Proklima

Global roadmap on ODS bank management

Management and destruction of existing ozone depleting substances banks

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Content

Abbreviations

BMUB	German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
CFC	Chlorofluorocarbon
COP	Conference of the Parties
DE	Destruction efficiency
DRE	Destruction and removal efficiency
EEE	Electrical and Electronic Equipment
EPR	Extended Producer Responsibility
EU	European Union
FODEP	Fonds de Dépollution
GCF	Green Climate Fund
GEF	Global Environment Facility
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GWP	Global warming potential
HCFC	Hydrochlorofluorocarbon
HCl	Hydrogen chloride
HF	Hydrogen fluoride
HFC	Hydrofluorocarbon
HPMP	HCFC Phase-out Management Plan
IKI	International Climate Initiative of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety
IPCC	International Panel on Climate Change
LEDS	Low emission development strategy
MLF	Multilateral Fund for the Implementation of the Montreal Protocol
MRV	Monitoring, reporting and verification
ODP	Ozone depleting potential
ODS	Ozone depleting substances
OECD	Organization for Economic Co-operation and Development
PCB	Polychlorinated Biphenyl
POP	Persistent organic pollutant
PUR	Polyurethane foam
RAC	Refrigeration and air conditioning
RAC&F	Refrigeration, air conditioning and foam
SDG	Sustainable development goals
TEAP	Technology and Economic Assessment Panel
TBM	Transboundary Movement
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value added tax
WEEE	Waste Electrical and Electronic Equipment

1 Background and overview

1.1 The importance of ODS bank management

This global roadmap provides information on key processes in this sector and gives guidance to policy-makers, e.g. national ozone officers and policy-makers from the waste sector, on developing strategies for successful management of ozone depleting substances (ODS) banks. Banks are defined as the "total amount of substances contained in existing equipment, chemical stockpiles, foams and other products not yet released to the atmosphere" (IPCC/TEAP, 2005).

Under the Paris Agreement reached in December 2015 (COP21), the parties to the UN Framework Convention on Climate Change (UNFCCC) agreed to limit temperature increase to below 2° C and to combat climate change by reducing their greenhouse gas (GHG) emissions.

However, an important source which depletes the ozone layer and heats up our planet has largely been neglected in the past: emissions from ODS banks. Large banks have accumulated globally by the excessive use of ODS, which is found in old refrigerators, insulation foam or cylinders.

This roadmap aims to reduce one of the greatest barriers to ODS bank management: the informational barrier. This includes a lack of awareness of the environmental impact of ODS, a poor understanding of the ODS bank amounts and a lack of knowledge regarding the treatment of ODS (GIZ, 2015).

When addressing ODS bank management, the destruction technology is often the only aspect decision-makers and other stakeholders consider, but there are many more complex aspects. Destruction technology should only be installed when sufficient ODS amounts for management are available, which requires a regulatory framework, a sustainable financing mechanism as well as a collection and recycling infrastructure.

Many countries have realised the urgent need to avoid the negative environmental impacts caused by ODS, which both deplete the ozone layer and significantly contribute to climate change. Almost all countries have ratified the Montreal Protocol, which effectively restricts the production and consumption of ODS.

Please refer to GIZ (2015)[1] for an extensive review of global ODS bank management, a description of the status quo and the key barriers such as those related to information, finance and technology.

1.2 Global ODS bank development

Within the project 'Management and Destruction of Existing Ozone Depleting Substances Banks'[2], an estimate for the global ODS bank was attained based on the reported consumption data from parties that have ratified the Montreal Protocol. In contrast to existing data from the UNEP Technology and Economic Assessment Panel (TEAP, 2009), this data set is based on a country basis and thus provides additional insights.

1 'Management and destruction of existing ozone depleting substances banks' (GIZ, 2015).

2 This project is commissioned by the Federal Ministry of Environment, Nature Conservation, Building and Nuclear Safety (BMUB) as part of its International Climate Initiative (IKI) and is being implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.

Figure 1: Decreasing global ODS bank and increasing HFC bank.

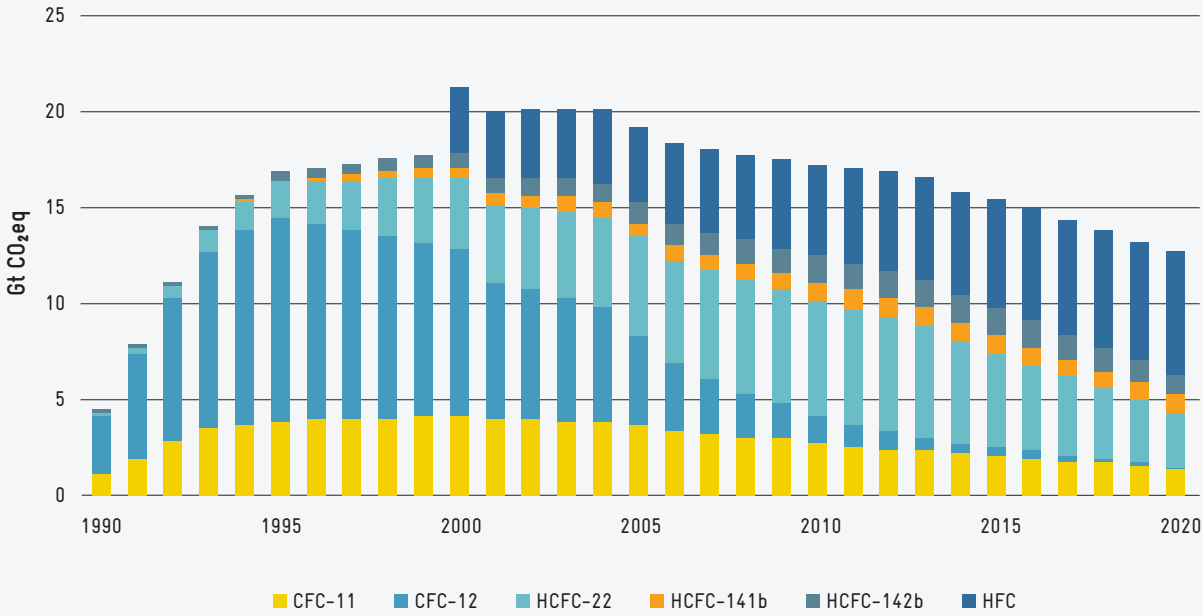


Figure 1 shows the current and future development of the global ODS bank. The current ODS bank corresponds to 9.2 Gt CO_2eq (year 2016).

The figure also shows a declining trend in the global ODS bank. This trend is caused by 1) the reduced consumption of ODS and 2) the emission of ODS from the bank into the atmosphere. The emission of ODS from the existing bank is the key aspect addressed in this roadmap. The trend emphasises the urgent need for action to avoid emissions now.

In addition to ODS, Figure 1 shows the increasing size of the hydrofluorocarbon (HFC) bank, which is a closely related issue as HFCs have largely replaced ODS. HFCs have no ozone depleting potential (ODP), but do significantly contribute to global warming due to their global warming potential (GWP).

Currently, a large part of the bank is not properly recovered but rather vented into the atmosphere. When ODS are released into the atmosphere, they cannot be recovered. In other words: **once the ODS bank has disappeared it will be too late for taking management measures**. The negative effects of emitted ODS from the bank on the ozone layer and the climate cannot be reversed.

The annual emissions from the global ODS bank amount to 1.5 Gt CO_2eq (Figure 2).

These emissions equal the annual emissions from 441 coal power plants[3] (see Figure 3).

3 Assuming a coal power plant emitting ca 3.4 Mt CO_2eq per year. http://www.epa.gov/energy/ghg-equivalencies-calculator-calculations-and-references#coalplant, last access November 2016.

Figure 2: Emissions from the global ODS bank.

