://ec.europa.eu/taxation_customs/general-information-customs/electronic-customs/eu-single-window-environment-for-customs_en

³³ While most illegal activities concern the related sector of F-gases, there are also some activities reported that concern ODS

with the legal base for customs controls, does not appear adequate in preventing such activities.

- **The registration system for laboratories using very small quantities of ODS leads to excessive costs compared to the benefits.** Registration of all laboratories using ODS is intended to prevent that ODS imported or produced for exempted laboratory and analytical uses are not used for processes where ODS is not needed or allowed. However, most users consume ODS only in miniscule amounts, e.g. for testing (often below 0.1 kg per year), so the environmental damage avoided is minimal. Many are SMEs that face entry costs in understanding the legislation, becoming acquainted with the registration system and providing the right information. Moreover, laboratories may be unaware about the need to register. This puts into question the cost-efficiency and effectiveness of the requirement. That being said, the collected information from the registration system has, in the past, been useful in facilitating the work of the technical bodies of the Protocol to better understand these uses.
- **Costs of the annual quota systems for import and production of exempted uses are disproportionate compared to the benefits.** Based on the results of the evaluation, import and production quotas did not result in any noticeable environmental effects, although they proved to be effective at reducing the use of the relevant substance groups in the past when the EU was still reducing the general consumption and production of ODS (Annex I) under the Protocol's schedules. As this has now been achieved, the remaining exempted uses are allowed only to the extent that they are actually needed. A quota system therefore appears to be redundant.
- **One halon prohibition date cannot be met and may therefore create administrative costs for airline companies and authorities linked to the need for individual derogation requests.** The aircraft industry is finding it challenging to find suitable alternatives for the protection of unoccupied cargo compartments on airplanes.

(ii) Drivers

- **The Regulation requires the presentation to customs of an import license for each imported and exported shipment.** Given the linking of customs offices to the EU central database, and once this system becomes mandatory in all Member States, the additional step of a prior application process on a shipment basis will no longer be necessary, as every shipment can be checked automatically as regards the information contained in the central database and determine its legality on that basis. Maintaining the requirement would therefore be creating costs with no corresponding benefit. Instead, a one-time registration (with periodic renewal) of the trader stating the specific conditions under which the trader may import or export, would be fully sufficient (a "trader licence") and will be checked and monitored through the CERTEX/Single Window system.
- The flexibility offered to traders by **some customs procedures might limit a good EU-wide enforcement** including border controls.
- **The Regulation requires** a large number of affected (small) entities using very small amounts of ODS to keep their **registration in the central database updated** for laboratory and analytical uses.

- **The Regulation requires** the Commission to **allocate quotas and** companies to **hold quotas** for importing and producing ODS, which result in costs for authorities and companies.
- **The Regulation requires that halons may not be used in the fire protection of normally unoccupied cargo compartments** in newly type certified airplanes.

(iii) How the problem will evolve

- The costs savings potential by carrying out automatic shipment-level controls through CERTEX/Single Window will not be realised, as manual controls and pre-applications for licenses would have to continue, even though a better³⁴ control is already achieved through the automatic checking of all relevant import and export shipment data with data contained in the central database. Based on the findings of the evaluation, costs for businesses (total €114,000 p.a.) and the Commission (132 person days p.a. plus cross-cutting IT costs³⁵) will continue at today's levels with only slight decreases until 2050. Illegal imports linked to special customs procedures will be difficult to avoid and represent potential emissions.
- Laboratories and other entities carrying out analysis will continue to bear costs (total €50,000 p.a. based on the evaluation) long-term for keeping their registrations updated, at little environmental benefit. The Commission will continue to have costs for using and maintaining the relevant IT system (99 person days p.a., €31,500 IT costs, based on the evaluation).
- The quota systems will continue to create costs for companies (€11,000 p.a. based on evaluation) and authorities (60 person days p.a. for Commission, some costs also for Member States, based on the evaluation), decreasing only slightly in the long term.
- The currently infeasible halon prohibition will, according to the evaluation, create costs for aviation companies (120 person days), Member States (120 person days) and the Commission (320 person days) until a viable alternative is found.

2.1.3. 2.1.3. *Incomplete monitoring and reporting*

(i) Status quo of the issue

While the evaluation found that the monitoring system in place is by and large adequate, except for the possibility of adding a few substances for monitoring, some Member State authorities and representatives of civil society suggested additions to get an even better overview, especially in view of the current shift towards also recognising the climate relevance of ODS. In particular, the system lacks mandatory reporting on:

- Feedstock use and destruction of new ODS (Annex II) despite high amounts (about half of Annex I substances in tODP);
- Emissions resulting from production and destruction by all emitters and at substance level. Some aggregate ODS emissions are monitored by the European Pollutant

³⁴ Due to the manual process many licenses are not checked at customs today

³⁵ Cross-cutting IT costs for licensing, registration and quota: 168 person days annual plus 177,700 annual IT implementation costs (see Table A4.7 and A4.8 in Annex 4)

Release and Transfer Register (Regulation (EC) No 166/2006 requiring Member States to report emissions from industrial facilities), but some thresholds apply and not all ODS emitters are in scope. Furthermore, the aggregate parameter based on weight does not allow to determine the relevance for the ozone layer (tODP) and the climate (tCO₂e)³⁶;

- The climate impact of ODS (Global Warming Potential (GWP)) is not conveyed.
- Intra-EU trade in ODS by producers, destruction facilities and feedstock/process agent users;
- Despite being used in significant quantities (production volumes in metric tonnes exceed those of Annex I substances several times³⁷), a number of substances with an ODP are currently not listed in the Regulation and therefore not monitored with a view to identifying future risks.

(ii) Drivers

There are no requirements in the Regulation mandating reporting on the substances and parameters listed above.

(iii) How the problem will evolve

Without addressing the monitoring gaps, the picture of ODS uses and emissions would remain incomplete. This would in particular affect the appreciation of climate-relevant emissions and emerging issues that would not be monitored in support of on-going research regarding their impacts. Some of the relevant trade flows would remain incompletely monitored and there would be less control on illegal trade within the Union. The lack of intra-EU data also makes reporting on production to the Protocol more difficult, as this needs to be done at Member State level. This is e.g. an issue in case an ODS is produced in one Member State, but used as feedstock or destroyed in another.

2.1.4. 2.1.4. *Coherence and clarifications*

(i) Status quo of the issue

The long experience in the implementation and enforcement of ODS legislation has led to a good integration of the Regulation within the EU environmental legal framework. However, as pointed out by the evaluation, some further coherence and clarity should be achieved on the following issues:

- Lack of coherence with the **Montreal Protocol**: Technological progress has allowed the tightening of the international **rules under the Montreal Protocol on destruction technologies and process agent uses and their limits**.
- Lack of legal coherence with the more recent **Regulation (EU) 182/2011**, which lays down the rules for the control of the Commission's exercise of its implementing powers:

³⁶ ODS have widely varying ODPs and GWPs, so that it is necessary to have emission values at substance level to determine effects on ozone layer and climate

³⁷ But produced quantities in tODP are significantly smaller than those of Annex I substances, since the unmonitored substances have rather low ODPs

The Regulation needs to be aligned with that Regulation (where it refers to Directive 1999/468/EC) and also needs to be aligned with the Treaty (where it refers to regulatory procedure with scrutiny)

- Lack of coherence with **customs legislation**: Better coherence with the customs rules is relevant for preventing illegal trade in a more effective way. A 2020 operation by the World Custom Organisation called DEMETER VI, where a number of EU Member States participated, found illegal shipments involving 11 tonnes of ODS³⁸. While this is not at the alleged level of illegal trade for fluorinated gases, custom officials have made the point that the role of customs in controlling imports is not sufficiently clear in the Regulation which complicates enforcement. Special temporary custom procedures, such as transit, have been pinpointed as areas where trade facilitation may be exploited for illegal activities. Many stakeholders have emphasised that the ODS Regulation and the Regulation (EU) No 517/2014 (**F-gas³⁹ Regulation**) should take similar approaches as they concern similar sectors and objectives (emission prevention). Currently the usefulness of the CERTEX/Single Window system is limited as relevant input data such as net mass is not provided with the customs declaration.
- Currently it is difficult to judge if **national penalties have a dissuasive effect** and non-compliance with relevant measures may not be treated as a criminal offence. Business stakeholders report large discrepancies between rules in different Member States, and industry associations request more harmonised and dissuasive penalties to discourage illegal activities.⁴⁰ Directive 2008/99/EC on the **protection of the environment through criminal law** establishes that the illegal production, trade, placing on the market or use of ozone-depleting substances is a criminal offence. As it will be substantially amended, coherence is currently not ensured.
- Differences with the **F-gas Regulation**: (Exempted) ODS, in contrast to F-gases, can be placed on the market without a requirement to destroy or capture the strong greenhouse gas HFC-23, which is often a by-product during the manufacturing process.

Finally, as indicated by the evaluation, there is also some scope for simplification and clarifications of the text. As these are not believed to have measurable impacts, they form part of all policy options. They are listed in Annex 7.

(ii) Drivers

The following drivers are relevant:

- The Regulation is not updated to binding international rules as regards allowed destruction technologies and process agent uses and their limits.
- The Regulation includes several references to the old ‘regulatory procedure with scrutiny’ for which no automatic alignment is envisaged by law.

³⁸ DEMETER VII (2021) only discovered 101 kg of substances, but additionally 493 pieces of equipment controlled by the Protocol

³⁹ “F-gases” = fluorinated greenhouse gases, as defined by Regulation (EU) No 517/2014

⁴⁰ This issue was also identified by F-gas and custom experts group that met several times between 2019 to 2021 to discuss illegal HFC trade. The Commission financed the group under the *The Customs 2020 Programme*.

- Some time limits relating to customs procedures are not aligned and the obligations of custom authorities are not explicitly specified in the Regulation. A clear legal base for requiring the net mass to be specified in customs documents is lacking.
- The Regulation specifies the need for proportionate and dissuasive penalties but does not mention criminal offence.
- The Regulation does not mirror relevant obligations on producers in the F-gas Regulation as regards the destruction or capture of HFC-23 by-production.

(iii) How the problem will evolve

With the current legal framework, the EU would not be able to align fully with international rules and could even risk non-compliance. Non-alignment with custom rules will prevent more efficient controls going forward and likely result in additional emissions. Similarly, non-alignment with EU rules on environmental crimes, taking into account developments on the review of the Environmental Crimes Directive, and a lack of harmonisation of penalty rules would prevent coherent implementation across the Union. Potential emissions may also arise from a non-alignment with the F-gas Regulation as it leaves some loopholes on producer obligations.⁴¹

3. 3. WHY SHOULD THE EU ACT?

3.1. 3.1. Legal basis

The legal basis for taking action is Article 191 of the Treaty on the Functioning of the European Union, in line with the objective to preserve, protect and improve the quality of the environment; protect human health; and to promote measures at international level to deal with climate change.

3.2. 3.2. Subsidiarity: Necessity of EU action

The EU and the EU Member States, as parties to the Protocol, have a number of requirements to fulfil (see 1.2) at the international level. There are similar requirements in international trade agreements that the EU has concluded. The EU is considered a regional economic integration organisation (REIO) under the Protocol, and therefore complies with these requirements at Union level (e.g. reporting, licensing system, consumption phase-out), which requires relevant legislation at the same level. Only for the Protocol's ODS production phase-out schedules is it the Member States⁴² that need to comply with this provision individually.

A hypothetical implementation of these commitments under the Protocol at Member State level is very **difficult to reconcile with the general principles of the EU internal market and the free movement of goods**. The evaluation concluded that only a common and harmonised EU approach can effectively implement the Protocol's obligations and respect internal market rules.

⁴¹ The F-gas Regulation is also currently being reviewed.

⁴² Only a few Member States continue to have ODS production (Czech Republic, France, Germany, Italy and The Netherlands)

3.3. 3.3. Subsidiarity: Added value of EU action

Compared to the counter-factual scenario where national systems for licensing import/exports, phase-outs, and reporting would need to be implemented, the EU level approach provides much higher efficiency for authorities and undertakings, in particular for companies operating in more than one EU Member State. By way of example, the trade and transfer of recovered, recycled and reclaimed ODS (Annex I)⁴³ strongly benefits from the interconnected EU market and harmonised rules for cross-border movement of goods. As estimated by the evaluation, the needed additional measures for national implementation of the Regulation compared to the current situation would increase the administrative effort by a factor larger than 18. Furthermore, Member States would likely implement different legislative approaches. Even though a few could choose to be more ambitious at the national level, the sum of national ODS legislation would likely be less ambitious than an overall EU-wide approach, as confirmed by industry and authorities alike. Likewise, undertakings would need to ensure that they comply with different requirements set by the countries where they operate. The EU added value is fully confirmed by the favourable opinion among stakeholders towards regulating ODS at EU level.

4. 4. OBJECTIVES: WHAT IS TO BE ACHIEVED?

4.1. 4.1. General (review) objectives

The EU should take action and provide solutions in order to examine if more ambitious emission reductions in line with the Green Deal are possible. Furthermore, while it is paramount to have an ambitious EU policy in place to protect the ozone layer and contribute to fighting climate change as well as to ensure compliance rules under the Protocol (and bilateral trade agreements), this should be achieved *in a more efficient, coherent and clear manner*, while maintaining and/or improving controls. .

4.2. 4.2. Specific (review) objectives

Fit for the European Green Deal:

- A. Achieve a higher level of additional emission reductions

Fine-tuning the design of the Regulation:

- B. Improve the efficiency of the Regulation while preserving the significant emission reductions achieved so far
- C. Ensure more comprehensive monitoring
- D. Improve coherence and clarifications

⁴³ Very relevant today for some ODS, given that new production is prohibited at the global level while still required in critical applications (e.g. halons) and for effective destruction at end-of-life of ODS equipment.

5. 5. WHAT ARE THE AVAILABLE POLICY OPTIONS?

5.1. 5.1. What is the baseline from which options are assessed?

The baseline, against which policy options are assessed, assumes that the current Regulation and implementing acts remain in place unchanged.

5.1.1. 5.1.1. *Baseline for environmental impacts*

The main relevant environmental impacts are linked to releases of ODS into the atmosphere, causing harmful damage to the ozone layer and the climate, due to their ODP and high GWP. The basis for estimating future emissions is the estimated developments of the parameters production, trade, use⁴⁴ and stocks/banks, from which emissions can occur, in addition to the associated emission factors. An exhaustive discussion of methodology and assumptions made (e.g. Table A4.3) is given in Annex 4. Table A4.4 shows the modelled future development of the underlying parameters.

Future overall ODS emissions are largely determined by the emissions from insulating foam banks (see Fig. 1), both in ozone (tODP) and climate (tCO₂e) terms. Emissions will rise from current levels of ca 6,000 to peak levels of 6,700 tODP (i.e. from 37 to 43 MtCO₂e) around 2033, and will only start to decrease after that, as the amounts of legacy material (i.e. ODS foams in old buildings) entering the waste stream each year will start to fall only after 2030 (Fig. A6.1 in Annex 6). Still, emissions will still be 4,000 tODP (23 million tCO₂e) in 2050. Emissions will continue for many years after, at slowly decreasing levels, as the contribution of slow but sustained emissions from landfilled material, where the ODS was not destroyed, will become relatively more important.

Emissions from all other sources are two to three magnitudes lower, so their contribution to the overall emissions is very low (Table A4.4 in Annex 4). In the baseline, emissions from production and feedstock uses are largely sustained, with moderate decreases expected for Annex I ODS only in the long run. Emissions from process agent uses will disappear in the long run as the remaining legacy plants using them will close (use by new installations is not permitted), and halon use will be phased out by 2040. This would also end related emissions as long as any remaining stocks are destroyed. Laboratory and analytical uses will continue unchanged, but emissions from these processes are minuscule (< 1 tODP).

5.1.2. 5.1.2. *Baseline for economic impacts*

At this stage, the Regulation no longer requires any major shifts towards ODS alternatives (as this has been largely accomplished). Therefore the cost baseline for businesses, Member States and the Commission (plus EEA) are essentially limited to administrative costs. There may, however, be some compliance costs for halon users to meet the remaining prohibition dates and for emission prevention measures. The cost data are primarily taken from the evaluation and projected until 2050, taking into account the expected changes to ODS market parameters (Table A4.4), where relevant, see tables A4.5 and A4.6 in Annex 4 for details on

⁴⁴ I.e. use as feedstock, process agents, laboratory and analytical, critical halon applications

cost drivers.⁴⁵ Furthermore, the cost trajectories between 2020 and 2050 are split by type of stakeholder and by the relevant measures resulting in these costs, such as licensing, quota allocations, monitoring, reporting, etc.

For business, annual administrative costs of ca. €300.000 would decline only slightly until 2050 in the baseline scenario (an overall decline of less than 10% is forecasted; see table A4.7 in Annex 4). The two most important cost categories are licensing and reporting requirements. The overall use of ODS, to which these obligations are linked, will decline very slowly over time. This means that fewer businesses will need to provide reporting and apply for licences. At the same time, those businesses that still do, will spend less time on these activities due to (slightly) lower ODS volumes (and a lower number of substances) to license and report. On the other hand, registration costs for laboratories and compliance costs to business related to emission controls, following protocols on destruction and reclamation, as well as inspections are assumed to remain constant in the long run.

The administrative costs for Member States would remain the same, at very modest levels. These costs (<€40.000 p.a. see table A4.8 in Annex 4) are mainly linked to reporting. Member States also need to carry out inspections, custom controls and general enforcement matters (ca. 507 person days in total annually).

The annual administrative costs at European level (Commission and EEA) would increase further until 2025, and decrease slightly thereafter. Annual costs for the Commission would increase from ca. 788 person days to ca. 825 person days (see table A4.8 in Annex 4). The main reason for the initial increase is rising personnel costs for the Commission related to the registration and licensing systems caused by more stringent requirements on data protection and security issues. Costs related to the day-to-day treatment of registration of laboratories would remain constant. Many other cost categories are expected to decline slightly over time, in line with the slowly declining use of ODS. Costs remain constant for general support topics such as ensuring compliance in MS, providing access to documents, outreach activities, advice to stakeholders etc. The costs to the EEA linked to the reporting systems are projected to continue but with an increase in IT project management costs as noted above for the Commission.

Effects of COVID-19. Targeted stakeholders representing the relevant types affected by the Regulation (see synopsis report, Annex 2) were routinely asked about the effects of the pandemic on their business. Most respondents were not able to indicate concrete impacts of the COVID-19 pandemic or to provide estimations on how the crisis would affect the expected impacts of the policy options. This is confirmed by the most recent company reporting data for 2020 on production and trade which is within the expected range.⁴⁶ However, one feedstock user expected that dichloromethane (DCM), which is used in the pharmaceutical sector, would be produced in increased amounts in the EU in the future, as the production of certain pharmaceuticals will be pulled from emerging markets back to Europe (relevant to option C5). One supplier of laboratories in the EU indicated that slightly

⁴⁵ Inflation is not taken into account in the costs. For comparison impacts in real terms are more relevant.

⁴⁶ EEA. EU (ODS) data summary 2021. Preliminary findings (not published)

fewer orders from customers had been observed recently, while another pointed out that the simplifications considered for the ODS licensing system (i.e. option B1) would probably increase the resilience of their business. An aircraft manufacturer stated that the aerospace sector has been significantly impacted and indicated that the research of halon alternatives has therefore been delayed by around twelve months, according to internal estimations. This delay in R&D would in particular be relevant for finding alternatives to the protection of normally unoccupied cargo compartments (see option B6). Most of the effects appear to be rather short term, linked to the general economic situation.

5.1.3. 5.1.3. *Baseline for other impacts*

The remaining impacts, which are grouped under social impacts, include impacts on employment, research & development, and consumer prices. These impacts are not assessed quantitatively, due to the very small expected impact for the baseline scenario (e.g. see costs to business identified above) and often a lack of distinct quantitative data at these low levels. Future employment is mostly dependent on the production of ODS feedstocks, as these are by far the largest quantities still in use, and will depend upon general future trends in the (European-based) manufacture of chemicals and their added-value products. Employment in this sector will therefore also depend greatly on general economic development. The steady progress on R&D and finding new alternatives of the past (in particular halons, process agents; less so for feedstock uses)⁴⁷ is expected to continue but at a slower rate as the remaining ‘leftover uses’ are the most difficult ones to replace. The implementation of measure A.4 could potentially increase consumer prices for owners renovating or constructing a building. These additional costs compared to the overall costs of constructing or refurbishing and retail prices for new property are generally very small. As the foam recovery activities would be linked only to major renovations or new construction, vulnerable consumers making smaller upkeep renovations would not be affected.

5.2. 5.2. Description of the policy options

ODS is a long-standing policy area. On the basis of the evaluation findings, the overall approach and main measures of the Regulation are not put into question. Given the EU’s international obligations and the need to avoid backsliding, the main rules, shown to be effective overall, must remain in place. They cannot be replaced by e.g. voluntary approaches or economic incentives. Compared to the past, in EU ODS policy today there is a shift in the focus: Rather than phasing out entire chemical groups of substances that was needed in the past (e.g. CFCs, HCFCs), it is more about **preserving the huge ozone- and climate-relevant emission savings that have been achieved in the past, and controlling the remaining uses in specialised areas**. Therefore, the review will seek to fine tune the Regulation to today’s remaining challenges, to maintain good control while using efficient measures.

To achieve this, a series of feasible measures were identified for each review objective and issue listed in section 2. The collected measures were to a large degree proposed by stakeholders, in particular the Member State authorities, during the consultations on the

⁴⁷ Compare findings of the evaluation

evaluation and the impact assessment. A number of measures were based on internal Commission experience of implementing this policy as well as suggestions by outside experts. An overview of the link between the issues and the measures chosen is provide in Annex 10.

As the Regulation is generally fit for purpose, many measures relating to the design of the Regulation are targeting rather small issues and the impacts or cost savings related to solving these issues are equally small. Nevertheless, it would be a missed opportunity to forgo a possible improvement. Furthermore, for some of the issues, the choice of measure to remedy the issue was self-evident. For others, several measures were considered and those that appeared infeasible or ineffective were discarded, see section 5.3 and Annex 9. The selected measures are generally compatible with one another and not mutually exclusive. They are grouped into three packages on the basis of their expected (abatement) costs (see Table 2):

- **Option 1** includes measures resulting in **savings or very low costs only**. It focuses mainly on simplifications and better coherence and clarifications where these do not result in relevant costs, and includes also one very cost-efficient measure to reduce emissions (foams recovery limited to the sandwich panel foams).
- **Option 2** includes all measures in Option 1 plus additional measures that are expected to generate **some costs**, notably measures targeting emission reductions (e.g. foams recovery also from certain laminated panelling) as well as more comprehensive monitoring and control.
- **Option 3** includes all measures including those with **high (abatement) costs**.

In the following sections all the retained individual measures are described in detail and the impacts of each measure is analysed, taking into account the feedback provided by stakeholders as regards the expected impacts of each measure. Subsequently, an overview of the impacts of all measures is provide in Table 3.

Table 2. The three policy options and the respective policy measures included

Policy options Measures	Option 1	Option 2	Option 3
A1 Make destruction mandatory for some types of foam banks ((sandwich) panels and (laminated) boards, unless infeasible)	Panels only	Panels & boards	Panels & boards
A2 Introduce a negative list for chemical production processes			
A3 Review prohibition dates for equipment containing or relying on halons			
A4 Prohibit the destruction of halons			
A5 Prohibit use of Annex II substances in cooling equipment			
B1 Require trader licenses			
B2 Monitoring of illegal goods			
B3 Special custom rules for ODS			
B4 Abolish registration for laboratories			
B5 Abolish annual quota allocation			
B6 Delay requirement for replacing halons in aircraft cargo compartments			

C1 Align reporting obligations for substances in Annex II to Annex I			
C2 Require reporting on emissions for ODS production and destruction of ODS			
C3 Add global warming potential (GWP) values to Annex I and II			
C4 Require reporting on sales and purchases of ODS within the EU for producers, destruction facilities and users.			
C5. Add DCM, PCE and BTP as substances to be reported			
D: All measures improving coherence and clarity			

5.2.1. 5.2.1. *Review objective A: Achieve a higher level of additional emission reductions*

Almost all respondents in the open public consultation agree that there is a need for further reducing emissions from foams at their end of life. Conversely, for feedstock use processes where alternatives do not exist, almost all businesses (14 out of 15) are opposed to limiting these uses, whereas other stakeholder groups were more open to consider this.

