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EXECUTIVE COMMITTEE OF
THE MULTILATERAL FUND FOR THE
IMPLEMENTATION OF THE MONTREAL PROTOCOL
Forty-eighth Meeting
Montreal, 3-7 April 2006

REPORT OF THE MEETING OF EXPERTS TO ASSESS THE EXTENT OF CURRENT AND FUTURE REQUIREMENTS FOR THE COLLECTION AND DISPOSITION OF NON-REUSABLE AND UNWANTED ODS IN ARTICLE 5 COUNTRIES
(FOLLOW UP TO DECISION 47/52)

1. The 47th Meeting of the Executive Committee discussed the issue of unwanted, recoverable, reclaimable, non-reusable and virgin Ozone Depleting Substances (ODS) in countries operating under paragraph 1 of Article 5 of the Montreal Protocol as part of its consideration of terms of reference, budget and modalities for a subsequent study on the collection, recovery, recycling, reclamation, transportation and destruction of unwanted ODS. In concluding the discussion the Executive Committee adopted decision 47/52, which requested the Fund Secretariat to hold a meeting of experts that would assess the extent of current and future requirements for the collection and disposition (emissions, export, reclamation and destruction) of non-reusable and unwanted ODS in Article 5 countries.

2. The Executive Committee also agreed that as many data as possible were to be collected and elaborated on regarding unwanted, recoverable, reclaimable, non-reusable and virgin ODS in Article 5 countries, and that the results were to be disseminated to participants in the meeting of experts. Part of that process was that Implementing Agencies, Executive Committee members and National Ozone Units were asked to provide data and related information to the Secretariat by 15 February 2006, that would constitute an initial sample reflecting the situation in both Article 5 and non-Article 5 countries. Consultants were to be recruited to collect and elaborate as many data as possible on unwanted, recoverable, reclaimable, non-reusable and virgin ODS in Article 5 countries for dissemination to participants in the meeting. The Executive Committee also requested that for this purpose, a standardized format for reporting should be developed. A decision was also taken by the Parties at their 17th Meeting (decision XVII/18) requesting TEAP to submit to the Fund Secretariat any available data to enable the Secretariat to undertake the work pursuant to decision 47/52.

3. The Secretariat undertook the necessary measures as requested, hired consultants, issued a questionnaire to all members of the Executive Committee, to Implementing Agencies and, through the UNEP CAP team, to all Article 5 countries and organised the expert meeting.

4. The expert meeting took place from 13 – 15 March 2006 in Montreal. It was attended by experts, members of the Executive Committee, representatives of implementing and bilateral agencies and the Multilateral Fund Secretariat. The expert team consisted of four consultants hired by the Secretariat and eight experts, of which three were from Article-5 countries. All experts nominated by the Executive Committee members had been invited to the meeting, although some could not attend. Seven members and co-opted members of the Executive Committee from Article-5 countries and eight from non-Article 5 countries also attended. During the expert meeting, views on the data presented, assumptions and conclusions were exchanged. A draft report was produced by the experts present, and discussed by all at the meeting resulting in some suggested changes approved by all those attending. The report was finalised subsequent to the meeting, in agreement with all experts before being forwarded to the 48th Meeting of the Executive Committee.

5. The report including the annexes is attached to this document, and can provide a basis for further consideration of terms of reference, budget and modalities for a study regarding collection, recovery, recycling, reclamation, transportation and destruction of unwanted ozone-depleting substances, as a follow-up to decision 46/36.

RECOMMENDATION

6. The Executive Committee may wish to note the report and discuss the terms of reference for a study regarding collection, recovery, recycling, reclamation, transportation and destruction of unwanted ODS (follow-up to decisions 46/36 and 47/52) in light of the conclusions presented in the experts' report annexed to this document.

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REPORT ON

Expert Meeting

To Assess the Extent of Current and Future Requirements for the

Collection and Disposition (Emissions, Export, Reclamation and Destruction) of

Non-Reusable and Unwanted ODS in Article 5 Countries

Held in Montreal, 13 – 15 March 2006

20 March 2006

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1. INTRODUCTION

The 47th Meeting of the Executive Committee discussed the issue of unwanted, recoverable, reclaimable, non-reusable and virgin Ozone Depleting Substances (ODS) in countries operating under paragraph 1 of Article 5 of the Montreal Protocol. As a conclusion to the discussion the Executive Committee adopted decision 47/52, which requested the Fund Secretariat to hold a meeting of experts that would assess the extent of current and future requirements for the collection and disposition (emissions, export, reclamation and destruction) of non-reusable and unwanted ODS in Article 5 countries.

