COPA
Cutting refrigerant emissions

POTENTIAL POLICY FRAMEWORK FOR THE PROMOTION OF SUSTAINABLE ODS/HFC BANKS MANAGEMENT

Climate and Ozone Protection Alliance (COPA)

September 2023

CONTENTS

LIST OF ABBREVIATIONS

ACR	American Carbon Registry
A6.4ER	Article 6.4 emission reduction
BTR	Biannual Transparency Reports
CAR	Climate Action Reserve
CDM	Clean Development Mechanism
CFC	Chlorofluorocarbon
COP	Conference of the Parties
COPA	Climate and Ozone Protection Alliance
CTF	Common Tabular Format
EIA	Environmental Investigation Agency
EOL	End-of-Life
EPR	Extended Producer Responsibility
ETF	Enhanced Transparency Framework
ETS	Emission Trading Systems
GHG	Greenhouse gas
GWP	Global warming potential
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HPMP	HCFC Phase-out Management Plan
IPCC	Intergovernmental Panel on Climate Change
ITMO	Internationally Tranferred Mitigation
KIP	Kigali Implementation Plan
MCTOC	Medical and Chemicals Technical Options Committee
MP	Montreal Protocol
MPGs	Modalities, Procedures and Guidelines
MLF	Multilateral Fund
NDC	Nationally Determined Contribution
NIR	National Inventory Report
ODS	Ozone depleting substance
OECD	Organisation for Economic Co-operation and Development
PA	Paris Agreement
PFC	Perfluorocarbon
PIC	Prior Informed Consent
RAC	Refrigeration and air conditioning
RMP	Rules, modalities and procedures
SDM	Sustainable Development Mechanism
TBM	Transboundary Movement
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCC	Voluntary Carbon Credit
VCM	Voluntary carbon markets
VCS	Verified Carbon Standard
WEEE	Waste from Electrical and Electronic Equipment

1 INTRODUCTION

Due to the need of concerted action to achieve net-zero emissions to limit global warming, the opportunity to avoid emissions of short-lived ozone depleting substances (ODS) and hydrofluorocarbons (HFCs) cannot be discounted. The Environmental Investigation Agency (EIA) estimates that the ODS/HFC banks contain emissions in the range of 24 GT CO_2eq[1]. Still, little is currently done to manage them. One reason is that the barriers are manifold. Barriers range from policy and administrative barriers for the movement of ODS/HFC waste and lack of guidance for emission reporting to the lack of financial resources.

In the challenging landscape of ODS and HFC bank management, the development of strong national policy frameworks can supplement the existing international agreements to further enhance the impact and leverage results. A comprehensive set of policies, both on international and national level, can promote sustainable ODS/HFC banks management and contribute to cut emissions. Sustainable ODS/HFC banks management has the potential to considerably reduce the emissions of these substances into the atmosphere, thereby contributing to the healing of the ozone layer as well as meeting the climate targets of the Paris Agreement.

The introduction starts with establishing an understanding of what is understood by ODS/HFC banks management, before looking specifically at the role of policy in this context. Specific attention is given to the perspective of developing countries. Next, this paper goes through the three main international treaties that impact the management of ODS/HFC banks management, namely the Montreal Protocol, the Paris Agreement and the Basel Convention. After that, detailed guidance for national policy makers on how to address the identified barriers on a national level is presented. The study concludes with recommendations based on the presented materials.

1 https://us.eia.org/wp-content/uploads/2022/10/Refrigerant-Lifecycle-FullReport-6Spreads-PRINT.pdf

1.1 ODS/HFC BANKS MANAGEMENT

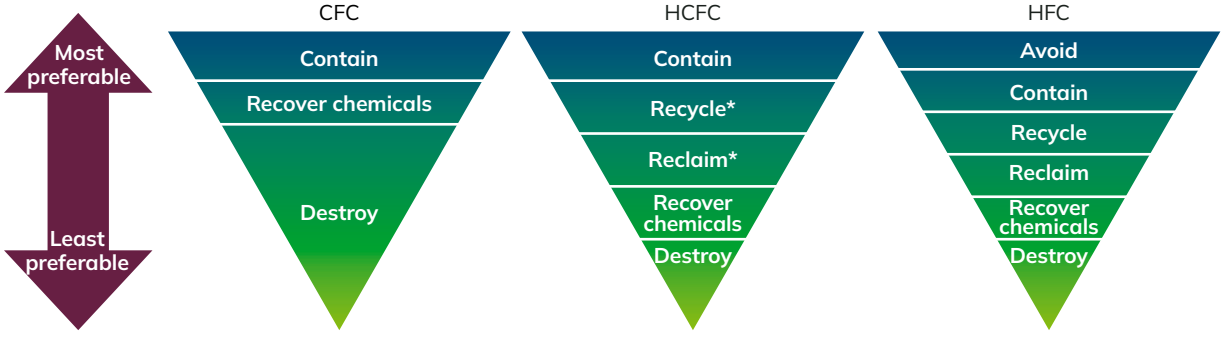
ODS and HFCs are controlled under the Montreal Protocol (MP) on Substances that Deplete the Ozone Layer. ODS are mainly chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs). Although the use of CFCs has been banned since 2010, equipment containing such substances are still in use and the accumulation of these substances in different equipment in use is called a bank. The global HCFC portion is currently larger than the CFC share, as HCFCs are still in use, mainly for servicing in developing countries while already phased-out in industrialized countries.

HFCs are currently still widely used in different equipment and these banks are consequently expected to continue to grow until, following the planned phase-down schedule of these substances, their bank will also start to decline.

The majority of ODS and HFC banks occur in the refrigeration and air conditioning (RAC) sector, followed by foam blowing agents in appliance and building insulation foam sector and, to a lesser extent, in fire protection systems. While international policies usually target the substance irrelevant from the sectoral application, national policies typically require sector specific provisions to address the source of the pollutant. The focus of this paper is the RAC sector.

Adapting a standard waste hierarchy to the circumstances of ODS/HFC banks management makes it possible to rank different interventions in terms of most preferred activity to least preferred action for each substance bank. In a waste hierarchy that promotes the circular use of resources, resource efficiency is always the preferred option. In other words, do not "waste" a resource that may still be used. Drawing on this analogy, the preferences for available interventions in a sustainable ODS/HFC banks management is illustrated in *Figure 1*.

***Figure 1**. ODS/HFC Bank Management Hierarchy.*



**Recycling and Reclaim of HCFCs should be subject to a cutoff date that is aligned with the phase-out of HCFCs*
Source: HEAT 2023

The overall guiding principle in this context (illustrated in *Figure 1* for each type of substance) is resource efficiency and promoting a circular economy. Consequently, where substances are already in use, **containment** of these substances is the most preferred action, as it is key to enable further management options for these substances. After that, from a resource efficiency perspective, **recycling** (usually done on-site) is preferred over **reclamation**, as it avoids transport and processing emissions. Expanding this logic, reclamation of a substance is preferred over **chemical recovery** and, as final and definite step, **destruction** of substances.

As the substances need to meet certain properties to enable efficient recycling and reclamation, proper handling that avoids contamination and mixing of the recycled and reclaimed substances is required for efficient reclamation.

Where reclamation is not possible, either because the refrigerant is banned, or the substances are contaminated, chemical recovery is the next option. In a so-called "chemical cracking" process, the constituents of refrigerants are separated under high temperatures: Aqueous hydrochloric acid and hydrofluoric acid are recovered and can be used for other purposes.

Building further on the principles established in *Figure 1*, the chemical processing in a cracking plant to recover chemical components for reuse is thus preferable from a resource-efficiency perspective than destruction of the substance, as it allows for chemicals to be recovered and used again. In practice, such cracking plants need to be integrated in large chemical industry installations and are thus not (readily) available in many parts of the world. Hence, when substances cannot be efficiently reclaimed, destruction often is the last option in *Figure 1*.