A1. Require mandatory recovery and destruction of ODS from specific foam banks

It will become mandatory to recover/capture and destroy ODS by incineration for certain types of foams found in construction and demolition waste. An approach based on economic incentives was not considered useful as this would likely exacerbate the current situation (see section 2.1.1.1) where separate collection of foams would only be undertaken in a few proactive Member States, as financial incentives in the waste sector and producer responsibility schemes are prerogatives at national level. The Regulation should list the types of foam for which this is considered feasible at reasonable costs at the time of building renovation or demolition. The policy options are considering two ambition levels: While Option 1 includes only metal-faced panels (measure A1(a)), whose separate collection is rather straightforward and where the economic business case is best due to the recovery of the metal part, Option 2 and 3 include laminated boards (measure A1(b)), where feasibility of recovery depends on the place of installation (see Annex 6). In cases where the installation (in floors, attached to concrete etc.) makes foam separation difficult, the burden of proving infeasibility would lie with the building owner and the contractor performing the works. If recovery is not done, they would need to keep evidence for up to 5 years why foam separation from other building materials was considered infeasible. Such evidence could be e.g. building audit documentation carried out before demolition.

Member States would need to enforce this obligation. This effort may often be linked to other requirements in existing national legislation on renovation/demolition works, waste policy and the need for separation of materials, in particular in light of objectives for a circular economy.

A2. Introduce a negative list for chemical production processes where alternatives exist

The use of ODS as feedstock will become prohibited in two types of processes: (i) the use of CTC to produce PCE, and (ii) the use of HCFC-22 to produce TFE. In both cases alternatives

appear to be commercially available.⁴⁸ This option could include that further processes would be added in the future via comitology procedure. Chemical producers using these synthesis pathways would need to modify their production processes in order to use alternative processes without ODS. Member States would need to ensure compliance.

A3. Move forward prohibition dates for equipment using halons

Prohibitions for using halons will be moved forward from 2035 to 2030 for fire protection of (i) engine compartments on military ground vehicles and (ii) normally unoccupied engine spaces on military surface ships. The evaluation and stakeholder input indicate that retrofitting with ODS alternatives appears to be already feasible in these cases. This would place an obligation on the military to either replace or retrofit such halon equipment more quickly, which could result in significant, unforeseen costs. Member States would need to ensure compliance.

A4. Prohibit the destruction of halons

Destruction of halons will be prohibited, with certain exemptions e.g. in case the quality of the recovered halon is not sufficient to allow any reclamation and reuse. This would place obligations on operators using halon-equipment to ensure proper recovery and reuse. Undertakings may be required to keep records for five years for any halons that are destroyed anyway, detailing the technical reasons for the destruction. Member States would need to enforce this obligation, in particular to avoid venting by operators.

A5. Prohibit the use of Annex II substances in new refrigeration and air conditioning equipment

It will be prohibited to place on the market Annex II ODS in cooling equipment. This would notably prevent the further use of trifluoroiodomethane (CF₃I) as a refrigerant (blend). Equipment manufacturers would need to stop using this substance as a part of refrigerant blends in their appliances. Member States would need to ensure compliance.

5.2.2. 5.2.2. Review objective B: Improve the efficiency of the Regulation while preserving the significant emission reductions achieved so far

Most respondents in the open public consultation consider the simplification of the licensing system in light of the Single Window as well as prevention of illegal activities to be (very) important. As regards the importance of simplifying registration for laboratory uses, all businesses (including two laboratory users) and most public authorities agree this is (very) important. Furthermore, all industry respondents and most public authorities find it (very) important to abolish the quota system. Aviation industry has highlighted the infeasibility of one halon prohibition which was confirmed by authorities.

B1. Modernise the licensing system in view of the EU Single Window Environment for Customs (“Single Window”): Introduce trader licences for ODS bulk and equipment

⁴⁸ Ramboll (2019). Support study for the evaluation of Regulation (EC) No 1005/2009 on substances that deplete the ozone layer. Final Report.

The requirement to have an ODS import and export licence per shipment will be replaced by a requirement to have a periodic ODS licence for each trader stating the conditions under which the trader may import or export (trader licence). The Single Window will allow per shipment controls of imports and exports on the basis of data in the customs documents and an automatic cross-check with the Commission's ODS licensing system. To complete the overview, and given the lower administrative burden of the automatic system, the substance listed in Annex IIA will be included in Annex I, with the only additional change being that licensing will also be required for this substance. This makes an application for ODS licences prior to the import/export and the (partly) manual approval of licences by the Commission prior to custom clearance obsolete. This measure should only enter into force when the Single Window is in place in all Member States. The EC would need to adjust its database to allow for trader licences. Economic operators would need to only apply for relevant trader licences (once a year or even less frequently).

B2. Better monitoring of illegal goods

To ensure better control at less resources, custom controls should increasingly rely on automatic controls (see B1 above). To enable these controls for relevant customs procedures, the trader will be required to specify the 8 or 10-digit TARIC⁴⁹ code. This will allow an identification of the ODS (group) and thus enable better controls of ODS submitted to these procedures. The requirements for custom documents would need to be changed. The economic operators would need to provide the code any time such a procedure is launched. The existing requirement to present a declaration of critical use for reclaimed halons for obtaining a license for import will instead be required as a certificate at the moment of import. Furthermore, it should be clarified that goods (including non-refillable cylinders) that may not be placed on the market in the EU should also be prohibited from physical entry into the customs territory of the Union. This measure includes prohibiting the placing on the market of ODS (bulk and in products and equipment) online. Customs would identify such shipments as ODS-policy relevant and carry out risk-based controls to ensure the Regulation is enforced. Surveillance authorities should monitor goods offered online.

B3. Special custom rules for ODS

To be able to better identify illegal activities at lower administrative effort, relevant customs procedures will only be permitted for goods sent to particular destination custom offices. This may affect the logistics of legitimate traders, but should not affect the volumes of trade. Member States would need to identify the customs offices that are equipped to handle ODS trade to ensure good control. Customs should control, using risk-based approaches, if the conditions are provided for such shipments.

B4. Abolish the registration system for laboratories

⁴⁹ TARIC = Integrated tariff of the EU

https://ec.europa.eu/taxation_customs/business/calculation-customs-duties/what-is-common-customs-tariff/taric_en

The requirement for laboratories to register will be abolished. Instead, suppliers and purchasers should keep records with specific information on the quantities and specific uses for five years. This requirement will facilitate the control of improper use and collection of information for identification of e.g. progress on alternatives. Member States would have to ensure compliance of the requirements of permitted and prohibited uses (Commission Regulation 291/2011). Shipment data collected via the Single Window could be checked automatically for any unusual amounts or import activities related to such intended uses. Reporting would ensure further overview of production and use.

B5. Abolish the annual quota allocation process

The annual quota requirements for feedstock, process agents, halons for critical uses and laboratory and/or analytical uses will be abolished. Shipment data collected via the CERTEX/Single Window can be checked automatically for any unusual amounts or import activities related to such intended uses. Reporting will ensure further overview of production and use.

B6. Delay the requirement of using non-halon fire protection for normally unoccupied cargo compartments in newly type certified aircraft

The cut-off date from which it is no longer allowed to submit an application for type certification for an aircraft that uses halons in fire protection of unoccupied cargo compartments will be moved from 2018 to 2024 to take into account that alternative solutions have not yet been successfully qualified and certified. Aircraft producers that submit an application for type certification will no longer have to provide the relevant technical data to their Member State to justify requesting a Commission Decision allowing a derogation from the cut-off date. This timeline would align with rules in place by the ICAO (International Civil Aviation Organization).

5.2.3. 5.2.3. Review objective C: Ensure more comprehensive monitoring

All non-business stakeholder groups in the open public consultation placed high importance on additional reporting measures, whereas businesses were divided on this issue.

C1. Require reporting on use as feedstock, process agents and destruction also for new ODS (Annex II)

The reporting requirements for new ODS will be aligned with those of ODS (Annex I) to give a better overview of the uses of the former. This will slightly extend the reporting scope for those companies that have not already been reporting such data voluntarily. The possibility is already enabled in the reporting system run by the EEA.

C2. Require reporting on emissions at substance level for the production and destruction of ODS

Producers and destruction facilities will be obliged to report their ODS emissions⁵⁰, by substance. No changes to the reporting system run by the EEA will be needed.

⁵⁰ Currently not a requirement but often reported voluntarily.

C3. Add global warming potential (GWP) values to increase awareness of the climate impacts of ODS

The relevant GWP value for each ODS (Annex I and II) will be added. No additional requirements for authorities or economic operators would arise from this change.

C4. Require reporting on sales and purchase of ODS (Annex I) also for producers, destruction facilities and feedstock and process agent users

Reporting will be required on intra-EU trade to better monitor the supply chain of ODS and facilitate compliance with reporting obligations under the Protocol.^{51,52} This will extend the reporting scope for those companies. The possibility is already enabled in the reporting system run by the EEA.

C5. Add new substances to Annex II B

Three substances with an ODP, which could become relevant⁵³, will be added to Annex II B (monitoring), namely 2-BTP⁵⁴, dichloromethane (DCM), and perchloroethylene (PCE), so that their trade and use can be monitored. 2-BTP is likely to be produced in larger quantities in the future as an alternative to halons. PCE is used in high volumes in the EU (between 100.000 – 1.000.000 metric tonnes according to REACH registration). DCM is of concern as it accounts for the majority of the rise in total chlorine in the atmosphere from very-short lived substances (VSLS).⁵⁵ From the European Pollutant Release and Transfer Register (E-PRTR)⁵⁶ data it appears that emissions of DCM may be 31 tODP per year.⁵⁷ This will extend the reporting scope for affected companies. Adding the three substances requires only minor changes to the EEA's reporting system.

5.2.4. 5.2.4. Review objective D: Improve coherence

Many of the suggestions to ensure better coherence and clarification have been provided by stakeholders in the context of the evaluation and in the context of the consultation activities for this review. Two thirds of the respondents to the open public consultation found it (very) important to ensure a clearer and more accessible legal text of the Regulation.

Alignment with the Montreal Protocol

⁵¹ Currently such data is only required from importers and exporters

⁵² For reporting on production at Member State level, also intra-EU trade is relevant. Reporting is only needed for Annex I substances

⁵³ There are a number of other substances with an ODP that are currently also not monitored. Some of these are emitted from other (natural) sources or sectors (e.g. from agriculture) that the Regulation is ill suited to address. For others, their contribution to endangering the ozone layer or the climate is rather small as the quantities in use are small or their ODP/GWP is minimal. Unsaturated HCFCs (or HCFOs) are not considered here since this substance group is included for monitoring under the F-gas Regulation.

⁵⁴ 2-bromo-3,3,3-trifluoroprop-1-ene

⁵⁵ According to the Protocol's Scientific Advisory Panel (SAP), emissions of anthropogenic VSLS chlorine affects stratospheric ozone. A sustained future increase in atmospheric concentrations of DCM would therefore slow the recovery of the Antarctic ozone hole.

⁵⁶ Emission Pollutant Release and Transfer Register. <https://prtr.eea.europa.eu/#/home>

⁵⁷ This number is similar to total known Annex I feedstock emissions.

D1. Update Annex VII on destruction technologies on the basis of Decision XXX/6 of the Protocol.

The Regulation needs to be updated in line with international requirements, updating the list of acceptable destruction technologies for different ODS groups. This affects destruction companies and requires oversight by authorities. All approved technologies by Protocol parties will be allowed, while the Commission retains an empowerment to regulate otherwise.

D2. Adjust process agent use and emission limits on basis of the Decision XXXI/6 of the Protocol.

The Regulation needs to be updated in line with international requirements, further restricting the list of uses where ODS can be employed as process agents and related maximum limits. Actual use and emissions process agent uses are already in line with these new limits.

Alignment with comitology rules

D3. Adjust the Regulation to new rules on comitology and delegated acts

The Regulation should be aligned with the new comitology rules envisaged under Regulation (EU) 182/2011. The Regulation still includes references to the possibility to update and adopt changes to the Regulation by using the outdated ‘regulatory procedure with scrutiny’. It remains important that the Regulation empowers the Commission, where appropriate under Article 290 of the TFEU to adjust or complement the rules of the Regulation quickly, taking into account international developments and/or to account for (lack of) progress on alternatives.

Alignment with customs law terminology and procedures

D4. Require the addition of net mass (and operator’s ID) to customs declaration (in view of the EU Single Window Environment for Customs)

This would allow full functionality of the Single Window by allowing for automatic quantity management of imported ODS and two-way identification of the economic operator. It requires the importer to provide this information in the customs documents.

D5. Remove Annex IV (CN codes)

As CN codes are adjustable in the TARIC code, this annex needs to be updated frequently to avoid being outdated. Thus removing the Annex will prevent inconsistencies and unnecessary procedures to change the Regulation.

D6. Clearly spell out obligations of customs and economic operators

The role of customs is clarified by naming the customs procedures subjected to envisaged measures, the existence of certificates to be checked, as well as their content on a risk basis. Customs should confiscate the illegal goods and dispose of them as appropriate and re-export should not be allowed. These measures will facilitate a more uniform enforcement by customs and competent authorities.

Alignment with Directive 2008/99/EC (Environmental crimes directive)

D7. Penalties related to the protection of the environment

This measure is making adjustments on the current Article 29 (penalties) taking into account that Directive 2008/99/EC on the protection of the environment through criminal law is being reviewed at the same time as the Regulation. The Commission's proposal was adopted recently.⁵⁸

Alignment with Regulation (EU) No 517/2014 (F-gas Regulation)

D8. Prohibit the placing on the market of ODS (Annex I & II) unless producers or importers provide evidence that trifluoromethane (HFC-23) produced as a by-product during the manufacturing process is in line with best available techniques

The F-gas Regulation requires that highly climate warming HFC-23 emissions must be prevented during the production of F-gases that are being placed on the market. For consistency, a similar requirement should apply to ODS imported or produced in the EU. This obligation is in all likelihood already complied with by all EU producers and would mainly hold imported ODS up to the same standard. The need to control this can be flagged in the TARIC code and it is not expected that it will be necessary to substantially increase enforcement activities for Member States.

In addition, a number of additional clarifications are considered (see Annex 7).

5.3. 5.3. Measures discarded at an early stage

During the stakeholder consultation exercise, a number of additional measures were proposed. Some of these were screened out early on due to a lack of feasibility (either of a **technical, legal, enforcement, effectiveness and efficiency or general nature**). These options are summarised in Annex 9.

6. 6. WHAT ARE THE IMPACTS OF THE MEASURES IN THE POLICY OPTIONS?

6.1. 6.1. Achieve a higher level of additional emission reductions

A1. Require mandatory recovery and destruction of ODS from some foam banks

The environmental benefit of this measure is very high, in particular in climate terms, due to the high GWP of the ODS used in these foams. This option is supported by both authorities and businesses consulted. Recycling experts consider that recovery and destruction is feasible today for some foam banks, e.g. metal-faced panels⁵⁹ and, to some extent for laminated boards, depending on where these have been installed⁶⁰. These foams are in principal recoverable for destruction if separated during renovation or demolition of buildings. On the other hand, a separate collection of block foams and spray foams would be very difficult to achieve. A full recovery of metal-faced panels would save up to 18,200

⁵⁸ COM(2021) 851

⁵⁹ The business case for metal-faced panels is more favourable as the metal can be recovered and sold.

⁶⁰ Boards from built-up systems or cavity structure are in principal recoverable, while floor insulation boards are not (See Annex 6 for details).

tODP or 88 million tCO₂e until 2050, which is ca 14% of all ODS in foams reaching end-of-life (in CO₂e) in that period (Option 1: measure A1(a)). If, in addition, 25% of foams from laminated panels in built-up systems and cavity structures⁶¹ are recovered (Option 2 and 3: measure A1(b)), this would save an additional 14,000 tODP or 91 million tCO₂e until 2050⁶², which is 28% of all ODS in foams reaching end-of-life (in CO₂e) in that period. The success rate will ultimately depend on the enforcement of the requirements and on the synergy with other relevant legislation prescribing separation and recovery of construction and demolition materials. There are clear synergies with the Waste Framework Directive (WFD) that set a 2020 Member States target of 70% preparation of construction and demolition wastes for re-use, recycling and recovery. The WFD also promotes waste prevention through improving planning and logistics on construction sites and selective demolition and sorting at source.

The costs appear proportionate in climate terms and are distributed over many years and a large number of building owners and developers. Based on stakeholder interviews it seems that the technical and economic feasibility of recovery has improved since the situation 10 years ago. Businesses indicated that a large fraction of the costs are labour costs due to the work involved in the collection and separation of construction and demolition wastes, rather than transport or destruction costs. Member States have very different legislative and technical approaches to the demolition of buildings and requirements to recover, separate, treat etc. different components of construction and demolition wastes. Where such legislation exists, a separate recovery of foams would be facilitated by these requirements and additional costs would be rather low. It is very difficult to set an average recovery cost for the EU as a whole by material type due to the cost dependency on country specifics (e.g. country waste regulations). In two case studies from Austria and the Netherlands⁶³, recovery costs for panels and boards were determined as €1050-1200/t raw material. In addition, incineration costs may be up to €2500-3500/t. Abatement costs based on these two case studies indicate that total abatement costs for the two scenarios would be roughly 450 million € for Option A1(a), and an additional 1.53 billion € for Option A1(b), which would in turn represent abatement costs of 25,000 €/tODP (A1a) and 87,000-132,000 €/tODP (2). In climate terms, this translates into abatement costs of 5.1 €/tCO₂e (A1b) and 15.0-18.4 €/tCO₂e (2),

⁶¹ Conservative estimate of which laminated boards are feasible to recover. This is because e.g. floor-installed boards will not be included, building audits may prove infeasibility of separation and there may be emission losses due to broken/damaged boards during separation.

⁶² Total savings from option 2 is almost corresponding to the total greenhouse gas emissions (UNFCCC) in the Netherlands in 2019 (181 million tCO₂e)

⁶³ In the NL example, the data obtained considers full recycling of ODS panels including prevention of emissions following an interview with an innovative recycling company. This example is for a regulatory environment where segregation and recovery is already mandated. In AT, the interviews with established waste management companies resulted in data for a business case on recovering and incinerating the panels to prevent emissions. In AT transport costs are higher, but the major driver of costs are the local incineration costs for hazardous wastes. A similar case of high incineration costs was found for SE. Conversely, the latter costs (but also landfilling costs) are usually cheaper in countries with less prescriptive waste regulations (e.g. BG).

respectively.⁶⁴ These moderate abatement costs in terms of CO₂ are achieved due to the strong climate-warming effects of the gases used in the foams, but may be higher in some Member States. Reliable cost estimates for all Member States, especially those where waste separation methods were less established, were difficult to obtain⁶⁵. The data for Austria and the Netherlands, while being only from two countries, does still provide a useful overview as they present two different “business cases” for proper management of ODS containing panels. In order to approximate how high costs could likely get in other cases, costs for asbestos recovery from buildings was also considered as an absolute worst-case cost approximation. These proxy costs⁶⁶ relate to the effort required for asbestos separation, transport and incineration and were determined to be € 228 per tCO₂e. Given the costly worker protection measures required for asbestos, which are not needed for ODS foams, real costs for foam treatment would be lower and therefore well below costs considered proportionate as abatement costs to reach carbon neutrality by 2050.⁶⁷ Finally, many countries for which costs on foam separation are not available, such as Eastern countries, have a relatively low share of the ODS foams bank as their use was not as widespread as in Northern and Western Europe.

Some authorities raised concerns regarding costs of this measure. The costs would in all likelihood be borne by building owners undertaking substantial overhaul or refurbishment activities, as demolition/renovation contractors are expected to pass these on. Thus they are distributed over a large number of persons and the additional costs compared to the overall costs of demolishing or refurbishing the building would tend to be rather small. Real estate prices are not expected to be affected by the requirement. As for small, vulnerable consumers, replacement of foams is not usually linked to necessary maintenance or emergency repairs.

This measure is expected to spur innovation and R&D on demolition, reclamation and recycling technologies, according to the experts consulted. This would in turn yield better and cheaper ways of ensuring recovery and support the aims of a circular economy. The measure may create some additional need for training specialised personnel in the relevant companies, which are often SMEs. On the other hand, as a result, **there may be positive effects on employment** due to the labour-intensiveness of the decommissioning process and the need for more treatment capacity for these types of wastes. Using the current revenue-to-employee ratios by a typical recycling plant treating foams in fridges, this could be extrapolated to 215 FTEs for scenario 1, and close to 2400 FTEs for scenario 2. Positive knock-on effects on the efficiency of refrigerator recycling from these activities is also expected.

⁶⁴ These numbers are slightly lower than what SKM Enviros (2012) estimated in 2012, i.e. ca. €25/tCO₂ for metal-faced panels (scenario 1) and €50/tCO₂ for laminated boards (additional part of scenario 2) for AU, ES, CZ, CY and UK.

⁶⁵ Recent relevant data was available for AU, DE, NL, SE and, for comparison, UK; little information could be found for BG, CZ, CY, ES, FR, and RO.

⁶⁶ Assuming asbestos panels would contain 220g of CFC-11 (similar to foam panels). Prices for asbestos were obtained for NL, AU, F, ES and BG. Price ranges in these countries were relatively similar and varied from 25 – 153 €/m² of panel.

⁶⁷ To reach climate neutrality, economy-wide costs are modelled as ca. €390 /tCO₂e abated

A2. Introduce a negative list for chemical production processes where alternatives exist

The environmental benefits of this measure are uncertain. While the identified processes where alternatives appear to be available represent 38% of all ODS used for feedstock in the EU in metric tonnes, they represent only 1.6% of total feedstock emissions in ODP, according to data reported by industry. The yearly savings possible are therefore below 1 tODP (or less than 10,000 tCO₂e). In addition, there may, according to a number of industry stakeholders, be (i) higher energy costs of alternative production systems (e.g. due to higher temperature processes for the alternative production of TFE), (ii) an increased risk of other greenhouse gases such as HFC-23 being emitted and a less efficient process resulting in unwanted by-products (TFE production), and (iii) less efficient use of an existing by-product from other processes (CTC) which would have no other use and require incineration (PCE production), which all result in negative environmental impacts. Accordingly, businesses expressed strong concerns on the technical and economic feasibility of the alternative pathways. Finally, if negative listing of these processes leads to the relocation of chemical production facilities outside the EU, any emissions benefits may not be realised at all, as the emission controls at non-EU facilities are frequently lower.

The measure could result in very significant economic costs for the companies involved and negative effects on employment. By way of example, a major TFE producer⁶⁸ claims that an annual €500 million value-added production line is entirely dependent on the pathway using HCFC-22 involving employment for 1600 persons. A change to a different process would involve “hundreds of million €” of investment, so that it is likely that production of TFE would be moved outside of the EU instead of the company investing in alternative processes. Stakeholders pointed out that relocation outside of the EU would also lead to a loss of jobs in industries that are relevant in terms of added-value and employment. As regards PCE production⁶⁹, an offshoring of production as a result of the policy measures appears less likely, but additional costs for producers would arise from having to incinerate, rather than consume CTC from by-production, and for having to purify the chloromethane flow. Member States would incur some additional costs for inspections. Industry stakeholders suggested instead to consider more cost-effective policy options for this sector such as setting emission limits under the IED. The latter may require additional measures to reduce emission losses to stay within the limits according to best practices, but would not require scrapping of the whole production line as would a prohibition of use.

A3. Move forward prohibition dates for equipment using halons

The measure may achieve some emission savings. The emissions of critical use halons where a suitable alternative is available for retrofit of equipment are estimated at 6.9 ODPt in 2030. This would theoretically provide total savings of ca. 35 tODP by bringing forward the prohibitions by 5 years (or roughly 44,000 tCO₂e for the whole period), but it is likely that the military users concerned will gradually retrofit or replace the equipment in advance of the 2035 ‘end date’ following their regular replacement schedules, so that real savings are likely

⁶⁸ There are in total four companies reporting the use of this process in the EU.

⁶⁹ Two companies are reporting the use of this process in the EU.

to be lower. While some businesses and authorities agreed that this option may lead to emissions savings, an expert on the use of halons in military applications and member of HTOC indicated that the quantities in the halon bank as well as emissions are low compared to other relevant ODS emission sources.

High economic impacts for the military are likely. Authorities pointed out the potentially high costs for the military to switch from halons and highlighted the importance of halons for existing defence material and maintenance contracts. If the Member State is simply advancing the retrofitting of existing equipment, it could simply be a matter of the timing of the costs, while the overall the costs in fact stay the same. However, if the intention is to scrap the vehicle or ship between 2030 and 2035, additional costs would be involved to either retrofit the equipment before 2030 or to advance the scrapping to before 2030. It has not been possible to get information from Member States that would allow an estimation of such additional costs. However, to provide an indication of the magnitude on the basis of information received from one Member State⁷⁰, the total expense for retrofitting fire protection systems for all their current military vehicles and ships with halons could be in the order of EUR 15 million for vehicles and EUR 0.5 million for ships. Assuming that other Member States are in a similar situation and assuming that only a share of their total fleet with halons would undergo additional retrofitting, possible costs for the additional retrofitting could be at least in the tens of millions of euros in total⁷¹. Abatement costs were determined as €1,265,000/tODP or €203/tCO₂e. In addition to this, higher depreciation costs related to early scrapping must be considered. One competent authority believed that this option could have negative impacts on the capabilities of defence forces and the safety of soldiers as a result.