In addition, the Executive Committee decided that as many data as possible was to be collected and elaborated on regarding unwanted, recoverable, reclaimable, non-reusable and virgin ODS in Article 5 countries, and that the results were to be disseminated to participants in the meeting of experts. Part of that process was that Implementing Agencies, Executive Committee members and National Ozone Units were asked to provide data and related information to the Secretariat by 15 February 2006, to constitute an initial sample reflecting the situation in both Article 5 and non-Article 5 countries.

The Executive Committee initiated the work described above as part of its deliberations on the terms of reference for a study on the collection, recovery, recycling, reclamation, transportation and destruction of ODS. The purpose of the expert meeting and the associated data collection and elaboration was described as having consideration of the extent of quantities of non-reusable and unwanted ODS before considering such terms of reference.

The expert meeting took place from 13 – 15 March 2006 in Montreal, attended by experts, members of the Executive Committee, implementing and bilateral agencies and the Multilateral Fund Secretariat. The expert team consisted of four consultants hired by the Secretariat and eight more experts, of which three were from Article-5 countries. All experts nominated by the Executive Committee members had been invited to the meeting, although some could not attend. Also attending were seven members and co-pt members of the Executive Committee from Article-5 countries and eight from non-Article 5 countries, as well as six representatives of Implementing Agencies and nine staff members and consultants from the Multilateral Fund Secretariat. During the expert meeting, views on the data presented, assumptions and conclusions were exchanged, and a final report was produced by the experts present. This report was discussed by the Expert Meeting, and is forwarded to the 48th Meeting of the Executive Committee.

The report focuses on CFCs, halons and CTC as the three ODS which are likely to have the highest impact on the current and future requirements for the collection and disposition of ODS. After discussing a number of essential definitions, the report describes two types of data, collected data as well as data resulting from modelling for CFCs, halon and CTC. It further elaborates on the impact of non-reusable ODS on the ozone layer and issues relating to the trans-boundary transport of hazardous waste under the Basel Convention, which is relevant for ODS as well. Finally, the report includes chapters on further information needs and also presents conclusions.

2. DEFINITIONS

2.1. Methodology and definitions needed

In order to provide estimates or data regarding the extent of current and future requirements for the collection and disposition (emissions, export, reclamation and destruction) of non-reusable and unwanted ODS[1] in Article 5 countries, a number of definitions have to be provided to ensure mutual understanding.

2.2. Timing of emissions

Ozone Depleting Substances are separated into several groups. The most prevalent Substances are CFCs (Annex), halons, CTC, TCA, and Methyl Bromide. These substances are used in a number of different sectors.

For the purpose of this report, it is meaningful to distinguish between sectors and uses where the substances are stored for a long time after the initial use in the application, and those where such time is only short. One could define the time between mandatory reporting of consumption under the Montreal Protocol, i.e. one year, as the dividing line.

Table 1: Several ODS, their applications and time lag between use and emission

Substance	Application	Time to emission after initial use
CFC	Aerosol propellant	Weeks to month after filling into cans
	Blowing agent	Decades after foaming
	Refrigerant	Years to decades after charging
	Solvent	Seconds to minutes after use
halon	Fire suppressant	Years to decades after installation
CTC / TCA	Solvent	In most uses seconds to hours after use
	Feed stock	Transformed, not applicable
	Process agent	Theoretically no emission
MeBr	Fumigant	Hours after release

2.3. Virgin, recoverable, reclaimable, non-reusable ODS

Virgin ODS are defined as newly produced ODS that satisfy certain specifications of a maximum percentage of impurities, non-condensables etc. Recovered ODS that have been reclaimed could technically also be considered as virgin ODS if they satisfy these specifications. Nevertheless, under the provisions of the Montreal Protocol, reclaimed ODS is defined as used ODS. It is therefore not recorded as consumption.

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[1] For the purposes of this report, the term ODS excludes HCFCs and methyl bromide.