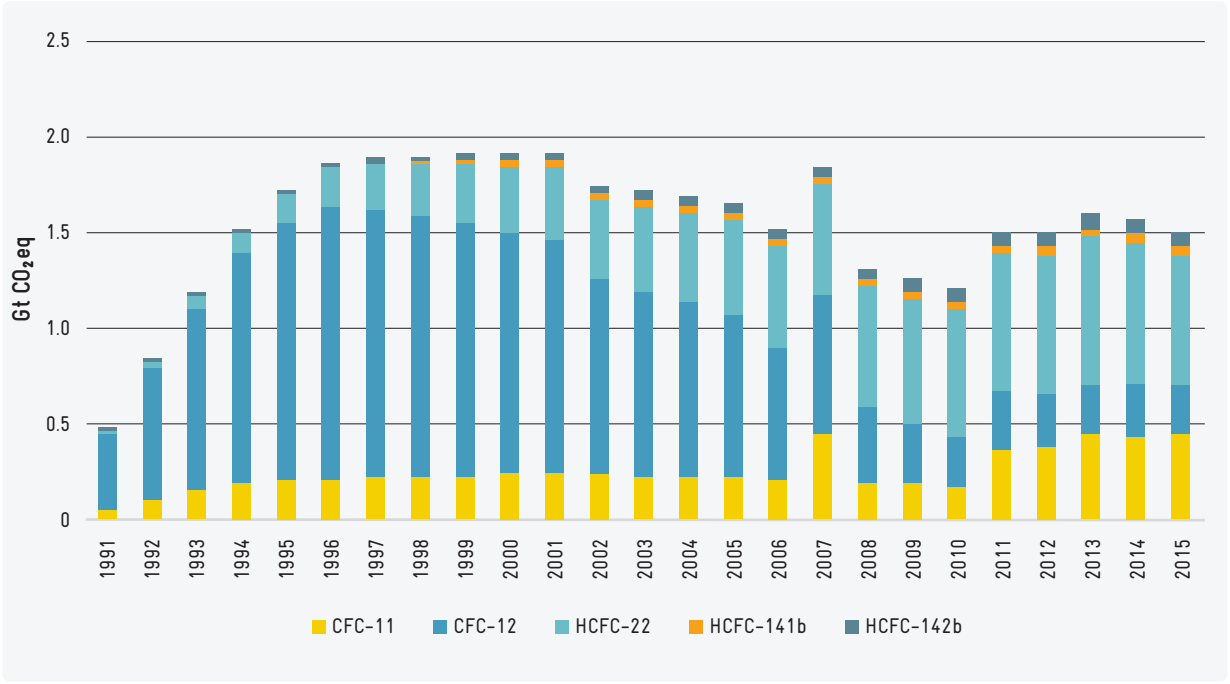


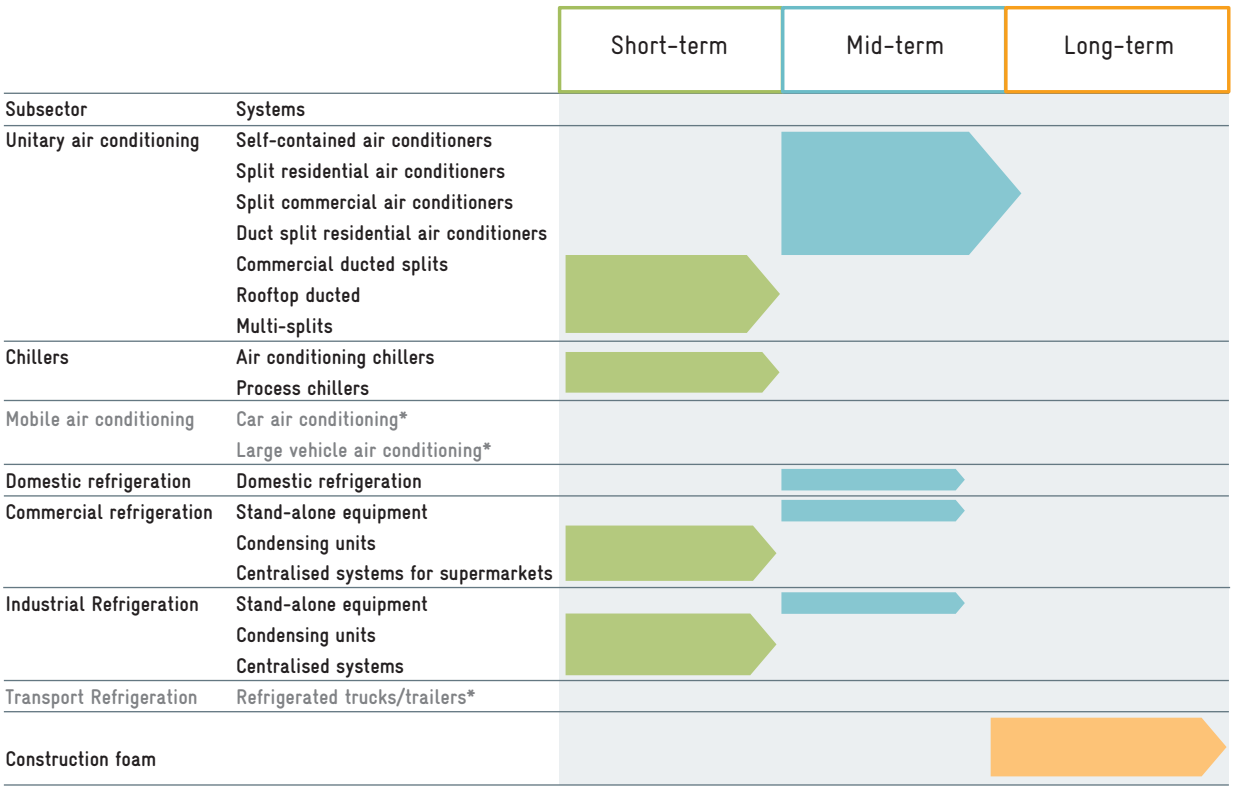
Figure 3: Annual emissions from the global ODS bank are equal to the annual emissions from 441 coal power plants.

1.3 Priorities for ODS bank management

As neither the Montreal Protocol nor any other international environmental convention regulates the management and destruction of existing ODS banks, it is each country's own responsibility to establish a successful ODS bank management scheme to handle this important source of emissions.

In an ODS bank management scheme, the priorities set depend greatly on technical feasibility. Technical feasibility is defined as the possibility to recover ODS at a reasonable level of effort and cost (ICF, 2010). TEAP (2009) assigned three categories of effort levels (low, medium, high) to the reachable bank in the refrigeration, air conditioning and foam (RAC&F) subsectors. Figure 4 shows the derived priorities: short-term actions (until 2020) should focus on large RAC systems, mid-term actions (until 2025) on the appliance sector and long-term actions on the ODS contained in construction foam (until 2030 – 2050 longer)[4]. The recovery of blowing agents from construction foam is a complex and expensive issue, but at the same time not urgent because of the slow release from the foam matrix. The short-term actions, i.e. the recovery of ODS from large RAC systems, are already being implemented by many countries and receive financial support from the Multilateral Fund for the Implementation of the Montreal Protocol (MLF). And several developing countries are also working on the recovery of ODS from RAC appliances (e.g. through replacement programmes).

Figure 4: Short-, mid- and long-term priorities for ODS bank management.



* The mobile AC and the transport refrigeration subsectors are meanwhile dominated by HFC, hardly any ODS banks will be found in these subsectors.

4 The time horizon is not given by TEAP.

2 Understanding the core processes of ODS bank management

The core processes (Figure 5, light red colouring) of ODS bank management will establish:

- a suitable set of policy measures (i. e. laws and regulations, but also fiscal and other non-regulatory measures);
- a sustainable financing mechanism;
- an effective collection mechanism;
- a functioning recycling and destruction infrastructure.

Generally, these processes are embedded in a larger framework or steering process such as the low emission development strategy (LEDS) or other national climate and energy plans. Important accompanying processes (support processes) include:

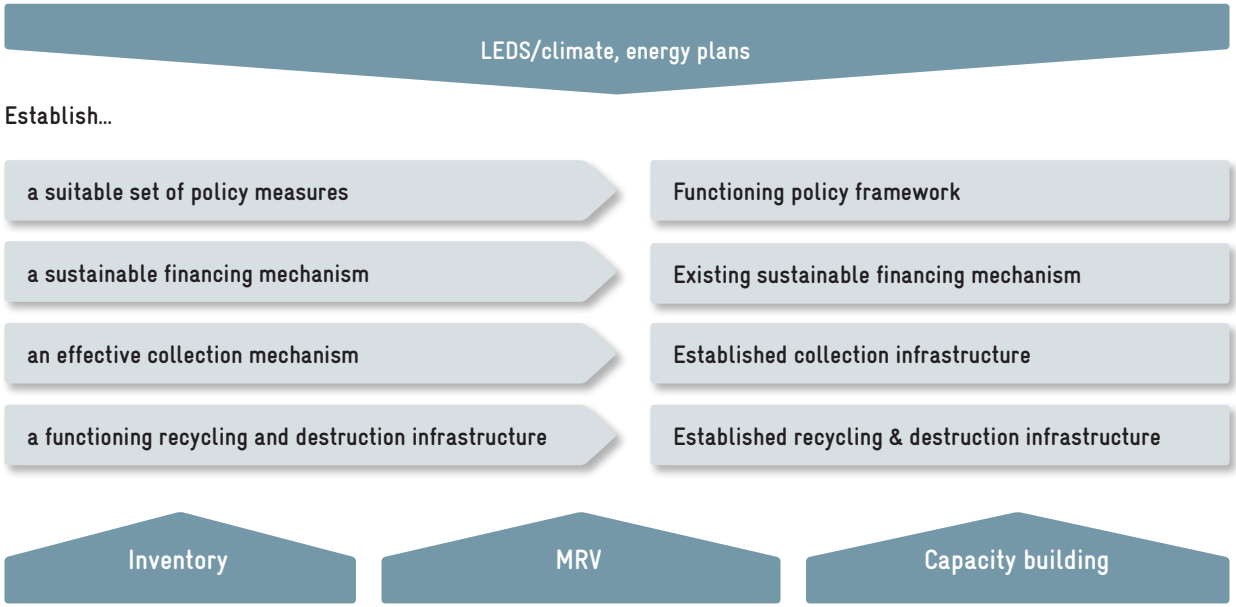
- the compilation of an ODS bank inventory;
- the establishment of a monitoring, reporting and verification (MRV) system;
- and capacity building (e.g. technician training to properly recover ODS from equipment).

Building a steering committee for ODS bank management with representatives from various working areas and ministries (ozone, climate, energy, waste etc.) is a key success factor for this cross-cutting topic. The steering committee interprets the progress and results from the core processes and, if necessary, adapts these to ultimately reach the envisaged objectives.