A4. Prohibit the destruction of halons

A positive environmental impact will be achieved from the avoidance of new production of halons in the future.⁷² Due to the continuing demand for critical uses at global level, this is unlikely to be guaranteed otherwise. Allowing production in the future would lead to additional emissions.⁷³ The EU annual demand is currently between 30–40 metric tonnes, which would need to be replenished if stocks expire. Additional annual emissions linked to these quantities from production and use could be around 21 tODP or close to 15,000 tCO₂e.⁷⁴ Further demand exists in many other countries in the world, which would need to be addressed in case of a global shortage, and which is likely to have much more important environmental impacts. By avoiding restarting production of halons, more efforts to prevent leaks from equipment globally is likely as well as an increased use of alternatives, which

⁷⁰ Despite the efforts made by the external experts, data on costs for the military were very difficult to obtain

⁷¹ Given that the situation for Member States is in reality very different, actual costs are very hard to determine and this estimation can only give an idea of the magnitude to be expected.

⁷² Currently not allowed under the Protocol.

⁷³ The exact amounts are difficult to predict as it depends on many factors including the actions of other major economies, the development of the aviation sector and any future international rules including under the Protocol. It is therefore not possible to give an abatement cost for this measure given these uncertainties.

⁷⁴ This assumes 0.02% emissions from new production and 0.5% emissions from use of these quantities (see Table A4.2 in Annex 4)

would add to the benefits. Good enforcement is needed to prevent a perverse incentive for owners of halon stock to vent the gases rather than recover them as a result of this policy option.

The measure could result in some additional costs to owners of halon stocks when reclamation, transport and sale is more expensive than the cost of destruction. Generally, there could be a good business case due to the high re-sale value of the gas after reclamation⁷⁵, which could go up in the future due to the expected increasing scarcity of stocks. This changes when halons need to be transported long distance to reclamation facilities, in particular across borders, as they are treated as hazardous waste.⁷⁶ The amounts recovered may in this case be too small to allow stock owners to fully recover their costs under current market conditions. Thus, depending on the circumstances, the option will either result in benefits or minor costs for businesses. Companies will also incur minor administrative expenses as they need to keep records on halon recovery and treatment. Since there will continue to be demand for halons in the future, their re-use will become more economically favourable. Some Member States have introduced legislation to address this issue such as national halon banks, but some also expressed concern on potential cost increases due to a need for additional enforcement and checks.

A5. Prohibit the use of Annex II substances in refrigeration and air conditioning equipment

The environmental benefit of this policy option is uncertain. The ODP of CF₃I is rather low (0.01-0.02) and its use in refrigerant blends in cooling equipment is very limited so far. Any potential ozone-relevant emission savings from disallowing the (future) use of this substance in refrigerant blends would need to be examined in light of reducing the choice and availability of refrigerants that are more climate-friendly than the highly warming HFCs that they aim to replace, with potentially much more substantial amounts of climate-relevant emissions to be saved.⁷⁷ In particular, adding small amounts of CF₃I reduces the flammability of low GWP refrigerant blends, allowing them to be used more easily as alternatives in applications where this may be required. A number of different stakeholders stressed the importance of CF₃I as an HFC alternative.

The economic impacts of this policy option are difficult to assess. Given the rapid development of the cooling market and the number of new refrigerant choices available since 2014 as result of the F-gas Regulation, it is very difficult to speculate at this moment how much any blend using CF₃I will in the future be adopted by equipment manufacturers and end-users, and thus be a suitable and cost-effective alternative. For the same reason, determining an abatement cost is not feasible. There would be a negative impact for some

⁷⁵ The destruction of halons costs between €2–3.5 per kg. The market price of halon 1301 and 2402 are ca 100 EUR and 200 EUR per kg, respectively, but could double up to 2025/2030. Reclamation costs of halons are estimated at EUR 4 per kg once the gas is at the facility.

⁷⁶ Shipment costs of €1070-1250 to reclamation site based on estimations by Member State experts.

⁷⁷ Regulation (EU) No 517/2014 (F-gas Regulation) is strongly driving the replacement of high GWP HFCs in the cooling sector, in order to reduce direct emissions of highly warming greenhouse gases (HFCs).

chemical producers that invested in using CF3I to make their HFC alternatives marketable and safe, as mentioned by authorities, industry and other stakeholders alike.

6.2. 6.2. Improve the efficiency of the Ozone Regulation while preserving the significant emission reductions achieved so far

The following measures have been conceived in order to maintain (and in some cases improve) controls at lower costs. Even though these efficiency gains are the main rationale, **there are some environmental gains to be expected for these measures from improved oversight, such as regards the control of illegal trade, but these are difficult to quantify.**

B1. Modernise the licensing system in view of the EU Single Window Environment for Customs: Introduce trader licenses for ODS bulk and equipment

This measure is expected to lower administrative costs for businesses applying for longer term trade licences (import/export) instead of pre-approved licences at shipment level, including for SMEs. Businesses indicated that such a change would lead to a reduction in person hours of between 13% to 80% ⁷⁸ and could save 163-395 days overall (€49,000-119.000).⁷⁹ Member States will save resources mostly due to the use of the Single Window itself irrespective of trader or shipment licenses, due to more efficient and automatic customs treatment procedures. This time saving is estimated at 30 to 45 minutes per shipment (EC, 2020)⁸⁰. In the open public consultation, many respondents placed high importance on the simplification of the licensing system in view of the EU Single Window environment for Customs. Industry stakeholders explained that the current system is overly bureaucratic, requiring significant paperwork and time for each individual shipment of ODS.

For the European Commission, licensing costs will go down as the number of licences goes down. Assuming the number of per-shipment licences is reduced from 1,859 in 2019 to 275 under the Single Window environment (which is an average of three trader licences per company in 2019, and a reduction of 85%), costs could drop to less than 20% of the baseline by 2025. In terms of number of days, this would save the EC 95 person-days per year, from a total of 132 days per year spent in the baseline scenario. There are, however, one-off costs for changing the IT system to accommodate for trader licenses.

The measure will, in combination with the Single Window, allow for a complete storing of shipment data (since this is done automatically and no dependency on custom closing licenses as currently the case) and the possibility for follow-up of any suspicious activities, and thus would increase the controls on illegal trade. A number of authorities, including customs, supported the measure, but pointed to the fact that the EU-wide rollout of the Single Window will not be immediate, meaning the current system would need to be maintained

⁷⁸ Based on the response of five companies

⁷⁹ Data from the evaluation, based on 13 respondents, yields total costs of the existing system as 309 days (2076 yearly licenses * 1.1 hours per license / 7.4 working hours per day, This confirms the magnitude of the administrative burden that may to a large degree be saved.

⁸⁰ European Commission. SWD IMPACT ASSESSMENT REPORT Accompanying the document Proposal for a Regulation of the European Parliament and of the Council establishing the European Union Single Window Environment for Customs Proposal [...].

https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CONSIL:ST_12529_2020_ADD_3&from=EN

until then. Some authorities expressed doubts on the achievable environmental benefits, as they consider that the current licensing system is working well.

B2. Better monitoring of illegal goods

This measure allows better control over illegal activities but leads to small administrative costs for the importer, as the 8/10-digit TARIC code would need to be specified in the customs declaration for relevant custom procedures, which is not mandatory so far. There are indications that these procedures are exploited for illegal activities as recent custom seizures indicate, but the overall extent is not known. Customs would incur costs due to carrying out controls on a risk basis, but the automatic controls via CERTEX/Single Window should make such controls more efficient. Stakeholders generally supported the extension of control to relevant customs procedures. A few authorities warned that this could increase the administrative burden on them.

B3. Special customs rules for ODS

This measure allows better control over illegal activities at moderate costs to importers. For traders, logistics and/or administrative costs may increase due to restrictions as to which customs offices can be used. However this is expected to be a transitory issue as frequent traders would adapt to these new rules quickly. Support was expressed by industry and some Member States for limiting the use of special procedures to certain custom offices equipped to handle ODS. The possibility in the transit procedure to legally change the destination customs office may limit the controls over that procedure. Furthermore, consistency of customs rules with the F-gas Regulation⁸¹ is important for many stakeholders. Customs would incur costs due to controls on a risk basis. Customs authorities interviewed indicated that the control of ODS should be rather strict. If well implemented, the additional administrative burden would likely be low, but vary depending on the volume of illicit trafficking.

B4. Abolish the registration system for laboratories

This measure will result in cost savings for companies as it will decrease the administrative burden on the 2,211 laboratories that registered in 2020.⁸² The total cost avoided each year would be around €50,000 (see evaluation). Laboratories and other entities that will be impacted by this measure are often SMEs. These savings are generally welcomed by stakeholders. One industry representative said in the stakeholder workshop that the current system is excessive compared to the quantities covered. Requesting instead 5-year record keeping will slightly reduce the savings, but laboratories should already be keeping track currently of substance acquisition, and this would therefore only entail ensuring that this information is not deleted. Some ODS suppliers expressed concern that some of these costs may be shifted to them for ensuring ODS are not misused for other prohibited purposes. There are savings for the European Commission amounting to 72 days per year of processing laboratory registrations and another 27 person days per year related to the development and

⁸¹ Also currently under review.

⁸² In addition to others that may not be complying with the obligation.

maintenance of the related IT system. Member States may have some enforcement costs, but as the quantities and risks are low in this case, such action is expected to be very light. Some authorities also feared that there may be less overview and control over this ODS use in the future. Generally however the lack of registration should not result in additional emissions given the small amounts of ODS involved and the control of trade by e.g. monitoring and licensing.

B5. Abolish the annual quota allocation process

This measure will result in cost savings for companies and authorities. This modification will decrease administrative burden on businesses including SMEs, saving them €11,000 per year with respect to the baseline. This does not include additional costs saved where the import quota application turned out to be too low and the company had to buy ODS on the EU market at high purchase prices in case of requiring bulk ODS at short notice without having applied for quota. While businesses were in favour of abolishing quota allocations, authorities had mixed views on its feasibility, as some of them were concerned that the system would not effectively control the quantities and application types. While Member States already have low costs, the European Commission would achieve savings of 60 person days per year related to the allocation of quotas. No additional emissions are expected as the necessary control is achieved through e.g. monitoring and licensing.

B6. Delay the requirement of using non-halon fire protection for normally unoccupied cargo compartments in newly type certified aircraft

This measure will result in cost savings for companies and authorities. Authorities and businesses alike highlighted positive economic impacts from removing the need to request corresponding derogations. Without this measure, aviation companies would need to ask for case-by-case derogations due to the current infeasibility to meet the 2018 prohibition. 3 to 4 derogation requests could be submitted to the European Commission until 2024 from Member States on behalf of operators of airplanes having such compartments, without the deadline change. These companies could therefore avoid the costs linked to preparing the case by providing all the relevant technical data (estimated to be at least 30 person days per derogation depending upon complexity). The concerned Member State would avoid costs for preparing the derogation request to the Commission (15-30 person days per derogation). Likewise, the Commission would not incur administrative costs for treating, issuing and monitoring such derogations (40 person days per derogation per year⁸³). In total, costs avoided could be 120 person days for both the aviation industry and Member State authorities, and up to 320 person days⁸⁴ for the European Commission. As mentioned by some businesses, no environmental impacts are expected as there are currently no suitable alternatives, meaning the use of halons will have to continue, either by derogations or by delaying the deadline. No additional emissions are expected, as the delay of the deadline is

⁸³ Based on data from evaluation (322 days for 8 derogations in period 2010-2017)

⁸⁴ Treatment of 4 derogations and their monitoring for 2 years (The Regulation could be applying from 2023 and derogations would therefore be avoided until 31 December 2024, i.e. for two years)

due to the fact that no technical options exist, so the use (and any potential future emissions) cannot be avoided at this time.

6.3. 6.3. Ensure more comprehensive monitoring

The rationale for these measures is to have a better understanding and overview of remaining ODS-related trade and use, for authorities, stakeholders and the public. In enabling better controls and early warning on any worrying trends, **there is an inherent environmental benefit to all these measures**, which is however difficult to quantify.

C1. Require reporting on use as feedstock, process agents and destruction also for new ODS (Annex II)

Stakeholders were rather confident that the additional costs for this requirement are rather low. Concerned stakeholders acknowledged that the data are, for the most part, already collected today (voluntarily) and could be reported without noteworthy increases in administrative costs. The benefit of this measure is a much better understanding of the use of those gases in the chemical industry, as stated by some authorities. The affected stakeholders are existing reporting companies, especially feedstock users, and additional administrative burden on businesses is estimated as being up to €5,500 per year for all undertakings combined. Annexes I and II data reporting requirements already require the same type of primary data collection, so the required data by the measure is often already available and does not need a separate collection. In addition, the feedstock produced is often also used by another part of the company conglomerate, which means that in these cases additional reporting on use is minimal. This policy measure has no impact on costs for the reporting system run by the EEA, since the additional reporting parameters are already included in the IT system.

C2. Require reporting on emissions at substance level for the production and destruction of ODS

This measure is expected to slightly increase the administrative burden for some of the affected businesses. Two businesses indicated higher costs corresponding to 1-2 and 1-5 additional working days per year, whilst one business even estimated no increase in costs because of similar information already collected for the IED and the E-PRTR. One Business representative stated in the stakeholder workshop that the reporting focus should be on monitoring emissions rather than quantities used as currently the case. Producers account for approximately 50% of entities who report on ODS. This measure implies that the reporting costs go up by up to €20,000 per year for all undertakings in total (based on a 2025 baseline). These additional costs are not expected to change over time if production of ODS stays stable. Some companies may already collect such data as was the case for 2 out of 4 companies interviewed, meaning this measure would not increase their costs. No additional costs are expected for the EEA reporting system, as it is already equipped to handle emissions reporting by producers and destruction facilities on a voluntary basis today. Given the relevance of knowing the emissions of these highly warming gases more accurately and

comprehensively than obtained currently from other sources such as E-PRTR⁸⁵ there is a **strong environmental rationale for monitoring them more closely**. One competent authority suggested to additionally include (fugitive) emissions from stocks in order to capture all relevant and potential emission sources.

C3. Add global warming potential (GWP) values to increase awareness of the climate impacts of ODS

This policy measure is an awareness raising measure and does not have immediate economic or social impacts. However, it is important in case other greenhouse gas relevant legislation points to the climate impact of these gases and for emission monitoring (in combination with C2). Although a majority of the authorities supported this revision, questions were raised by some on added value and environmental benefits.

C4. Require reporting on sales and purchases of controlled ODS (Annex I) also for producers, destruction facilities and feedstock and process agent users

This measure is expected to slightly increase the administrative burden for some of the affected businesses. Reporting intra-EU sales is expected to impact most businesses who are still involved with ODS. However, most trade flows are expected to be linked to a select number of multinational companies, as by far the largest quantities of use are linked to feedstock. Similar to some of the other monitoring measures above, some business stakeholders indicated this would not increase costs for them substantially, as data is already collected internally. Businesses indicated additional costs to be from 0 up to 3 working days. Assuming an additional 20% in reporting effort for 50% of companies, the impact would amount to €13,000 per year for all undertakings combined. These additional costs are not expected to change with time assuming the production of ODS stays stable. The main benefit will result from better control on existing trade flows, which may be desirable in case the traditional control systems such as quotas and registrations are removed (supporting the putting in place of efficiency measures B4 and B5).

C5. Add new substances to Annex II B

This measure is expected to increase the administrative burden for some of the affected businesses. From the stakeholder consultation, the expected additional reporting cost for a large business to report on the production of a new ODS is one to two weeks of person days per year. Some authorities referred to potential future positive environmental impacts of the measure as it would allow for informed decisions on potentially controlling their use in the future based on the reported data. On the other hand, businesses often considered the environmental impacts of potential new ODS as low since they do not remain for a very long time in the atmosphere (VSLS). As DCM is produced using methylchloride (already in Annex II) as a feedstock, existing reporting data on the latter substance (e.g. 14 companies) can be used as a proxy for the number of companies likely to be faced with an additional reporting requirement on production. This would add 21 weeks of yearly reporting effort for

⁸⁵ E-PRTR emission data is limited for monitoring of climate effects since it is not reported for individual substances included in the Ozone Regulation and has a different scope, due entities covered, as well as capacity and pollutant thresholds.

all producers combined, which totals €6,200 per year of additional reporting costs.⁸⁶ For PCE there are only 8 registrants in the REACH database, 5 of which already report under this Regulation. PCE is commonly used as a dry cleaning agent, but these users (e.g. the dry cleaning industry and its 1000s of SMEs) would not be covered by the reporting obligation. From E-PRTR, 30 companies report PCE industrial activities, not all of which would fall under the new reporting requirement. 45 weeks⁷³ of additional reporting effort are estimated in total, or €13,300 additional reporting burden per annum. The impacts of inclusion of 2-BTP are expected to be even lower, as this is chemical produced or imported in lower volumes and by a few companies only. Based on these considerations, about €25,000 in total additional costs can be expected for reporters. Adding three substances to the reporting system requires only minimal changes to the EEA reporting system.

6.4. 6.4. Improve coherence and clarity

These measures are not expected to have significant economic and environmental impacts. Across consultation activities, all stakeholders generally agreed that it is important to have a clearer and more accessible legal text of the Regulation. Most options contribute to improving compliance and enforcement by providing clarifications. Option D3 may help to avoid costs for business and authorities by allowing to adjust infeasible obligations, and help the environment if progress on alternatives is reflected in a more timely way. The customs alignment measure allows for better customs controls and are widely supported by stakeholders including customs authorities consulted. Measure D8 may have a positive environmental impact for cases where this obligations is not already complied with by fluorocarbon producers outside the EU.

7. 7. HOW DO THE OPTIONS COMPARE?

Table 3 provides an overview of the impacts of the measures in the three policy options.

Table 3. Overview of impacts for the each measures included in each of the 3 options

Measures	Environment	Economic impacts – cost increases or savings (per year unless otherwise specified)			Indirect economic/social	
		Business	Member States	EC/EEA		
Option 1						
A1 (a)	Foam bank recovery Sandwich Panels only	(++) up to 18,200 tODP Or 88 MtCO ₂ e	(-/-) Abatement costs ⁸⁷ : €25,000/tODP €5.1/tCO ₂ e	(-) Enforcement costs	N/A	(+) R&D, (+) Employment : 215 FTEs, (+/-) Real estate prices

⁸⁶ Assuming 1.5 week per company based on stakeholder feedback

⁸⁷ Costs could be higher in some Member States but should be well below €228€/tCO₂e (asbestos proxy costs) in all cases

B1	Trader licences	Positive due to better controls with CERTEX/Single Window	(++) Total savings of 49,000-119,000	Benefits from CERTEX/Single Window	(++) 95 person days savings One-off costs for IT changes	N/A
B4	Abolish laboratory register	0	(++) € 50,000 savings	(0/-) enforcement	(++) 99 person days savings € 31,500 IT savings	N/A
B5	Abolish quota	0	(+) Savings of € 11,000	(+) Small savings	(+) Savings of 60 person days	N/A
B6	Delay one halon cut-off date for aircraft cargo compartments to 2024	0	(++) Savings of 120+ person days (€36,000)	(++) Savings of up to 120 person days	(++) Savings of up to 320 person days	N/A
C1	Annex II reporting	(+) Better overview on ODS use	(-) € 5,500	N/A	N/A	N/A
C3	Add GWP to Annex	(+) Better awareness on climate effects	0	N/A	N/A	N/A
Option 2 (includes also all measures of Option 1)						
A1 (b)	Foam bank recovery also for laminated boards	(+++) Additional 14 000 tODP= 90 MtCO _{2e} [i.e. in total for panels and boards (A1(a)+A1(b)): up to 32,000 tODP Or 179 MtCO _{2e}]	(-/-) Abatement costs ⁸⁷ : €87,000-132,000 / tODP €15.0-18.4 / tCO _{2e}	(-) Enforcement costs	N/A	(++) R&D, (++) Employment : 2400 FTEs, (+/-) Real estate prices
A4	Halons destruction	(+) Max 21 tODP and 15,000 tCO _{2e} annually by avoiding new production requires good enforcement /positive global ODS policy implications	(0/-) Good re-sale value, but (cross-border) transport may be costlier for some, record keeping	(-) Some enforcement costs	N/A	N/A
B2	Better monitoring of illegal goods	(++) (reduced illegal trade)	(-) More data to customs	(-) Follow-up on suspicious cases	(-) Follow-up on suspicious cases	N/A
B3	Special custom rules for ODS		(-) Less flexibility	(-) More obligations to check	N/A	N/A
C2	Report production emissions	(+) Better knowledge on climate emissions	(-) € 20,000	N/A	N/A	N/A
C4	Report intra-EU sales	(+) Better overview of ODS trade	(-) € 13,000	N/A	N/A	N/A
C5	New Annex II substances	(+) Better overview of future risks	(-) €25,000	N/A	(0/-) Update of EEA reporting system	N/A
Option 3 (includes also all measures of Options 1 & 2)						
A2	Feedstock negative list	(+/-) (highly uncertain benefits)	(--) Potentially high impact, >€100 million capital	(-) € 4,000	(-) Up to €10,000 for	(- -) Employment : Loss of several 1000

		investment cost if production facilities displaced		maintenan ce of negative list	FTEs possible (+/-) R&D (0/-) Consumer prices
A3	Halons end dates	(+) max 35 tODP or 0,044 MtCO ₂ e p.a.	N/A	(-) > € 10 million ⁸⁸ across 2020 - 2035	N/A
A5	Annex II RACHP	(+/-) (positive for ODP, but uncertain future CO ₂ e emission balance)	(-) Possibly higher costs for endusers, manufacturers, gas producers	N/A	N/A

Legend: Scale applied is +++, ++, +, 0, -, --, --- (very high/positive to very low/negative); Corresponding colour codes are dark/medium/light red, yellow (neutral), light/medium/dark green

All 3 Options include the measures to improve clarity and coherence, aligning with the Protocol (D1-2), with comitology rules (D3), customs law (D4-6), the environmental crimes directive (D7), and the F-gas Regulation (D8). As alignment measures, these are not resulting in relevant additional impacts.

The low-cost option (Option 1) would save a relevant amount of emissions (18,200 tODP or 88 million tCO₂e until 2050) due to the mandatory reclamation and destruction of ODS from sandwich panels (the most cost-efficient type of foam to be recovered). It would achieve costs savings for business and authorities by modernising the licensing system, abolishing quotas and the laboratory registration system as well as allowing more time to eliminate halons in aircraft cargo compartments. Very minor costs linked to reporting (C1) may be incurred. Given the fact that it fails to achieve other proportionate emission savings (i.e. measure A1(b)), and does not include a number of efficiency and monitoring measures with environmental benefits at moderate costs, its effectiveness and coherence with the Green Deal is only slightly positive. On the other hand, as it comes at a very low costs, its economic effects are negligible, cost efficiency is good and social effects (employment) are positive due to in particular R&D and job creation in the waste treatment sector.

Option 2 would almost double the emission savings from foams (32,000 tODP or 179 Mt CO₂e), still at moderate abatement costs, as well as reducing the risk that new production of halons will be needed, ensure that border controls can be improved and that relevant data is available to monitor climate effects, any emerging issues and as yet unmonitored trade flows. Additional costs largely arise from the foam measure (for building owners) but these will be spread over many years and number of persons/entities. Finally, there are some reporting costs to companies, and some enforcement costs for customs. Option 2 is very effective and in line with the Green Deal as it achieves a high amount of emission reductions at proportionate costs. While the cost efficiency of the measures is good, there are some additional costs linked to better control and monitoring. Employment is stimulated in the waste sector.

⁸⁸ Costs are difficult to estimate given the different situation of the military in Member States.

The overall emission savings of Option 3 are only very marginally higher than Option 2. This is because the major emission savings potential is linked to the recovery of foams, which is the same for both options. Also, some of the smaller additional achievable emission savings from Option 3 may cancel out due to negative effects on e.g. energy use and emissions of other greenhouse gases (HFCs). Prohibiting some feedstock uses and anticipating halon end dates would likely lead to very high costs to business and the military and may have considerable detrimental effects on employment (despite the stimulus in the waste sector). Given these costs, its coherence with the Green Deal is considered to be lower than in Option 2, even though a similar amount of emissions is saved.

The coherence options as well as clarifications are included in all three ambition scenarios. By design they all constitute improvements, however their impacts could not be quantified.