In addition, all substances are stored between production and use. These virgin Ozone Depleting Substances are contributing to the consumption to be reported under the Montreal Protocol. Once registered as consumption, and being by definition of virgin quality, these ODS could typically be expected to be used.[2] One can safely predict that these virgin quantities will be predominantly absorbed by the market. Therefore, they probably do not contribute significantly to the quantities of unwanted ODS, and thus this report will not focus on the particular topic of virgin ODS.

A special case is Carbon Tetrachloride (CTC). Contrary to the other ODS, which are products intentionally manufactured in quantities believed to be marketable, CTC is also a by-product of the production of certain fluorochemicals, in particular HCFC-22 and PTFE. As a result, CTC could be available well beyond market demand, potentially generating the storage of virgin CTC.

To recover ODS means to isolate or remove the substance, independent of its condition, from an installation, appliance, equipment or product, often by placing it in an external container. For foam, the term ‘recovery’ can be applied at two levels: the first involves the recovery of the foam itself from a building or appliance and the second involves the separation of the blowing agent from the foam matrix itself. Currently, the principle purpose of recovery in the refrigeration and halon sectors is to extend the useful life of the ODS, and thereby to decrease the dependency on newly-produced ODS. As demand reduces, recovery will be increasingly used to make the ODS or product containing the ODS available for destruction.

Any ODS is recoverable as long as its location can be identified and it can be extracted. Recovered ODS may be contaminated to such a degree that it cannot be reused. Contaminants may be from a variety of sources, such as other ODS, water, oil, etc

To recycle ODS means to re-use recovered ODS which have been cleaned by applying various, relatively simple, separation methods to remove a large portion of the contaminant from the ODS. This could be, in case of ODS refrigerants, by using oil separation methods followed by passing through filter dryers which reduce moisture, acidity and particles. Restrictions can be placed on the re-use of recovered ODS where their quality has not been proven by analysis.

To reclaim ODS means to reprocess recovered ODS to meet internationally recognised product specifications as proven by chemical analysis. Reclamation goes beyond the cleaning process used when seeking to recycle recovered ODS and removes virtually all contaminants such as water, chloride, acidity, high boiling residue, particles and solids, non-condensables and other impurities.

Non-reusable ODS are those that cannot be reused, recycled or reclaimed owing to excessive contamination and/or a lack of capacity for recycling or reclamation within the local or national environment. Levels of non-reusable ODS are influenced by local or national technical capabilities and the purity requirements pertaining during the period in question. Since these requirements can change with time, the extent to which ODS are non-reusable may in principle

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[2] There are certain rare exceptions, e.g. a case where cans with MeBr were stamped with a “use before” date, i.e. the ODS, although virgin, appears unusable and is therefore unwanted.

also change with time; since these changes are rare as well as unpredictable, for the purpose of this report, they are not taken into account. Non-reusable refers therefore to the conditions as they were known or presumed at the time of writing of this report.

Surplus ODS are ODS that are reusable but cannot be used in equipment or in products due to local, national or international regulations, practices or market conditions which force discontinuation of use. The term “surplus ODS” is location and time dependent. It is possible that surplus of one substance exists in some locations while in other locations there may be demand for the same substance.

Unwanted ODS include those which fall either into the categories non-reusable (possibly specifically at local or national level) or surplus. Both of these categories have time and location dependency. It will be a subjective judgement and so is not used as an objective term in the report.

For the purposes of this report, the term disposal means land-filling or other waste management processes that do not involve the recovery or ultimate destruction of the ODS.

2.4. Banks

Banks consist of all ODS which have been manufactured and have not been emitted or destroyed. They can be stored in containers, equipment, products or waste streams. It is therefore possible to sub-classify banked materials in a number of ways

- banks of virgin and reclaimed ODS stored in containers (bulk and small quantities) (“virgin ODS bank”);
- banks of ODS stored in equipment or products (“in-product bank”); and
- banks of recovered ODS stored in containers (“recovered ODS bank”).