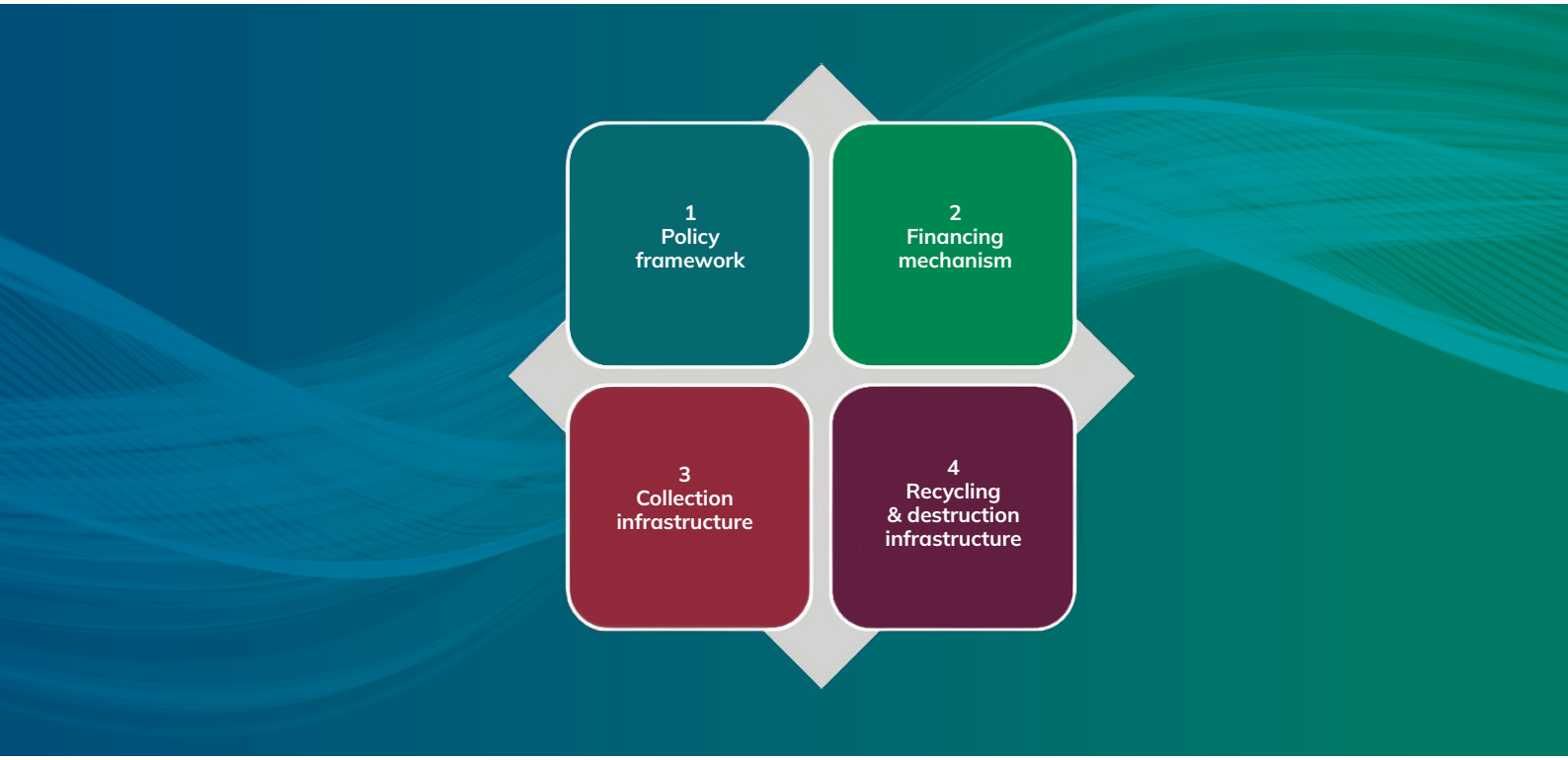
Further to the above, *Figure 1* provides a differentiation depending on the regulatory state of the substance group concerned. The division is made between CFC (forbidden since 2010), HCFC (phased out in developed countries) and HFC (phase-down about to start in developing countries). Where substances are already phased-out or approaching phase-out, options for re-use of these substances are therefore limited and controlled destruction is the preferred option over recycling and reclamation. Where substances are still put in new equipment, as is the case mainly for HFC, options to reduce their amount and thereby reduce effort and cost for bank management should be explored before destruction is conducted.

1.2 THE ROLE OF POLICY IN MANAGING ODS/HFC BANKS

A comprehensive set of policies, both on international and national level, can promote sustainable ODS/HFC banks management and contribute to cutting emissions. By overcoming and removing well-known barriers through concerted action, a clear policy framework sets boundaries and provides a clear indication of preferred behaviour for management options for stakeholders, as illustrated in *Figure 1*. It distributes responsibilities to market proponents, ideally monitors the implementation of actions and enables sanctioning of those who do not follow their regulatory obligations. This includes a broad range of policies from accounting principles and market guidance to a robust monitoring system to ensure compliance.

Previous guidance papers and a road map presented by the Climate and Ozone Protection Alliance (COPA) introduced four key principles for an efficient and successful ODS/HFC banks management, illustrated in *Figure 2*. While all four topics are taken up by COPA's thematic working groups[2], the focus of this paper is, as mentioned above, on the policy frameworks and how these can help overcome barriers to a sustainable ODS/HFC banks management.

***Figure 2**. Core processes of ODS/HFC bank management*



2 https://www.copalliance.org/our-work/thematic-working-groups

2 INTERNATIONAL AGREEMENTS RELEVANT FOR ODS/HFC BANKS MANAGEMENT

Regulatory measures are only as good as their enforcement. In this section, the three main current international agreements that regulate or impact ODS/HFC banks management are analyzed with regard to their enforcement limitations and barriers. First, a brief introduction is given to each agreement, starting with the Vienna Convention and its Montreal Protocol (MP), followed by the Paris Agreement and the Basel Convention. After each introduction, the policy barriers related to the management of ODS/HFC banks for that agreement are highlighted before, finally, potential solutions to overcome those identified barriers are assessed.

2.1 VIENNA CONVENTION AND THE MONTREAL PROTOCOL

The Vienna Convention for the Protection of the Ozone Layer was created in 1985 in response to the scientific evidence on the depletion of the Ozone Layer. Its aim is to promote cooperation by exchanging information on the effects of human activities on the ozone layer. The parties meet every three years to consult on the harmonization of research policies and strategies. It took effect in 1988 and since then continuously contributes to a harmonized global network of atmospheric observation. For example, in 2022, the Vienna Convention provided recommendations to improve regional emissions quantification[3].

The use of ODS and HFCs is controlled under the MP on Substances that Deplete the Ozone Layer. It controls the production and consumption of specific chemicals, none of which occur naturally, such as CFCs, HCFCs, methyl bromide, and sets specific targets for reduction of the included substance - including a timetable for doing so.[4]

The MP can be regarded a consequence of the Vienna Convention, as a state must be party to the Vienna Convention to become a party to the MP. The signatory countries are further required to take control actions to protect the Ozone Layer. Since its adoption in 1987, the MP has led to the phase-out of nearly 99% of banned ozone depleting substances (WMO et al., 2022). As it stands, the ozone layer is now recovering and is expected to return to 1980 levels by 2040 for most of the world. Scientists estimate that the work done to date will see a reduction of

3 Decision VC XII(II)/1
4 https://legal.un.org/avl/ha/vcpol/vcpol.html

0.5°C in average surface air temperature warming. The Kigali Amendment, which was added to the MP in 2016, requires the additional phase-down of production and consumption of some HFCs mainly developed as replacements for ODS in air conditioning, refrigeration and other sectors. While HFCs do not directly deplete ozone, they contribute significantly to global warming. It is expected that the implementation of the Kigali Amendment would avoid additional 0.3–0.5°C of warming by 2100 (WMO et al., 2022). Noteworthy, while the MP is effectively overseeing the phase-out of ODS and HFCs, there are currently no agreements in place for those ODS and HFCs already produced and still in use, leaving a blind spot with regards to ODS/HFC banks management actions and priorities.

As mentioned above, the MP controlled substances are mainly CFCs, halons, methyl bromide, HCFC, and HFCs. Still relevant for the RAC sector are HCFCs and HFCs, which are contained in Annex C and F of the MP[5]. While industrialized countries are obliged to undertake control measures on their own account following the MP adoption, the Multilateral Fund of the Montreal Protocol (MLF) financially supports countries categorized as so-called Article 5 countries[6] with their control measures obligations under the MP.

The metric for compliance towards the MP is the bulk consumption of controlled substances in a country that is an MP signatory. Bulk consumption is defined as the sum of production and import, from which export and destruction is deducted (See *Equation 1* below). That means that the MP compliance targets are related to the amount of substances that enter the domestic market, but the management of controlled substances at their end-of-life is not specifically regulated through this agreement. Nevertheless, many countries still take action to reduce their ODS/HFC emissions during equipment servicing and decommissioning – often as part of their HCFC phase-out management plan (HPMP) and Kigali Implementation Plan (KIP).

However, as end-of-life measures are not required nor part of the agreement itself, the results of such bank management measures in terms of avoided emissions is not monitored under the MP. For HFCs, the monitoring and progress of bank management activities could be included in the Nationally Deter-

Equation 1: *Definition of bulk consumption under the MP*

CONSUMPTION = PRODUCTION + IMPORT - EXPORT - DESTRUCTION

5 https://ozone.unep.org/treaties/montreal-protocol/articles/annex-c-controlled-substances and https://ozone.unep.org/treaties/montreal-protocol/articles/annex-f-controlled-substances

6 Article 5 countries are a group of members of the Montreal Protocol whose annual consumption of controlled substances was less than 0.3 kilograms per capita at the time of entry into force of the Protocol or at any time thereafter up to 01.01.1999. There are currently 147 countries in this group.

mined Contribution (NDC) reporting or – indirectly – in the national greenhouse gas (GHG) inventory report (NIR) under the Paris Agreement (see chapter 2.4). However, for substances such as CFCs and HCFCs, there is no reporting provision, neither under the MP nor under the Paris Agreement/NDCs.

National quota and licensing systems are the most common domestic policy instrument to implement the MP reduction schedules on national level. They are described in *Chapter 3*.

The MLF provides funds to help developing countries to comply with their obligations under the MP to phase out the use of ODS at an agreed schedule.[7] The MLF provides assistance for the policy set up as well as manufacture conversion and support to the servicing sector such as technician training and specific tools.