Table 4: Comparison of the impacts of the options

Policy options	Option 1	Option 2	Option 3
Impacts and cost efficiency			
Effectiveness / emission reductions	+	+++	+++
Coherence with the European Green Deal	+	+++	++
Economic impacts	+/-	-	--
Cost efficiency	++	++	---
Social impact	+	++	--

+++/++/+ positive, -/--/--- negative

8. 8. PREFERRED OPTION

The preferred option is Option 2. It achieves significantly more emission savings than the low cost option and is therefore more coherent with the European Green Deal than Option 1 (See Table 4). **Moreover, compared to the forecasted costs in the EU long term strategy needed to reach climate neutrality (€390/tCO₂e), the abatement costs for Option 2 are very reasonable and proportionate to what is asked of other sectors.** On the other hand, Option 3 would add considerable costs at only incremental and possibly doubtful environmental benefit.

The preferred option is characterised as follows:

- The main additional way of avoiding emissions, in climate and ozone terms, is to make explicit requirements on recovering some foams from construction and demolition waste and destroying the ODS contained therein;
- It should also be prohibited to destroy halons to preserve stocks for the remaining critical uses until these have all disappeared, to prevent a future need for new production of halons;
- All options that are meant to reduce the burden on companies and authorities and/or improving the controls in place are included;
- All options to improve monitoring are included;
- All options to improve coherence and clarifications are included.

8.1. 8.1. REFIT (simplification and improved efficiency)

A significant focus of this review is on increasing efficiency of the existing measures, rather than creating new ones, given that this is a Regulation that has been evolving over three decades. The cost savings achievable by some of these efficiency measures are outlined in Table 5. In addition, two efficiency measures (B2 and B3) aim at increasing customs controls in order to control illegal trade more tightly at little extra cost.

Table 5. Refit costs savings of the preferred option

<i>REFIT Cost Savings – Preferred Option(s)</i>		
<i>Description</i>	<i>Amount</i>	<i>Comments</i>
Implementation of a trader licence (B1). Businesses apply for trade licences instead of per-shipment licences to reduce administrative costs.	<u>Undertakings</u> : €49,000-119,000 per year <u>EC</u> : 95 person days per year	Non-aviation importers and exporters are the recipient of the recurrent cost saving.
Abolish the registration requirements in the LabODS Registry (B4). Reduces the administrative burden and IT costs.	<u>Undertakings</u> : €50.000 per year; <u>EC</u> : annual 99 person days + €31.500 IT maintenance and development costs	Laboratories and other entities (including SMEs) EC: annual 72 person days for processing registrations: 27 person days on the IT system;
Abolish annual allocation of quota by Commission Decisions (B5). Reduces the administrative burden.	<u>Undertakings</u> : €11.000 per year <u>EC</u> : 60 person days per year	Feedstock, process agent, halon and laboratory users. Also small savings for Member States by avoiding preparation of Committee meeting
Delay a halon cut-off date for newly type approved aircraft to prevent administrative costs for individual derogations requests and Commission Decisions (B6).	<u>Undertakings</u> : up to €36,000 in total; <u>Member States</u> : up to 120 person days in total; <u>EC</u> : up to 320 person days in total	Aviation companies

9. 9. HOW WILL ACTUAL IMPACTS BE MONITORED AND EVALUATED?

Future monitoring and evaluation of the Regulation can rely on the Regulation's company reporting data that is collected and aggregated by the EEA each year. A confidential report on ODS activities within the EU has been drafted by the EEA for Member State representatives and DG CLIMA which includes data on imports, exports, production, destruction, process agent use, feedstock use and consumption, stocks and data on new ODS (Annex II). The evaluation and this document relies heavily on these data for its analysis. The data reported on production, feedstock, destruction, imports and exports are presented to the Ozone Secretariat, to comply with the EU's annual reporting obligation carried out on this basis. In addition, there is a public version in the form of a web-based ODS indicator published and updated regularly by the EEA. The policy options C1, C2 and C5 would improve the completeness of this monitoring, in particular as regards production, feedstock use and related emissions of both Annex I and II substances as well as three new ODS added.

In addition, Member States reporting pursuant to Art. 26 allows to (i) monitor the availability of halon stocks to satisfy the remaining critical uses, and to (ii) report on illegal trade activities which may give an indication of the success of aligning with customs rules and improving controls, including through modernising the licensing system. Efficiency improvements will be monitored by the amount of resources still needed on the EC side, as well as the numbers of (traders) licenses that companies would still require.

The enforcement of the recovery of foam banks would be in the hands of the competent Member State authorities. There are synergies with national waste regulations that may already monitor the presence of hazardous substances such as ODS in demolition wastes, that would allow to better ensure that ODS are indeed recovered for destruction. Given the distributed nature of the source (i.e. insulation foams in millions of old buildings everywhere, as well as in landfills), regular monitoring of the ODS banks seems difficult to achieve (see discarded options).

An evaluation of the Regulation should be carried out by 2033. In this context, a study similar to SKM Enviro (2012) would be needed to estimate the progress on foam banks. The evaluation should also examine the developments in administrative costs.

Annex 1: Procedural information

1. LEAD DG, DeCIDE PLANNING/CWP REFERENCES

- Lead Directorate-General (DG) of the European Commission: DG Climate Action (DG CLIMA).
- The ODS Regulation was selected for the REFIT programme. The preceding evaluation has been carried out by Unit A2 - Climate Finance, Mainstreaming, Montreal Protocol. The result can be found here:
https://ec.europa.eu/clima/sites/default/files/ozone/docs/swd_2019_406_en.pdf
- Decide Planning reference: PLAN/2019/927 “Impact Assessment of the Ozone Regulation”.

B. ORGANISATION AND TIMING

- As per the Better Regulation Guidelines, an **Interservice Group (ISG)** was set up in March 2020 on the basis of the ISG for the evaluation to follow up and steer the assessment process. The ISG ensured coherence and comprehensiveness with the Commission’s overall responsibilities and activities in related policy areas, such as environment, economic growth and customs.
- The ISG for this impact assessment involved staff from the following Commission’s departments in addition to DG Climate Action: DG ENER, DG ENV, DG GROW, DG TAXUD, Legal Service, and Secretariat-General. Also invited to all meetings and receiving the background information, but not attending, were DG MOVE and DG TRADE.
- The ISG met three times (per videoconference): 23 April 2020, 18 November 2020, and 23 March 2021. Through these meetings and several written exchanges, the ISG participated in the whole impact assessment process leading to the finalisation of the external study and this Staff Working Document. A written consultation was made on a draft of the final Impact Assessment on 17 May and subsequently bilateral meetings were held on 27 May with the Services that provided comments.
- The Commission signed a contract for a **support study** on the impact assessment (contract ref. 340201/2019/815261/ETU/CLIMA.A.2) on 27 November 2019. The final report of the support study was approved on 2 June 2021.
- An **inception impact assessment** was published on 26 March 2020 on the Commission's Europa web site⁸⁹. The feedback period was open until 23 April 2020.
- A **public consultation** ran from 13 July 2020 to 9 November 2020 (17 weeks, extended because of summer period and pandemic). The results have been published online.⁹⁰

⁸⁹ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12310-Ozone-layer-protection-revision-of-EU-rules>

⁹⁰ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12310-Ozone-layer-protection-revision-of-EU-rules/public-consultation>

C. CONSULTATION OF THE RSB

The **draft impact assessment** was submitted to the Board on 2 June 2021.

The meeting with the **Regulatory Scrutiny Board (RSB)** took place on 30 June 2021.

The Board gave a positive opinion but also considered that the report should further improve with respect to the description of some measures and options as well as the impact analysis of a number of measures

The Board asked to improve the following:

- The report should present more clearly the measures and policy options. It should explain how the individual measures were selected. As regards the measures to reduce emissions, the report should justify the focus on obligations and prohibitions, and explain why other measures such as economic incentives are not considered. It should clarify which types of foam banks are covered by the different options on their recovery and destruction and why.

In response, the description of measures and policy options, including their selection, was significantly improved in section 5.2. More detail on foams, including a reference to economic incentives, is given in 5.2.1 and Annex 6.

- The report should strengthen the impact analysis. It should increase the robustness of the evidence by including information from more countries on the feasibility and costs of the mandatory destruction of some types of foam banks. It should clarify the level of additional costs for the monitoring of illegal goods. For the measure that introduces a negative list for chemical production processes, it should expand on how this measure will lead to very significant economic costs for the limited emission reductions. The report should strengthen the analysis on the impacts on renovation costs, consumer prices and affordability for vulnerable consumers.

In response, the sections on measure A1 was significantly improved (5.2.1 and 6.2.1). In particular, a number of further countries were examined as regards the feasibility of foam recovery and destruction. As additional quantitative cost data was difficult to obtain, as a proxy a worst-case approximation using asbestos removal was carried out for which cost data was available (this was added to section 6.2.1 and Annex 6). Further details was also provided on renovation costs, consumer prices and vulnerable consumers. The sections on illegal goods and chemical production were strengthened.

- The report should elaborate on differences across Member States as regards their contribution to remaining emissions. It should explain to what extent impacts are expected to differ across Member States, possibly depending on the geographical concentration of the most affected sectors, the historic use of products containing ODS and existing policies on waste management, including enforcement.

More information is provided with regards to foams where this is most relevant in the Annex 6 and the impacts of measure A1 in section 6.1.

- The report should improve the comparison of options. It should be consistent on the scores allocated to each measure.

This section was improved and inconsistencies avoided, in particular in overview tables 3 and 4. Annex 10 was updated to clearly illustrate which measures belong to the three options. The selection of the preferred Option 2 was better justified.

A number of additional improvements were made taking into account the technical comments received from the Board, including on how the Regulation links to other EU legislation, a better description of the envisaged future customs controls and the issue of illegal trade under the problems section (2.1.3), more information on the baseline of other impacts,

D. EVIDENCE, SOURCES AND QUALITY

This impact assessment draws on a support study carried out by an external consultant including an extensive consultation of the relevant stakeholders and experts as well as on the internal expertise of the Commission.

The evidence used for the impact assessment comes from several data sources, in particular the annual reports on ozone-depleting substances by the European Environment Agency and the consultation with stakeholders, including Member States authorities and undertakings. More information is provided in the Annex on methodology below. The support study is the source for data in cases where no particular external source is mentioned.

Annex 2: Synopsis report of stakeholder consultations

A. INTRODUCTION

This report summarises the results of the consultation activities carried out for the Impact Assessment for amending Regulation (EC) No 1005/2009 on substances that deplete the ozone layer (ODS Regulation).

The consultation aimed to capture feedback from industry, public authorities and civil society through:

- **An inception impact assessment⁹¹ (IIA)**, for which the feedback period ran in March - April 2020. 4 responses were received.
- A **public consultation⁹² (OPC)** that ran in July - November 2020. 34 respondents replied.
- A **targeted stakeholder consultation (TSC)** that was tailored to ODS businesses, NGOs and public authorities and involved 42 stakeholders.
- An online **stakeholder workshop** held on 26 February 2021 to present preliminary results of the impact assessment and ask for stakeholder input on existing data gaps. 66 stakeholders participated. 12 organisations provided written feedback after the event.

Key stakeholders in the processes were:

1. Authority	<ul style="list-style-type: none"> • MS Authorities • Customs Authorities
2. Business	<ul style="list-style-type: none"> • Chemical industry including importers/exporters • Laboratories • Aerospace industry (halon users) • Reclamation/Recycling/Incineration companies
3. Other	<ul style="list-style-type: none"> • EU bodies (e.g. European Aviation Safety Agency) • EU citizens • Non-Governmental Organisations (NGOs) • International organisations including technical panels of the Montreal Protocol

⁹¹ <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12310-Ozone-layer-protection-revision-of-EU-rules>

⁹² <https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/12310-Ozone-layer-protection-review-of-EU-rules/public-consultation>

B. RESULTS OF THE CONSULTATION ACTIVITIES

Achieving a higher level of emission reductions

Respondents were asked about the importance of achieving a higher level of emission reductions through the revision of the ODS Regulation and potential impacts of the related policy options. Across all consultation activities, all respondents agreed on the importance of safeguarding the progress made and most respondents also welcomed maintaining global leadership and a higher level of ambition. On the latter, while Authorities and ‘Other’ stakeholders were mostly in favour of additional ambition, Businesses were divided in their views. A Business representative mentioned that the options to achieve a higher level of emission reductions should be combined with new reporting obligations on emissions to better monitor the progress made.

Limiting the exempted uses further in line with technological progress

On the option to **prohibit the use of ODS in two chemical production processes** where alternatives apparently exist, Businesses expressed strong concerns on the technical and economic feasibility of the alternatives, e.g. regarding the level of investment, and the achievable environmental effects. They flagged that the prohibition may lead to a larger amount of ODS to be incinerated and create higher energy use. A Business mentioned that the ODS would still exist as by-product from other processes. Hence if its use were prohibited, it would need to be destroyed and therefore there would still be an environmental impact. A Business indicated that the overall GHG footprint of the alternative production pathway is higher than for the current process. However, a few Authorities supported the option as they wanted a faster reduction of such uses.

On the option to **anticipate some prohibition dates for fire-fighting equipment containing or relying on halons**, Authorities and Businesses acknowledged the potential for a positive environmental impact, but at the same time stated that the ODS quantities and related emissions are low. ‘Other’ stakeholders considered it would not be feasible to review prohibitions dates for military applications due to technical limitations. Authorities quoted the potentially high costs and highlighted the importance of halons for defence applications.

On the option to **prohibit the destruction of halons**, as their production is not anymore allowed and stocks are decreasing, most businesses indicated that no significant economic impacts would be incurred. However a Business mentioned that halons can be contaminated in some cases and therefore cannot be recycled. Another Business stated that the prohibition to destroy halons should exempt cases of complex mixtures of chemicals with similar boiling points, because the reclamation is not feasible. Authorities mentioned a potential increase of their costs due to a need for additional enforcement and checks. Every group indicated positive environmental impacts, if the implementation avoids the need for halon production to be permitted under the Montreal Protocol. On the other hand, stakeholders also pointed to potential adverse environmental impacts if undertakings would release the halons to the atmosphere instead of shipping it to a country where demand for halons exists. An Authority also noted that prohibition itself may not ensure recycling, due to hazardous waste / waste

shipment regulation barriers and the lack of demand for recycled halons in some Member States.

Other options for achieving a higher level of emission reductions

Stakeholders from each group stated that **mandating recovery and destruction of foam banks** is feasible for some cases, e.g. metal-faced panels. Some Authorities raised concerns regarding the costs for the proper treatment of the waste. Businesses indicated that a large fraction of the costs depends on the level of disaggregation of waste during waste management. Additional costs for the separate collection of foam material are likely to vary considerably among EU MS, depending on national regulations. Regarding the environmental impacts, Authorities and Businesses confirmed that the policy option would have a considerable positive environmental impacts in saving emissions.

Regarding **prohibiting the use of new ODS (listed in Annex II) in cooling systems**, stakeholders from each group stressed that these chemicals replace HFCs, which are substances with much higher GWP. All stakeholder groups expected negative economic impacts for companies which already invested in using ODS additives to make their HFC alternatives marketable and safe. Businesses stated that environmental gain is likely to be low, due to the relatively low ODP and atmospheric lifetimes of the new ODS that would be prohibited. One Authority indicated that other alternatives for cooling equipment are available, which is why the use of an ODS should be prohibited.

Improving the efficiency of the Regulation while preserving effective prevention of illegal activities

As regards the option to **replace per-shipment licences with multi-shipment licences** (so-called “trader licenses”) for bulk substances and products or equipment with ODS, once the Single Window environment for customs⁹³ is in place, Businesses suggested that recurring licensing costs for bulk substances could decrease by up to 80%. Several authorities indicated the introduction of trader licenses would not lead to significant changes in their costs, but one respondent expected a 50-60% reduction in the number of licences the European Commission would be required to process. Only a few Authorities indicated significant positive environmental impacts, i.e. a further reduction of illegal trade, from the policy option because the current licensing system is considered to work well. Two Authorities mentioned that the current ODS Regulation has already successfully introduced multi-shipment licenses for aviation equipment. Two Authorities were sceptical about the timeline for the introduction of the Single Window Environment.

All stakeholders supported **aligning with customs legislation and including all customs procedures** in the licensing system, including controlling special customs procedures for ODS (such as transit, storage, specific use and processing). Three Authorities considered that including customs procedures could increase the administrative burden. No respondent was able to provide evidence on environmental impacts. However, it was indicated that the policy

⁹³ https://ec.europa.eu/taxation_customs/general-information-customs/electronic-customs/eu-single-window-environment-for-customs_en

option might enhance monitoring of shipments to some extent and therefore decrease illegal trade. A business welcomed possible improvements envisaged by enabling better custom controls, but mentioned the need to ensure consistency between the Regulation on fluorinated greenhouse gases (F-gas Regulation) and the ODS Regulation.

Authorities envisaged that cost savings could be achieved by **abolishing the registration process for laboratories**. One Business was able to indicate the economic impact of the abolishment of the registration requirement as a reduction of 25.6 hours per year. The concerned laboratories welcomed the proposal as it would decrease their administrative costs. However, some other Businesses expected that some of the administrative burden currently incurred by laboratories could be shifted to ODS suppliers and Authorities for tracking and spot-checking the necessary records. Some Businesses and Authorities also feared that some oversight and control of this ODS use might be lost. One Business indicated that the EU's registry is one of few sources of information on the availability of alternatives to ODS in laboratory or analytical uses that informs respective bodies under the Montreal Protocol.

Businesses generally favoured **abolishing the annual allocation of quota for import and production of ODS**. A Business indicated likely positive economic impacts due to EU companies being able to import ODS at short notice (without having applied for quota at least half a year in advance). Authorities had mixed views, and although they agreed with all other stakeholders that the option would result in a reduction in administrative costs, some Authorities were concerned about the possible effect on the controls of ODS quantities and uses.

On the option to **delay one prohibition concerning the use of halon-based fire protection equipment aboard aircraft** to 2024, Authorities acknowledged that this cut-off date was hard to meet by the aviation industry. Some Businesses mentioned that even the postponed date could be hard to comply with. Both Authorities and Businesses highlighted positive economic impacts from removing the need to request corresponding derogations from the cut-off date. Businesses considered the environmental impacts to be minor.

Ensuring more comprehensive monitoring

Respondents were asked about the objective to ensure more comprehensive monitoring of the Regulation, while preserving effective prevention of illegal activities, and potential impacts of related policy options. Across consultation activities, Authorities and 'Other' stakeholders placed high importance on additional reporting measures, whereas Businesses were divided on this issue.

An option considered was aligning Businesses and Authorities considered that their costs would not increase if **reporting obligations for new ODS (listed in Annex II) were aligned to those of ODS listed Annex I**. A Business highlighted that the required data for new ODS was already collected by them and available for reporting or already reported. Some Authorities indicated minor positive environmental effects as a result of better oversight, particularly with regard to completeness of emissions data from feedstock.

Authorities and Businesses also indicated that economic impacts of a new reporting obligation **requiring reporting on emissions for ODS production and destruction** would

be at most minor. However some Businesses mentioned that this option would introduce double regulation due to existing reporting obligations under the Industrial Emissions Directive (IED) and European Pollutant Release and Transfer Register (E-PRTR). One Business estimated no increase in costs, whereas two Businesses indicated higher costs corresponding to 1-2 and 1-5 additional working days per year. Environmental benefits were indicated by Authorities due to improved oversight.

Although a slight majority of the Authorities supported to **add GWP values to substances listed in Annexes I and II of the ODS Regulation** as a way to increase awareness of the climate impact, some questions were raised on added value and environmental benefits. Both Authorities and Businesses indicated no additional costs related to this policy option. Businesses assessed this policy option as not beneficial to the environment as the remaining use of ODS is mostly feedstock, where ODS are not emitted in significant quantities.

Authorities and Businesses considered the option to require some ODS users to **report on ODS sales to/purchases** from other EU undertakings as feasible, since many of these undertakings already report on their suppliers and recipients. As the relevant data for reporting is basically already collected, Businesses indicated additional costs to be 0-3 working days. No environmental benefits were considered likely by stakeholders.

Most Authorities indicated that the policy option to **add additional substances⁹⁴ to the list of new ODS** in Annex II, so that they would need to be reported in the future, would not lead to increases in implementation and enforcement costs. Many Authorities referred to potential future positive environmental impacts, as this option would allow for informed decisions on these new chemicals. On the other hand, Businesses considered environmental impacts of these two substances as low, since they are Very Short-Lived Substances (VSLS). A Business estimated additional costs for a laboratory supplier needing to report on the production of a new ODS as 0.625 days per year.

Improving coherence of the Regulation

Respondents were asked about the objective that aims to improve internal coherence of the Ozone Regulation. The policy options aligned provisions with other policies, addressed inconsistencies within the Ozone Regulation and streamlined legal text of the legislation.

For all stakeholders, aligning provisions with other EU policies were considered important. All stakeholders generally agreed that it is important to have a clearer and more accessible legal text of the Regulation. Policy options that improve the coherence of the ODS regulation are expected by most Authorities and Citizens to reduce administrative costs, whereas most Businesses expect no change in administrative costs. A customs representative stated that the alignment of the ODS Regulation with customs regulation is a must and that having an alignment with F-Gas licensing would increase effectiveness of controls and level of compliance.

⁹⁴ E.g. Dichloromethane (DCM) and 2-bromotrifluoropropene (2-BTP).

Annex 3: Who is affected and how?

1. PRACTICAL IMPLICATIONS OF THE INITIATIVE

Due to the accomplished phase-out of most ODS, the number of stakeholders is now greatly reduced from the beginnings of this policy in the 1980s and 90s. It is now limited to a few entities in a number of discrete sectors. The five main business types that are affected by the initiative:

1. (Large) industrial chemical producers as well as incineration companies;
2. Importers and exporters of ODS;
3. Halon equipment owners, e.g. in aviation and the military;
4. Laboratories, either public or private, who use ODS as solvents for experimental use;
5. Building owners, recycling and demolition companies.

Given that the HCFC phase-out has now also been accomplished, **a new Regulation will cover less entities than the current Regulation did from its outset.** Many measures discussed set out small changes to an already well-established system of regulating ODS and therefore the corresponding **changes to the costs (savings) are expected to be small. The main impact in terms of environmental benefits and abatement costs relates to insulation foams.**

Some of the efficiency measures (removal of obligatory laboratory registration and quota requirements) will reduce the number of companies directly affected further. Adding a few additional measures on monitoring will not add many new entities and the additional effort for the ones already affected is modest. The changes proposed to the ODS regulation do not signify a significant change in the way of working for most companies (but may provide a boost to the recycling sector). A number of policy options are aimed at reducing administrative burden (B1, B5, B6, streamlining of trade via trade licences, abolishing the ODS quota applications and delaying the halon cut-off date for aircraft compartments), but others may slightly increase the burden to achieve better oversight and control (options B2, B3, C1, C2, C4, C5 on additional monitoring and reporting).

Overall, it is not expected that category 1 businesses would not experience a noticeable increase in administrative cost.

For category 2, there are significant savings from B1 and B5, which should more than compensate costs linked to better controls (B2, B3).

For category 3, A4 may result in some costs depending on the circumstances, while B6 should result in savings for aviation companies.

For category 4 on laboratories, the suggested policy changes (B4, B5) in particular would represent a reduction in administrative burden.

For category 5, the policy option A1 (foams) would represent some compliance costs for the owners, though the extent depends on the national regulatory background (i.e. waste legislation), will be shared by a large number of building owners, over several decades, and is considered small compared to overall demolition, renovation or re-development costs. Moreover, these small increases are likely to affect business owners and citizens that own and develop real estate, i.e. that are relatively well off as opposed to vulnerable citizens.

The burden for the authorities at European level (European Commission, EEA) will be significantly reduced, in line with a shift of focus from reducing gas uses further to ascertaining the general use prohibition for ODS and avoiding emissions from historic uses. Better controls will be possible at less resources due to fully exploiting the combination of EU-wide electronic systems consisting of the ODS Licensing System and the EU Single Window Environment for Customs.

The burden for national authorities will remain low and is mostly related to limited annual reporting, border controls and inspections, the latter in synergy with other legislation such as the Industrial Emissions Directive.

Citizens benefit from the health benefits of avoiding dangerous radiation from the ozone hole, as well as lessening the impacts of a changing climate by keeping highly warming gases out of the atmosphere.