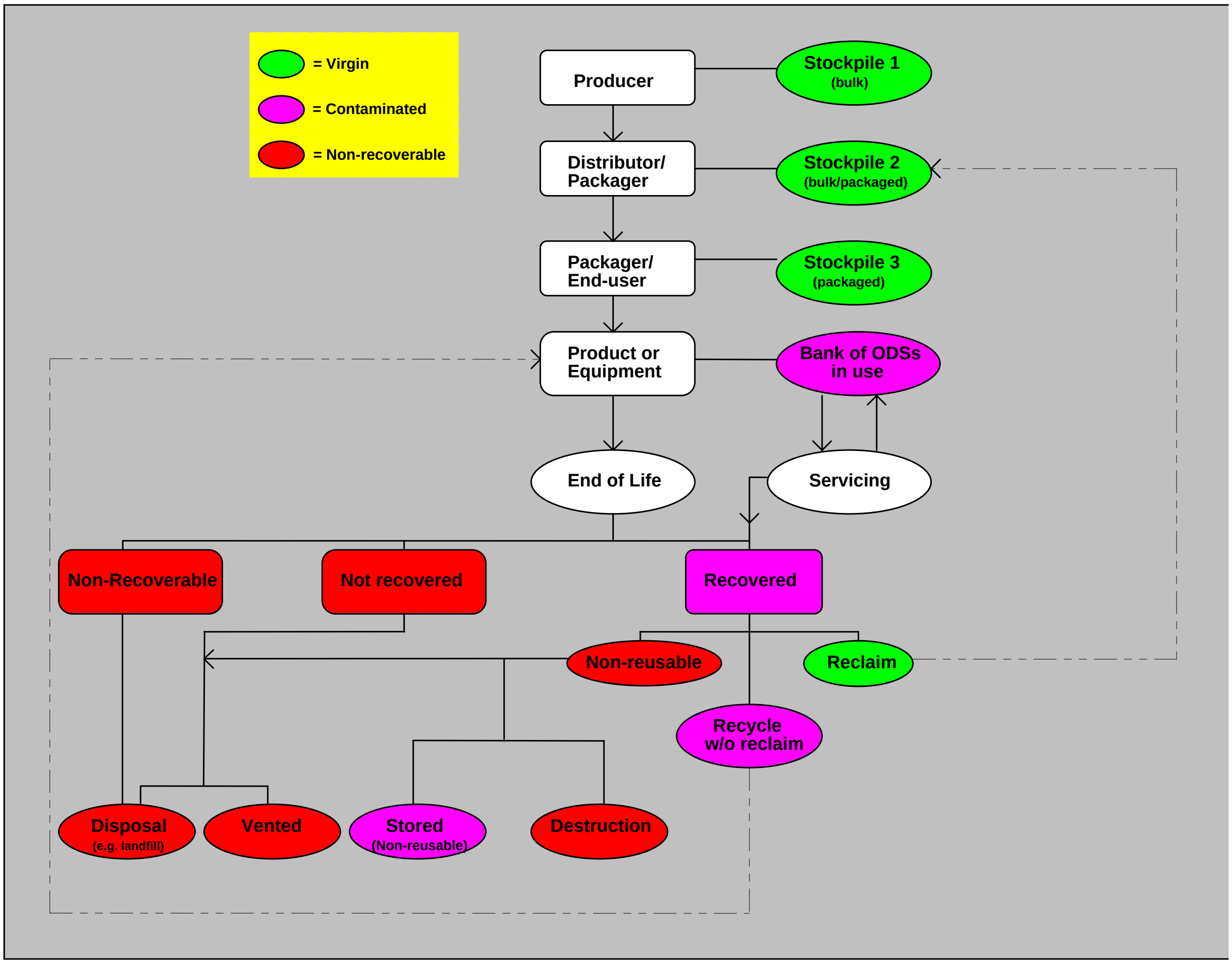
Further subdivisions are possible by storage, and, in order to allow for the determination of the size of these banks and their assessment, by use (refrigeration, foam, fire suppressant) as well as location (e.g. local, national, regional, global).

Stockpiles are a specific sub-set of banks which are intermediate stores of material with the intent of future action.

In-product banks and recovered ODS banks can consist of concentrated ODS (typical for use as refrigerants or halons) or of diluted ODS (typical for use as foam blowing agent). In the case of diluted ODS a further separation process is often necessary, which might require considerable efforts unless the ODS can be destroyed in-situ.

The following schematic in Figure 1 provides an overview on how the different banks are linked.