2.1 Establish a suitable set of policy measures

The responsible ministries have different policy options for guiding ODS banks management to reach the required goal of reducing emissions, including regulatory, fiscal and non-regulatory measures. Policy options can be aimed at different RAC sectors, e.g. domestic refrigerators or refrigerant collection overall. For comprehensive ODS bank management, both ODS containing waste

Figure 5: Core processes for successful ODS banks management (light grey), as well as steering processes (dark grey, top) and support processes (dark grey, bottom).



electrical and electronic equipment (WEEE) and ODS themselves need to be considered. The European Union (EU) has established several regulations and directives addressing different aspects of ODS bank management. Key regulations include the Regulation (EC) 1005/2009 on substances that deplete the ozone layer ('ODS Regulation') and the Directive 2002/96/EC with its recast version 2012/19/EU on waste electrical and electronic equipment (WEEE) (see Figure 6). The WEEE Directive is embedded in the 2008 Waste Framework Directive (2008/98/EC) which sets the overarching legislative framework. It defines the main concepts such as the 'polluter pays principle' and the 'waste hierarchy'.

Figure 6: Key EU regulations that address the management of ODS.

Ideally, ODS management will be part of a waste management system with overarching policies and regulations on specific waste streams that have already been installed. Waste streams relate to the management of specific waste, such as metals, plastics, or electronic equipment. The general framework deals with topics such as definitions of terms, waste stream categories, responsibilities of different stakeholders as well as requirements regarding waste management plans, collection and treatment. There may be separate regulations on treatment options, such as incineration and landfilling, and the respective standards and licensing procedures to be followed by their operators. The waste framework may also deal with waste prevention.

Factors for successful policy measures to prevent emissions from ODS banks include:

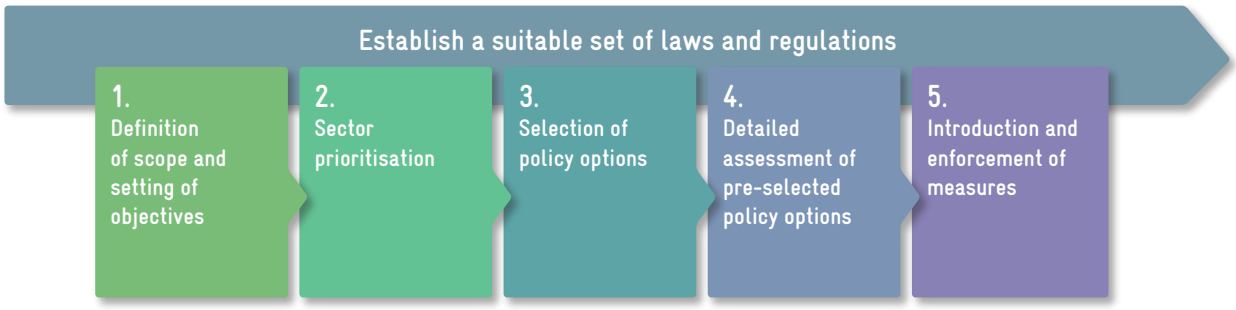
- taking **enforcement and financing of policy measures** into consideration already in the planning stage;
- **integrating the policy measures into an existing environmental policy framework** and taking cross-cutting topics (e.g. waste management) into consideration;
- making extended producer responsibility (EPR) schemes an widely applied solution in this context to avoid shifting all the financial burden associated with ODS collection and destruction to the end-user, technicians or the informal sector.

To establish a suitable set of policy measures, the following steps should be followed:

STEP 1

Definition of scope and setting of objectives

A thorough analysis of existing policies and activities regarding ODS is the basis for choosing the set of policy options to be introduced. In addition, the main objective of ODS bank management can vary from country to country with a stronger focus on either the reduction of the existing bank, the prevention of the accumulation of additional amounts, the treatment or destruction of collected ODS, or the reduction of emissions through leakage during servicing and decommissioning of appliances. The chosen objective depends on the country's situation and priorities. However,



comprehensive ODS bank management will aim to combine several or all of these objectives. The selection of certain objectives may require specific policy measures.

It is also important to look at all stakeholders and institutions in the field, including the intervention areas given by the HCFC phase-out management plans (HPMP).

STEP 2

Sector prioritisation

When **prioritising the sectors**[5] to focus on, it is important to identify the available ODS amounts, to analyse the respective reduction potential and to determine the technical feasibility for ODS recovery. The highest reduction potential will occur where large amounts of substances with high ODP can be recovered with low effort. This is often the case for large systems in urban areas as opposed to small systems in remote areas. Also, this approach implies focusing on the remaining CFC bank rather than the HCFC bank. Indeed, the remaining CFC bank that can be recovered at reasonable costs might be low. However, the environmental impact is exceptionally high when reducing CFC.

5 For the definition of (sub)sectors in refrigeration and air conditioning, please see the see the 'Guideline to conduct an ODS bank inventory' (GIZ, 2017d).

STEP 3

Selection of policy options

Important policy measures to prevent the accumulation of and emissions from ODS banks can be divided into regulatory, fiscal and non-regulatory approaches. **Regulatory** measures include ODS or F-gas regulation, monitoring, venting bans, refrigerant or product bans, or phase-down and phase-out as well as EPR schemes. **Fiscal** measures include, for example, GWP-weighted taxes on refrigerants, rebate systems, and financial incentives for end-users. **Non-regulatory** measures include information campaigns, voluntary industry agreements, training and certification schemes as well as technical standards.

> A detailed list of measures with their description and examples can be found in the 'Guideline on policy measures for the management and destruction of ozone depleting substances' (GIZ, 2017b)

Besides managing ODS banks, several policy options that are discussed in this guideline can be extended to include HFCs as well. The Kigali Amendment of the Montreal Protocol of 2016 provides for a mandatory phase-down of HFCs

under the Montreal Protocol and will contribute to reducing future GHG emissions[6].

In order to select suitable measures and to ensure the policy framework is designed in a way that reaches the targets, the following questions can be used to provide guidance:

- Which sectors will be affected?
- Will impacts be short, medium or long-term?
- Which stakeholders will be affected (will they be able to comply and will they be reached by regulatory measures)?
- Which financing mechanisms are possible?
- How much time will the implementation need?
- Which policies could support their introduction?
- Is enforcement considered and is it realistic?

STEP 4

Detailed assessment of pre-selected policy options

In the next step, the **pre-selected policy measures need to be assessed according to the costs for all involved stakeholders, their benefits in terms of emission saving potential**, as well as other positive or negative effects that may be associated with their introduction. While ranking the policy options according to costs and benefits, weighting factors might be considered if some aspects seem more important than others.

It is important to analyse all potential benefits, including environmental, economic and social.

Examples of benefits

- Environmental benefits: reduction of greenhouse gas emissions and the reduction of hazardous waste with the associated health risks.
- Economic benefits: taxes will result in revenues for the government; the promotion of new alternative technology in the RAC sector can have a positive impact on the market in certain sectors.
- Social benefits: additional jobs in research and development, as well as in other areas.

The **enforcement strategy** should be discussed during the design of any new policy measure. A lack of enforcement results in an uneven and unfair playing field in the market, allowing free riders to continue to avoid taking responsibility. In addition, without enforcement policy instruments will have no effect. Key aspects of an enforcement strategy include the analysis of implementation modalities and the reasons for non-compliance that need to be addressed.

Examples of enforcement measures include regular controls, reporting, monitoring of implementation and fines. Besides on-site visits, the establishment of a monitoring scheme is essential.

> More information on monitoring and the responsibility of stakeholders can be found in the 'Guideline to establish a collection system for equipment containing ODS' (GIZ, 2017e)

The illegal import of equipment containing ODS or the venting of large amounts of refrigerants from industrial equipment should be heavily fined.

Apart from the enforcement strategy, the venting of small ODS amounts from appliances can be prevented through effective information, infrastructure supporting collection activities, and training and financial incentives. Heavy fining of the infor-

6 The Kigali Amendment did not come into force yet and needs ratification by the Parties to the Montreal Protocol to become effective.

mal sector or conducting small workshops is not adequate and will not result in change as monitoring the results is not possible.

Finally, the consequences of non-compliance must also be designed and made known to the target groups.

2.2 Establish a sustainable financing mechanism

2.2.1 Sustainable financing mechanisms

ODS bank management needs to be based on a sustainable financing mechanism. Financing is not only necessary for the destruction of ODS but also for other activities such as the infrastructure for and operation of a collection scheme, including transport of ODS and equipment containing ODS. In this context, the appliance market (e.g. refrigerators) and the non-appliances market where refrigerants will be recovered on site (e.g. air conditioning chillers and centralised systems in supermarkets) must be considered separately[7].

The steps to establish a sustainable financing mechanism are closely linked to the establishment of a collection scheme and a regulatory framework. These processes should therefore be addressed in an integrated approach. The following section describes various mechanisms that can be implemented.

Extended Producer Responsibility (EPR) schemes for RAC appliances

In terms of the appliance market, in particular RAC equipment containing ODS, the most promising sustainable financing option is EPR as it requires manufacturers to bear the financial and organisational responsibility for their products throughout their life cycle. EPR is defined as 'an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle', i.e. after decommissioning (OECD Guidance, 2001). For detailed guidance on how to establish EPR schemes, please see OECD (2016).

EPR schemes increase collection and recycling rates of the products and shift financial responsibility from municipalities to producers, who then have the responsibility for handling all waste components of the product. Producers often commission waste management operators, or producer responsibility organisations (PROs), with logistics and treatment of the decommissioned equipment. EPR supports the country's collection system by providing a continuous flow of material for the recycling industry. In addition, EPR encourages producers to switch to natural refrigerants as this leads to lower recycling costs – it therefore gives manufacturers an incentive to produce environmentally friendly products without ODS or other hazardous components.