The MLF is currently also the central source of funding for ODS/HFC banks management. Since bank management it is not its main goal, specific funding for this is limited to a few so-called funding windows. One such MLF funding window was provided between 2008 and 2014 for demonstration projects on ODS destruction. Then in 2021, a new MLF funding window was again opened for Article 5 countries to establish an inventory of banks of used or unwanted controlled substances, together with a plan for the collection, transport, and disposal of such substances (Decision 91/66). First project results are expected by the end of 2025. With the opening of this latest funding window, concerted action in Art. 5 countries is supported by MLF for:

- Inventory of banks of used or unwanted controlled substances
- Plan for collection, transport and disposal of such substances, including consideration of recycling, reclamation and cost-effective destruction.

Each Article 5 country that has not received funds for such activities from MLF previously is entitled to an additional amount of 70 000 to 100 000 USD to undertake the above-mentioned actions, latest until December 2027. While undertaking inventories and making plans is essential for further action, the MLF does not have the mandate to finance actual reclamation or destruction of ODS/HFC for Article 5 countries.

The proposed inventories and ODS/HFCs banks management plans shall be coordinated with national phase-out/down plans of controlled substances and consider the current legislation. They must also contain a description of a potential business model ranging from waste collection to destruction or export, along with the needed arrangements with stakeholders, required policies and regulations, while detailing the obligations of manufacturers and distributors regarding recovery, recycling and reclamation and destruction, as well as necessary coordination with relevant conventions on transboundary movement of waste (for export).

7 http://www.multilateralfund.org/aboutMLF/default.aspx

COPA'S CONTRIBUTION

COPA supplements and advances the actions carried out under the new MLF funding window and may support COPA partner countries by, for example:

1. **Providing a standard methodology for inventories and national action plans**
2. **Complementing national inventories with status quo analyses in selected urban areas**
3. **Supporting mitigation project concept development based on inventories and status-quo analyses**
4. **Supporting selected activities through mobilizing finance, for example for ODS/HFC collection, reclamation, and destruction activities (specifically, such as implementation of banks management action plans).**

2.2 OVERCOMING BARRIERS TO ODS/HFC BANK MANAGEMENT THROUGH MP

As stated above, emission reduction is not reflected in the compliance metric of the MP. While the reduction of consumption of ODS is reported under Article 7 of the MP, there is no standardized reporting of emission reduction resulting from end-of-life management under the MP. The definition of consumption under the MP can even lead to a perverse incentive: Since any substance destruction is deducted from the consumption, the destroyed amounts could be replaced by virgin substances entering the domestic market. As those virgin substances can be potentially emitted, the overall emission reduction is uncertain and often not adequately monitored.

Depending on the substance group, this "perverse incentive" effect may seriously impact the actual emission reductions. This does not concern controlled substances already phased-out, such as CFCs, as there is no new consumption of these substances. In this case, the environmental effect of destruction is positive, as it effectively avoids emissions. Regarding emission control, the last two options in *Figure 1*, cracking for chemicals recovery or destruction, yield the same results as the substance taken out of the market.

The problem with the "perverse incentive" occurs primarily for substances where there is a market demand for (virgin) replacement of the destroyed substances. For HCFCs and HFCs, where consumption is (still) allowed, any destroyed amounts can lead to an increase of virgin substances entering the national market. Without policy interventions such as e.g., mandatory containment provisions being effectively enforced, the overall emission reduction cannot be ensured in these situations. Another way to avoid any perverse incentive is to ensure the environmental integrity of HCFC and HFC destruction, for example by not allowing the destroyed amounts to be added to the allowed consumption in the country under the MP. Either as an MP decision or implemented on the national level within the quota system. In practice, this could mean that destroyed amounts would not be reported under Article 7 of the MP (or, alternatively, indeed reported as destroyed, but not added to the amount of allowed consumption).
As described above, funding for ODS/HFC banks management under the MP is limited to dedicated funding windows from the MLF, as emission prevention is not required for compliance to the MP. For this reason, it can be argued that for substances whose consumption is still allowed under the MP, recycling and reclamation provide more sustainable and reliable emission reduction options in the *Figure 1* hierarchy.

With reclamation, the reclaimed amounts of substances are, same as for destruction, also not discounted from the consumption allowance implemented by the MP. In this case, however, the reduction schedule of the MP still provides an incentive for reclamation of substances in the wake of the decreasing level of allowed consumption. There ought to be an increasing demand for reclaimed substances, as using these is allowed while at the same time containment is promoted due to the economic value. In short: It provides an economic incentive for keeping the substances in the cycle of existing equipment, it both avoids emissions and reduces the need for early retirement of equipment induced from non-availability of the required refrigerant (less risk for stranded assets). Reclama-

tion activities of HCFC and HFC banks may thus further increase the overall resource efficiency of substances and equipment material. Provided that the existing equipment has reasonable energy efficiencies, this is a triple win for the environment as it promotes resource efficiency for equipment and refrigerants as well as avoids refrigerant emissions.

Nevertheless, a cut-off date for reclamation of certain substances could further enhance the potential emission reductions in ODS/HFC bank management, e.g., by forcing HCFCs and high global warming potential (GWP) HFC to be collected for destruction after a specified date, whereby corresponding equipment relying on them is to be decommissioned too.

The MP can only set requirements, while specific policies to promote reclamation and destruction are introduced on a national level, which is the topic of *Chapter 3. Table 1* below provides a summary of barriers to ODS/HFC banks management in the MP together with possible policy approaches to overcome these.

***Table 1**. : Summary of barriers under the MP and possible policy solutions to overcome them*

Barrier	Possible policy option to overcome barrier
Perverse incentive to add virgin substances for destroyed amounts for substances whose consumption is still allowed (HCFC and HFC)	Policy to not add destroyed amounts to allowed consumption (national or international level) Regulation imposing and enforcing mandatory containment provisions
Reclaimed amounts are not deducted from allowed consumption, hence the overall domestic consumption might increase due to reclamation	Imposing continuously decreasing level of allowed consumption creates an economic incentive for reclamation Cut-off date for reclamation in alignment with phase-out schedules, to avoid extending the lifetime of equipment.

2.3 PARIS AGREEMENT AND NATIONAL DETERMINED CONTRIBUTIONS (NDCS)

The Paris Agreement (PA) is a legally binding international treaty on climate change. It was adopted by 196 Parties at the annual UN Climate Change Conference (COP21) in Paris in December 2015. The parties agreed to reduce GHG emission to keep global warming below 2°C, preferably below 1.5°C, in contrast to pre-industrial levels. Countries' commitments to the PA targets are reviewed every five years through an updated climate action plan, the so-called Nationally Determined Contributions (NDC). In 2023, the first "global stocktake" under the PA will assess countries' collective progress on the PA goals[8].

Under the PA, the countries' GHG emissions are to be reported to the United Nations Framework Convention on Climate Change (UNFCCC) based on guidelines for national GHG inventories provided by the Intergovernmental Panel on Climate Change (IPCC)[9]. The IPCC's list of gases covered in the guideline are shown in *Table 2*. HFCs are included in this list, but not ODS, the implication of this in relation to a sustainable ODS/HFC bank management is discussed below the list.

Table 2: *Greenhouse gases included in 2006 IPCC Guidelines for national GHG inventories*

CARBON DIOXIDE (CO_2)
METHANE (CH_4)
NITROUS OXIDE (N_2O)
HYDROFLUOROCARBONS (HFCs)
PERFLUOROCARBONS (PFCs)
SULPHUR HEXAFLUORIDE (SF_6)
NITROGEN TRIFLUORIDE (NF_3)
TRIFLUOROMETHYL SULPHUR PENTAFLUORIDE (SF_5CF_3)
HALOGENATED ETHERS
OTHER HALOCARBONS NOT COVERED BY THE MONTREAL PROTOCOL