2. SUMMARY OF COSTS AND BENEFITS

<i>I. Overview of Benefits (total for all provisions) – Preferred Option</i>		
<i>Description</i>	<i>Amount</i>	<i>Comments</i>
<i>Direct benefits</i>		
Reduced ozone- and climate-relevant emissions	Emission saving: 32,000 tODP for 2021-2050 179 million tCO ₂ e for 2021-2050	Almost exclusively from action on foams (option A1), in addition some contributions from better controls and monitoring (options B1, B2, B3, C1, C2, C4) and prohibiting halon destruction (A4)
Administrative cost reductions for business	Annual savings up to €216,000	For business, mostly from efficiency options Affects importers/exporters (B1, B5), laboratories and other entities doing analysis (B4), chemical industry (B1, B5) and aviation companies (B6)
Administrative cost reductions for authorities	Savings: 694 person days/a up until 2024, 254 person days/a from 2024 onwards; Annual IT costs of €31,500	EC: 574 person days/a until 2024, 254 person days/a thereafter, plus annual IT costs of €31,500 Member States: 120 person days until 2024
<i>Indirect benefits</i>		
Job creation	Up to 2400 FTEs	Recycling, reclamation and incineration entities
R&D	Innovation on demolition and treatment processes for foams Knock-on effects on refrigerators recycling	Recycling, reclamation and incineration entities

II. Overview of costs – Preferred option							
		Citizens/Consumers		Businesses		Administrations	
		One-off	Recurrent	One-off	Recurrent	One-off	Recurrent
Action A1	Direct costs	<i>Compliance costs:</i> Higher costs to building owners. Costs include: Recovery: ca. € 1050-1200/t; incineration €2500-3500/t; Total costs: 1.98 billion € distributed over a high number of owners; Abatement costs: €25,000–132,000 / tODP or 5.1-18.4 tCO ₂ e		<i>Compliance costs:</i> Same as citizens if commercial building owner			
	Indirect costs						Enforcement costs for Member States; synergies with waste and circular economy policies
Action A4	Direct costs			<i>Compliance costs:</i> Halon equipment owner (e.g. aviation company, military etc.) Costs may arise if transport, reclamation and sale is higher than destruction	<i>Administrative costs:</i> Keeping of records for 5 years		
	Indirect costs						Enforcement costs for Member States
Action B1	Direct costs						
	Indirect costs					Changes to IT system for EC	
Action B2	Direct costs			<i>Administrative costs:</i> Minimal higher			

				cost to importers			
	Indirect costs						Enforcement costs for Member States
Action B3	Direct costs						
	Indirect costs			<i>Administrative costs:</i> Cost to acquire authorised trader status for importers	<i>Compliance costs:</i> Less flexibility on logistics for importers		Enforcement costs for Member States
Action C1	Direct costs				<i>Administrative costs</i> for reporting companies*: total €5,500 p/a		
	Indirect costs						
Action C2	Direct costs				<i>Administrative costs</i> for producers/ destruction companies/ feedstock users: total €20,000 p/a		
	Indirect costs						
Action C4	Direct costs				<i>Administrative costs</i> for reporting companies*: total €13,000 p/a		
	Indirect costs						
Action C5	Direct costs				<i>Administrative costs</i> for reporting companies*: €25,000 p/a		
	Indirect costs						

* Reporting companies include ODS importers, exporters, producers, feedstock/process agent users and destruction companies

Annex 4: Analytical methods

A. Data sources

The input data for modelling future developments of the baseline and the policy options relies on recent data on relevant parameters at substance level for the years 2010-2019. It was developed using data from:

- The European Environment Agency (EEA) annual report on ODS based on company reporting under this Regulation (production, import, exports feedstock uses and process agents uses);
- Commission's ODS Licencing/Registration System, for laboratory use and imports and exports;
- Member States reporting Art. 26(1)(b) for critical use of halons (2015-2019);
- Research on existing and future ODS emissions sources (Evaluation, Ramboll (2019));
- Data on insulation foam banks from SKM Enviros (2012) and ICF (2018);
- Stakeholder input collected through the consultation process.

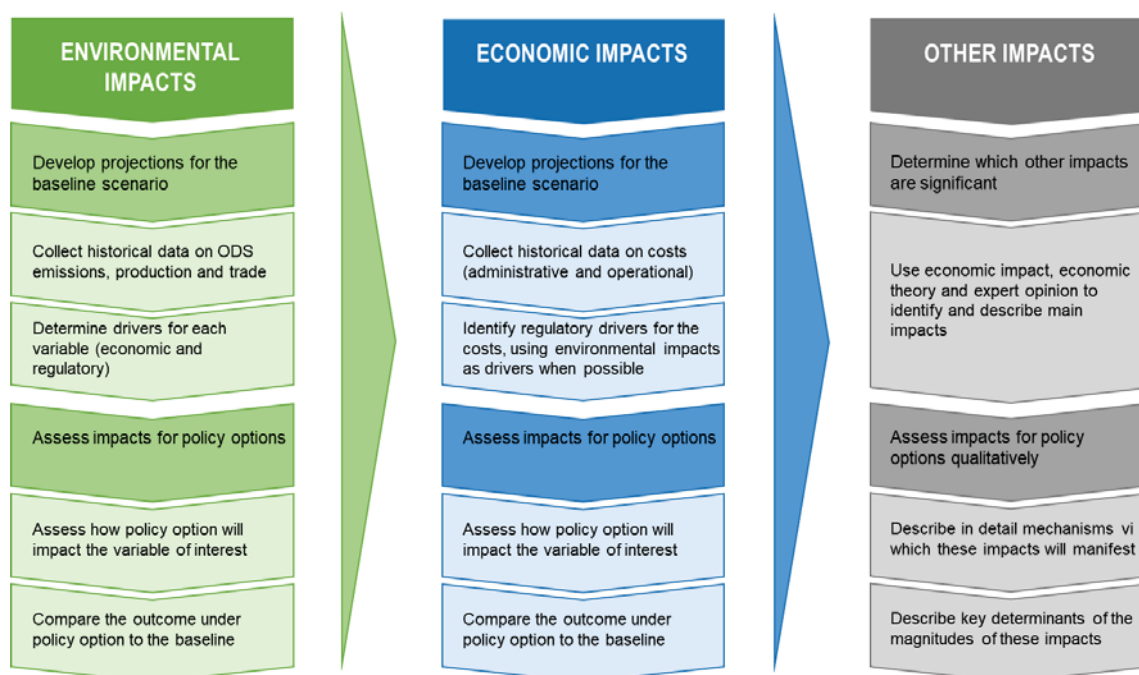
The Commission also collected data based on an online open public consultation, a consultation of targeted stakeholders by an external consultant and an open stakeholder conference, see the consultation synopsis report in Annex 2.

B. General overview of modelling approach for baseline

The modelling of impacts relies on understanding the historic trends across environmental, economic and social variables. This data is used to define a baseline scenario across relevant environmental, economic and, where relevant, other impacts.

Figure A4.1 shows a schematic overview of the approach to the impact assessment. Environmental and economic impacts are the main relevant impact categories, with social impacts treated as a follow-on effect ("other impacts" in the figure) of any economic changes experienced by stakeholders.

Figure A4.1 Overview of the impact assessment model



Historical data and relevant drivers define the future development of the relevant environmental variables that the Ozone Regulation is targeting. The basis for estimating future emissions is the estimated developments of production, trade, uses and stocks/banks of ODS, from which emissions can occur, in addition to the relevant emission factors. The environmental module includes the flows of raw material (production, use, export, import etc.) and the associated emissions, for both ODS (Annex I) and new (Annex II) substances.

The economic module then takes into account these drivers and adds costs for the relevant stakeholders reflecting the Regulation, which are limited largely to administrative costs. The administrative costs are identified at the level of the relevant individual measures of the Regulation. Where possible, these administrative costs (such as the cost of licences) are projected into the future using known information about the policy they are supporting. Drivers from the environmental module are used to project administrative costs where there is no such information available, and where the assumption of constant costs into the future is not considered reasonable.

C. Development of relevant parameters for the baseline

The production, use of, and storage of ODS releases emissions into the atmosphere, which can cause harmful effects due to their ozone depleting potential (ODP) and greenhouse warming potential (GWP). As a result, the environmental impacts associated with the emissions of ODS are twofold:

1. **Destruction of ozone** according to the ODP of a substance, which ranges from 0.005 to 10 for controlled substances, with a median of around 0.1.

2. **Contributing to climate change** due to some ODS also having high GWP and long atmospheric lifetimes.

Both of these environmental impacts are within the remit of the Regulation, which states that action has to be taken to reduce emissions of the emitted gases “to protect human health and the environment against adverse effects resulting from such emissions and to avoid risking further delay in the recovery of the ozone layer.”

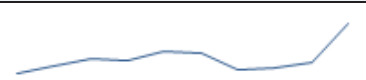


The data on relevant parameters from recent years is used to derive the relationships between ODS uses/banks and emissions and the underlying drivers. The following parameters are considered:




- **ODS production, imports, exports, and uses**, distinguishing between uses for feedstock, process agents, laboratories, foam banks and critical halons applications. The data is summarised in Table A5.1 below, which gives the flow of these parameters as a time series.
- **Emission rates** include emissions from production and use of ODS, distinguishing between emissions associated to the use for feedstock, process agent, laboratory use, foam banks and halon banks. Recent emission trends are shown in Table A5.2 below.

Recent trends in the background data over the 2010 to 2019 period are used to make a prediction, in combination with expert judgement about what is likely to happen with the sector going forward, to produce the baseline up until 2050 for each ODS emissions source. The discussion below illustrates how this was done in detail. For emissions linked to uses of non-listed ODS and other uses of Annex II substances (e.g. solvent use), there is no reliable baseline information due to the lack of current systematic monitoring.

Table A4.1 shows the recent trends observed for the relevant parameters.

Table A4.1 Recent trends on flows of ODS (2010 to 2019 unless otherwise specified)

Flow/ Stock	ODS source	2010 – 2019 trends (annual or stock tODP)			Data source
		2010	Trendline	2019	
Raw material (annual flow)	Production	48,100		59,517	EEA
	Imports (2015 – 2019)	2,420		3,900	EEA
	Exports (2015 – 2019)	3,609		15,723	EEA
Use (annual flow)	Feedstock	51,200		38,717	EEA
	Process agents	952		298	EEA
	Laboratory use	26 (2011)	No intermediate years data available	3 (2017)	Evaluation

Flow/ Stock	ODS source	2010 – 2019 trends (annual or stock tODP)			Data source
Banks (annual size of the stock)	Foam Banks	2012 estimate at 570.000 tODP			SKM Enviros (2012) ⁹⁵
	Critical halons installed capacity (2015 – 2019)	645 (2015)		626	Art. 26(1)(b) reports
Annex II substan ces	Production	22,946		20,494	EEA
	Feedstock use	22,831		20,391	Evaluation

In the EU, ODS are produced and imported for use by chemical industry (i.e. feedstock use, process agent use), laboratory use, and for export outside the EU. Currently, only the chemical industry is using ODS in large quantities, mostly as feedstock.

Production has increased significantly recently but this seems to be linked to a demand outside of the EU, as exports have similarly been rising strongly very recently. Production for the EU market, which is essentially for feedstock use, has been declining. Exports of ODS is sensitive to the global market, but feedstock use will continue worldwide in significant quantities. As a proxy, the global chemical industry scenario from the IEA (SDS, Sustainable Development Scenario) for global ammonia⁹⁶ demand is used. It is expected however that many feedstock chemicals will also be produced in Southeast Asia in the future. With this in mind, exports are expected not to surpass the (high) 2019 figure and are kept constant. As a result, production of ODS (Annex I) expressed in tODP is expected to decrease over the 2020 – 2050 period.

For the use of ODS, between 2010 and 2019, and also for the more recent 2015-2019 period, there is a clear decrease in **feedstock use** (and process agent use), in terms of tODP. For feedstock use, the amount in metric tonnes has not decreased substantially, but the average ODP of the substances has. This reduction is due to a shift away from relatively high-ODP feedstocks (a sharp reduction of CTC use). For **process agents** the reduction from 2015 is 28.5%, although it should be emphasised that a single company takes up more than half of all the use. As there are alternatives for the use of ODS as process agents, they are expected to be phased out naturally in the medium term for the few remaining old installation that still use such processes. For feedstock use of Annex II substances, the decrease can be attributed to a decrease in methyl chloride production.

If chemical production in the EU continues to grow at the same rate (0.3% annual growth as shown by CEFIC indicator in the last 5 years), we should expect to see the historical trends in

⁹⁵ SKM Enviros (2012) , “Further Assessment of Policy Options for the Management and Destruction of Banks of ODS and F-gases in the EU”, European Commission Service Contract Number: 070307/2010/576660/SER/CLIMA.C.2

⁹⁶ Ammonia is linked to pesticides production, one of the main feedstock uses of ODS

ODS-related variables to continue. The downwards trends shown in the process agent (in tODP and metric tonnes) and feedstock use (in tODP only) data, however, show very rapid decreases recently. If they were projected linearly into the future, the feedstock use in tODP would reduce more rapidly than what can be reasonably expected from the chemical industry, given that the total use in metric tonnes did not decrease.



The ODS Regulation does not restrict feedstock use, and there is no technological justification to assume the reduced 2019 emissions and feedstock use ODP is a reliable trend that will continue at the same pace in the long-term. There are indications of industry relocation to South East Asia, though this is difficult to forecast. To adjust our projection to these expectations and make sure our baseline scenario does not incorporate aggressive reductions, **the reduction rate in tODP for feedstock is reduced to 33% of the 2010-2019 trends.** This allows for the movement of less high-ODP feedstocks to continue, but reflects that in metric tonnes, feedstock use stays relatively constant. **This correction was also applied for process agents, but more aggressively at 50%, as these are used in a small number of old installations in the EU, for which phase out is expected to continue.**

ODS emissions are mainly occurring from three sources:


1. **End-of-life emissions from banks**, most notably foam banks, which account for the vast majority of remaining emissions.
2. **Industrial processes** whereby low amounts of emissions are released as part of ODS production, feedstock use, and process agent use
3. The **release of halons during critical use applications and banks.**

In table A4.2 the recent emission factors and trends for different emission sources are given.

Table A4.2 2019 emissions of ODS and recent trends of emissions factors

Flow	ODS source	2019 Emissions (tODP)	Emission factor trends for 2010 – 2019 (annual or stock tODP)	
Raw material	Production of controlled substances (2010 – 2019)	10*	<i>No reliable data on trends available, as data is only reported voluntarily with varying sample size of < 10% of production. Based on the latter, emission rates declined from 0.12% in 2010</i>	
	Production of Annex II substances	<i>Not reported, estimated as 4 (2019) based on emission factors established for Annex I substances as above</i>		
Use	Feedstock – controlled substances ⁹⁷	35	0.13% (2010)	
	Feedstock – Annex II	18	<i>Not reported, but assumed to be similar as the EF for feedstock use of Annex I substances</i>	
	Process agents	4	11.78% (2010)	
	Laboratory	< 1	<i>Not available</i>	

⁹⁷ Reported data for feedstock emissions is self-reported by industry, and may be underestimated, as the emission factor of 0.09% is below the lower value of the expected range of feedstock emissions at 0.1 – 4%.

	use				
Banks	Foam Banks	6000**	Data not available on a yearly basis		
	Critical halon applications (2015– 2019)	22.6	0.75% (2015) ⁹⁸		0.37% (2019)

* Extrapolated value based on available data for 10% of the total production

** value from SKM (2012)

In the chemical industry, there are several uses with non-zero emission factors that are expected to continue into the future, including emissions from production, feedstock use, and process agent use.

Raw material: Production emissions. The annual production of ODS is published annually by the EEA, based on self-reported data from each company producing in the EU. This does not include emissions associated with production, not being part of the reporting requirements. Some reporting companies do provide data on measurements or estimations of emissions associated with their production amounts. There is considerable margin for error, due to the low sample size of companies. Of 27 companies producing controlled substances in 2019, only five reported emissions. The self-reported emissions from the five reporting companies cover about ~ 10% of all ODS production.

To obtain an estimate for all emissions associated with production, the available emission measurements were upscaled to the total amount of ODS produced. Due to the small sample size, the sharp decrease in the production emission factor shown in Table A4.3 can likely be attributed to the decrease in emissions between 2015 and 2019 from one company, while the production stayed the same. Therefore, when forecasting, this drop in the emission factor is not taken into account and the average emission factor from production across 2010-2019 is used instead. For production, this partly reflects the reduced emission factor from 0.12% to 0.02%, at an average 0.054%. In the absence of any data, the same emission factor was used for production of Annex II substances.

Feedstock use emissions. ODS can escape during chemical production processes, even if they are intended to be fully consumed or transformed during the process. The average emission factor for feedstock emissions between 2010 and 2019 is moving from 0.13 to 0.09% of the total feedstock that is used, which is on the low end of the expected emission factor at 0.1 – 4% globally ⁹⁹. This emission factor is expected to go down further to 0.08% in the future, but is not expected to reduce further as the maximum reasonable emission reduction ceiling will be reached.

In Europe, remaining ODS uses for industry happens in very controlled environments in a small number of companies, and therefore lower than average emission factors are expected, but there is still the possibility that emissions are underestimated. Comparison of some data with E-PRTR in the past has shown some inconsistencies, i.e. that emission levels may be

⁹⁸ The emission factor of the total bank each year (emissions / (total installed + stock) is on average 0.5% over the 2015 – 2019 period.

⁹⁹ Sherry et al. (2018), Current sources of carbon tetrachloride (CCl₄) in our atmosphere

higher. For emissions from production there is no reporting requirement, and emissions estimates and their trends are based on only 10% of production.

Emissions from feedstock use are therefore largely dependent on the total amount of ODS used for feedstocks. The same assumptions was made for the use of Annex II gases as feedstock.

Process agent use emissions. ODS used as process agents may escape during the production process. In contrast to feedstock uses, ODS that are used as process agents are not chemically transformed as part of the process, which is why relative emissions rates are higher than during feedstock uses. Based on the historical data reported, the emission factor is relatively constant at around 1.2% of total ODS used as a process agent in the period 2016-2019. However, only six companies carrying out such processes have remained active in the EU. These total emissions from process agents are dominated by activities from one of these six companies, who is responsible for more than 75% of emissions. The most recent emission factor (2019) of 1.3% is taken forward into the baseline. In the medium to long-term the use of process agents will be discontinued due to modernisation of plants which will significantly reduce emissions further.

Laboratory use emissions. No primary data on emission factors for laboratory use is available at this stage. Therefore, we have taken forward the estimate from the Evaluation at < 1 tODP per year as the baseline. We assume that the ODS emissions from laboratory uses will not change in the baseline, as up until 2050, there are no economic, technological, or policy reasons identified that would lead to a significant increase or decrease in laboratory activity associated to ODS use. This is because there is very limited scope for any further reductions and these activities involving ODS are expected to continue in similar extent into the future, and may be less sensitive to economic growth as the industrial uses above. Moreover, the emissions associated to laboratory use represents less than 0.1% of total emission associated to ODS.

Foam bank emissions. Emissions from foam banks are the largest category, with an estimated 6,000 tODP of emissions in 2019, from a total bank of around 570,000 tODP estimated to exist in 2010. Furthermore, it was estimated that between 2015 and 2030, an average of ~ 13,000 tODP is added to this bank due to legacy materials reaching end-of-life. Due to this continuous input of material with ODS inside, the bank itself is not expected to reduce in size until after 2030, and annual emissions are also maintained and peak only after 2030.

This emissions source is significantly larger than emissions from any other use. As per analysis by SKM in 2012¹⁰⁰, the annual emissions estimated from foam banks are primarily emissions from decommissioning and demolition of buildings. They constitute about 1.2% of the bank each year. It is recognised to be difficult to efficiently recover/destroy the blowing

¹⁰⁰ SKM Enviro (2012) , “Further Assessment of Policy Options for the Management and Destruction of Banks of ODS and F-Gases in the EU”

agent after it has been integrated into a foam product, which means that this emission factor of 1.2% of the bank per year is not expected to change in the baseline.

Further research has been done to reduce the margin of error on the estimation of annual emissions from foam banks. If assuming that foam products have lifetimes of around 50 years before they are decommissioned (recycled), the implied foam bank emission rate from this would be about 2%. The actual emission rate of 1.2% is lower than the implied emission rate. This can be explained by the fact that not all foam products are being decommissioned and a significant part ends up stored in landfills. There is therefore an unknown share of the 570.000t ODP bank stored in landfills currently, which might lead to further fugitive emissions above the current estimate of 1.2% per year.

Some countries have done some research at a national level with respect to the remaining emission sources of ODS, based on observational data of concentrations present in the local atmosphere. There is also academic research with observational data that focuses on Europe as a whole. For example, the United Kingdom Met Office estimated about 400 tODP of unreported emissions¹⁰¹, which has not been part of the annual inventory reported to the EEA. These estimations are in a similar order of magnitude, extrapolating the emissions from one country to 27, with the expectation that there is between 6,000 and 7,000 tODP of emission from banks from the EU as a whole.

Banks of critical use halon emissions. Emissions from critical uses of halons are reported under Article 26(1)(b) and are provided in the form of annual Member State reports. This data is used in conjunction with information on the total available stock and the specific prohibition dates for critical uses from the Evaluation. Article 26(1)(b) reports specify total emissions and total use, from which emission factors are determined.

For banks of critical use halons, for which production is prohibited, the potential can be estimated by assessing the future end-dates by which these use cases will be fully prohibited under the current policy regime, combined with an emission factor for the remaining critical uses. These end-dates are based on data collected during the Evaluation, and result in a gradual reduction of the halon bank to zero from 2040 onwards. There is a possibility that by the end dates, no alternatives are identified for remaining uses and therefore use will continue after 2040. This could apply to up to ~30% of the halon bank. Emission rates have been going down in recent years and stand at 24 tODP or almost 14,700 tCO₂e in 2019. The average emission rate from the total halon bank over the period 2015-2019 has been 0.5 %.

Two other remaining emissions sources of ODS that were considered in the Evaluation are solvent use and emissions from cooling equipment, e.g. refrigerators and air conditioners. These have not been considered in this impact assessment, as they are not relevant anymore. Solvent use has been prohibited since 2008 for all purposes. For RAC, emissions from banks of in-use or end-of-life RAC equipment are not considered significant in the EU anymore, given the large amount of time that has passed since the phasing out of this ODS use, so the

¹⁰¹ UK Met Office (2018), Long-term atmospheric measurement and interpretation of radiatively active trace gases

remaining estimated emissions bank remaining in 2020 is near zero¹⁰². Evidence exists from Poland that there is a remaining bank of ~83 tons of CFCs and HCFCs in containers holding 3 kg ODS or more. Even when extrapolating this value to other Member States, this is a very small quantity compared to the estimated bank of ODS in foams at 570.000 tODP. There is a contribution from old equipment in landfills to emissions.

Based on the considerations above the drivers and assumptions made to construct the baseline scenario are summarised in Table A4.3.