EPR schemes are usually a mix of instruments from four intervention areas (OECD, 2014):

- product take-back requirements,
- economic and market-based instruments,
- regulations and performance standards, and
- accompanying information-based instruments.

A good example for established EPR schemes can be found in regulations of the EU[8].

7 According to this distinction, appliances are portable electronic devices which enter the waste stream after decommissioning, still containing ODS.

8 Directive 2012/19/EU on waste electrical and electronic equipment (WEEE). http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32012L0019, last access November 2016.

Large RAC systems

In contrast to appliances, large RAC systems are assembled on-site. Here, the owner of the RAC system is financially responsible for proper servicing and waste management including ODS treatment after decommissioning, which includes the containing (hazardous) components. The end-user will have to pay service technicians and waste managers to fulfil this task. To avoid the uncontrolled release of ODS after decommissioning, a comprehensive regulatory framework and enforcement scheme including regular controls is needed (see GIZ, 2017b).

Import tax or levy[9] (part of economic and market-based instruments of EPR schemes)

EPR schemes generally include importers of EEE. If RAC equipment is entirely imported, a tax could be imposed on imported EEE. Ideally, the funds from this tax should be administered by an independent third party.

Alternatively, a tax can be directly applied on refrigerants based on their GWP. These taxes are also called incentive-taxes.[10] The revenues could be used for financing ODS bank management.

Advanced disposal fee[9] (part of economic and market-based instruments of EPR schemes)

Fees can be imposed for purchases of appliances containing ODS (and HFC) to fund the cost of collection, transport and proper waste management and destruction. In Austria and Switzerland these systems have been successfully implemented, and are similar to systems in China and Costa Rica. A country's government can imposed effective fees, but also voluntary programmes by the industry offer an alternative. However, the latter have often been problematic and did not achieve the envisaged goals (Nicol & Thompson, 2007). Voluntary programmes are most promising when an industry sector is aware that in the absence of these programmes, policymakers would introduce legally binding measures. Also, valuable lessons can be garnered from such pilot programmes for future, more robust and sustainable obligatory measures, i.e. the introduction of laws.

In this case, the costs are paid by the consumers and not the general tax-payers.

Use of carbon dioxide allowance auction revenues

Each country (or region) can introduce a carbon compliance market (e.g. EU Emission Trading System[11]). If such a cap and trade mechanism is in place, a certain percentage of the revenues earned can be used for various mitigation actions, amongst others ODS bank management (see the German programme IKI, mentioned below).

Voluntary carbon market

Another potential financing mechanisms for ODS bank management and destruction is a voluntary carbon market. For a critical discussion on this topic, please see GIZ (2015).

2.2.2 Support through industrialised country's contributions to climate financing and ozone layer protection

There are various options to receive financial support for ODS bank management by industrialised country's contributions to climate financing and ozone layer protection. This support can kick-start the process for ODS bank management. However, sustainable financing concepts should be established (see chapter 2.2.1) for long-term financing.

9 A tax or fee can be charged by government institutions or PROs and non-profit entities (required by law). Alternatively, producers can establish voluntary systems.

10 http://www.oecd.org/env/tools-evaluation/48164926.pdf, last access November 2016.

11 http://ec.europa.eu/clima/policies/ets/index_en.htm, last access November 2016.

The Multilateral Fund of the Montreal Protocol (MLF)[12]

The MLF has funded a total of 15 projects, including two regional and one global project[13]. In an accompanying decision of the MOP 28[14], the MLF has been requested to "consider funding the cost-effective management of stockpiles of used or unwanted controlled substances, including destruction". The Executive Committee (ExCom) of the MLF has also been requested to finalise funding guidelines by the end of 2018 at the latest, including cost-effective management of ODS banks.

Climate programmes

Many developed countries run climate financing programmes, supporting developing and newly industrialised countries with the implementation of their low emission development strategy.

Germany, for example, launched the **International Climate Initiative (IKI)**[15] of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), which has been financing climate projects around the world. In the programme's beginning, the financial resources came from the proceeds of auctioning allowances under the emissions trading scheme. Later, further financial resources were made available by the funds through the Special Energy and Climate Fund, both part of the Ministry's regular budget.

The IKI also supports ODS bank management. The project 'Management and destruction of ODS banks' is funded by the BMUB within this framework.

The Green Climate Fund (GCF)[16]

The Fund is a unique global initiative to fight climate change. Financial support is provided for a very broad spectrum in the field of low-emission and climate-resilient development; funding needs to be linked to mitigation or adaptation. So far, there are no examples for GCF financing of ODS bank management. However, it should be considered an option when closely linked to the national mitigation actions.

Global Environment Facility (GEF)[17]

The Global Environment Facility (GEF) is an operational financial mechanism for several multilateral environmental agreements. GEF is not designated as a financial mechanism for the Montreal Protocol; however, financing activities to reduce ozone layer depletion have always been one of the focal areas ('ozone and climate'). Supported activities need to be consistent with the objectives of the Montreal Protocol but may not already be covered by the MLF in order to avoid double financing.

GEF also approved many projects focusing on improving energy efficiency. In particular, the 'new for old programmes' in the RAC sector are suitable approaches in this respect, because these programmes increase the penetration of energy efficient appliances while simultaneously addressing proper waste management, including ODS such as CFC-11 (blowing agent in foam) and CFC-12 (refrigerant) from old refrigerators.

12 http://www.multilateralfund.org/default.aspx, last access November 2016.

13 Supported countries include Algeria, China, Colombia, Cuba, Georgia, Ghana, Lebanon, Mexico, Nigeria, Turkey, the Central Africa region, Europe and the Central Asia region. Preparation of projects took between 18 and 24 months. In most cases government institutions have contributed additional funding. All projects were focused on demonstration or tests without long-term strategies. The projects were approved in 2010/11, and an evaluation in 2015 indicated that all projects were more or less ongoing. Please see also UNEP (2015).

14 http://conf.montreal-protocol.org/meeting/mop/mop-28/final-report/SitePages/Home.aspx, last access November 2016.

15 https://www.international-climate-initiative.com, last access November 2016.

16 http://www.greenclimate.fund, last access November 2016.

17 http://www.thegef.org, last access November 2016.

As GEF is the entity responsible for the operational financial mechanism of the Stockholm Convention on Persistent Organic Pollutants, it can support various activities such as transport, collection and temporary storage. There is significant potential for synergies when including ODS in strategic planning.

World Bank[18]

The World Bank also assists countries in phasing out ODS. For ODS bank management, funding opportunities outside the World Bank's Multilateral Fund and GEF portfolios need to be considered. One option are donor trust funds that involve financial and administrative arrangements with external donors for grant funding. Donor countries could agree with the involved stakeholders on the earmarking of ODS bank management. The World Bank could also actively mobilise donor resources for this purpose, or it could integrate ODS bank management into the clients' poverty reduction strategies.

2.3 Establish an effective collection mechanism

To establish an effective collection mechanism, the following steps should be followed:

> Several examples for formulating regulations to address important aspects of a collection scheme can be found in the 'Guideline to establish a collection system for equipment containing ODS' (GIZ, 2017e)

STEP 1

Assess existing policy framework

At this stage, an assessment of the existing policy framework should have taken place. This involves analysing whether a WEEE regulation is in place and addressing all relevant issues of the collection scheme. Important issues that require specifications can be found in the EU Directive 2012/19/EC[19].

18 http://www.worldbank.org, last access November 2016.

19 http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:197:0038:0071:en:PDF, last access November 2016.

STEP 2

Establish steering structure and set-up stakeholder process

The establishment of an appropriate steering structure and a participatory stakeholder process are further key success factors. Usually, government entities coordinate the development of collection systems for equipment containing ODS and establish the strategic orientation and binding timelines for their implementation. The key steps are:

- establish an appropriate steering structure, including the nomination of a leading government entity;
- establish a technical advisory group;
- establish additional inter-ministerial cooperation for consideration of cross-sectoral issues;
- conduct a comprehensive stakeholder analysis identifying the role of all relevant players involved in the product lifetime of equipment containing ODS, including the informal sector;
- create thematic technical working groups and establish a transparent stakeholder process with feedback and participation of all identified relevant stakeholders.

STEP 3

Set time frame and draft a sector plan

In order to set a time frame and draft a sector plan, it is essential to have a good understanding of the sector, its industries, adequate technology to handle ODS waste, current emissions, waste streams, and the current and future regulatory framework. A sector study should be commissioned addressing these points and providing recommendations for a sector agreement. The findings from the study should enable the **preparation of a comprehensive sector plan**, which serves as an agreement for the implementation of the collection systems. Equally important are the recommendations from the stakeholder process from the previous step.

The final version of the sector plan should be discussed and agreed upon with all relevant stakeholders and published for public consultation. The sector plan must also contain a realistic and binding timeframe. It may take several years from the moment a WEEE regulation has entered into force until the implementation of the collection systems.

STEP 4

Start capacity building and outreach activities

Environmental awareness campaigns and training programmes are crucial for the successful implementation of a collection scheme. Outreach activities are specifically important for

- service technicians;
- personnel dealing with equipment containing ODS when it becomes waste;
- ministerial departments or third parties who are responsible for monitoring the flow of e-waste, including equipment containing ODS.