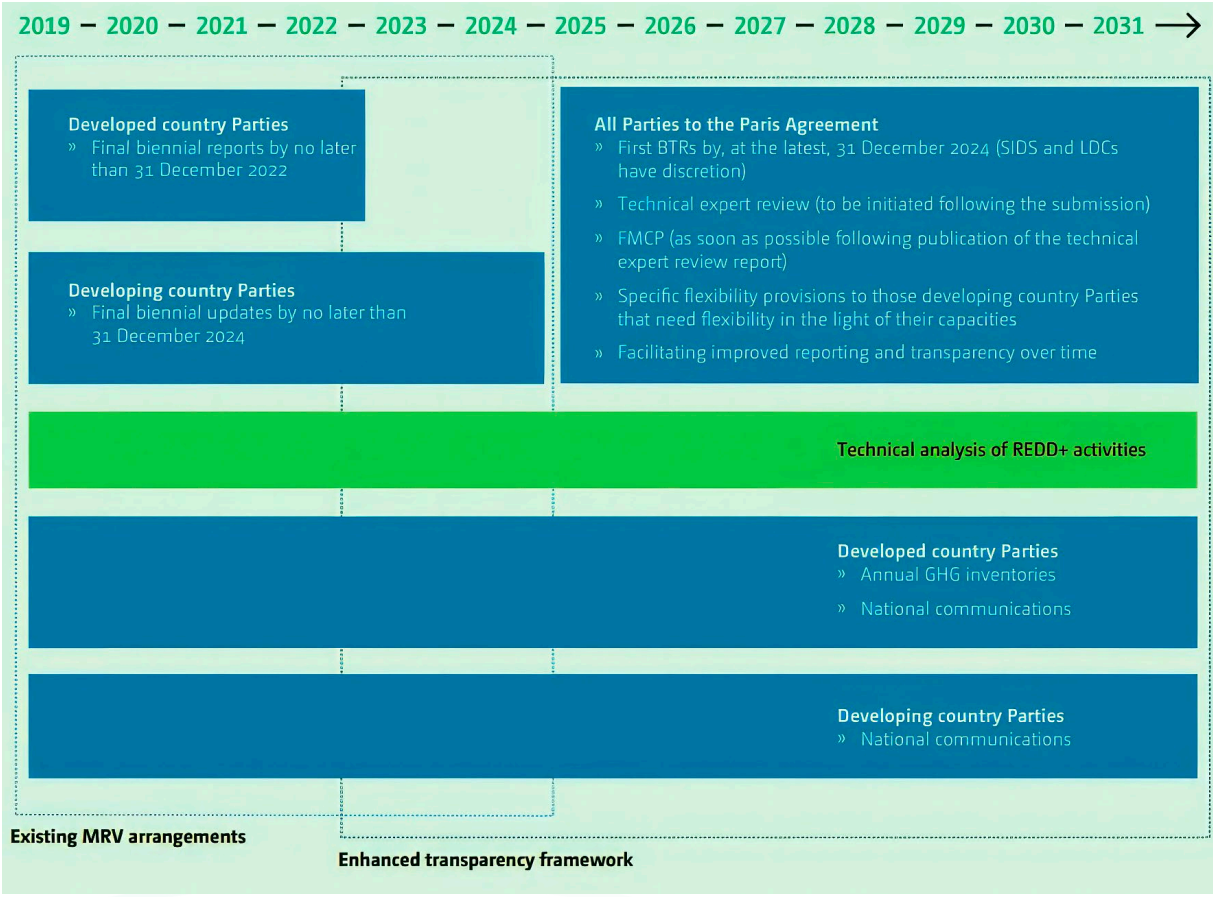
As mentioned above, HFC emissions are included under the PA and are reported in the National Inventory Reports (NIRs) submitted to the UNFCCC in alignment with the IPCC guidelines for GHG inventories. This reporting is mandatory for developed countries, while developing countries can use flexibility provisions and chose not to report on their HFC emissions under the PA.

8 Sourced from: https://www.un.org/en/climatechange/paris-agreement, for more details, also see: https://unfccc.int/process-and-meetings/the-paris-agreement

9 The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change. Link: https://www.ipcc.ch/

Reporting on GHG emission is not the only obligation of parties to the PA, there is different reporting to be done by the signatory countries, some voluntary others not. To facilitate these reporting duties and to build trust among the parties, the Enhanced Transparency Framework (ETF) is a central component of the PA. It contains a detailed set of modalities, procedures and guidelines (MPGs) based on a set of guiding principles which define the information to be provided, the technical expert review, transitional arrangements, etc. Through this detailed guidance, the ETF makes it possible to track each country's progress and enables the comparison of a country's actions against its plans and ambitions as described in its NDCs. Within the ETF, the Parties further agreed to common reporting tables for national GHG inventories; common tabular formats (CTF) for tracking progress towards NDCs and climate finance, technology transfer and capacity building; outlines of the biennial transparency report (BTR) and a national inventory document and technical expert review report, among other things, see *Figure 3* below.[10]

***Figure 3**. Moving towards the enhanced transparency framework*



Source: Reporting and Review under the Paris Agreement | UNFCCC

10 UNFCCC: https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-paris-agreement

However, if countries decide to include HFCs emissions targets in their NDCs, then they also need to include them in their NIR of GHG emissions to the UNFCCC. In this case, there is a link to the Montreal Protocol: A top-down methodology is available to facilitate the calculations and help estimate the amount of HFC emission to include in the NIR based on the HFC consumption data as reported by the country under the MP.

Starting in 2023 and then every five years, governments will take stock of their implementation progress towards the PA and assess their collective progress towards achieving the purpose and long-term goals. It is like an inventory exercise, which, depending on the outcome, will identify any need for course correction of the parties. The outcome of the global stock-take (GST) will subsequently be used to inform the preparation of (updated) NDCs, thus allowing for increased ambition and climate action.[11]

HFC emissions are part of the GST under the PA. CFCs and HCFC (ODS) are not part of the GST under the PA, nor included in any other reporting under the UNFCCC. Countries' CFC and HCFC consumption are solely reported under the MP, which might sound strange. This division has historic reasons: when the scope of GHG inventories was defined by UNFCCC, gases controlled under the MP were deliberately excluded to avoid double reporting. HFC were included only with the Kigali Amendment of the MP in 2016, after the PA 2015, which is why it is included in both reporting processes.

2.4 OVERCOMING BARRIERS TO ODS/HFC BANK MANAGEMENT IN PA / NDCs

The operationalization of the ETF is very much ongoing. All parties are required to submit their first BTR and NIR latest by the end of 2024, which might prove to be a challenge for some countries. To support especially developing countries, a comprehensive handbook on the implementation of the ETF has been developed by the Consultative Group of Experts, the second edition was published in 2023 and is available online[12].

There is a potential link between the MP and PA, as emission reduction from activities undertaken under the Kigali Amendment may be reported as part of countries' NDCs. In case a country includes HFCs in its NDC, the progress towards emission reduction shall also be reported in the BTRs. Countries are free to define their baseline, target and indicators as long as they are transparently defined. The comparability and linkages between the MP and the NDCs could be further strengthened through general guidance on how to report HFC emission reduction resulting from the implementation of the Kigali Amendment.

Although ODS (CFCs and HCFCs) often have a high GWP and a strong impact on climate change, they are usually not included in countries' NDCs, as they are not defined as GHGs in the IPCC Guideline for national GHG inventories for historical reasons. (see above section). Consequently, there is also no official guidance on if and how to include emission reduction from ODS in NDCs and BTRs. However, as NDCs contents are determined by each country, a country may still decide to

11 UNFCCC GST: https://unfccc.int/topics/global-stocktake/about-the-global-stocktake/why-the-global-stocktake-is-a-critical-moment-for-climate-action

12 https://unfccc.int/sites/default/files/resource/ETF%20Handbook-Edt2_EN.pdf

include ODS in its NDC scope[13] – qualitatively and with a dedicated target. Since these ODS emissions are not part of any NIR to UNFCCC, these emission reductions would be regarded as non-GHG emissions and thereby not be counted within the standardized reporting.

Regardless of the reporting standard, any emission reduction through ODS/HFC destruction should only be accounted for once. Precautions against double counting - especially when ODS/HFC is exported for destruction - need to be taken. Currently, the only guidance for reporting on ODS/HFC emissions (and thus emission reductions) is provided through the national scope of GHG inventories under the UNFCCC, meaning that emissions are counted where they occur (i.e. at the source). However, methodologies for HFC emissions follow a mass-balance or emission factor approach (or a combination thereof). Especially in mass balance approaches, destruction is an emission reduction measure and is deducted from consumption (remember the MP definition of bulk consumption in the previous section). Consumption defines the amount of HFC entering the market and reporting usually includes virgin substances only. Used HFC intended for destruction is not likely to be counted in this context, neither as export nor as import, which would be the correct way in terms of the real emission calculation: The exporting country deducts the amount from the national substance bank as end-of-life management measure, while the importing country adds the amount to its bank and accounts for the destruction. Today, several countries do not yet include HFC emission in their inventories, meaning that such emission reductions might not even be counted and reported at all at the moment.

Nevertheless, it is still possible for countries to overcome this challenge and correctly (once) report and keep track of emission reductions originating from ODS/HFCs bank management activities. The national methodologies for HFC emission calculation could for example include the aspect where countries import or export HFCs for destruction for correct estimates. In this situation, an automated data collection of imported and exported ODS/HFC for destruction purposes could help streamline the process. While import/export for reclamation is currently not common practice either, similar issues as well as solutions as described for destruction may occur.

To further ensure a correct reporting, and thus better understand the effect on emission mitigation measures due to ODS/HFC bank management under the PA, developing standardized reporting procedures upon the existing basis of MP data could be a good starting point. Intensifying the linkages between the ozone and climate protection through a methodology for transparently reporting ODS and HFC emission reductions should benefit both the ETF and the NDCs. Looking especially at the barriers described above, such a methodology could include a clear guidance on how to report measures for ODS emission reduction under the ETF,

13 Canada's NDC (2021) contains the following: In addition to addressing greenhouse gases covered under the UNFCCC and the Paris Agreement, [...] . Canada remains committed to phase out ozone-depleting substances covered under the Montreal Protocol, many of which are also greenhouse gases.
https://unfccc.int/sites/default/files/NDC/2022-06/Canada%27s%20Enhanced%20NDC%20Submission1_FINAL%20EN.pdf

maybe similar to existing "memo items" such as international bunker fuels for aviation which are not counted towards a country's national emissions. Countries should further be encouraged to include and report HFC emissions in the NIR for the PA using at least IPCC Tier 1 methodology. Additional guidance for good practice regarding baseline setting and the definition of measures as part of the NDC target definitions could also be provided, especially on how to take actions undertaken as part of the Kigali Implementation Plan into account for the ETF and NDCs under the PA.

Issues related to transboundary movement (TBM) of ODS/HFC for destruction (or reclamation) related to the accounting of ODS/HFC banks movement from one country to another could also be considered for integration in the ETF, which is covered in the next section on the Basel Convention in this report (see *Chapter 2.7* for further discussion).