Table A4.3 Overview of drivers and assumptions for the baseline scenario of relevant parameters

ODS source	emissions	Stock emissions (tODP and tCO2e) or and	Driver for 2020 – 2050 trend
Production	Controlled substances (tODP stock)		Production reduces in line with use of controlled substances as feedstock (see below under Feedstock), to account for the expectation that most EU production will be for EU industry, and that exports is not used by industry to make up some of the difference of reduced demand.
	Emissions (tODP)		Emissions are reduced in line with production
	Emissions (tCO2e)		Emissions are reduced in line with production. See Feedstock use for calculation details of converting from tODP to GHG. No expected significant change in emission factor (EF) for production.
	Annex II substances (tODP stock)		Assumed to stay constant for use and emissions, as less regulatory pressure, but also no indication for significant growth from historic data (production stayed relatively constant across 2010 – 2019).
	Emissions (tODP)		As there is not enough primary data to uncover a meaningful trend in emissions data, this is also assumed to stay constant and is not reduced.
	Emissions (tCO2e)		
Feedstock use	Controlled substances (tODP stock)		Taking the 2013 – 2019 trend. 2010-2012 is excluded as there were very high feedstock quantities used which may have been affected by the economic recovery after the 2009 crisis. Using the 2013 to 2019 reduction results in an annual reduction of 3.53%. This reduction (in tODP) was considered as unrealistic to be sustained in the long run, so this reduction factor is divided by 3, assuming that intrinsic factors to the 2013 – 2019 period resulted in a faster reduction than is usual. Further, an overall chemical sector production increase of 0.3% per year is added to account for economic growth of the EU chemical sector in line with 2010 – 2019 trends ¹⁰³ . Trend is applied to data reported for 2019 from EEA.
	Emissions (tODP)		Method similar to tODP stock, starting with reported EEA data, but emissions reduce slightly faster than use, reflecting a reduction in emission factor between 2010 to 2019 (from 0.013 to 0.09). As the maximum potential is almost reached, emission factor is considered to reduce only from 0.09 to 0.08 between 2020 and 2050.
	Emissions (tCO2e)		Converted tODP to tCO2e using GWPs from the GHG protocol (citing IPCC AR5) ¹⁰⁴
	Annex II substances* (tODP stock)		Assumed to stay constant, in line with reasoning and driver for production of Annex II emissions.
	Emissions (tODP)		With use constant, emissions reduce only in line with the slowly reducing emission factor. This reduction in emission factor is assumed as equal to the reduction of the emission factor for controlled substances (which reduces from 0.09 to 0.08, or ~ 11% from 2020 to 2050).
	Emissions (tCO2e)		Converted tODP to tCO2e using GWPs from the GHG protocol (citing IPCC AR5)

¹⁰² SKM (2012), Further Assessment of Policy Options for the Management and Destruction of Banks of ODS and F-Gases in the EU

¹⁰³ CEFIC (2020), CEFIC Economic Outlook 2021

¹⁰⁴ GHG protocol (2016), Greenhouse Gas Potential Values (citing from IPCC AR5), available at: [https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%28Feb 16 2016%29 1.pdf](https://www.ghgprotocol.org/sites/default/files/ghgp/Global-Warming-Potential-Values%28Feb%2016%29%201.pdf)

Controlled substance feedstocks with potential identified alternatives	Stock	Identified via the uses highlighted in the Evaluation, and the process-specific data from the EEA reporting.
	Emissions	
	Emissions (tCO ₂ e)	
Process agent use	Stock	Process agent use is expected to decline significantly to 25% of 2019 levels in 2040 as old installations are being eliminated.
	Emissions	Emissions decline linearly in line with use.
	Emissions (tCO ₂ e)	Emissions decline linearly in line with use.
Laboratory use	Licences (# no annual licences)	Use of the EC licence data to identify number of licences. The use of the Laboratory Registration System (LabODS) slowly increased and is expected to max out at 1200. Not expected to increase or decrease, as no clear link to 2010 – 2019 economic trends identified in the licence data.
	Emissions (tODP) ¹⁰⁵	Emissions assumed to be < 1 tODP per year and stay constant in line with licences.
Foam banks	Annual release (tODP stock)	All data derived from the forecast model of SKM (2012) with no modifications. For ODS banks of foam, predictions on future emissions can be made through understanding the current size of the bank in combination with an assumption on how much of this is released into the atmosphere annually, which is set at 1.2% based on previous research (SKM Enviro, 2012). Large quantities of foams are reaching their end of life until 2030. Sustained high levels of emissions will occur until 2050 and beyond.
	Emissions (tODP)	
	Emissions (tCO ₂ e)	
Critical use halons	Stock	Identified from the Evaluation support study, Table 38 (Ramboll, 2019).
	Emissions (tODP)	Using Article 26(1) reports, aggregated data for each Member State excluding the UK, for the 2015 to 2019 period. As the required critical halon stock reduces in line with the prohibition dates, emissions are also reducing to a similar degree. See also Annex 5
	Emissions (tCO ₂ e)	Converted tODP to tCO ₂ e using GWPs from the GHG protocol (citing IPCC AR5)
Imports	Annual flow	Imports and exports are aligned with the global IEA (2020) SDS (Sustainable Development Scenario) trend for Ammonia, as a proxy for the high-volume basic chemical production system that ODS are part of. Imports are relatively constant over the 2010 to 2019 period and therefore the average over the 2015 – 2019 period is used as a starting point for extrapolating with the IEA SDS. Exports are not constant, as in 2019 exports increased by 150%, largely in line with a sharp reduction of feedstock demand. Therefore, exports cannot be assumed to stay in line with the average of 2015 – 2019 average. Instead, data point for 2019 is used as a baseline which is extrapolated using the IEA SDS trend.
Exports	Annual flow	

D. Development of the environmental baseline

To define a baseline scenario for ODS emissions, the relevant drivers which influence the remaining ODS emissions in the EU are projected into the future. Projections have been developed for 5-year steps from 2020 to 2050, for each relevant activity that is impacted by, driven by, or relevant to the Regulation.

Table A4.4 Baseline results for flows of ODS linked to exempted uses and banks

ODS emissions source	Stock or emissions (tODP and	2020	2025	2030	2035	2040	2045	2050
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¹⁰⁵ Due to the heterogeneity of substances used for laboratories, the total GWP of these substances could not be estimated as no substance-level data is made available for any one year.

tCO2e)								
Production	Annex I substances (tODP stock)	52,285	51,930	50,210	48,576	47,022	45,541	44,130
	Emissions (tODP)	10	10	9	9	9	9	8
	Emissions (tCO2e)	59,706	59,301	57,336	55,471	53,969	52,005	50,394
	Annex II substances (tODP stock)	22,115	22,115	22,115	22,115	22,115	22,115	22,115
	Emissions (tODP)	4	4	4	4	4	4	4
	Emissions (tCO2e)	2,400	2,400	2,400	2,400	2,400	2,400	2,400
Feedstock use	Controlled substances (tODP stock)	38,377	36,721	35,136	33,620	32,169	30,781	29,453
	Emissions (tODP)	34	32	30	28	27	25	24
	Emissions (tCO2e)	203,000	200,268	195,190	190,240	185,416	180,714	176,131
	Annex II substances* (tODP stock)	22,583	22,583	22,583	22,583	22,583	22,583	22,583
	Emissions (tODP)	20	19	19	19	18	18	18
	Emissions (tCO2e)	11,248	11,043	10,842	10,645	10,452	10,261	10,075
Annex I feedstocks with potential identified alternatives ¹⁰⁶	Stock	14,612	13,981	13,378	12,801	12,248	11,720	11,214
	Emissions	0.56	0.53	0.49	0.46	0.44	0.41	0.38
	Emissions (tCO2e)	9,638.00	9,054.33	8,506.00	7,990.88	7,506.96	7,052.34	6,625.26
Process agent use	Stock	283	220	170	132	102	79	61
	Emissions	4	3	2	2	1	1	1
	Emissions (tCO2e)	14,200	11,000	7,050	7,050	3,700	3,700	3,700
Laboratory use	Licences (# no annual licences)	1,200	1,200	1,200	1,200	1,200	1,200	1,200
	Emissions (tODP) ¹⁰⁷	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Foam banks**	Annual release (tODP stock)	14,000		14,800		8,900		3,100
	Emissions (tODP)	6,000		6,700		5,700		4,200
	Emissions (tCO2e)	37 * 10 ⁶		42 * 10 ⁶		38 * 10 ⁶		27 * 10 ⁶
Critical use halons	Stock	5,586	5,210	4,866	4,549	3,247	0	0
	Emissions (tODP)	42.8	40.2	38.0	36.0	22.6	0	0
	Emissions (tCO2e)	26,619	25,017	23,653	22,400	14,095	0	0
Imports	Annual flow	4,202	4,096	3,961	3,826	3,695	3,569	3,447

¹⁰⁶ In section 4.3.1.1, the substances identified by the Evaluation of the Regulation as having potential viable alternatives are discussed

¹⁰⁷ Due to the heterogeneity of substances used for laboratories, the total GWP of these substances could not be estimated as no substance-level data is made available for any one year.

Exports	Annual flow	15,970	16,272	16,166	16,031	15,896	15,765	15,639
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**For Annex II substances, 99% of production is assumed to go to feedstock use. Imports of Annex II substances are unknown, so not included.*

*** For foam banks, data is from SKM Enviros (2012)*

E. Economic baseline drivers

Economic impacts are the baseline costs for businesses and laboratories, Member States as well as costs for the European Commission, without any change to the legislation. These costs are split by actors and measures that pertain to monitoring, reporting, licencing, etc. Some of these costs depend on the outputs of the environmental drivers above, as they depend on ODS use and emission projections as drivers of costs. Many economic costs are related to administrative costs, which are taken from the evaluation and stakeholder feedback.

It is recognised that there may be additional categories of costs that may be incurred by companies as a result of the policy options, such as operational costs for a small number of businesses due to possible requirement of halon substitutes, that includes airlines using halons for fire protection or costs of reconversion on feedstock alternatives. These costs are included in the subsequent analysis of the policies by looking at the relative change (as the added costs for the policy scenarios versus the baseline of not having such costs).

The cost estimates are based on data provided in the Evaluation and the related external study by Ramboll (2019), which give data on the estimated number of days spent by authorities and the businesses across an 8-year period (2010-2017) on the various actions associated with the Regulation. Time series data was available for most cost categories, though for some categories related to the time investment from the European Commission, only one data point was available. However, for most time series across 2010 – 2017, costs did not change significantly, and the average has been used to forecast. The exception to this is costs of licencing to business, which decreased sharply in 2014 after the introduction of the current ODS Licencing system and the bulk licence for aviation companies, and stayed at this lower point for the following 4 years up until 2017. Therefore, for the costs of licencing, the average of the 2014 – 2017 has been used for forecasting.

For cost categories for which only time investment was provided, the estimated number of days was then used to devise a monetary impact of these costs. The number of days spent per cost centre was assumed to be constant over the 8-year period, and for business stakeholders, 1 hour of labour was estimated at €40 (consistently with the assumption made in the same study in case of businesses), and it was assumed that a person worked 7.5 hours per day. By combining these assumptions, the annual cost estimations were produced. In the baseline, this is done for all stakeholders to provide a full overview of all costs. However in the impact assessment of specific options, the costs for the EC are estimated in person-days in line with the Evaluation.

The baseline scenario for the costs has been developed by extrapolating timelines of cost data based on key drivers out to 2050. The lack of data over time on some cost categories associated with the Regulation has meant that other, secondary variables have been necessary to assess how costs change over time. Each regulatory cost was assigned a ‘driver’ which it

was assumed to have a linear relationship with, for example, the ‘registration requirements for laboratories’ was assumed to be correlated with the use of ODS in laboratories. The selection of drivers is limited to the information available and thus are primarily an output of the environmental impact assessment module (with information projected up to 2050). Given this, the drivers used are intentionally broad and are intended to provide an indication to understand how the cost may vary rather than an exact projection of costs.

Each of the cost components is assigned a specific driver, according to the underlying activities performed by businesses, Member State or EU authorities and how they are expected to respond to the expected trends in the baseline (or, how they are expected not to respond and could stay constant). For the analysis of the policy options, we have introduced additional cost variations, to reflect expected changes that these policies will likely introduce to the costs.

The assessment of the environmental and economic impacts in the respective modules is then used to **assess the remaining impacts** (i.e. impacts on employment are derived from the economic impacts). These impacts are not assessed quantitatively, due to the small expected magnitude and lack of quantitative data to underpin any significant changes. Where the remaining impacts cannot be directly linked to the environmental or economic ones, the impacts have been assessed qualitatively.

Table A4.5 and A4.6 describe how for each driver used in the economic baseline, the source data and how this was projected up until 2050.

Table A4.5 Description of baseline cost drivers for Business

Description of cost	Description of driver methodology used to forecast from 2020 to 2050
Licensing requirements	Licencing requirements are driven by predicted imports and exports over the 2020 to 2050 period. Imports and exports increase in the first 5 years, then very slowly decrease), in line with the proxy global chemical industry scenario from the IEA (SDS, Sustainable Development Scenario) for global ammonia demand.
Quotas	Quotas are expected to go down by up to 16%, reflecting the trend of market concentration of actors in the chemical industry, so less entities are likely to interact with the quotas over time.
Registration requirements for laboratories	Data from the Evaluation is used from Table III.6 in the Evaluation, only the last 4 years as costs went down significantly in 2014. Registration requirements are expected to remain constant, as there is no historic time series available to verify its link to any other driver.
Reporting requirements	Reporting requirements are expected to go down in line with an expected concentration of the market, as global economic trends favour market concentration with a reducing number of market players across the chemical industry. Costs baseline is from Table III.6 in the evaluation.

Table A4.6 Description of baseline cost drivers for Member State authorities and the European Commission/EEA

Description of cost	Description of driver methodology used to forecast from 2020 to 2050
Member State Authorities	
Reporting	Totals are taken from Evaluation table III.8, average across 8 years. We then multiply by 27 and divide by 28 to 'take away' the UK part. This is expected to remain constant in the future

Description of cost	Description of driver methodology used to forecast from 2020 to 2050
Other costs, including inspections, customs, promotion and recycling	Using Evaluation Table III.7, it can be assumed that > 80% of movements came from the countries who provided data here. The NL figure from Table III.7 is likely repeated and it is unlikely the time would be spend double for "checking imports and exports" and "conducting inspections", so therefore this has only been counted once. This total is then upgraded to 100% and divided by 8.
Admin costs to the European Commission	
Licencing requirements	Baseline data from Evaluation, in line with the trend for licences for businesses, costs for processing of licences are expected to decrease in line with Annex I import and exports. The trend driver is the same as used for business.
Quota allocation	Baseline data from Evaluation. Drivers are Annex I imports and production. In line with the cost trend for businesses.
Registration requirements for laboratories (LabODS registry)	Baseline data from the Evaluation, expected to stay constant in line with the trend for businesses.
Registration for ODS companies and customs (ODS licencing system) ¹⁰⁸	Baseline data from the Evaluation, expected to go down as import and export movements slightly decrease every year up until 2050. The trend driver is the same as used for business.
IT system (cross-cutting: licencing, registration for labs)	Baseline data from the Evaluation, IT system costs are increased by 50% between 2020 and 2030, in line with IT cost development in the EC. A large cost driver are concerns on data security and (personal) data protection. This is not expected to increase further after 2030.
Reporting requirements	Baseline data from the Evaluation, and use a combined driver that includes the combined average of all imports, exports, production, feedstock and process agent reports.
Phase-out schedules ¹⁰⁹	Costs move in line with the phase out schedule for critical use halons, which is defined by use case and quantity in the evaluation up until 2040. No more costs after 2040 as all phase out schedules have passed.
Illegal trade & customs	Baseline data from the Evaluation, where the trend is defined by import + export movements.
Technical requirements for destructions	Data from Evaluation, expected to stay constant with no evidence to the contrary.
Technical requirements for labelling	Data from Evaluation, expected to stay constant with no evidence to the contrary.
Technical requirements for leakage, emission control and related Member State implementation measures	Data from Evaluation, expected to stay constant with no evidence to the contrary.
Derogation decisions	Data from Evaluation, projected using knowledge of prohibition dates for remaining uses subject to derogations or future derogations

¹⁰⁸ Costs for the ODS licencing system does not assume adoption of the Single Window system, as the implementation of the policy option is linked to implementation of the Single Window environment. Therefore, for ease of calculation, the impacts of implementing the Single Window environment are included in the assessment of the policy option, and not in the baseline.

¹⁰⁹ These costs are associated to critical use banks and evolve in line with the dynamics for these uses in the baseline scenario.

Description of cost	Description of driver methodology used to forecast from 2020 to 2050
General correspondence and advice	Data from Evaluation, expected to remain constant.
Ensuring data security and data protection	Data from Evaluation, expected to remain constant.
Outreach activities (meetings and brochures)	Data from Evaluation, expected to remain constant.
Assuring compliance in the Member States	Data from Evaluation, expected to remain constant.
Providing access to documents	Data from Evaluation, expected to remain constant.
IT implementation costs	Data from Evaluation. The trend is expected to remain constant as this concerns overhead IT implementation costs. The expected increase in IT costs is already covered in the IT system data row.
External support	Data from Evaluation, expected to remain constant.
Admin costs to EEA	
IEEA Admin costs	Costs increase by 25% to account for expected cost increases in by 2030
EEA Topic centre	Constant
EEA External IT support consultancy for ODS webform	ODS development cost. As the webform now exists, expected to only need 50% of this for maintenance from 2025 onwards. Costs remain the same in 2020 due to data security and protection.
EEA External IT consultancy for BDR system	Constant

Table A4.7 shows that total costs for businesses are expected to decline slightly in the baseline. Although the costs associated with registration requirements for laboratories are not expected to change, the rest of the costs are expected to be declining in line with the declining overall use of ODS. Two most important cost categories are licencing and reporting requirements. The baseline assumes that, with a decline in the use of ODS, less businesses will need to apply for licences and report. At the same time, those businesses that still do will spend less time on these activities due to lower ODS volumes (and lower number of substances) to licence and report.

Many components of the costs are projected to decrease, following the trends on declining use of ODS in the EU (approximately by 5% every 5 years, following the trends described above), so the total costs are also expected to fall overall.

Table A4.7 Baseline projected administrative costs to businesses associated with the ODS regulation, EUR 2020

Description of cost	2020	2025	2030	2040	2050
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Description of cost	2020	2025	2030	2040	2050
Total Cost for businesses	303,486	303,428	297,391	285,658	274,892
Licensing requirements	113,731	114,836	113,477	110,455	107,608
Quotas	10,961	10,871	10,511	9,841	9,232
Registration requirements for laboratories	47,297	47,297	47,297	47,297	47,297
Reporting requirements	131,498	130,425	126,106	118,066	110,756

Source: Derivation from Table III.6 in the ODS Evaluation

Table A4.8 presents the estimated baseline administrative costs associated with ODS Regulation between 2020 and 2050 for Member State Authorities and the European Commission/EEA. These costs are presented in real terms of 2020 currency in EUR or in person-days. As described above, the costs are based on the recent cost data primarily sourced from the Evaluation. Most cost categories are expected to stay constant or decline slightly, due to declining use of ODS. There are, however, some cost categories that are expected to increase in the baseline scenario. For example, IT system costs are expected to go up, as the result of strengthening data and security requirements.

Table A4.8: Baseline projected administrative costs associated with ODS Regulation for Member State authorities, the European Commission, and the EEA, in EUR 2020 and days, depending on the cost category

Description of cost	2020	2025	2030	2035	2040	2045	2050
Total admin costs to Member State authorities							
Reporting (EUR)	38,133	38,133	38,133	38,133	38,133	38,133	38,133
Other costs, including inspections, customs, and promotion of recycling (days)	507	507	507	507	507	507	507
Admin costs to the European Commission							
Total EC admin costs for categories expressed in person days	788	827	825	817	803	768	762
Licencing requirements (days)	132	133	132	130	128	127	125
Quota allocation (days)	60	60	58	56	54	52	51
Registration requirements for laboratories (LabODS registry) (days)	73	73	73	73	73	73	73
Registration for ODS companies and customs (ODS licencing system) ¹¹⁰ (days)	63	63	63	62	61	60	59
IT system (cross-cutting: licencing, registration for labs) (days)	168	202	202	202	202	202	202
Reporting requirements (days)	52	51	50	49	47	46	45
Phase-out schedules ¹¹¹ (days)	18	17	16	15	9	0	0
Illegal trade & customs (days)	84	85	84	83	82	81	80
Technical requirements for destructions (days)	5	5	5	5	5	5	5
Technical requirements for	5	5	5	5	5	5	5

¹¹⁰ Costs for the ODS licencing system does not assume adoption of the Single Window system, as the implementation of the policy option is linked to implementation of the Single Window environment. Therefore, for ease of calculation, the impacts of implementing the Single Window environment are included in the assessment of the policy option, and not in the baseline.

¹¹¹ These costs are associated to critical use banks and evolve in line with the dynamics for these uses in the baseline scenario.

Description of cost	2020	2025	2030	2035	2040	2045	2050
labelling (days)							
Technical requirements for leakage, emission control and related Member State implementation measures (days)	5	5	5	5	5	5	5
Derogation decisions (days)	40	40	40	40	40	20	20
General correspondence and advice (days)	24	24	24	24	24	24	24
Ensuring data security and data protection (days)	19	24	28	28	28	28	28
Outreach activities (meetings and brochures) (days)	11	11	11	11	11	11	11
Assuring compliance in the Member States (days)	15	15	15	15	15	15	15
Providing access to documents (days)	14	14	14	14	14	14	14
Total EC admin costs for categories expressed in EUR	213,950	258,375	302,800	302,800	302,800	302,800	302,800
IT implementation costs (EUR)	177,700	177,700	177,700	177,700	177,700	177,700	177,700
External support (EUR)	36,250	36,250	36,250	36,250	36,250	36,250	36,250
Admin costs to EEA¹¹²	159,163						
In house thematic project management (€)	142	160	178	178	178	178	178
Total EEA admin costs for categories expressed in EUR	116,450	111,600	116,563	116,563	116,563	116,563	116,563
European Topic Centre (EUR)	39,700	44,663	49,625	49,625	49,625	49,625	49,625
External IT consultancy support for ODS	19,625	9,813	9,813	9,813	9,813	9,813	9,813

¹¹² Additional IT costs due to strengthening of data and security requirements are included under EC IT costs. These categories reflect maintenance costs.

Description of cost	2020	2025	2030	2035	2040	2045	2050
webform (EUR)							
External IT consultancy support for BDR development and maintenance (EUR)	57,125	57,125	57,125	57,125	57,125	57,125	57,125

Source: Derivation from Tables III.7 - 13 in the ODS Evaluation



Annex 5: Detailed information on halon banks

Halons, which have very high ODP and GWP values, are still used for fire protection in certain “critical” applications, e.g. on aircraft and military equipment.

All ‘new equipment’ and existing equipment in use where retrofit was deemed possible¹¹³ must already be halon free today. For other areas such ‘end-dates’ are still in the future; some extend even until 2040. This means halons will be still be in use for the next two decades and the quantities needed will depend on the quantities of concerned equipment. The use of halons could possibly be avoided in two areas, where it is currently still allowed to use halons until 2035.¹¹⁴

New production of halons is not allowed under the Protocol¹¹⁵. Halon users globally depend on existing stocks and halons reclaimed from old equipment. Current stocks of halons in the EU represent only 60% of the amounts installed (2019: see Table A5.1). The data presented excludes the UK, which increased the storage of halons significantly (from 90 to 160 mt between 2018 and 2019), likely as a response from UK-based halon users fearing trade limitations post-Brexit. In the period 2015-2019, 9% of the existing stocks in the EU-27 were used on average each year to fill equipment. Losses due to emissions, destruction and exports to third countries represent another 9% of quantities stored in the same period. Amounts destroyed in 2019 were significantly reduced from 2015 levels, but still represented roughly 20% of the quantities needed to fill new equipment in 2019. The driver for destruction are high transport costs of the reclaimed material. While there are exports in similar amounts as those destroyed, there are hardly any imports of halons for critical use to compensate such losses. From 2015 to 2019, EU stocks (see quantities “stored”) have shown some variability, but have not declined (yet). If future demand for halons cannot be met (including at the global level), it will become unavoidable to restart new production.

Table A5.1 Halon quantities installed, stored, used, emitted, destroyed and exported in/from the EU-27 (excluding UK) in the years 2015 – 2019.

Quantities (metric tonnes)	2015	2016	2017	2018	2019	Average	2019 - 2015	2015-2019 Trends
Installed ⁽ⁱ⁾	596.4	861.0	763.2	765.0	719.1	740,9	+21%	
Stored ⁽ⁱⁱ⁾	412.9	450.0	385.5	424.9	434.8	421,6	+5%	

¹¹³ At the moment of drafting the existing Regulation, i.e. 2008

¹¹⁴ These critical uses are for fixed fire protection systems of (i) engine compartments on military ground vehicles, and (ii) normally unoccupied engine spaces on military surface ships. Alternatives are also available for the inerting of fuel tanks on aircraft and in lavatory waste receptacles, but remaining quantities used are very low for the latter two uses.

¹¹⁵ Currently production of new halons is prohibited under the Protocol.

Quantities (metric tonnes)	2015	2016	2017	2018	2019	Average	2019 - 2015	2015-2019 Trends
Used ⁽ⁱⁱⁱ⁾	28.6	42.5	52.1	28.3	37.0	37,6	+29%	
Emissions ^(iv)	4.9	7.2	6.0	5.4	3.4	5,4	-30%	
Emissions ^(v) (tODP)	37.3	61.1	51.3	40.5	23.7	42.8	-37%	
Emissions (tCO2e)	23,209	38,197	31,804	25,195	14,688	26,619	-37%	
Destruction ^(vi)	37.9	31.8	4.5	3.0	7.5	16.9	-80%	
Exports	48.1	9.3	5.8	10.7	7.3	16.2	-85%	
Imports	0.3	0.0	0.0	0.0	1.6	0.4	* ^(vii)	

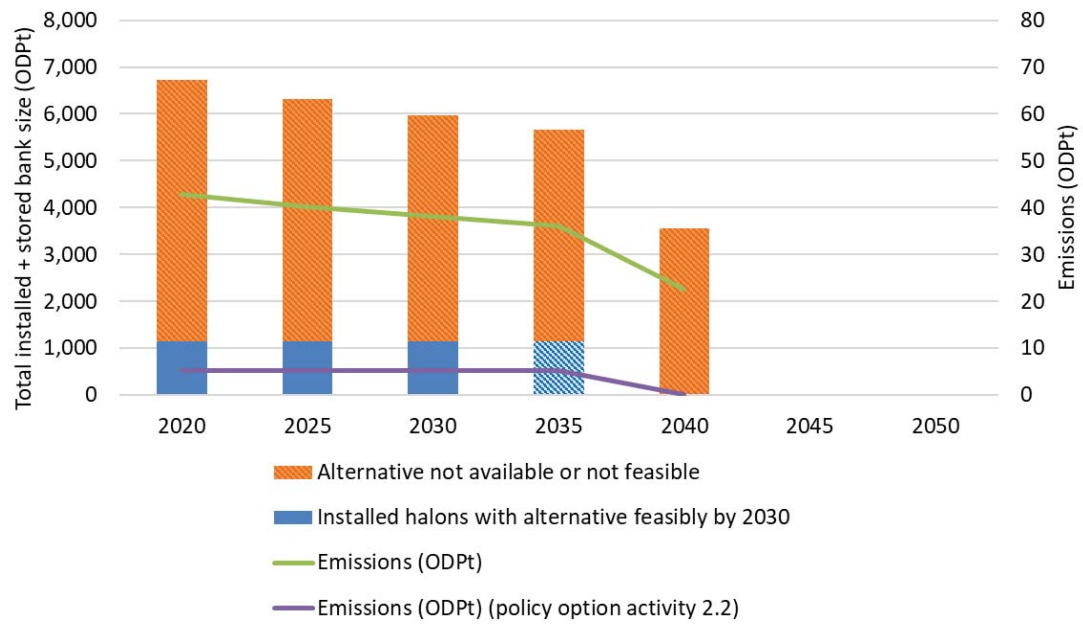
- (i) Missing data: 2015 LV (ca. 1.2 metric tonnes based on following years), 2017 HR (ca. 6 metric tonnes based on previous and following year)
- (ii) Missing data: 2015 LV ca. 0t, 2017 HR ca. 0.15t,
- (iii) Missing data: 2015 LV ca. 0t, 2017 HR ca. 0.2t,
- (iv) Missing data: 2015 LV ca. 0t, 2017 HR ca. 0.001t,
- (v) Missing data: 2015 LV ca 0 tODP, 2017 HR ca 0.01 tODP
- (vi) Amounts destroyed are shown as reported under Article 27 of the Ozone Regulation. In order to reflect quantities destroyed that have been recovered from equipment located in the EU, amounts imported for destruction have been subtracted from the destruction figures.
- (vii) A trend statistic is not relevant here. Imports continue to be very low.