STEP 5

Create additional incentives

Financial incentives may increase the probability for recovered ODS to be returned. A distinction can be made between direct and indirect incentives[20].

20 For more examples, please see the 'Guideline to establish a collection system for equipment containing ODS' (GIZ, 2017e).

STEP 6

Incorporate the informal sector

Another success factor is to incorporate the informal waste sector, because around 90 % of the WEEE containing ODS in developing and emerging countries is processed by the informal sector. Policymakers need to create alternative employment opportunities and social frameworks for those whose subsistence is based on this sector. This includes basic training and certification schemes, which allow low-educated people to work in a formal manner and thus to benefit from social insurances. Also the collaboration between the formal and the informal sector is possible, where the formal sector accepts collected equipment from the informal sector. In return the formal sector is engaged in training measures and awareness raising for scrap collectors but also offering contracts as required.

STEP 7

Endorse sector plan and monitor results

The final step is to endorse the sector plan and to monitor the results.

2.4 Establish a functioning recycling and destruction infrastructure

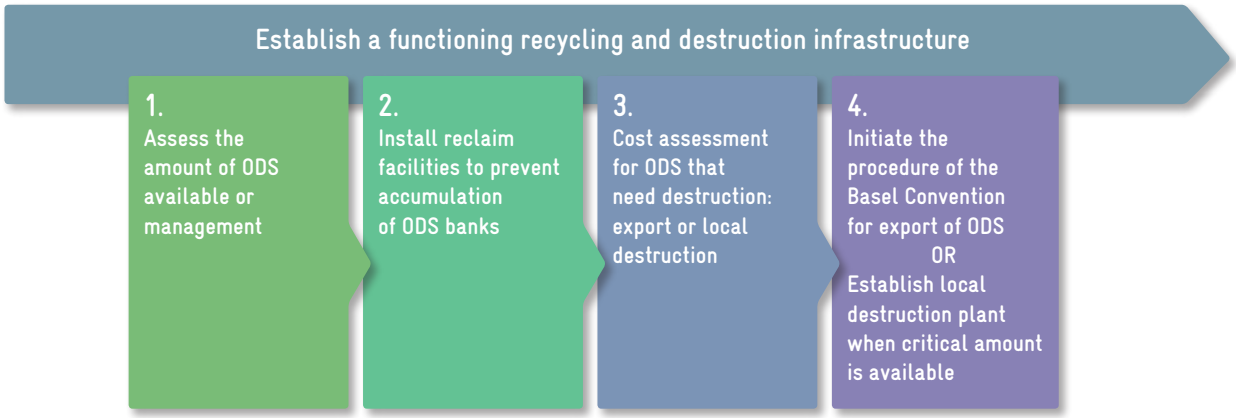
To establish a functioning recycling and destruction infrastructure, the following steps should be followed:

STEP 1

Assess the amount of ODS available for management

By preventing ODS from being vented, emissions are avoided. Other intervention areas include either re-use of the substances or final destruction. Before establishing a recycling and destruction infrastructure, the amount of ODS available for management needs to be assessed.

> To quantify the available amount of ODS for management, please see 'Guideline to conduct an ODS bank inventory' (GIZ, 2017d)



The following parameters are of key importance for decision-making in this respect:

- reachable ODS bank (amount of ODS in the country, apart from landfills)[21];
- amount of ODS potentially available for management: remaining charge of RAC equipment at decommissioning;
- amount of ODS effectively available for management: amount captured by the collection scheme (determined by recovery rates and effectiveness of the collection scheme).

STEP 2

Install reclaim facilities to prevent accumulation of ODS banks

In ODS bank management, re-use of ODS should be the priority. Re-use reduces the need for virgin refrigerant, reduces emissions and saves money for end-users.

To understand re-use, it is important to differentiate between the following terms:

- recovery: removing refrigerant in any condition from a system and storing in an external container.
- recycling: reduction of contamination in used refrigerant with the aim of subsequent reutilising the refrigerant. Recycling is a fairly simple process that should be applied by end-users, i.e. operators, of RAC systems with significant refrigerant charges. However, recycled refrigerants should only be refilled in systems from which the refrigerants were recovered to avoid the danger of refilling refrigerants that are not suitable.
- reclamation: processing recovered refrigerant to new product specifications (see AHRI standard 700 and 740) and verifying that new product specifications are met by analysing the refrigerant. This is required when refrigerants have been extracted from different systems.

Sufficient recovery, recycling and reclamation facilities should be available in the country. These facilities can be acquired within the framework of the HPMPs. Technicians and operators often lack the financial resources for these investments. Policy makers could support the distribution of the recovery, recycling and reclamation facilities with appropriate incentives, e.g. tax incentives.

Reclamation facilities separate oil, acid, moisture and hard particle contaminants through special methods to pump the refrigerants (liquid or vapour) into a separation chamber. These units generally have average capacities of around 2.5 kg/min, with investment costs of approximately 10,000 US dollars. Reclamation units can process HCFC-22, but also HFC such as HFC-134a and blends (e.g. R404A and R410A). Recovered chlorofluorocarbons (CFC) must not be recycled.

STEP 3

Cost assessment for ODS that require destruction: export or local destruction

Exporting ODS for destruction to another country can be financially attractive in cases where there are no local destruction facilities and the amount of ODS effectively available for management is relatively small. To decide whether to export or destroy ODS locally, the costs detailed in Table 1 must be assessed.

21 Reachable ODS bank is the 'total amount of substances contained in existing equipment, chemical stockpiles, foams, and other products not yet released to the atmosphere' (IPCC/TEAP, 2005), however, excluding ODS contained in landfilled products (TEAP, 2006).

Export requires relatively little investment and the fixed costs have a low share of total costs. The variable costs have a higher share and depend on the amount and type of ODS. Contrarily, local destruction usually requires high investment, which is independent of the amount and the share of variable costs is comparably lower. The investment costs can only be offset if large amounts of ODS waste are continuously available for destruction over the coming years. This not only requires knowledge about the potentially available amount of ODS waste, e.g. by means of an inventory, but also a functioning collection system.

> For further guidance, please see 'Guideline to conduct an ODS bank inventory' (GIZ, 2017d) and 'Guideline to establish a collection system for equipment containing ODS' (GIZ, 2017e)

Based on experience and available price information, the export of ODS is estimated to be the best choice when less than 10 tonnes of ODS are effectively available for management on a regular basis.

Export costs can be reduced if transport costs are low, for example if the destruction can be conducted in a neighbouring country and the transport can be conducted via road (special legislation for the transport of dangerous goods might apply). Shipping costs do not only depend on distance. Loading and handling fees might be high compared to the costs per kilometre and more common routes might be cheaper. It is important to note that not every country allows the import of hazardous waste, not even if this is destined for destruction only.

Export of foam is not financially viable for treatment abroad because of the high volume, so that the blowing agent has to be extracted locally before export can be considered (see Box 1).

Figure 7 shows the comparison between costs for local destruction and export costs for destruction depending on the available ODS amount. The parameters listed in Table 1 have to be adjusted for individual calculations so that deviations from this estimate are possible.

Table 1: Comparison of cost parameters for export and local destruction

	EXPORT FOR DESTRUCTION	LOCAL DESTRUCTION
Fixed – independent of amount	administration	investment
	organisation	
Stepwise increase with amount of ODS	cylinders	
	transport	
Variable – depends on amount of ODS	destruction costs	destruction costs (operation, personnel, administration, monitoring and reporting, compliance with local environmental standards)
	VAT	

Figure 7: Comparison of destruction costs (US dollars/kg), depending on the available ODS amount for export and local destruction.