Table 3 below summaries the discussed barriers to ODS/HFC banks management within the PA, while also listing potential policy interventions to overcome them.

***Table 3**. Summary of barriers under the MP and possible policy solutions to overcome them*

Barrier	Possible policy option to overcome barrier
Different requirements for reporting of HFCs under MP, PA and NDCs/ETF	Guidelines would facilitate data collection and reporting of these substances, specifically for developing countries
No mandatory or clear requirement for reporting of ODS emission reduction in NDCs	Guidance, possibly mandatory, on ODS emission report and their potential inclusion as non-GHG gas in the NDC
Double counting of HFC destruction is built into current reporting procedures	Implement provision for reporting of import and export of HFC intended for destruction within national GHG accounting
Unclear reporting requirements for inclusion of ODS and HFC emission (reduction)	Development of standardized reporting procedures of ODS and HFC emission (reduction) for NDCs/ETF on the basis of MP data

2.5 SPOTLIGHT ON PARIS AGREEMENT ARTICLE 6: CARBON MARKETS

A thorough introduction to the PA Article 6 and carbon markets in relation to ODS/HFC banks management is provided in COPA's paper on financing and fundraising, published in April 2023 and available on COPAs website[14]. A short summary is provided here for consistency.

The PA's Article 6 supports the notion that (international) carbon markets could help in the achievement of national GHG reduction targets. This would be done through the trade of carbon reduction credits through either compliance or voluntary arrangements. The operationalisation of Article 6 (Glasgow Rulebook) is underpinned by the notion that significant cost savings and welfare gains can materialise through the trade of Internationally Transferred Mitigation Outcomes (ITMOs) across parties and, especially, between the Global North and South. The key elements of Article 6 are Article 6.2, Article 6.4 and, to an extent, Article 6.8. Article 6.2 spells out guidelines for ITMOs between two Parties to the PA. Article 6.4 addresses the new Sustainable Development Mechanism (SDM) to replace the previous Clean Development Mechanism, whereas Article 6.8 addresses non-market approaches such a voluntary action or capacity building measures.

All three articles are understood to be "cooperative approaches" for the achievement of NDCs, which are at the heart of the PA's more bottom-up approach. The PA is available to review on the UNFCCC website[15], details on the Glasgow Rulebook on Article 6 can be found, e.g., on the IISD website[16].

There are three core aspects to the carbon markets today:

1) **The mandatory or compliance markets** (such as the EU-ETS, CARB, CORSIA) which trade government issued/ permitted emissions allowances within a structured market;
2) **Sovereign carbon markets** (Article 6.4 ERs, REDD+, ART Trees and Verra JNR) which act at a national level for emissions reduction and removal;
3) **Voluntary carbon markets** (VCMs); which trade credits based on carbon offsets for emissions avoidance, reduction or removal on a voluntary basis.

VCMs trade credits are based on offsets, which are not specifically mentioned within the PA. The market-led approach of the VCMs exists because compliance markets have not been implemented in all jurisdictions and are not scaling up fast enough to meet the goals enshrined in the PA (Miltenberger et al., 2021).

Voluntary Carbon Credits (VCC) or carbon offsets can be used to help companies meet voluntary corporate climate targets for emissions reductions or removal in support of the low-carbon transition. Unlike the highly regulated compliance markets such as the Emission Trading Systems (ETS), VCMs do not currently benefit from direct government or regulatory oversight. VCCs are instead issued by so-called carbon standards and certification providers, non-governmental issuing bodies with their own rules and procedures. These include the Verified Carbon

14 https://www.copalliance.org/imglib/downloads/TWG%20FM/2023-04-25%20COPA%20FM%20study.pdf
15 https://unfccc.int/process-and-meetings/the-paris-agreement
16 https://www.iisd.org/

Standard (VCS or Verra), the Gold Standard, the Climate Action Reserve (CAR) and the American Carbon Registry (ACR).

In addition, several different registries function as centralized record-keeping systems, keeping track of how VCCs are generated, issued, transferred, retired and cancelled. When a registry cancels or retires a VCC, it is permanently removed from circulation in the VCM and cannot be traded and used any longer.

To address concerns about double counting emission reductions under Article 6.2, a successful trade and market will require, among other things:

- a public, centralized registry
- mandated periodic reporting
- transparency and integrity, and
- an adjustment mechanism, to ensure that the benefit of the emissions reduction or removal would be reflected in an official transfer.

These challenges are currently (partly) met in the VCM through the voluntary carbon standards, but there are still some details to be agreed on for double counting. Also, additionality remains central to the creation of any carbon credit.

There is increasing pressure on companies and their investors to only use high quality, high integrity credits in reaching their net zero goals – which means credits that demonstrate emissions reductions that are additional and permanent. The destruction of ODS/HFC gases should qualify for additional and permanent reductions, as long as those credits are sold outside the ODS/HFC value chain and operating entities continue to phase out ODS and HFC.

Increasing climate risk and a growing focus on sustainability are leading to a rapid growth in demand for credits in both the private and public sector, but there are continuing challenges deriving from a lack of trust in market integrity for carbon credits.

The voluntary carbon market – possibly operating outside of Art 6.4 is still struggling to adjust to the PA and discusses several approaches (Kreibich & Hermwille, 2021). Items discussed include the origin of the emission reduction (from within NDC covered sectors or from unregulated areas), the transfer of credits between countries as well as the concept of additionality within the call for increasing ambition within the PA. Examples from CDM implementation have shown that the additionality principle and perverse incentives pose severe risks to the environmental integrity of such systems (Michaelowa et al., 2019).

This is challenging given the history of carbon offsets and the distaste many environmental activists have for their use. The argument against offsets has historically been that global polluters were continuing to pollute while ‘offsetting’ their emissions elsewhere, which practically has little to no effect on global emissions overall (Jackson, 2009). This was exacerbated in the early days of the Clean Development Mechanism (CFM), where perverse incentives led to the inadvertent creation of more GHGs (Burston, 2010). Since then, framework conditions have improved.

However, several aspects need to be considered to ensure the environmental integrity and the contribution to sustainable development of such undertakings.

Currently, few examples of voluntary carbon market activities on emission reductions from the destruction of ODS exist. One of them is the Climate Action Reserve with its methodology for CFC destruction, where CFC that is collected within the US or in another country is transported to the US for destruction. While initiatives to avoid CFC emissions are to be supported, their set-up and the trading of achieved reductions from outside the GHG accounting for GHG emissions require dedicated design to ensure overall environmental integrity and sustainable development.

2.6 OVERCOMING BARRIERS TO ODS/HFC BANK MANAGEMENT WITH CARBON MARKETS

When it comes to environmental integrity, permanence and additionality are key. As already outlined in previous chapters, a distinction between CFC, HCFC and HFC needs to be made because of their stage in the phase-out (down) process in the MP and KA and their different accounting provisions.

1. **CFC** (an ODS): The fact that ODS emissions are usually outside of the scope of NDCs has several implications: on the one hand, this predestines emission reduction is this area for voluntary credits, as the transfer of credits between countries is not as issue. On the other hand, if buyers of such credits use such offsets in lieu of their own emission reduction efforts this is not in line with the imperative of the Paris Agreement to be as ambitious as possible (Kreibich & Hermwille, 2021) and mixes CO_2 reduction goals with offsets from substances that are outside of the scope. Initiatives such as "Science-based targets"[17] aim to provide guidance to corporate stakeholders for appropriate sector-specific emission reduction targets to avoid the "buy-out" from own emission reduction efforts. Nevertheless, for CFCs, as their consumption is completely phased-out, any kg that is destroyed prevents this kg from being emitted.
2. **HCFC** (an ODS): The consumption is still allowed to a limited extent in developing countries until 2030. Therefore, environmental integrity can only be guaranteed by a suitable accounting and policy framework that prevents the destroyed amount from being replaced by virgin substances, as discussed in previous sections.
3. **HFC:** These substances are expected to be in use for many years to come, making recycling and reclamation of HFC substances to be preferred above destruction, (remember *Figure 1*) to avoid a perverse incentive for destruction to occur.

Additionality is an issue for all substances in the carbon market context: Activities are only regarded as additional as long as no national regulation on end-of-life (EOL) management is installed and enforced. While extended producer responsibility schemes and takeback obligations by distributors are state of the art in several developed countries, developing countries could refrain from such policies to not discourage carbon market activities. On the other hand, activities within the voluntary carbon market may also exhibit limited contribution to a system transformation, as they tend to only collect the easily accessible substances for maximized revenue. Once they are collected, no funding is available to collect and treat the remaining substances, which is often the larger share of a country's bank.

In summary, there are two issues with carbon markets in the context of ODS/HFC banks management:

1) **Offsetting GHG emissions** from VCCs that are created outside the scope of GHG accounting is a risk for integrity

17 https://sciencebasedtargets.org/

and potentially causes the buyers of such credits to not ambitiously reduce their own emissions.

2) **Profit-based destruction activities** pose the risk of only collecting easily accessible amounts and do not provide funding for the management of a country's entire bank.