Figure 1: Flow diagram for ODS



Virgin ODS is transferred from stockpile 1 to stockpile 2 and stockpile 3. These three stockpiles form the virgin ODS bank. The virgin ODS are used, during manufacture or, where relevant, service, and becomes part of the in-product bank. In case of end-of-life or, where relevant, service, the ODS might be recovered and becomes part of the “recovered ODS bank”. The in-product bank experiences continuous losses due to emissions during the normal life-time, while in service, and when the equipment reaches the end of its life. If the ODS are being recovered, the emissions per unit of equipment will be small at the end of life, although some are normally unavoidable. If the ODS are not recovered, the emissions will, over a period of time, be the entire ODS content of a unit of equipment.

For all sectors some emission will occur at every stage of the flow diagram, particularly where handling or external processing is involved. However, these emissions are not specifically identified.

2.5. Accessibility

Particularly in the case of in-product banks, ODS are likely to be widely distributed in relatively small quantities, thus collection and accumulation requires significant efforts. Since the processes of collection, accumulation and separation may lead to significant efforts, these need to be weighed against the benefits (environmental and economic) achievable through the recovery of the banks.

Whilst there was no data available which would allow quantifying the effort to collect diluted ODS, one can safely assume the following trends:

- less specific effort is required per unit of recovery for installations containing larger quantities;
- less specific effort is required for ODS which are geographically more concentrated;
- less specific effort is required for non-diluted ODS than for diluted ODS;

These assumptions, if applied to the different use sectors, lead to the following grouping for the three main sectors of ODS use where ODS are stored in in-product banks:

Table 2: Effort required to collect diluted CFCs and halons

Effort required	Low specific effort	Medium specific effort	High specific effort
CFC in refrigeration applications	X	X	
CFC in foams		X	X
Halons in fire fighting equipment	X	X	

The terms low specific effort, medium specific effort and high specific effort will be used in this report to provide an indication of the accessibility of ODS in in-product banks for the purpose of recovery.

3. DATA

3.1. Data needs and assumptions

The main sectors where ODS are likely to be prevalent in in-product banks and in recovered ODS banks are the foam, fire-fighting and refrigeration sector. Consequently, data regarding the related substances and their use in the sectors was desired. These substances are in particular

- CFC-11 and CFC-12 in the refrigeration sector;
- CFC-11 in the foam sector; and
- Halon 1211, 1301 and 2402 in the in the fire extinguishing sector.

A number of detailed investigations have been performed in the past regarding in-product banks. Detailed bottom-up investigations were performed in the refrigeration and, to a slightly lesser degree of detail, the foam sector. The data regarding the halon sector has been usually determined through a top-down approach, supported by limited bottom-up information.

The quantity of ODS in the different banks can only be estimated. No direct data is available on the size of the different banks, in particular also because the quantities are fluctuating. Certain framework data is available, such as the amount of ODS entering the virgin ODS bank as ODS consumption. With a number of assumptions, the size of the different banks can be assessed. For refrigeration and foam sectors, bottom-up approaches have been built over a number of years, using statistical application data, combined with technical information and the known supply information to estimate the in-product bank in increasing accuracy. For the estimation of unwanted ODS, additional framework conditions have to be added to understand how much ODS are transferred from the in-product bank to the recovered ODS bank. These framework conditions are assumptions on the emissions, the frequency of repairs, the amount of recovery and R&R equipment available, etc. It was assumed that some of those assumptions can be supported by data available within the Montreal Protocol.

3.2. Data available at the Multilateral Fund Secretariat

Data available in the Multilateral Fund Secretariat and the Ozone Secretariat, in particular regarding country programme reporting and reporting under Article 7, was utilized. Several hundred project proposals and project completion reports ranging back to the 7th Meeting of the Executive Committee were assessed for this report. Further data was extracted from previous Multilateral Fund evaluations in the fields of refrigerant recovery and recycling, halons as well as information collected as part of the ongoing evaluations on the topics of CTC and National ODS Phase-out Plans.

3.2.1. Country consumption data

Parties to the Montreal Protocol report their consumption by substance to the Ozone Secretariat. This data is not public and is therefore only published in an aggregated form, usually by group of substances and country. For the purpose of this report, the Ozone Secretariat supplied halon data by substance and region. This halon data was compared with substance and country specific data available from country programme reporting in the Secretariat, and showed good correlation.

Country programme data was also used to obtain information about the amount of ODS used for refrigeration servicing.

3.2.2. Information relating to projects

Data included in project proposals provides an indication of the recovery and recycling infrastructure in Article 5 countries. Project completion reports provide an insight into the effectiveness of the recovery and recycling operations.