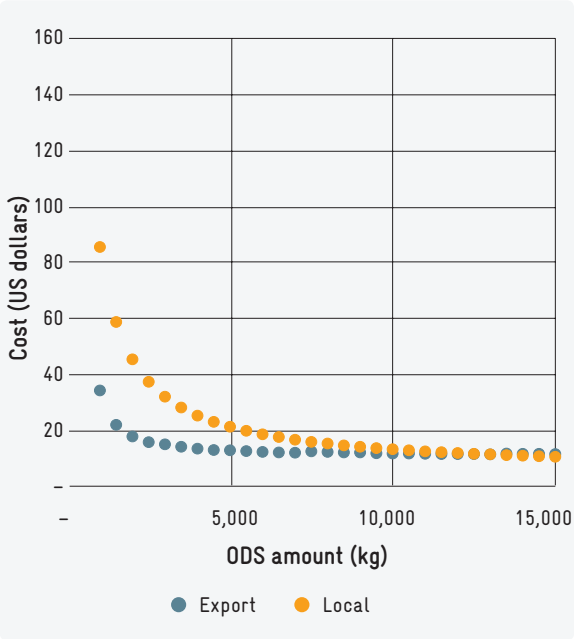


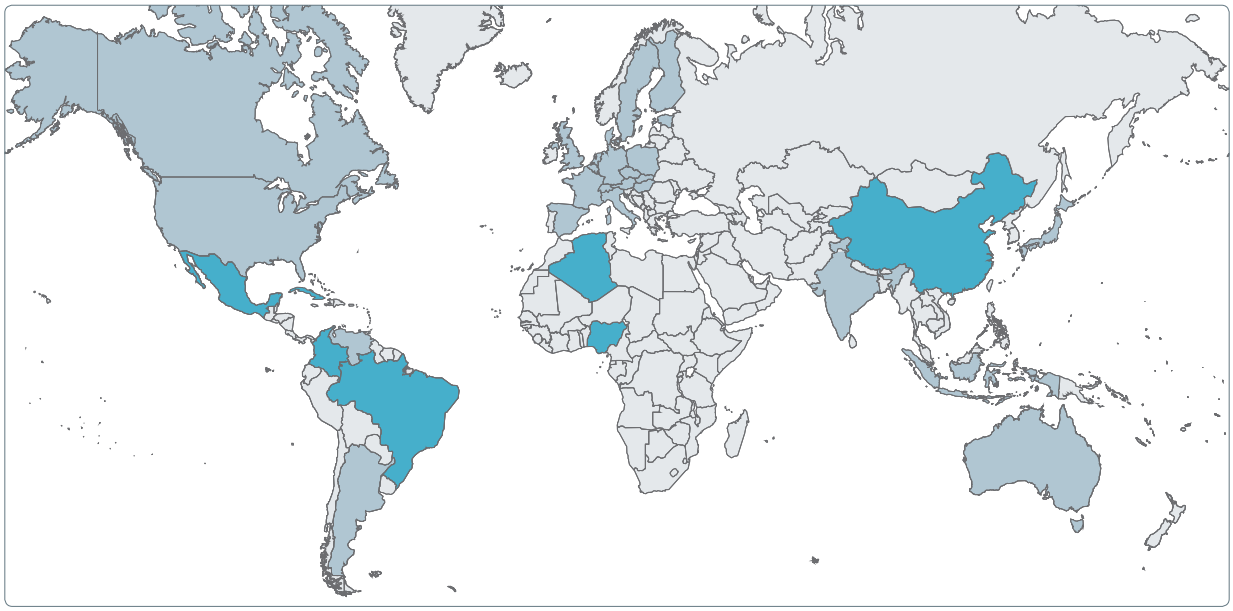
Figure 8 shows the countries where destruction facilities are available[22].

STEP 4

Initiate the procedure of the Basel Convention for export of ODS

The transport of ODS is subject to the 'Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal'. The export must follow a certain procedure. More information can be found in the 'Guideline for the Transboundary Movement of ODS' (GIZ, 2017a) and on the Basel Convention website[23].

Figure 8: Countries with destruction facilities. The blue colouring (■) shows the countries which received financial support by the Multilateral Fund for local ODS destruction demonstration projects.



22 Data sources: ICF (2008), UNEP (2015) and personal communication with national ozone officers.

23 http://www.basel.int, last access November 2016.

For further guidance on the export of ODS under the Basel Convention, please see 'Guideline for the Transboundary Movement of ODS' (GIZ, 2017a)

STEP 5

Establish local destruction plant when critical amount is available

If a larger amount of ODS is available in the country, a local destruction facility may be the more cost-effective solution. In this case, no extensive export procedure administration is needed. Another advantage is that other substances, such as spent oil containing polychlorinated biphenyls (PCB) can also be incinerated in the same kind of facility. In addition, ODS do not have to be stored until a sufficient amount has been collected for export (with possibly high leakage rates), but rather can be destroyed whenever it is recovered.

For further information, please see the 'Guideline on the Manual Dismantling of Refrigerators and Air Conditioners' (GIZ, 2017c)

If local destruction is chosen, an appropriate TEAP approved technology should be selected (GIZ, 2015). First research should be conducted to determine if there are existing facilities such as cement or rotary kilns that can be converted to destroy ODS. Conversions can be less expensive than new plants.

TEAP provides a list with suitable technologies for (H)CFC destruction (TEAP, 2002). For this assessment, criteria for the technical performance are considered: most important are the destruction

BOX 1

Stage II plants to process the blowing agent

Insulation foam in refrigerators often contains **critical blowing agents:** Old units reaching the waste stream still contain CFCs, younger units hydrochlorofluorocarbons (HCFC) or cyclopentane. The blowing agent content of old refrigerators is often higher than the amount of refrigerant per unit, representing a high emission reduction potential. However, retrieving blowing agents is more complicated and expensive than recovering refrigerant if no direct incineration of the foam is possible: the foam has to be ground into very fine particles in an environment placed under pressure. The blowing agent then has to be liquefied and filled in cylinders or collected on an activated carbon filter for final disposal.

In countries with a large number of refrigerators reaching the waste stream and the potential for high financial investment, so-called stage II or stage III plants are common. In a stage II facility, the refrigerant is recovered (stage I) and then the foam is treated. In a stage III plant, the refrigerant and the blowing agent are destroyed in the facility straight away. A smaller stage III plant is likely a more suitable and cost-effective investment if there is no local destruction facility comparable to a stage II plant.

A less expensive and more practical solution is a small shredder that can be operated with little training and at low cost. The process air must pass an activated carbon filter to recover the blowing agent for later disposal. The activated carbon can be exported for disposal or the blowing agent can be desorbed at a disposal facility and the carbon can be re-used. When flammable cyclopentane is processed at the same time, additional safety features are applied during processing, storage and transport of the activated carbon.

BOX 2

Popular destruction techniques in developing countries: rotary kilns, cement kilns and plasma technology

Rotary Kiln Incineration
The advantage of this technology is that both gas and foam can be treated. Temperatures are around 1,200° C with peak values of 1,400° C, and the gas residence time exceeds two seconds. Gases are injected into the feeding line of the main burner while foams are added together with the solid waste via the feeding chute.

Cement Kiln
Cement kilns appear to be the most suitable and easily available thermal destruction technology in developing countries. Clinker production requires temperatures of 1,400 – 1,600° C, and the residence time is around ten seconds. ODS is injected into the primary fuel to pass the hot flame of the burner, but can also be mixed with the primary air.

The main advantage of cement kilns is the direct neutralisation of the resulting acids, HCl and HF. The second burner could theoretically be used to destroy polyurethane (PUR) foams, however this procedure still must be explored.

Plasma technology appears attractive because these units are built as small compacts systems. However, a big disadvantage are the high costs of plasma processes, including operational electricity costs. In addition, the infrastructure requirements impede their implementation in developing countries.

efficiency (DE) and the destruction and removal efficiency (DRE). The DRE is more comprehensive and must show a value of 99.99 % for concentrated sources such as refrigerants and 95 % for non-concentrated sources such as foams. Furthermore, there are air emission standards to limit the emissions of certain products and by-products, such as hydrogen chloride (HCl), hydrogen fluoride (HF), or dioxins (see also the Directive 2000/76/EC). The destruction of (H)CFC requires high temperatures above 1000° C. Local legislation regarding air and water quality needs to be consulted. The legally binding threshold values must be observed by the local facility and other national environmental requirements must be complied with for operation of the facility.

TEAP accepted destruction processes must be demonstrated again in pilot plants with a minimum throughput of 1 kg/h. Incineration and plasma processes are recommended most frequently. The MLF decided in 2009 to provide financial support for demonstration projects in several Article 5-countries[24]. The countries decided to use cement kilns, rotary kilns, and arc plasma technology, and to export ODS for destruction. Destruction costs generally range from between 5 – 8 US dollars per kg.

Currently, the most popular destruction technologies are rotary kilns, cement kilns, and arc plasma technology (Box 2).

24 Article 5-countries (A5 countries) have a per capita production and consumption of ODS smaller than 0.3 kg.

3 Decision tree: ODS bank management from A to Z

Countries often lack information to take the right decisions concerning ODS bank management (informational barrier). While chapter 2 explained the core processes and key actions, this chapter describes a decision tree (Figure 9), providing a summary of the entire process.

Before taking decisions, all information on existing ODS bank management within a country should be collected. The template provided in Annex I, a country factsheet for 'Management and destruction of existing ozone depleting substance banks', can assist in systematic information collection. The factsheet covers the following topics:

- international conventions;
- ODS specific information;
- solid waste and e-waste;
- existing projects;
- stakeholder and relevant actors.

Specific questions are formulated for each topic in the factsheet (grey colour) to facilitate completion. The factsheet also requires information on the amount of recovered ODS awaiting destruction.

If there is no substantial amount of recovered ODS and uncertainty about the potential amount available in the country, an ODS bank inventory should be conducted first.

> For further guidance, please see 'Guideline to conduct an ODS bank inventory' (GIZ, 2017d)

If there is no substantial amount of recovered ODS, but still great potential[25], then a gap analysis is recommended. An appropriate template for this is provided in Annex II. The gap analysis will consider both the status quo (information from the factsheet) and key measures of the four core processes, introduced in the previous chapter. Thus, the gap analysis helps to identify weak and strong points of ODS bank management and should include an assessment of the robustness of the ODS bank estimates. If current ODS bank estimates do not exist or are based solely on consumption, a detailed ODS banks inventory should be established first. If a gap or weak point is identified, appropriate measures should be implemented.

> For further guidance on appropriate measures, please see:
> › 'Guideline on policy measures for the management and destruction of ozone depleting substances' (GIZ, 2017b)
> › 'Guideline to establish a collection system for equipment containing ODS' (GIZ, 2017e)

After a regulatory framework with a functional collection scheme that will result in ODS recovery and storage is in place, the remaining issue is final destruction. Please first consider applying a reclamation and recycling process (see chapter 2.4).