Halon emissions are estimated to decline from ca 43 tODP (0.027 Mt CO₂e) in the period 2015 to 2019 to 23 tODP (0.014 Mt CO₂e) or lower¹¹⁶ in 2040 and no more emissions thereafter, as all equipment must be halon free by then. However, **the existing stocks of halon may deplete** due to emissions, destruction and export to third countries, in particular as production of new halons is not allowed at the global level. Recent assessments carried out by the Protocol's Halons Technical Options Committee (HTOC) indicated that non-virgin halon stocks for critical uses might not be sufficient to meet the needs from 2030 onwards at global level. New production, in particular at the global level, could lead to additional emissions of these substances with very high ODPs and GWPs. Emissions linked to critical uses where there are already alternatives available are estimated to be 6.9 tODP annually in the years preceding 2035, by when the current prohibitions becomes applicable.

Fig. A5.2 shows the halon bank split depending on the potential availability of viable alternatives. Emissions are forecast up until 2040 using the average installed halons and associated emissions for the period 2015 - 2019. Emissions are expected to reduce as the bank size shrinks in line with different critical uses reaching their end date. The total average emissions reported in Article 26(1)(b) reports is 43 tODP, which is the average over the 2015 – 2019 period. These emissions is forecast to go down in the baseline, as shown via the top line in the figure.

¹¹⁶ It is expected that not all equipment will be replaced at the last moment before the end date, i.e. emissions may reduce more quickly.

Figure A5.2 Remaining size of the active critical use halon bank in the baseline, split by availability of alternatives as identified by the Evaluation.



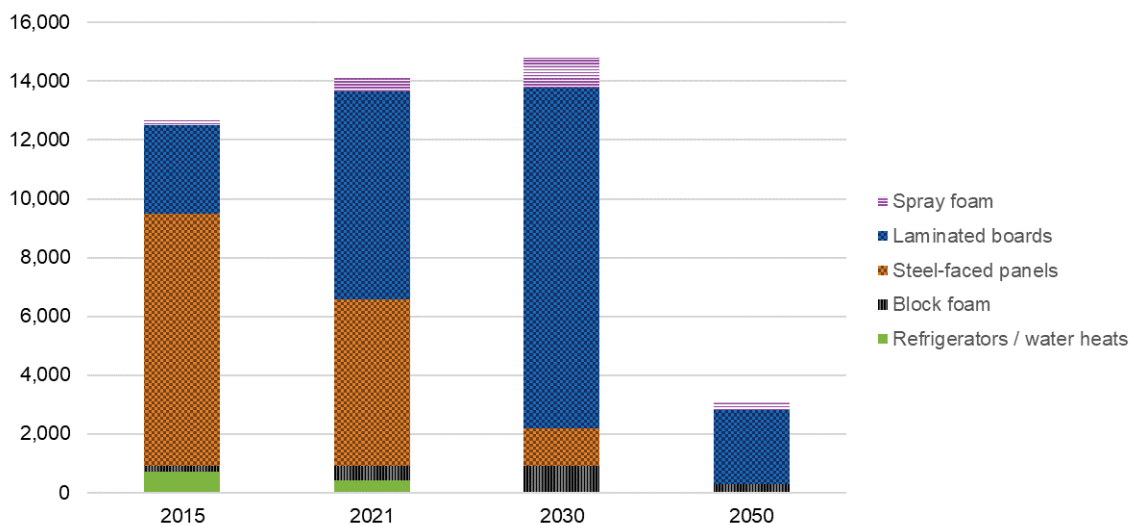
Annex 6: Detailed information on foams recovery

A. Emissions from foam banks

The main source of current and future emissions are ODS banks in particular from certain building materials containing foams blown with ODS. The estimated size of this bank in 2010 was 570,000 tODP, of which about 1.2% is emitted each year, which is ca. 6000 tODP¹¹⁷ or 37 Mt CO₂e (Fig. A6.2), which amounts to more than 98% of all reported ODS emissions. Most emissions occur when buildings using such foams are renovated or demolished and the foams are crushed or shredded. In addition, significant emissions also occur thereafter, if relatively intact foams from construction waste are landfilled without treatment, as the remaining ODS gases will slowly leak out over time.¹¹⁸ The Regulation requires recovery when it is technically and economically feasible. This is however open to interpretation and results in little recovery activity in most Member States.

Large quantities of ODS foams will enter the waste stream each year until 2050, with an expected peak not before 2030 (Fig. A6.1).

Figure A6.1 Estimated annual flow of ODP trapped in legacy materials (“banks”) that is reaching end-of-life each year (in tODP).



Source: Ricardo using findings from (SKM Enviros, 2012)¹¹⁹

Very significant amounts of emissions, in particular in climate terms, are expected to continue from the lack of recovery of ODS from foams during the refurbishment and

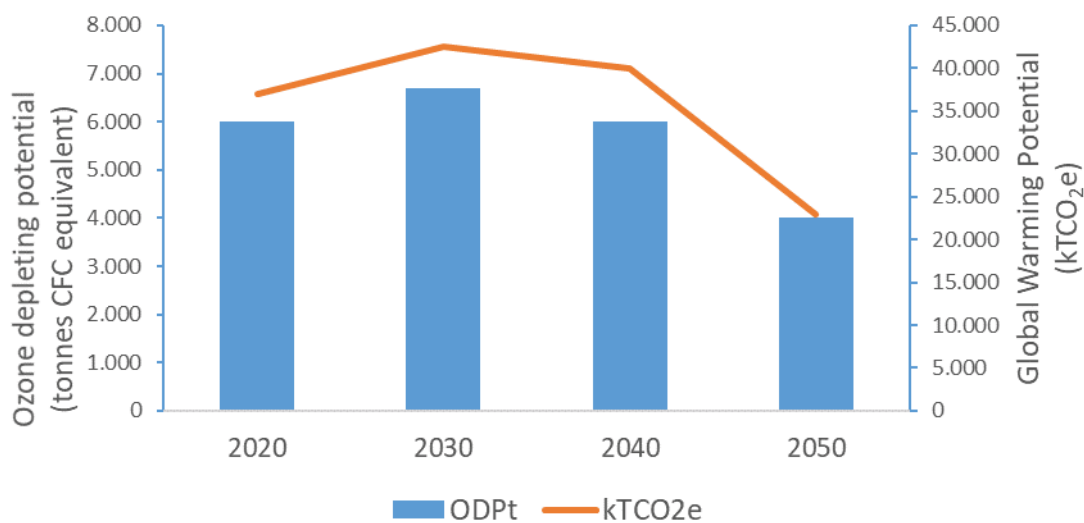
¹¹⁷ tODP: tonnes ODP

¹¹⁸ Old cooling equipment such as refrigerators with ODS are practically not in use anymore. However, those already present in landfills and where the ODS was not removed and destroyed, also contribute to these emissions.

¹¹⁹ SKM Enviros (2012). Further Assessment of Policy Options for the Management and Destruction of Banks of ODS and F-Gases in the EU. https://ec.europa.eu/clima/sites/default/files/ozone/docs/ods_f-gas_destruction_report_2012_en.pdf

demolition of buildings. Annual emissions will increase until 2030-35 to almost 6700 tODP or 42 million tCO₂e, about half of the total amounts entering the wastes stream each year¹²⁰. After 2035 this trend will reverse, but the potential emissions still remain at ca. 4000 tonnes tODP or 23 million tCO₂e even in 2050 (Fig. A6.2). This is due to the significant contribution of long-term leakage from landfilled ODS foams in the latter years, even though the amount of ODS foams entering the waste stream will already be significantly reduced in 2050 (see Figure y). The main sources of ODS emissions from insulation foams are metal-faced panels and laminated boards, with smaller contributions from block foam and spray foam. Many categories of insulation foam remain mostly an uncollected waste stream that goes to landfill.

Figure A6.2. Expected EU annual emissions from foam banks



B. Distribution of ODS foam banks for EU Member States

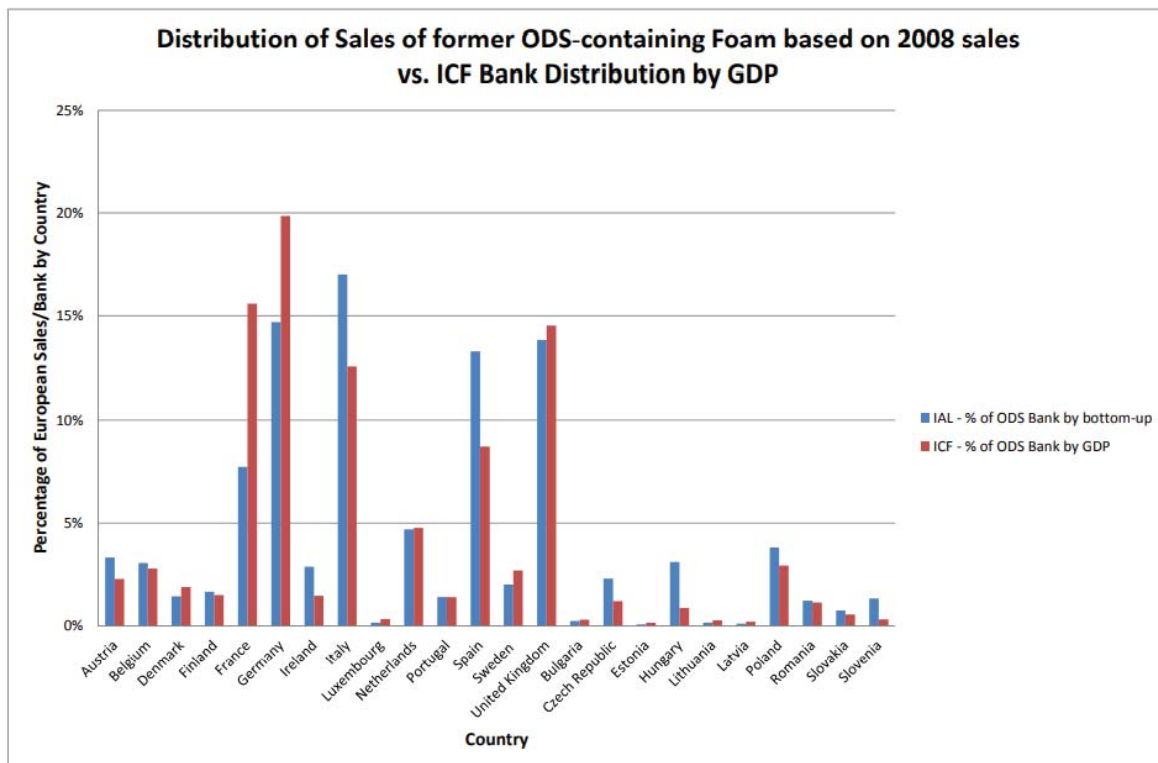
The use of ODS foams in the past was not equally, i.e. based on population, distributed between Member States. By way of example, Eastern European countries have a lower share of the ODS-foam bank, as ODS foams were not used nearly as widespread as in other parts of Europe. The majority of CFC production was present in Northwest Europe plus France, Spain and Italy. In the period 1960 – 2000, adding insulation to buildings was also more prevalent and widespread in Northern Europe. For buildings, the use of ODS in the EU ended in 2003 for all foam applications. CFC use ended by end 1994 in the EU-15 and ended few years later in Eastern countries. In general, the demolition waste from the building sector can be assumed to contain CFC-11/12 or HCFC 141b/142b, which were popular blowing agents for polyurethane (PU) and extruded polystyrene (XPS) foams used.

This likely distribution of foam banks across the Member States is shown in Figure A6.3. The figure does not represent the ODS-containing foam bank itself, but rather it shows the countries with the most likely largest contribution, based on 2008 use patterns of foams that

¹²⁰ Most of the remainder will be a source of long-term emissions from landfills.

would have contained ODS in the past. In the figure, the blue bars (% of ODS by bottom-up) are assumed to be more accurate, as this data is less based on economic assumptions and more on real-world data on insulation foam sales. The figure shows that Germany, France and the UK are likely to have the largest individual contribution to the European ODS foam bank, but Spain and Italy also have relatively high consumption.

Figure A6.3. Estimated ODS bank distribution for EU-28



C. Policies regarding Construction and Demolition Wastes (CDW) in Member States

About 375 million tonnes of construction and demolition waste (CDW) were generated in 2016 making it is the largest waste stream in the EU by weight (Eurostat, 2019). CDW is defined as a priority area in the EU according to the Circular Economy Action Plan, while the revised Waste Framework Directive (WFD 2008/98/EC, amended 2018/851) sets a mandatory target for its recovery of 70% by 2020. Despite a high average recovery rate, CDW is often down-cycled. Waste management options are ranked in the EU’s waste hierarchy. The highest priority is on waste prevention, followed by recycling, energy recovery and finally disposal, e.g. by landfilling.

Despite its potential, the level of recycling and material recovery of construction and demolition waste varies greatly across the EU, ranging from less than 10% to over 90%. EU countries apply different definitions of construction and demolition waste, which makes cross-country comparisons difficult. The EU main objectives for this waste stream include to ensure that CDW is managed in an environmentally sound way. According to the requirements set under the Waste Framework Directive, the following objectives exist for CDW:

- Promote selective demolition to enable removal and safe handling of hazardous substances and facilitate re-use and high-quality recycling by selective removal of materials and establishing sorting systems, and
- Increase the preparing for re-use, recycling and other material recovery (including backfilling) of non-hazardous construction and demolition waste to a minimum of 70 % by weight by 2020.

A separation of ODS foam banks will be less costly in cases that legislation on separation of waste (for other materials) already pre-exists. In a recent study (2018) carried out for the European Commission, existing CDW policies were examined in a number of representative Member States: Netherlands, Denmark, Germany, Belgium, France, Italy, Poland, Czech Republic, Portugal, Romania and Malta.¹²¹ While all of these countries have transposed the EU waste acquis into national legislation, CDW management is regulated to a different extent across the Member States. Except for Romania and Malta, all the other analysed Member States have regulations specifically targeting CDW. Thereby, the most developed regulations can be found in the Netherlands, Denmark, Germany, Belgium, France and Italy. These countries include also most of the ODS foam banks as shown in Figure A6.3. The legislative framework of these leading countries is characterised by a variety of legislation specifically targeting CDW management combined with other tools promoting recycling of CDW. The most advanced legislations targeting CDW management comprise for example specifications on separation and requirements regarding the pre-treatment of CDW, mandatory pre-audits on demolition sites, mandatory departmental CDW management plans, as well as quota of percentage for recycled materials (including construction materials) and products in public procurement and new plants for sorting of waste materials were opened in the Netherlands. These plants recover materials such as wood, metals, plastics and inert materials. The study also mentions that many interviewees stressed the importance of a favourable and stable regulatory context for the economic viability of CDW recycling. The recycling of CDW would greatly benefit from a harmonized EU legislation that is appropriately enforced in all Member States. Today, each Member State has different set of regulations and in many cases, there are even large regional differences.

D. Feasibility of ODS foam recovery and treatment

It is **more costly to separate, transport and destroy the ODS contained in the foam than standard disposal via landfilling without ODS recovery**. There are a number of constraints that make effective recovery and treatment difficult and/or costly. These include:

- Demolition companies may have difficulties to ascertain whether there is CFCs or not in a panel, and therefore judge how it should be handled (e.g., whether it can be


¹²¹ IDEA et al. (2018) "Development and implementation of initiatives fostering investment and innovation in construction and demolition waste recycling infrastructure"
https://ec.europa.eu/environment/document/download/099b6bff-d853-4061-a15c-58ade46cfe6b_en

crushed on-site or not). Building audits are expensive and take time, but are required to ascertain level of ODS present.

- Transportation is expensive per tonne of material handled as ODS foams are considered hazardous materials.
- Foam material with ODS cannot be crushed on site without emitting the ODS, increasing transportation cost for relatively light materials such as laminated boards panels.
- Costs of waste segregation are high for some materials, especially if contaminated with bitumen. For laminated boards, segregation is required to avoid contamination by other substances or building materials
- The recycling technology may require significant energy input.
- For metal-faced panels, the capacity of nearby recycling facilities may be too limited to process all metal-faced panels
- National capacity of waste recycling plants is not evenly distributed across Member States.
- Lack of enforcement is a driver for demolition companies to avoid separation of CDW fractions and reduce costs.




The technical and economic feasibility also strongly depends on the type of foam (e.g. panels, boards, spray or block), and where it is installed (see table A6.1).

Table A6.1 Feasibility of building foams recovery by material

Material	Current feasibility	Justification
Metal-faced panels	Medium-High 	Refurbished recycling facilities that have so far been treating old refrigeration equipment can treat metal-faced panels. According to experts interviewed ¹²² , it is economically and technically feasible to recover Metal-faced panels . The Metal component accounts for approx. 50-80% by weight (depending on panel thickness) and is easy to segregate and can be treated by existing refrigerant panel recycling plants. In this study, the recovery of the metal component of panels is assumed to already be economically viable, and only the foam component is analysed with respect to additional cost. At the moment, without a mandate for separation of panels and separate disposal of the metal and foam elements, there is low natural demand for the use of refrigerator panel recycling plants for this purpose.
Laminated boards	Medium-Low	Laminated boards are more difficult and expensive to recover than metal-faced panels. However, built-up systems ¹²³ could be feasible to recover since they are easy to segregate and collect, and they can be cut into smaller pieces to transport and process without losing much ODS content.

¹²² Interview with UK-based recycling facility owning several refrigerant plants refurbished for metal-faced panels, and expert knowledge from authors of SKM (2012)

¹²³ Type of laminated boards easily demountable system primarily used for roofing insulation.

Material	Current feasibility	Justification
		<p>Boards in cavity structures¹²⁴ could also be feasible to recover. Costs in some Member States like Germany, the Netherlands or Austria, would be lower due to existing waste regulations in place and favourable building practices that reduce the contamination level of the materials. There is a knowledge gap on the feasibility of this beyond these countries.</p> <p>Floor insulation boards are not yet economically feasible to recover since they are contaminated with concrete, removal of which requires more innovation. In a board, CFC is under concrete, hence, it is highly contaminated and costly to collect and segregate.</p>
Spray foam	<p>Low</p> 	<p>According to the experts interviewed, spray foam recovery is not feasible in the demolition phase. ODS spray foam is mainly used in walls and roofs. It was often used on top of existing structures for e.g. roof insulation, sprayed against surfaces, pumped into cavity holes. When the walls are demolished, foams are trapped in the wreckage and it would require time- and cost-intensive manual segregation.</p>
Block foam	<p>Low</p> 	<p>For block foam, as part of concrete slabs, the recovery is not feasible in the demolition phase as no examples have been identified of successful splitting of this material from the generic demolition waste stream. For block foam part of pipe insulation, recovery opportunities may exist during pipe replacement activities. No evidence however was identified during this study on the recovery of pipe (block) foam in practice.</p>

In summary, it appears feasible to recover about 100% of the waste stream of metal-faced panels. They are the cheapest option given their valuable metal component and because they can be cut into smaller pieces without emitting a significant amount of ODS being released. Thus they can be treated in existing facilities for domestic appliances. It is estimated that approximately 25% of built-up systems and cavity structures (the two sub-types of laminated boards) should also be feasible to recover given the evidence of suitable construction procedures. Floor insulation boards may still represent too many technical or economic challenges to be a candidate for mandatory recovery because they are trapped into the wreckage in the demolition process and, collection and segregation stage is labour intensive and costly. In floor insulation, CFC is under concrete, hence, it is highly contaminated and costly to collect and segregate. Spray foam is not efficient to recover as it is expected to lose

¹²⁴ Type of laminated boards that are introduced in empty cavities of existing panels mainly used for wall insulation

most of its ODS already in the use phase, making the cost-benefit ratio of mandatory recovery very inefficient.

The industry is pro-actively exploring further options to divert end-of-life foam from landfill. Recycling and recovery solutions have been developed and have proven their technical feasibility. Raw material prices have been steadily increasing over the past years and are likely to continue this development. The cost for landfill is also going up. This will contribute to the economic viability of recycling and recovery options.

E. Economic Impacts

Economic impacts are assessed only for metal-faced panels, built-up system, and cavity structure laminated boards, as these are part of the policy option assessed. New evidence on the cost of recovery is based on data from two case studies and an expert interview from stakeholders engaging with waste streams in Netherlands, Germany, Austria and the United Kingdom. The final cost of the option per kg of ODS will be Member State specific, as building practices differ across the EU Member States. Therefore, these costs may be higher in other Member States than suggested for the Netherlands or Germany (where existing waste separation policy means that less additional cost is borne by the recycling plant or incinerator to obtain foam material, as it is already separated out and classified as a hazardous mono-fraction). Abatement costs in Table A6.2 are based on indicative prices from the two case studies, but are rather moderate in terms of CO₂ given the high GWP of the ODS used in these foams. The total cost of around 1,978.5 billion € are borne by a high number of building owners and/or project developers.

Table A6.2 Overview of the total costs of the policy scenario, with the materials targeted and the relevant ¹²⁵

Material	Policy scenario target	Estimate of policy scenario abatement		Total cost (NPV 2020 – 2050) EUR	Abatement cost		Unaddressed potential	Estimate of untargeted emissions (2020 - 2050)	
		tODP	GHG (kt CO ₂ e)		EUR/t ODP	EUR/t CO ₂ e		tODP	GHG (kt CO ₂ e)
Metal-faced panels	100%	18,200	88,050	447,054,292	24,563	5.1	0%	0	0
Built-up systems	25%	7,328	42,650	639,445,333	87,259	15.0	75%	22,000	128,000
Cavity structure	25%	6,734	48,363	891,752,000	13,243	18.44	75%	20,200	145,000
Floor insulation	0%	0	0	-	-	-	100%	19,800	151,000

¹²⁵ It is assumed that 10% content of blowing agent out of the total foam weight (German Federal Environmental Agency, 2012) excluding the metal cladding.

Spray foam	0%	0	0	-	100%	5,300	25,500
Block foam	0%	0	0	-	100%	3,800	20,000
Total		32,262	179,063	1,978,251,625		71,100	469,500

Table A6.3 shows a comparison of abatement costs for metal-faced panels, built-up systems and cavity structures, and compares with the estimates made with the abatement costs in SKM (2012). SKM (2012) presented these costs only for GHG equivalent, and therefore this comparison is not made for tODP. Based on evidence from the stakeholder consultation, for those countries with an available waste stream, technical progress achieved over the last decade resulted in a significant likely decrease in recovery costs compared to the lower cost limit presented in SKM (2012). Note that this is known to be applicable in the Netherlands, Belgium, Austria and Germany, where the plants from the case studies source their material. Note that for metal-faced panels, it is assumed in this study that there exists a business case for the recovery of the metal, and therefore the calculated abatement cost is only for the additional cost to separate and recover the foam.