3.3. Survey

3.3.1. Methodology

The Secretariat and consultants were given the task to develop a questionnaire and collect and elaborate as much data as possible on unwanted, recoverable, reclaimable, non-reusable and virgin ODS in Article 5 countries. At the same time, implementing agencies, Executive Committee members and National Ozone Units were asked to provide data and related information, to constitute an initial sample reflecting situations in both Article 5 and non-Article 5 countries. In addition, UNEP offered to provide data from the regional networks and ODS recovery and disposal workshops conducted by Japan. A questionnaire on non-usable CFCs, halons and CTC was formulated by the Secretariat and sent to the countries.

The questionnaire is divided in three parts dedicated to each of the three chemicals in question and it contains questions regarding:

- amounts of used CFCs/halon that have been collected and that cannot be used in the country due to contamination and are now stored in the country;

- amounts of new CFCs/halon that have been stockpiled in the country;

- amounts of used CFCs/halon collected and that could be reused, but not yet so far;

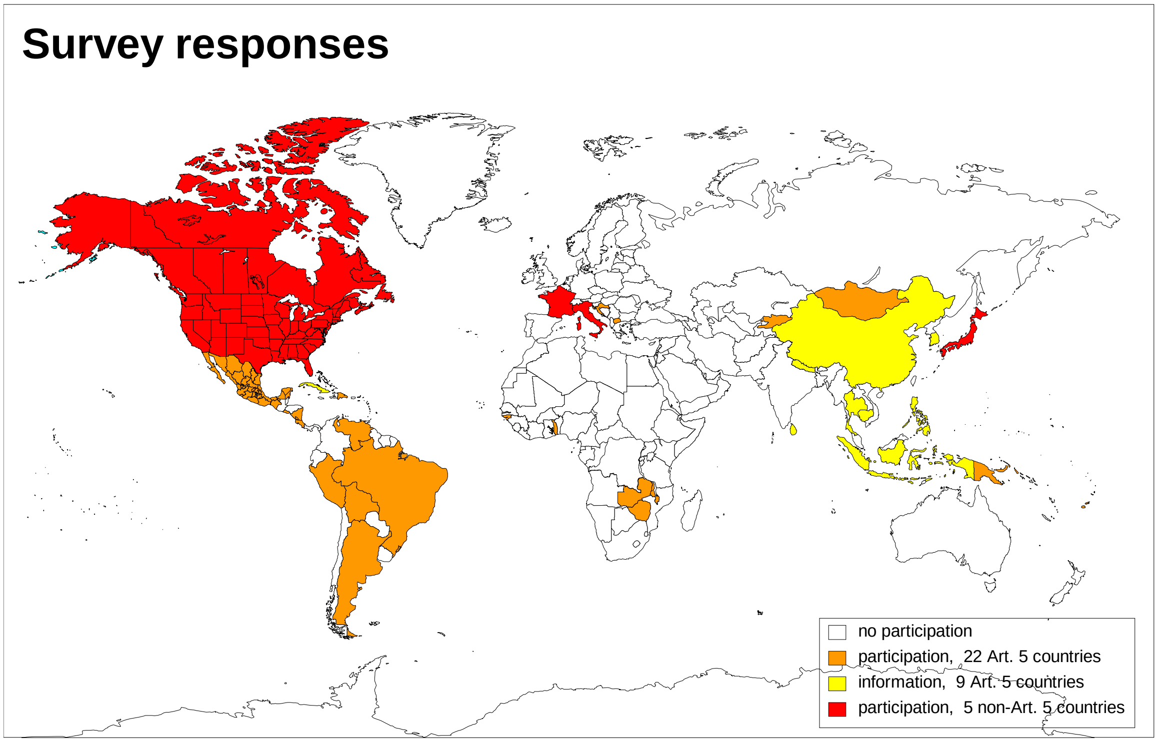
- changes in the latest year where data was available (how much CFCs/halon was recovered, how much of that CFCs/halon has not been reused, how much due to contamination, and how much CFCs/halon was destroyed);

- information related to CTC: data regarding use or storage, unwanted stored CTC and unwanted CTC added to the amount in the last year when data was available.

3.3.2. Responses

A total number of 5 Article 2 countries and 22 Article 5 countries submitted their answers to the questionnaire. In addition, Japan submitted a large amount of collected data from nine countries in Asia. The countries where data could be collected are shown in the figure below.