Activities under 6.2 are a matter of negotiations between the cooperating countries, where such considerations can be taken up. Cooperative approaches can be a chance for the host country to receive comprehensive support towards a regulated market, where the venting of ODS and HFC is banned, operators are obliged to pay for collection and treatment and equipment and substance distributors are required to take back equipment and substances and enable their environmentally sound treatment. Possible building blocks of such regulations are proposed in *Chapter 3*. Such support can take the form of policy design, capacity building for enforcement officers, the supported set-up of a database to track the supply chain of substances, equipment import and/or operators of ODS/HFC containing equipment. Other options encompass the supply of infrastructure for collection, storage and treatment, technician training and the procurement of the necessary tools for technicians to perform the recovery and handling. The ITMO host country should optimally define a strategy leading to a national regulation on above mentioned activities and not delay regulatory development due to potential future ITMs.

Projects undertaken under 6.4 need to follow approved methodologies, where credits that can be used for offsetting could be limited and requirements for a project's contribution to the host country's policy framework development could be defined. The introduction of national regulations should not be slowed down by a country's consideration of risking additionality for potential projects. Similarly, the integration of HFC emissions into the national NDC should not be prevented for reasons of additionality.

Activities under Art 6.4 could take the form of single projects as well as programmes of activities. Examples for actions, that would require the development of a method to be approved by the supervisory board are listed below. Please note that only actions towards HFC emission reduction are taken into account here, as those are the only ones being accounted for in the scope of NDCs: Improved containment of HFC during use:

- train and pay service technicians to recover HFCs and collect them either for on-site recycling or for treatment.
- Provide for treatment (reclaim or destruction).
- Prove the impact by a centralized monitoring system and compare to national benchmark for the same kind of installations/equipment.

The technician training and the set-up of the monitoring system are contributing to the sustainable development of the host country. Such activities could focus on a specific subsector before a potential upscale.

Similar considerations are relevant with the voluntary carbon market, where countries have limited influence on the used standards, as they are developed by private entities. However, countries might set up a

national framework including minimum standards and require a national approval process for voluntary carbon market projects. Such a framework can include specific requirements for sustainable action when dealing with ODS/HFC banks. Examples for such requirements are:

- commitment to work on a whole subsector or a defined region and increase recovery and treatment, instead of only focusing on already collected amounts of substances.
- Work with local technicians and train them in good practices.
- Agree on an MRV system that accurately reflects the project activities and reduces the chances for fraud by documenting the work of the individual technician and follows the substances along the collection chain.
- Agree on the usage of earned emission reduction and necessary corresponding adjustments.
- Develop an MRV system where the project activity can serve as a pilot for enforcement authorities to be scaled up to the whole sector later on.
- Define an exit strategy after the agreed crediting period, where additionality ends and project experience is used to implement an regulated system.

While the carbon market has undoubtedly a role to play especially in short to medium term funding of EOL management of ODS/HFC, countries would benefit from treating such options as a transition to a regulated market, where producers, distributors and end-users have the obligation to avoid emissions and take care of the treatment. This is also in line with the goal of the sustainable development mechanism to promote sustainable market development in host countries.

With this in mind, national authorities responsible for the administration of an activity under Article 6 or a voluntary carbon market scheme should make use of their options to co-design methodologies and baseline definition in order to make any activity a contribution to sustainable development leading to long-lasting behavioral changes also after the activity is completed. Annex 1 provides an overview table of different options for carbon market activities within Article 6 of the Paris Agreement and beyond as well as related implications and policy options.

2.7 BASEL CONVENTION

The Basel Convention on the control of transboundary movements of hazardous wastes and their disposal was adopted in 1989 and entered into force in 1992 as a reaction to the frequent shipment of toxic waste from developed countries to developing countries for disposal in the 1980s (Secretariat of the Basel Convention, n.d.). Its primary aim is the protection of human health and the environment, and it is the most comprehensive agreement on hazardous waste on a global level. The signatories of the agreement commit themselves to reducing Transboundary Movements (TBM) of waste as much as possible. If TBMs of waste are necessary for its disposal, principles of environmentally sound management have to be applied. To date, 191 countries are Parties to the Basel Convention[18], including all major economies (G20 members) except the United States of America. While the rules of the convention only allow to move hazardous waste between parties, bilateral, multilateral or regional agreements can provide for TBM also to non-parties.

Since 2019, the so-called Ban Amendment to the Basel Convention is in force, prohibiting the export of hazardous waste from the EU and Organisation for Economic Co-operation and Development (OECD) to non-EU and non-OECD countries. Although exports from the EU to low- and middle-income countries are already banned since 2006 through the Waste Shipment Regulation, the formal ban contributes to further combat illegal shipments of hazardous waste. For TBM between OECD countries, the OECD control system for waste recovery can be applied (OECD Decision C(2001)107/FINAL[19]), however no recovery facilities for ODS/HFC or related pre-consented waste details are defined in the OECD database.

COPA'S CONTRIBUTION

COPA has published a guideline with step-by-step guidance on the TBM process and its administrative requirements, however the guideline does not help to reduce complexity or speed up the process. It is available on the COPA website.
https://www.copalliance.org/imglib/downloads/2017_Guideline_for_the_transboundary_movement_of_ODS_waste.pdf

18 https://www.basel.int/Countries/StatusofRatifications/PartiesSignatories/tabid/4499/Default.aspx
19 https://www.oecd.org/env/waste/theoecdcontrolsystemforwasterecovery.htm

2.8 OVERCOMING BARRIERS TO ODS/HFC BANK MANAGEMENT FROM TBM PROVISIONS

ODS and HFC are hazardous waste and its TBM falls under the Basel Convention and its Prior Informed Consent (PIC) Procedure. The intension of this procedure is to promote environmentally sound management and prevent dumping of hazardous waste to less regulated economies. Although well intended, the administrative burden of PIC is often identified as a barrier (PREVENT & StEP, 2023), limiting export of ODS and HFC waste for treatment. Especially the PIC requirement that all transit countries need to consent to the movement, makes the approval process difficult to complete within a reasonable time frame. Depending on the (transit) countries, several waste definitions might be applicable for the same shipment and several authorities might be involved within each single country to approve the shipment.

Setting-up a streamlined procedure for ODS/HFC export for destruction or reclamation could facilitate and speed up the PIC procedure and is recommended by the Medical and Chemicals Technical Options Committee (MCTOC, 2022). Linking the expertise of National Ozone Units (NOUs) with the focal points of the Basel Convention, thereby using the OECD control system for waste recovery as inspiration, could further enhance the process by making use of pre-consented facilities. This approach would mean that the responsible competent authority can specify certain destruction and/or reclamation facilities where they decide to not object to the import of ODS/HFC waste to the specified facility. Flexibility can be built in the system by making decisions limited to a period of time and the possibility to be revoked at any time. Similarly, if transit countries were allowed to not object to the transit of ODS/HFC waste under pre-specified conditions, such as if the final destination is a pre-consented facility, the administrative burden would decrease even further. All together or alone, such provisions would allow for shorter processing times of the Basel PIC, as consent is assumed if not objected and only a short period of time is allowed for specific objections from transit and importing countries. As comparison, the OECD procedure applies seven working days as regular time frame and up to 30 days if a country raises special needs for examination, whereas the PIC can take up to several months for approval, depending on the route and substance.

An example of a list of pre-consented facilities is in the database of OECD control system for waste recovery[20], where pre-consented waste facilities with the related waste details are listed. Such a pre-consented list of facilities could also help exporting countries to identify suitable facilities to export their ODS/HFC waste to.

If the PIC procedure were to be utilized to also specify the recording of the transported amounts of ODS/HFC waste in terms of emissions monitoring, the data collected could potentially also be fed into other reporting systems provided through MP and PA. Essential for such aspirations, however, is that each country with a destruction facility in their territory takes part in the initiative.

20 https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.oecd.org%2Fenv%2Fwaste%2FOECD-Database-of-Transboundary-Movements-of-Wastes-25-January-2023.xlsx&wdOrigin=BROWSELINK

***Table 4**. Summary of barriers and possible policy solutions under the Basel Convention*

Barrier	Possible policy option to overcome barrier
Administrative complex and time-consuming process to comply with PIC, which delay or hinder TBM of ODS and HFC heading for destruction facilities	Basel Convention implementation of a streamlined procedure for ODS/HFC export for destruction or reclamation Potentially enhance the process above by approving a "white-list" of pre-consented facilities on national level, similar to what is custom in the OECD control system

3 NATIONAL POLICY INTERVENTIONS RELEVANT FOR ODS/HFC BANKS MANAGEMENT

Policies on the national level are required to meet the goals of international agreements such as those resulting from the MP, and the Basel Convention. Targets on HFC emission reduction are nationally determined as part of a national emission reduction target and thus should be included in the NDC. This chapter highlights suitable policy interventions for sustainable ODS/HFC banks management, taking up the management hierarchy introduced in *Figure 1*. As COPA activities are targeted towards closing the loop in the ODS/HFC bank management, the focus is placed on containment and end-of life treatment. As several existing COPA guidelines focus on several aspects of policy interventions, the reader is kindly directed to those for more background information, where relevant.

3.1 POLICIES FOR CONTROLLING MARKET ENTRANCE

A quota system is required by all parties to the Montreal Protocol to enforce the consumption reduction on national level. It defines the annual amount of bulk substances that are allowed to enter the domestic market. Usually, the national quota reflects the international reduction schedule applicable to the specific country. However, in some cases, a country may decide to reduce amounts faster than the international schedule. A licensing system might further enhance a quota allocation. It allocates licenses under pre-defined requirements to market proponents wishing to import bulk substances. Importers applying for a license may need to prove that they have adequate competence for the safe handling of the substances and meet reporting obligations, perhaps also pay a fee for the license. A common gap in the current MP consumption licenses system, is that they do not include substances that are contained in imported equipment.