Table A6.3 Blowing agent recovery cost assumptions (EUR / kt CO2e)

		Ricardo 2021	SKM 2012		Change (%)	
			Low	High	Low	High
Metal-faced panels		5	25	120	-82%	-97%
Laminated boards	Built-up systems	15	50	150	-70%	-90%
	Cavity structure	18	50	150	-65%	-88%

To compensate for a lack of observed quantitative data on the costs across all Member States, the costs for the practice of asbestos panel recovery was examined as a proxy. Compared to the foam category of metal-faced panels, asbestos panels are somewhat similar in that they are still in use as covering in old buildings, and need specific recovery actions to protect the environment and human health as buildings are decommissioned. Further, asbestos panels cannot be shredded on site to save space in transport, similarly to what would be required of ODS-containing insulation panels. Asbestos recovery, because of its requirements for personal protective equipment, is of course expected to be significantly more expensive at the demolition stage than even the costliest example of foam panel recovery. Asbestos recovery cost should therefore represent a useful worst case upper limit of the segregation and transport costs panels with hazardous materials in different Member States.

The asbestos panels can be given a "shadow carbon price" by calculating what the carbon price of recovery would be, if the asbestos panels contained an amount of ODS similar to ODS-containing metal-faced panels (which is about 200 – 220 gram per m² panel¹²⁶,

¹²⁶ Estimate obtained from interview with Insus Recycling

equalling about ~ 1 ton of CO₂e per m², assuming a CFC-11/12 blown foam). The price data per m² panel is available for different Member States. While price ranges can vary by up to one magnitude within a country, they are rather similar across the different countries.

Table A6.4 Example of asbestos removal costs (full process costs per m² panel) in different Member States.

Member State	Asbestos – proxy recovery costs (with landfill disposal destination)	Shadow carbon price of asbestos panel recovery, if the panels contained 220 grams of CFC-11 (GWP 4660), similar to metal-faced panels
Netherlands	Cost of removal (including landfill) 14 – 50 €/m ²	€ 51./m ²
Austria	€ 30/m ²	€ 31./m ²
France	Cost of recovery: 25-150 €/m ² Cost of landfill disposal: 300-500 €/ton	€ 25 – 153 /m ² Per ton comparison on landfill not comparable due to weight differences between asbestos and metal-faced panels, and significant additional landfill requirements for asbestos
Spain	Cost of recovery: 100-150 €/m ² Cost of landfill disposal: 160 €/m ³	€ 102 – 153 /m ² Per m ³ comparison not comparable due to weight differences between asbestos and metal-faced panels, and significant additional landfill requirements for asbestos
Bulgaria	Cost of recovery 36 – 51 €/m ²	€ 37 – 52 /m ²

The asbestos recovery costs can be seen as an **upper limit to the costs of segregation and transport**. Asbestos is generally assumed to be stored in landfill sites, and therefore do not have further significant costs after the material has been transported to the site. In the hypothetical scenario that segregating and transporting ODS insulation panels would cost just as much as segregating asbestos panels (real prices would be much less!), and the final destination requires incineration at the prices quoted by Austria, then these costs, based on the data obtained in this study, would be about € 75 + € 153 = € 228 per t CO_{2e}.

F. Social Impacts

Research and development

According to interviewed experts the recovery of foam banks can be expected to spur innovation since it will create an incentive to reduce costs of reclamation via research and development into demolition and recycling technologies. Based also on the experience related to the mandatory recovery from domestic appliances, such a policy is likely to result in better and cheaper ways to ensure recovery. Since 2002, the Ozone Regulation mandates the recovery and destruction of ODS contained in insulation foams within domestic refrigerators and freezers (SKM Enviros, 2012). Prior to the introduction of the requirement, there were no incentives to allocate resources to research recovery technologies and the recovery was expensive. However, in order to comply with the new requirement, companies invested in research and development to reduce costs and as a result, the recovery of domestic refrigerators and freezers which was already proven as technically feasible became much more economical.

In sum, the effect of mandatory recovery of building foams on research and development is expected to be positive and significant for metal-faced panels and some types of laminated boards, for which technical feasibility has been already proven. Moreover, given that transport costs are high, research and development is likely to be carried out by domestic companies, creating added value within the European Union.

Consumer prices

The implementation of policy option A4 could potentially increase consumer prices, i.e. for owners renovating or constructing a building. If new construction in a building site must be preceded by incurring in the recovery of ODS from the decommissioned building, real estate prices could increase slightly as a result. However, there is evidence in the literature suggesting that construction prices have a low influence on the evolution of real estate prices (Martins et al., 2020).

The higher demolition costs are expected to be borne by the building owners, as demolition companies would pass these on. The costs are therefore distributed over a large number of persons and the additional costs compared to the overall costs of demolishing or refurbishing the building would tend to be rather small.

New buildings are more expensive on average, and hence mostly bought by households with high purchasing power or by companies as office space. Thus vulnerable consumers are less likely to be affected by such price increases. Moreover, richer households pay

high premiums (e.g. for “good neighbourhood”) hence the potential increase in consumer prices due to additional costs of recycling, even if realised, would be very marginal compared to the final housing price.

In case of *existing buildings*, foam removal would in all likelihood only be linked to substantial overhaul or refurbishment activities. Conversely, necessary maintenance or emergency reparations would in almost all cases not include ODS foams removal. Thus consumers with little financial means would usually not have to worry about also paying the bill for foam replacement activities.

Employment

The policy option A4 may increase employment due to the labour-intensive and complex nature of the demolition and reclamation processes.

Currently demolition, segregation and insulation foam recovery processes are largely mechanised and are not labour-intensive activities, although there are differences among Member States. According to the literature¹²⁷ it is unlikely that recycling will add labour time (or cost). In fact, in many cases recycling would save time spent on waste management.

Foam insulation recycling accounts for a small part of the activities and it is difficult to isolate the current number of associated recovery jobs in the EU. However, as an example, a representative company for recycling refrigeration equipment interviewed has a revenue-employee ratio of 1.8 employees per million € of revenues. This would suggest creation of approximately 215 FTEs in the EU for the medium effort scenario, and 2,377 FTEs in the high effort scenario.

¹²⁷ Kameswari (2015). Construction and Demolition Waste Management - A Review. International Journal of Advanced Science and Technology, Vol 84.

Annex 7: List of clarifications needed in Regulation

- Clarify definition of destruction in relation to feedstock.
- Add definition of non-refillable container.
- For non-refillable containers, in addition to placing on the market prohibit transport and possession, unless the containers are intended for laboratory and analytical use.
- One incorrect reference has been identified in Article 15(2)(k) to Article 11(5) where it should be to Article 11(8).
- Clarify the wording of Article 5(3) and make clear that both servicing of equipment with controlled substances and any other use of controlled substances, except for the uses exempted in other articles, are prohibited.
- Clarify the links with additional airworthiness specifications: Refer to Regulation (EU) 2015/640 ¹²⁸ (as amended by Implementing Regulation (EU) 2019/133 ¹²⁹), prohibitions to use halons in lavatories from 18 May 2019 and in handheld fire extinguishers from 18 February 2020 in all newly produced large aeroplanes and large helicopters (“forward fit dates”)
- Reference to Directive 91/414/EEC should be replaced by reference to new Regulation (EC) No 1107/2009 and reference to Directive 98/8/EC should be replaced by reference to new Regulation (EU) No 528/2012
- Replace references to Decision 1999/468/EC ¹³⁰ with Regulation (EU) No 182/2011 ¹³¹
- Delete the reference to 15(2)(h) from Art. 17(2)(d), as imported ODS for destruction should not be allowed to be re-exported for destruction.
- Adjust Article 23(1) so that it includes the specific terms of the obligation to limit ODS emissions, including during production, transport and storage and prohibits venting
- Clarify (the obvious fact) that “products and equipment containing or relying on ozone depleting substances shall be decommissioned when they reach the end of their life”
- Simplify the leakage rules taking into account the general servicing ban on equipment and the fact that little relevant equipment remains.
- Delete obsolete provisions.

¹²⁸ Commission Regulation (EU) 2015/640 of 23 April 2015 on additional airworthiness specifications for a given type of operations and amending Regulation (EU) No 965/2012

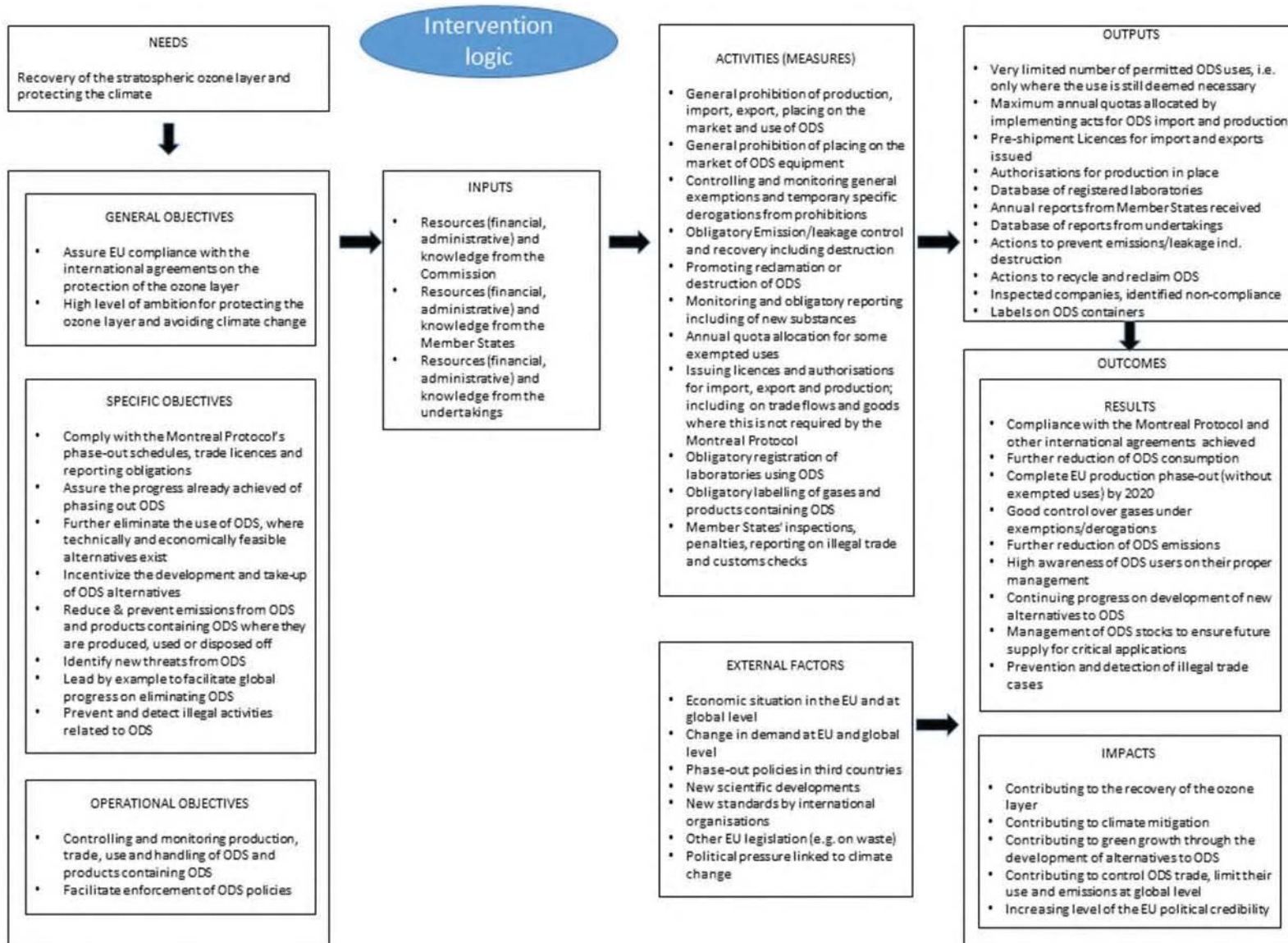
¹²⁹ Commission Implementing Regulation (EU) 2019/133 of 28 January 2019 amending Regulation (EU) 2015/640 as regards the introduction of new additional airworthiness specifications

¹³⁰ Council Decision 1999/468/EC of 28 June 1999 laying down the procedures for the exercise of implementing powers conferred on the Commission

¹³¹ Regulation (EU) No 182/2011 of the European Parliament and of the Council of 16 February 2011 laying down the rules and general principles concerning mechanisms for control by Member States of the Commission’s exercise of implementing powers

Annex 8: Measures and Intervention logic of Regulation (EC) No 1005/2009

Measure	Relevant Articles of the Ozone Regulation
General prohibitions to produce, place on the market or use ODS as bulk or in products or equipment	Articles 4-6 prohibiting production, placing on the market and use of all ODS in Annex I (e.g. CFCs, HCFCs, halons, methyl bromide,..) including in products and equipment
Exemptions from the general prohibition	In relation to: Article 7: Feedstock uses Article 8: Process Agent uses Article 9: Destruction and Reclamation Article 10: Laboratory and analytical uses Article 12: Methyl bromide emergency use Article 13: Critical halon uses
Prohibitions on trade (import export) unless related to exempted uses, as well as licensing requirements for trade	Articles 15, 17 and 18
Quota limitations related to the exempted uses	Article 16
Registration requirements for laboratory and analytical uses	Article 10
Technical requirements for labelling that are mirroring the exemptions	Article 7, 8, 10, and 11
Recovery and destruction	Article 22, Annex VII
Obligations to prevent leakage and emissions	Article 23
Obligations on Member States to conduct inspections and have penalties	Article 28 and 29
Reporting requirements for EU Member States and undertakings (including illegal trade)	Article 26
Company reporting on ODS	Article 27



Annex 9: List of discarded options

A9.1 Discarded options regarding the exempted uses

- **Impose strict maximum limit for use and placing on the market for feedstock uses.** Such a general requirement, in the absence of viable alternatives, will result in a restriction of the production in the installations where such feedstock is used. This may result in relocation of the affected chemical production processes outside of the EU, with potentially very high economic impacts. This would not lead to any environmental gains, as emissions would result elsewhere and very likely under less strict controls. For the impact assessment, it was decided to investigate the option A2 further, namely a list of only those processes where alternatives appear to be available.
- **Introduce emissions controls on feedstocks (and process agents).** This option was regarded as a possible duplication of emission control systems under the Industrial Emissions Directive (IED). Some provisions in the IED already apply to some ODS (Annex I) producers, users of ODS (Annex I) as feedstock and destruction companies. ODS are addressed in some BAT document, but a more general consideration there could be useful. The reduction of emissions of ODS (Annex I) from feedstock and process agent uses could therefore be regulated further under the IED as appropriate, rather than through new provisions introduced under the Regulation.
- **Introduce a prohibition date for process agents.** This option would likely have significant negative economic impacts for the few businesses concerned since it would directly restrict their highly specialised business activity and could lead to closure of plants. Considering the low quantities being used by EU undertakings and corresponding emissions (yearly emissions amount to circa 4-5 tODP), a complete ban of these processes appears not cost-effective.
- **Impose a lower maximum limit for laboratory and analytical uses.** This option would have technically constrained business activity due to the limited availability of alternatives, particularly the use as reference material.
- **Require a permit for destruction of halons.** This option would require destruction facilities to request a permit for destruction of halons including a proof that reclamation back to specification standards is not possible, e.g. due to technical issues based on the low purity of the product and excessive costs for multiple distillation processes. The destruction facility would have to check the purity of the halon in question first, and then either apply for permit (if certain criteria appear to be met) or return the halon back to the supplier. Further taking into the account the need to issue permits by competent authorities, this option was expected to entail excessive costs for the destruction facility and the authorities.
- **Permit the use of mixtures containing HCFCs as an alternative to halons when non-ODS alternatives do not exist.** Mixtures containing HCFCs could be suitable

alternatives to halons for firefighting, as both GWP and ODP are lower, but are currently not allowed under the Regulation. However, such an option would not be in line with the current requirements set by the Montreal Protocol, which allows servicing only (not first fill) for fire equipment already in use by 1 January 2020 (and only until 2030). Stakeholders indicated that the number of corresponding equipment falling into this category might be very low, if existent at all, which is why this option was discarded. Should these rules under the Protocol change in the future, a flexibility clause in the Regulation would help to capitalise on such developments (see option D3).

A9.2 Discarded options related to emission prevention from equipment using ODS:

- **Align qualification requirements for with the F-gas Regulation** for personnel that is involved in handling refrigeration, air-conditioning and heat pump equipment, including at the end of useful life, i.e. leakage checking, recovery and decommissioning. However, such equipment still containing or relying on ODS (Annex I) after 2020 is very small. Furthermore such ODS equipment is very likely serviced and decommissioned by the same personnel as F-gas equipment, which would therefore already be sufficiently trained and certified. Close alignment would require relevant Commission Implementing Regulations related to the F-gas Regulation to be adjusted and, at Member State level, national vocational systems would need to be changed to reflect these changes. This appears disproportionate to the small remaining quantities.
- **Move (some) substances from Annex II Part B to Part A.** This options would mean prohibiting these new ODS except for the exempted uses. The largest quantities of these substances are used for feedstock, in which case the option would have no effect as feedstock uses are exempted. However, some of these substances such as methyl chloride appear to be used as solvents, for which the availability of technically and economically feasible alternatives is uncertain. Others are already banned for such use under REACH (n-propyl bromide). As there does not appear any immediate environmental gains from this option while there might be some complications, this option was not retained.
- **Include ODS not yet covered under the Ozone Regulation directly in Annex II Part A,** i.e. prohibiting them except for exempted uses. This was not retained as more information would need to be collected first on quantities, their uses and their relevance for the EU industry to justify such a requirement.

A9.3 Discarded options related to achieving more efficiency

- **Simplify the registration system for laboratories.** This option introduces *de minimis* thresholds for registration to lower the number of affected low-scale users. However, if the coverage is incomplete and a diversion of ODS can thus not be excluded, there seems to be little advantage to the option of abolishing the registration altogether and achieve higher cost savings (option B4).

- **Introduce a *de minimis* for the annual quota allocation process** that would still require annual quota allocation by large-scale importers, but would exempt transactions dealing with small amounts. Such a hybrid system would not achieve a lot of control or provide an incentive for using alternatives and is due to lower savings on balance not preferable to the complete abolishment of quotas (option B5).
- **Add a requirement for customs to close licenses** to ensure that the licenses of ODS shipments are checked. This was not retained as this option would add to the administrative burden for customs and it becomes obsolete as soon as the EU-Single Environment for Customs is operable and mandatory in all Member States.
- **Add requirements for customs to liaise with competent authorities where appropriate.** This was not retained as this option would add to the administrative burden for customs and it becomes obsolete as soon as the EU-Single Environment for Customs is operable (i.e. custom offices and competent authorities are connected to the ODS Licensing System) and mandatory in all Member States.
- **Add additional labelling requirements.** ODS have to be labelled under the CLP Regulation by indicating the name of substance and the hazard phrase that it is damaging the ozone layer. Noting that the EU Single Window Environment for Custom will include information on the substances of a licence, the requirement to introduce an additional labelling scheme appears to be not needed.
- **Establish a barcode system for bulk gases** to allow digitised tracking of shipments as a means of controlling illegal trade. As the implementation of such a system in all 27 EU Member States would likely involve a high administrative burden and costs for customs and economic operators of the whole supply chain, this option was discarded.

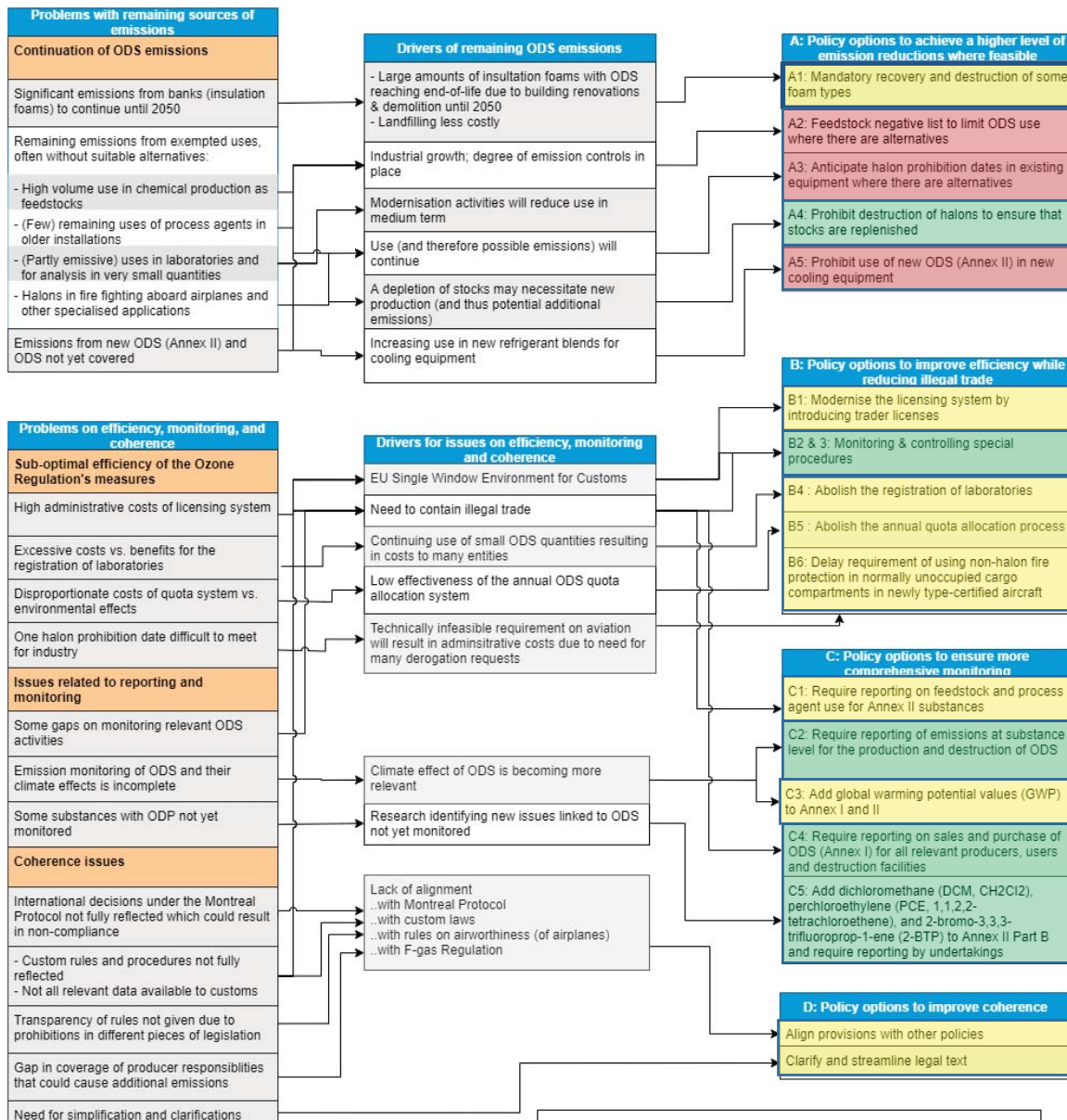
A9.4 Discarded options related to better monitoring

- **Require emissions data collection from remaining ODS banks by Member States.** The main remaining ODS equipment reaching its end of useful life today are foams used in construction of buildings in the past. Collecting data systematically is difficult and costly due to the disperse and widespread use of these foams. Sustained leakage is also expected from landfills, where a requirement to measure in a systematic fashion would similarly be disproportionate. One-off surveys are probably a more appropriate approach to gather such data and do not require a legal basis.
- **Add minimum reporting limits for laboratory and analytical uses.** This option was not retained as it would not be in line with reporting requirements of the Protocol.
- **Require registration for ODS suppliers, users and destruction facilities** as well as prohibiting the sale to a non-registered entity. This option would involve mandatory record keeping on names of purchaser, quantities supplied to the

purchaser and reason of the purchase. Given the likely additional administrative burden for companies, national authorities and the EC, this option was screened out.

- **Add unsaturated hydrochlorofluorocarbons (HCFOs) for monitoring purposes.** As some of these substances belonging to this group are already monitored under the F-gas Regulation, it seems more appropriate to consider the inclusion for monitoring of any other gas belonging to that group there.
- **Add a criteria based on ODP for an automatic inclusion of substance for monitoring.** This option would include all substances with a certain ODP automatically in Annex II Part B. Inclusion of some ODS that are not yet covered under the Ozone Regulation might require reporting by many undertakings that are not yet registered in the reporting system. Also, there are substances such as N₂O, which have an ODP, but are used in completely different sectors alien to those the Ozone Regulation (e.g. agriculture and natural sources for N₂O) and where the measures of the Regulation are ill suited to address these. An automatic inclusion would therefore have unwanted and unforeseen circumstances.

Annex 10: Visual aid showing the links between the problems identified, relevant drivers and individual measures to address the problems



Policy Option 1

Policy Option 2: also includes **PO1** measures

Policy Option 3: also includes **PO1** and **PO2** measures

n.b.: Measure A1 is more ambitious for PO2 and PO3, compared to PO1, as it also includes laminated boards