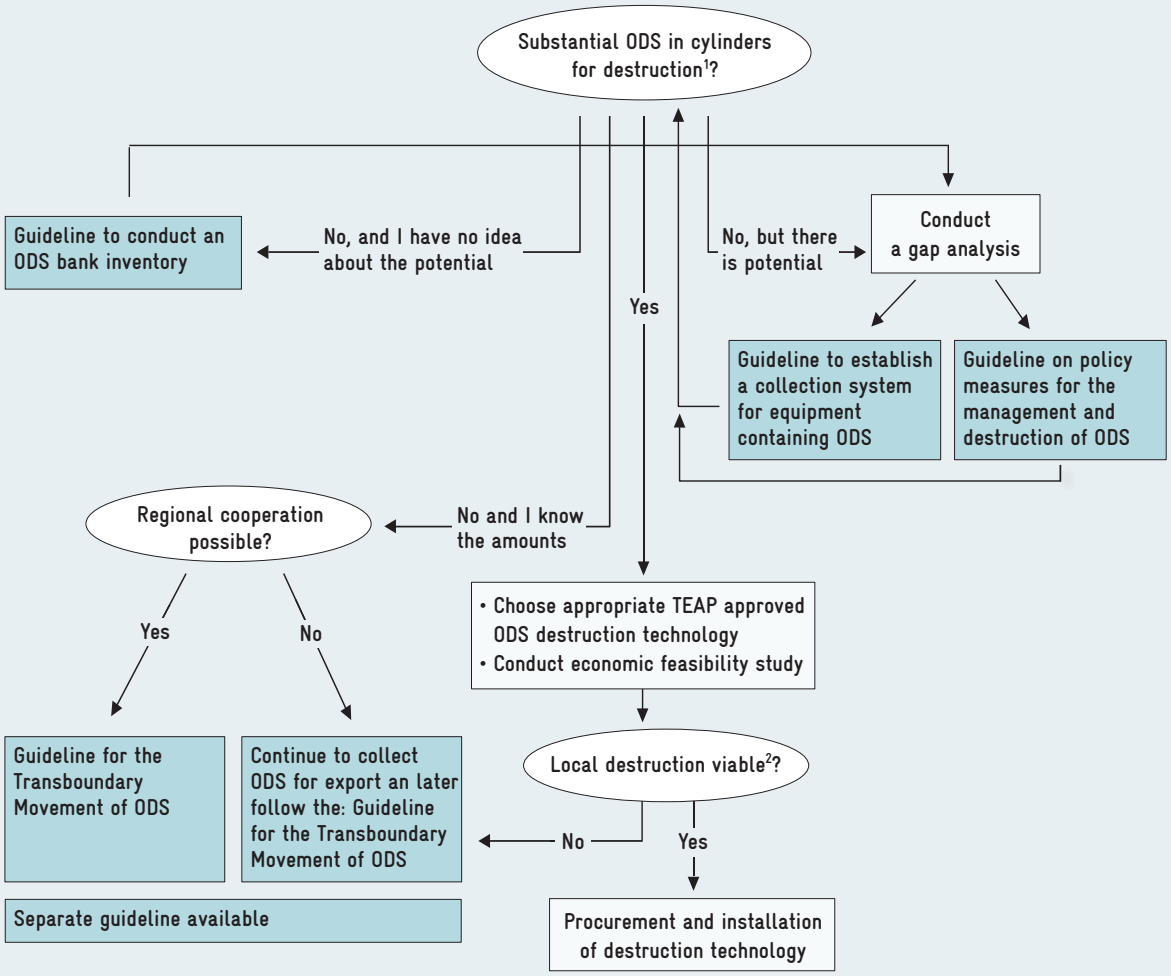
25 Sector experts and ozone officers are familiar with the situation in the country and can assess whether equipment based on CFC is still in the country. Another indicator is the current consumption of HCFC for refill of equipment.

If less than 10 tonnes of ODS are available per year for destruction, exploring possibilities for regional cooperation schemes to increase the available amounts is recommended. Either the collected ODS are exported to an adjacent country for local destruction, or the collected amounts from the cooperation are exported to a country with a TEAP-approved destruction plant. Both cases involve the transboundary movement of hazardous waste using the established procedures of the Basel Convention. Please note that countries sometimes formulate stricter national legislation and completely prohibit the import of hazardous wastes (according to Article 4 of the Basel Convention). Similar terms have been formulated in regional agreements, such as the Bamako Convention.

For further guidance on this topic, please see the 'Guideline for the Transboundary Movement of ODS' (GIZ, 2017a)

When more than 10 tonnes of ODS are available for destruction per year, the use of a local destruction plant should be considered (please see Box 2 for suitable destruction techniques). When the local destruction of ODS is viable (economic feasibility study is required), possibilities for funding should be assessed to initiate the procurement and installation of a destruction plant.

Figure 9: Decision tree for ODS bank management.



1 The availability of about 10 metric tonnes of ODS per year is a reasonable threshold
2 Cost > 11 – 12 US dollar/kg ODS appear as too expensive for local destruction for many countries

4 References

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GIZ 2017c. Guideline on the Manual Dismantling of Refrigerators and Air Conditioners. Eschborn, Germany.

GIZ 2017d. Guideline to conduct an ODS bank inventory. Eschborn, Germany.

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5 Annex I: Factsheet for the 'Management and destruction of existing ODS banks'

1. International conventions

BASEL CONVENTION	
Party to the Basel Convention	Please select yes or no from the dropdown list.
Definition of hazardous waste	• Please state your country's definition of hazardous waste. • Is ODS part of hazardous waste according to the country's definition?
Bilateral or regional agreements under the Basel Convention	• Are there any bilateral or regional agreements regarding the transport of hazardous waste that are registered at the Basel secretariat? • Are there any other bilateral or regional agreements not registered at the Basel Secretariat?
Import bans reported to the Basel Secretariat	If yes, please state since when you have prohibited the import of ODS and hazardous waste and the name of the regulation.
Focal point or competent authority	Please give the name and contact details of the national focal point and competent authority.
Regular transboundary movement (TBM) of other hazardous waste according to Basel?	Does your country regularly conduct transboundary movements of hazardous waste under the Basel Convention?
STOCKHOLM CONVENTION	
Party to the Stockholm Convention?	Please select yes or no from the dropdown list.
National focal point	Please give the name and contact details of the national focal point and official contact point.
Activities under Stockholm	Are there any planned or active collection programmes for persistent organic pollutants (POP)? Are there any planned or active destruction programmes for POP? If yes, please specify? Are there destruction facilities in the country? Who is involved? Are there regular imports or exports of POP?
UNFCCC	
Ratification of the Kyoto Protocol	Please select yes or no from the dropdown list.
Ratification of the Kyoto Protocol and Paris Agreement	Please select yes or no from the dropdown list.
Does the country have specific climate goals, e.g. within the (I) NDC?	Please include specific targets (emission reductions, year, targeted substances).

2. ODS and HFC specific information

ODS AMOUNTS	
Existing data about ODS banks	If ODS data is available, please specify: • According to which methodology was the data collected? • Who was responsible for data collection? • What are the results in metric tonnes (t), ODP-t and GWP-weighted t? • Please specify the substances. • How are these ODS stored (e.g. cylinders, equipment, other)? • Which sectors are these from? e.g. domestic refrigeration, commercial and industrial refrigeration, air-conditioning, foam, etc.
Existing ODS consumption and production (e.g. HPMP, other)	If you use ODS, please specify details as given in the HPMP: • Historical time series of HCFC consumption split into substances and sectors. • Historical time series for HCFC production, import and export split into substances (in t and ODP-t). • Reduction targets.
Existing HFC consumption and emission inventories	If an existing HFC inventory exists, please specify: • According to which methodology the data was collected and processed (e.g. Tier 1 and Tier 2, IPCC)? • Who was responsible for data collection? • Please provide the sector distribution or at least the most important sectors. • What are the results in t and GWP-weighted t? • Any HFC stored (e.g. cylinders, equipment, other) for destruction? If so, which sectors are these from, e.g. domestic refrigeration, commercial and industrial refrigeration, air-conditioning, foam, etc.)?
Prognosis of future ODS amounts and past substance replacements	• What are the growth rates in different refrigeration, air-conditioning and foam sectors (based on consumption, production or sales figures of equipment)? • When have ODS-free systems been introduced in the different sectors (RAC&F). Please indicate changes of refrigerant or blowing agent (e.g. HFC-134a and HCFC-141b instead of CFC-11 and CFC-12 for refrigerators. • When were HFC-free systems been introduced in the different sectors (RAC&F). Please indicate changes of refrigerant and blowing agent (e.g. R600a and pentane instead of HFC-134a and HCFC-141b for refrigerators). • Which companies have introduced these systems? What are their market shares?
NATIONAL LEGAL MANDATE	
Venting of ODS or HFC	Please list and specify existing or planned (please differentiate) national legal mandates which prohibit the venting of ODS or HFC.
Import and export of ODS or HFC (see also Basel)	Please list and specify existing or planned (please differentiate) national legal mandates which prohibit the import and export of ODS or HFC.
ODS or HFC management during the lifetime of equipment	• Please list and specify existing or planned (please differentiate) national legal mandates which regulate the management of ODS or HFC during the lifetime of equipment. • Can this only be carried out by certified personnel? • If so, please specify the certification.