As quota and licensing systems have been in place for CFC and HCFC for many years, they are not the focus of this study. However, it should be noted that any market regulation depends on a functional quota system that effectively prevents illegal imports. Controlling the overall amount of substances available on the market is the basis for effective incentives for containment, recycling and reclamation.

3.2 POLICIES FOR CONTAINMENT AND RECYCLING

Avoiding the emission of ODS and HFC is the foundation for any subsequent banks management, as discussed throughout the previous sections of this report and illustrated in *Figure 1.* A formal venting ban, prohibiting any intentional release of ODS/HFC, provides the legal basis for such behavior. However, enforcement of such policies and regulations requires special attention to effectively address the problematic.

Regular system tightness checks and prompt repair of any discovered leaks are efficient tools for avoiding refrigerants emissions. Imposing obligations for such work would improve the ODS/HFC containment in their respective systems and effectively reduce emissions. Enforcement of such a regulation could be monitored by e.g., an equipment registry where results from system tightness checks as well as from refrigerant fill and refill are documented. If additional automated alerts to enforcement bodies are built into the system in cases of non-alignment, or when unusual amounts of refill are noticed, the efficiency can be further enhanced, for example by spurring supplementing action such as technical aid or physical on-site checks.

Table 5 on the next page provides a list of suitable policy options for promoting more efficient ODS/HFC containment and recycling. The individual measures are explained in more detail in COPA's Guideline on policy measures for the management and destruction of ODS[21] and in the RAC NDC Guideline[22], where ambition levels are additionally distinguished for country groups depending on their HFC consumption. These publications are available on COPA's website.

21 https://www.copalliance.org/imglib/downloads/2017_Guideline_on_policy_measures_for_the_managment_and_destruction_of_ozone_depleting_substances.pdf

22 https://www.green-cooling-initiative.org/fileadmin/user_upload/2023_GCI_NDC-RAC-Guideline.pdf

***Table 5**. Policy interventions promoting containment and recycling*

Policy interventions	Examples of implementation
Venting ban for ODS/HFC	EU F-Gas regulation Art. 3: "The intentional release of fluorinated greenhouse gases into the atmosphere shall be prohibited where the release is not technically necessary for the intended use."[23]
Legal obligation for operators to provide for recovery, recycling (and further treatment where recycling is not possible)	EU F-Gas regulation Art. 8: "Operators of equipment that contains fluorinated greenhouse gases not contained in foams shall ensure that the recovery of those gases is carried out by qualified/certified natural persons so that those gases are recycled, reclaimed or destroyed." [24]
Provisions for regular system tightness checks and prompt repair of detected leaks	EU F-Gas regulation Art. 4: "Operators of equipment that contains fluorinated greenhouse gases in quantities of 5 tonnes of CO 2 equivalent or more and not contained in foams shall ensure that the equipment is checked for leaks." [25]
Technician training (curriculum) and certification for proper handling practices	→ Fit for Green cooling[26] → Case study Indonesia (Resource Book for Life Cycle Management of Fluorocarbons[27])
Support for procurement of required tools for technicians for recovery and recycling	This is often done as part of HPMPs or KIPs with financial assistance from the MLF
Establishing a platform or similar for an operators' registry, to facilitate enforcement and monitoring or related regulation(s)	→ Case Study on Poland's system (MRV Handbook[28])

23 F-gas Regulation (EU) 517/2014, Article 3/1
24 Modified from F-gas Regulation (EU) 517/2014, Article 8
25 F-gas Regulation (EU) 517/2014, Article 4/1
26 https://www.green-cooling-initiative.org/green-cooling/fit-for-green-cooling
27 https://iifir.org/en/fridoc/resource-book-for-life-cycle-management-of-fluorocarbons-good-145280
28 https://www.green-cooling-initiative.org/fileadmin/Publications/GIZ2021_Measurement_Reporting_Verification_MRV_Handbook.pdf

3.3 POLICIES FOR COLLECTION, RECLAMATION AND DESTRUCTION

Where refrigerants cannot be recycled on-site, they need to be transferred and moved to a collection system to either be reclaimed or destroyed. The policies described in Chapter 3.2 provide the basis for further action elaborated on in this chapter.

The setting up of a collection system requires the cooperation of several stakeholders, and many governments struggle to maintain it properly. Problems can arise from both sides:

1) Too little collected substances to justify reclamation or destruction, as technicians are not performing recovery and collection due to various reasons;
2) Too little collection and storage capacity in the collection systems, perhaps because treatment options are not established or export for treatment proves difficult.

In several industrialized countries, the collection and treatment are regulated to be the responsibility of substances producers and distributors. Thereby, the existing logistic system for distribution is often utilized to also include the collection of used substances, as the distributors obliged to take back used substances are the providers of these systems in the first place. However, there is usually no obligation to provide the required collection system free of charge. Hence the fee charged for using the collection system depends on the business model and on the demand for used refrigerants. At some occasions, distributors have been known to even buy used refrigerants for (their) reclamation. Such systems of mandatory "reverse logistics" make use of the existing distribution system for the take back and relieve governments from setting up additional infrastructure. It follows the "polluter pays principle" and offers an alternative to the government driven system.

In the absence of a public operational collection system, actors from the voluntary carbon market might step in and collect substances for destruction if the national market is large enough to provide profitable amounts to collect. (See section 2.5 and 2.6 on PA Article 6 and Carbon Markets)

Reclamation is less difficult when substances are not mixed and are as pure as possible, thus proper handling and storage of substances is important. When it comes to ODS and high-GWP HFCs, a certain cut-off date for reclamation is advisable, after which the collected refrigerant is destroyed, and their emission is permanently avoided. A certain cut-off date is a strong market signal setting an end to the servicing of outdated equipment. The required replacement catalyzes the installation of more efficient equipment, potentially using a refrigerant with less harmful impact on the environment.

***Table 6**. Policy interventions promoting collection, reclamation and destruction*

Policy interventions	Examples of implementation
Obligation for substance distributors to take back (their) used substances (or equivalent amount)	German law on circular economy (Kreislaufwirtschaftsgesetz, KrWG, 2020[29]), Article 4: Producers and distributors of fluorinated greenhouse gases are obliged to take them back after use or to ensure that they are taken back by a third party designated by them. (author's translation)
Support for cylinder logistic system providing the necessary containers for transporting the substances	Could be part of HPMP/KIP activities, depending on a country's preference
Cut-off date for reclaim of ODS and high GWP HFCs	No example known
(Financial) Incentive scheme for technicians to return used and collected refrigerants to reclamation facilities /collection utilities.	Norway, Denmark, Slovenia, Spain → Case study Norway and Denmark (Resource Book for Life Cycle Management of Fluorocarbons[30])
Enforcement by introducing a tracking system of refrigerants, providing information of large amounts of refrigerants being lost	Slovakia's leaklog system → Case Study on Slovakia's system (Resource Book for Life Cycle Management of Fluorocarbons[31])

3.4 POLICIES FOR PROVIDING MARKET GUIDANCE

In addition to the policy options directly focusing on ODS/HFC banks management, additional market guidance can be provided by a clear policy framework, promoting alternatives to ODS and high GWP HFCs and with reliable enforcement of the regulations. There already exist several publications with such focus, some of them are mentioned below as recommended reading, links to the online versions are provided in the footnotes:

- The Green Cooling Initiative guidelines for policymakers (Nov. 2022) "Raising ambition in NDCs through holistic mitigation approaches in the cooling sector"[32] offers a variety of options to provide market guidance, presented for three country groups with varying starting points and ambition levels.

29 Gesetz zur Förderung der Kreislaufwirtschaft und Sicherung der umweltverträglichen Bewirtschaftung von Abfällen (Law to promote circular economy and environmentally sound treatment of waste), retrieved from: http://www.gesetze-im-internet.de/krwg/index.html
30 https://iifiir.org/en/fridoc/resource-book-for-life-cycle-management-of-fluorocarbons-good-145280
31 https://iifiir.org/en/fridoc/resource-book-for-life-cycle-management-of-fluorocarbons-good-145280
32 https://www.green-cooling-initiative.org/fileadmin/user_upload/2023_GCI_NDC-RAC-Guideline.pdf

- Financial incentives for market guidance are described in COPA's paper on financing and fundraising[33]. Examples include financial incentives for the collection of ODS and HFC by a rebate system, hence giving the collected substances an economic value.

Regulatory measures are only as good as their enforcement, this cannot be stressed enough. For example, the tightening quota for specific substances on the EU market has led to increased prices, which attracted illegal import activity, and ultimately undermining the quota system. Concerted action of enforcement bodies and transparent supply chain tracking is necessary to reduce illegal quantities entering the market. Examples of enforcement could include equipping each container with a code stating its origin to ensure the end-user obtained substances that entered the market under the quota.

3.5 SPOTLIGHT ON EXTENDED PRODUCER RESPONSIBILITY FOR WASTE APPLIANCES

The term Extended Producer Responsibility (EPR) is often used in the context of end-user products that contain hazardous material, such as batteries, fluorescent lamps or Waste from Electrical and Electronic Equipment (WEEE). EPR means that producers are mandated responsibility for their products at the end of life. In other words, it is an environmental policy approach that enforces the responsibility of a product's post-consumer stage to the producer. The ultimate goal of EPR schemes is to incentivize manufacturers to use designs that are resource-sensitive and avoid hazardous substances where possible.

The fraction of WEEE containing ODS and HFC are refrigerators, freezers, small ACs, heat pumps, heat pump tumble dryers and small commercial refrigerators and freezers. Setting up and establishing WEEE collection systems for ODS/HFCs is a medium to long-term process, where the responsibility for the collection and treatment of waste appliances is usually shared among manufacturers and importers relative to their market share.

COPA'S CONTRIBUTION

COPA has published a guideline on the collection of equipment that contains ODS that describes the necessary steps in detail. It is available on the COPA website.

https://www.copalliance.org/imglib/downloads/2017_Guideline_to_establish_a_collection_system_for_equipment_containing_ODS.pdf

33 https://www.copalliance.org/imglib/downloads/TWG%20FM/2023-04-25%20COPA%20FM%20study.pdf

3.6 OVERCOMING BARRIERS TO ODS/HFC BANK MANAGEMENT WITH EPR

Countries that have a large second-hand market of refrigerators and ACs sourced from imports of used equipment are faced with the challenge that the original manufacturers do not consider themselves responsible for the handling of waste equipment in other countries. Applying the EPR logic, the importers of the equipment would in this case be responsible for the waste handling. Difficulties to implement this approach of EPR often arise from incomplete import reports, making it difficult to track the share of responsibility of importers for the handling of waste equipment.

In the light of recently internationally iterated calls to stop using less developed countries as "dump sites" for obsolete equipment from the global north, efforts to stop the import of used equipment could become legitimate. Import countries would in such cases benefit from clear import requirements for equipment, especially regarding the contained refrigerant and minimum energy efficiency.

Where the second-hand market occurs within a country, the consequences for the EPR system are limited. Most relevant in this aspect is the relative market share of the manufacturers and importers who placed the equipment on the market first. Possibly, second-hand dealers could be included by contributing to the system relative to their number of re-sold equipment. In principle, general efforts should be made to prevent old, inefficient equipment from re-sale, as such equipment causes (financial) strain on the household's economy through high energy consumption and consequently on the national grid's energy demand.

***Table 7**. Summary of barriers and possible policy solutions for EPR schemes in developing countries*

Barrier	Possible policy option to overcome barrier
Second-hand imports of appliances from other countries detach the responsibility from producers	Clear import regulations with requirements for energy efficiency and refrigerant avoiding the import of obsolete equipment
Unclear burden of responsibility sharing for imported products among the importers	Complete and central import reporting enables transparent burden sharing
Domestic second hand-market dealers are not included in the original EPR systems	Second-hand dealers could be included in EPR systems by contributing to the system relative to their number of re-sold equipment

4 CONCLUSIONS

In the challenging landscape of ODS and HFC bank management, the international frameworks of MP, PA and the Basel Convention can be leveraged. With increased coordination, agreed international pathways for substance treatment and a common approach to reporting could be established. The overall aim is to ease access to treatment facilities for countries where national solutions are not feasible and to ensure the environmental integrity of reclamation and destruction. A sound policy and regulatory framework might also provide a more substantial basis for dedicated funding by reducing the uncertainty and assessed risk.

The development of strong national policy frameworks for sustainable ODS/HFC management is the next logic step towards implementation. Progressive national frameworks can also drive international opinion building. In the meantime, it provides independence from the goodwill of other parties and ensures that mitigation efforts are carried out within national borders. This not only contributes to global efforts but also fosters national resilience and sustainability.

Regarding regulations, it is suggested that both international and national frameworks should support sustainable EOL management of ODS/HFC banks. A sustainable regulatory infrastructure should meet minimum criteria to avoid rebounds and other negative impacts. These criteria should promote resource efficiency, emission reduction, and compliance with international agreements.

In conclusion, the opportunity to leverage international frameworks, develop national policies, and implement sustainable practices is thoroughly reviewed and presented in this report. By following this path, a contribution can be made to the healing of the ozone layer, the achievement of climate targets, and the fostering of national resilience and sustainability. This opportunity is there to be seized, and collective work towards a sustainable future is encouraged.

5 REFERENCES

Jackson, F. (2009). *Conquering Carbon: Carbon Emissions, Carbon Markets and the Consumer.* New Holland Publishing.

Burston, J. (2010, January). *Refrigerant gases cool offset integrity.* Https://Www.Reutersevents.Com/Sustainability/Communications-Reporting/Refrigerant-Gases-Cool-Offset-Integrity.

Kreibich, N., & Hermwille, L. (2021). *Caught in between: credibility and feasibility of the voluntary carbon market post-2020. Climate Policy,* 21(7), 939–957. https://doi.org/10.1080/14693062.2021.1948384

MCTOC. (2022). 2022 *ASSESSMENT REPORT OF THE MEDICAL AND CHEMICAL TECHNICAL OPTIONS COMMITTEE*. https://ozone.unep.org/science/assessment/teap

Michaelowa, A., Hermwille, L., Obergassel, W., & Butzengeiger, S. (2019). *Additionality revisited: guarding the integrity of market mechanisms under the Paris Agreement. Climate Policy,* 19(10), 1211–1224. https://doi.org/10.1080/14693062.2019.1628695

PREVENT, & StEP. (2023). *Practical Experiences with the Basel Convention: Challenges, Good Practice and Ways to Improve Transboundary Movements of E-Waste in Low and Middle Income countries.*

Secretariat of the Basel Convention. (n.d.). *Controlling transboundary movements of hazardous wastes.*

WMO, NOAA, NASA, UNEP, & EC. (2022). *Scientific assessment of ozone depletion: 2022.*

6 ANNEX: OVERVIEW TABLE ON CARBON MARKET OPTIONS FOR ODS AND HFC EMISSION REDUCTION AND EXEMPLARY POLICY INTERVENTION

Framework	ODS emission reduction potential	HFC emission reduction potential	Activities which enable emission reduction (examples)
Art 6.2: ITMOs Authorized for use towards an NDC or other international mitigation purposes based on corresponding adjustments	Non-GHG ITMOs are possible [34]	ITMOs are possible	• Support and establish the policy set-up and regulation necessary to allow ITMOs to be traded, both as host and as buyer country. • Policy and financial support for adequate infrastructure development, awareness raising, initial support for stakeholders to adapt to new requirements • Develop and establish MRV system to track emission reduction
	Could be part of bilateral agreements Countries to shape conditions of cooperation Host country should define strategy leading to national regulation		
Art 6.4: SDM Emission Reduction (A6.4ER) require authorization to be used towards an NDC or towards other international mitigation purposes. The host party applies a corresponding adjustment.	Non-GHG A6.4ER are not mentioned in the RMPs[35], hence no generation of A6.4ER assumed	Possible if approved methodologies and additionality assessments are respected	• Develop strategies and methodologies to promote sustainable development and market transformation • Avoid delaying national regulation or the integration of HFC in the NDC just to keep the additionality requirement • A host party's national authority can communicate preferred types of activities, baseline approaches and methodologies I (incl. MRV) requirements • Registering and applying approved (HFC) methodology might increase credibility used for voluntary market
Voluntary Carbon Market No international supervision Corresponding adjustments might be required for traded credits	Potentially possible in non-regulated countries (no obligation or enforcement for EOL treatment)	Potentially possible in non-regulated countries (where HFCs are not included in NDC scope, no obligation for EOL treatment)	• Provisions by host country to avoid targeting only easy access ODS/HFC banks by activities of project proponent/buyer entity • Transparency of reporting to avoid double counting
Art 6.8: Non-market approaches, e.g., no transfer of emission reductions	Design depends on cooperation partners Cooperation through financing and technology transfer, capacity building, policy development		

34 Annex to Dec 2/CMA.3: Guidance on cooperative approaches referred to in Article 6, paragraph 3, Chapter III Corresponding adjustments
35 Annex to Dec 3/CMA.3: Rules, modalities and procedures for the mechanism established by Art 6, paragraph 4

COPA
Cutting refrigerant emissions

Implemented by:
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

In cooperation with:
UNIDO
UNDP

Supported by:
Federal Ministry for Economic Affairs and Climate Action
on the basis of a decision by the German Bundestag

IKI INTERNATIONAL CLIMATE INITIATIVE

Imprint

Published by
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn

Dag-Hammarskjöld-Weg 1–5
65760 Eschborn, Germany
T +49 6196 79-0
F +49 6196 79-11 15
E info@giz.de, proklima@giz.de
I www.giz.de/proklima, www.copalliance.org

Project
Climate and Ozone Protection Alliance

Responsible
Ellen Michel (GIZ Proklima)

Author
Irene Papst

HEAT GmbH
Habitat, Energy Application & Technology
Seilerbahnweg 14
61462 Königstein/Ts.
Germany

Coordination
Lara Teutsch, Malin Emmerich, Anja Werntges

Photo credits
© shutterstock: page 1, 9, 23, 29
© COPA: page 1 and 13

Design
creative republic || Thomas Maxeiner Communications
Frankfurt a. M. / Germany

On behalf of
The German Federal Ministry for Economic Affairs and Climate Action (BMWK)

Status
November 2023

GO TO WEBSITE

Learn more about COPA and all upcoming events by visiting our website via the QR code to the right or go to:
https://www.copalliance.org

Contact us:
Email: contact@copalliance.org