ODS or HFC treatment at EOL of equipment	• Please list and specify existing or planned (please differentiate) national legal mandates which regulate the management of ODS or HFC at decommissioning of equipment. • Can this only be done by certified personnel? • If so, please specify the certification.
Recycling and destruction of ODS or HFC containing products	Please list and specify existing or planned (please differentiate) national legal mandates with regard to recycling, destruction of ODS or HFC, ODS or HFC containing products.
Technical industry standards regarding recycling and destruction of ODS or products containing ODS (also HFC)?	Are there any other technical industry standards regarding recycling and destruction of ODS or HFC containing products? If so, please list and specify in brackets which topic (e.g. installation, decommissioning, servicing, refrigerants).
ODS BANK MANAGEMENT ACTIVITIES	
Existing activities regarding the collection of ODS or HFC containing equipment	• Are there existing collection activities related to ODS or HFC and ODS or HFC-containing equipment? If so, please proved details (type of equipment, stakeholder, etc.). • Are specific sectors targeted (e.g. domestic refrigeration, industrial equipment, car air-conditioning or others?) • Systematic or one-off activities? • How is the programme funded? • Who is involved?
Existing activities regarding the recycling of equipment containing ODS or HFC	• Are there existing recycling activities related to ODS or HFC-containing equipment? If so, please proved details (type of equipment, stakeholder, etc.). • Are specific sectors targeted (e.g. domestic refrigeration, industrial equipment, car air-conditioning or others)? • Systematic or one-off activities? • How is the programme funded? • Who is involved?
Existing activities regarding the destruction of equipment containing ODS or HFC	• Are there existing activities regarding the destruction of ODS or HFC and ODS or HFC-containing equipment? If so, indicate whether ODS or HFC is exported or destroyed locally. • If ODS or HFC is destroyed locally, which destruction technology is used (e.g. arc plasma, cement kiln)? • What is the volume of destructed ODS or HFC? • Are specific sectors targeted (e.g. domestic refrigeration, industrial equipment, car air-conditioning or others)? • Systematic or one-off activities? • How is the programme funded?
Barriers regarding past, new and planned future ODS bank management activities	Please specify, if possible, the following barriers: • Informational (e.g. no ODS or HFC data); • Financial (e.g. no financial capacity for ODS or HFC destruction); • Technical (e.g. no technical solution or know-how for destruction); • Logistical (e.g. no transport or collection system); • Legal (e.g. no legal mandate for ODS or HFC management); • Other (e.g. public opposition due to air quality).

3. Solid waste and e-waste

WASTE GENERAL	
Competent authorities	Please list and give contact details.
Informal sector involvement	Please describe the involvement of the informal sector in waste management.
Legislation, regulation, standards – in force	Please list all legislation, regulation and standards with date of entry into force.
Legislation, regulation, standards – planned	Please list all legislation, regulation and standards that are planned but not yet in force (with date).
State of enforcement (responsibilities, control)	Please describe which agency is responsible for enforcing waste regulation. Please describe instruments that are used for enforcement and control of waste regulation.
Financing of waste management	Please describe how waste management is financed.
Installed waste management infrastructure	Please describe the installed infrastructure regarding (process and involved parties): • transport; • collection; • incinerators; • landfills; • recycling.
Existing cement kilns	Are there any cement kilns in the country? • Where are they situated? Who is the operator (contact details)? • What is their capacity? • Are they already used for the co-destruction of waste? If yes, which waste?
Associations regarding waste	Are there any national or international associations in the waste sector? Please give contact details.
E-WASTE AND EPR SCHEMES	
Existing regulation and legislation dealing with e-waste	Please list relevant regulation and legislation with date of entry into force.
Planned regulation and legislation dealing with e-waste	Please list relevant regulation and legislation that are planned but not yet in force (with date).
Activities under EPR schemes	• Does the scheme apply to all e-waste? If not, which e-waste is affected? • Who organises the EPR scheme? Government agency, industry, other? • How does the mechanism work? • How is it financed? • What is the state of enforcement? • Is the EPR scheme integrated into the national waste management scheme? • Is the informal sector involved in collection, recycling, and dismantling activities?
Association dealing with e-waste	Are there any national or international associations dealing with e-waste? Please give contact details.

4. Existing projects

SUBJECT	PROJECTS	RESPONSIBLE ORGANISATION	CONTACT PERSON (Name, address)
EPR	e.g. white goods.	e.g. GEF, implementing agency, national project.	
(E-)waste	e.g. establishing collection system, incineration, infrastructure.	e.g. GIZ, NGOs.	
ODS substitution	Current and future activities e.g. technician training, conversion of production lines.	e.g. HPMP and implementing agencies (e.g. GIZ, UNIDO, etc.).	
ODS collection	e.g. Establishing infrastructure (collection points), purchase of cylinders.	e.g. MLF and corresponding implementing agency; GEF; national government (EPR scheme or other).	
ODS recycling			
ODS destruction	e.g. export for destruction, destruction in dedicated or converted facilities.	e.g. MLF and corresponding implementing agency; GEF.	
Other			

5. Stakeholder and relevant actors

CATEGORY	CONTACT DETAILS (contact person, address, e-mail, phone number)	FUNCTION AND RESPONSIBILITY
Government, policy making		e.g. ministries, governmental agencies, etc.
Enforcement of laws		
Focal points or national contact points etc.		e.g. NOU, Basel Convention, UNFCCC.
Associations and networks for (e-)waste		e.g. SWEEP, ISWA, national waste associations).
Refrigeration, air conditioning and foam association		
Industry		companies involved in waste management, EPR schemes, cement kiln operators, incinerator operators, etc.
International implementing agencies		Active in the country regarding HPMPs, waste projects, etc. e.g. UNIDO, UNEP, GIZ.
Informal sector		Organisational structures?
Non-governmental organisations (NGO)		Active in waste management, ODS related issues, climate topics etc.

6 Annex II: Gap analysis template

6.1 Functioning policy framework

MILESTONE Colour shading indicates progress and implementation status in the country[26]	CURRENT STATE	FURTHER ACTIVITIES NEEDED
ODS or HFC venting prohibited		
Regulation of ODS or HFC management during the lifetime of equipment (proper servicing without leakage)		
Mandatory certification of technicians		
Development of technical standards: • best servicing, operation and installation practices • introduction of sealed system design characteristics • containment and reduction of ODS emissions from existing equipment and decommissioned equipment		
Monitoring scheme of recovered ODS: • consumer (commercial and industrial end-user) • technicians (servicing, decommissioning) • recycling, reclaiming, destruction		
WEEE regulation with take-back obligations of ODS or HFC containing equipment and EPR schemes		
Assess implementation of further policy measures: • information campaign • GWP-weighted taxes on refrigerants • rebate system refrigerants • incentives for end-users • voluntary industry agreement		
Enforcement of existing regulation		

26 The colour shading needs to be adopted by each country; the given colouring is only an example.

6.2 Existing sustainable financing mechanism

MILESTONE Colour shading indicates progress and implementation status in the country	CURRENT STATE	FURTHER ACTIVITIES NEEDED
Sustainable financing mechanisms are established for the RAC sectors: • EPR scheme is established for the appliance sector or end-user of large systems are obliged to pay for the recovery and management of ODS • import tax or levy is introduced • advanced disposal fee in place • carbon dioxide allowance auction revenues are used for financing		
International, multilateral or national climate financing programmes are used for ODS bank management: • MLF • national climate programmes such as the IKI • GCF • GEF • World Bank		
Elimination of electricity incentives for end-users		
Voluntary carbon market		

6.3 Established collection infrastructure

MILESTONE Colour shading indicates progress and implementation status in the country	CURRENT STATE	FURTHER ACTIVITIES NEEDED
A sufficient infrastructure for the collection of recovered ODS is in place with sufficient financial support from the MLF		
Appropriate policy framework is in place, requiring collection and financing mechanisms of WEEE containing ODS → for more details see also 'Functioning policy framework'		
An appropriate steering structure is in place (for WEEE appliance sector) including a leading government entity, a technical advisory group together with a well-defined stakeholder process		
Existing sector study and sector plan, considering for example: • available waste stream (inventory) • infrastructure and technology for ODS management • economic feasibility • responsibilities of reverse logistic systems • co-benefits (for WEEE appliance sector)		
Installing collection points for recovered ODS (part of sector plan) (non-appliance sector)		
Capacity building and awareness raising for technicians and end-users dealing with RAC equipment containing ODS, but also for ministerial departments and third parties with responsibility for monitoring the flow of WEEE: • seminar, training, workshop • helpdesk • seminars • news, radio, TV • brochures and flyers • etc.		
Indirect or direct incentives are in place to increase the recovery of ODS and collection rates of WEEE containing ODS		
Initiatives for the transition from informal to formal waste management (e.g. WEEE manager and scrap collectors), including RAC technicians		
If a sector plan is established, endorsement and monitoring are taking place		
Monitoring of ODS or HFC substances flow (appliance and non-appliance sector)		

6.4 Established recycling and destruction infrastructure

MILESTONE Colour shading indicates progress and implementation status in the country	CURRENT STATE	FURTHER ACTIVITIES NEEDED
Assessment of ODS amount available for management (inventory)		
Installation of sufficient recovery and reclaim facilities		
Cost assessment for ODS that need destruction: comparing export and local destruction costs • Relationship between available amounts and costs • Include destruction facilities in adjacent countries for the export option		
Assess local destruction options when sufficient ODS is available • dedicated destruction facility, rotary kiln, cement kiln, municipal waste incineration etc. • national legislation on air pollution control		
Assess local policy regarding export when small quantities of ODS are available • member of Basel Convention? • contact local focal point of Basel Convention • check local definition of hazardous waste • Import or export bans of hazardous waste		
Assess financing options for most cost effective and sustainable solution → see sustainable financing mechanism		
Implement facility or initiate export		

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