Figure 2: Geographical distribution of the responses to the survey



Data was also submitted by the USA on imports of used ODS.

In addition, Japan submitted a large amount of collected data from the South and South-East Asia regions.

3.3.3. Bottom –up approach for the refrigeration sector

The advanced TIER2 method, using the RIEP programme (Refrigerant Inventories and Emissions Predictions) /Pal03/ has been applied in this study. This had originally been developed under the support of the French government (ADEME) and has been adopted since as a basis for benchmarking its own models by the United States EPA amongst others.

In order to calculate the refrigerant inventories in equipment with high accuracy, the first step required is to gather reliable data for the equipment numbers. Annual statistical data is available for nearly all mass-produced equipment, some are publicly available, and some marketing studies can be purchased from specialised companies. This bottom-up method applies the following steps: (1) determination of the annual sales of new equipment and the amount of the different refrigerants charged into it, (2) the determination of all the fleets of equipment in the different subsectors, which yields a cumulative value for the refrigerant bank for the specific application. Once this is known per year, the entire life cycle of a product can be described in time, and also for all product types in an aggregated manner; furthermore, the amounts of refrigerant in equipment by type of refrigerant and per country can be presented. For countries where only few specific equipment data is available, some general data for these countries (such as data on energy production and consumption, population, and economic parameters) can be used to create ratios between the number of refrigerating equipment and this data, e.g. ratio between equipment, GDP and population. The refrigerant equipment data so derived can then be used in the RIEP programme.

3.3.4. Bottom-up approach for the foam sector

The source information used for this assessment has been the dataset generated in support of the development of the IPCC/TEAP Special Report on Ozone and Climate /SROC05/. Much of this data was originally generated during a project conducted for AFEAS from 1998-2000 and was then validated and updated during the preparation of the 2002 UNEP TOC Foams Assessment Report in which 2001 consumption data was assembled in parallel using regionally spread experts. The dataset was extended, particularly in its assessment of future emissions and end-of-life management options in 2004 in order to better quantify banks in the period following decommissioning of foam. The data-set spans eighteen different foam sub-sectors, each of which has a differing consumption and emission profiles.

3.4. Modelling for CFC banks

The databases prepared for the IPCC/TEAP Special Report on Ozone and Climate /SROC05/ have been used as the basis for determining the existing stockpiles and banks of CFCs and projections for 2010 and 2015. The analysis has also allowed the determination of reachable banks of material which are further assessed in terms of low, medium and high specific effort, as set out in Table 2.

Elaborating further on the databases themselves, these are based on activity (consumption) data which have been compiled from national equipment and product data, with cross-reference to global and regional sales and use data on the CFCs themselves. Emissions are predicted by applying validated emission factors. In-product banks are therefore the cumulative difference between the chemical that has been consumed in an application or sub-application and that which has already been emitted or destroyed. In time, the in-product banks themselves become a significant source of emission as they accumulate. Such methods of determining emissions at sub-application level are described as TIER 2 methods. In the case of refrigeration, an advanced TIER 2 method (RIEP[3]) was applied. For foams, another TIER 2 method has been applied at sub-application level. This was initially developed at regional level under the auspices

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[3] RIEP - Refrigerant Inventories and Emissions Predictions

of AFEAS, but has since been developed further at country level and is also now used as a benchmarking tool by governments. Further details of both models are found in Appendix II.

Reachable banks of CFC were defined separately for refrigerant and foams. In the case of refrigerants, it was viewed that all CFCs in the supply chain, still in equipment or already collected into bulk storage after the decommissioning of equipment are technically recoverable (i.e. reachable) although a large proportion of these are recognised not to be currently recovered in practice, even in developed countries. Accordingly, the additional analysis, based on low, medium and high specific effort is of particular importance. Options of low specific effort include those CFCs which are already identified for recovery and onward recycling or reclamation. Low specific effort materials would also include those in stored waste. A substantial part of the material contained in industrial refrigeration units and chillers would also be envisaged as requiring low specific effort to recover. Virgin banks consist only of those chemicals in the supply-chain and those which had been satisfactorily reclaimed. Future estimates of recoverable materials requiring low specific effort necessarily involve an estimate of the market penetration of various recovery options. Table II-1 in Annex II shows the basis of this determination for refrigerants in 2010 and 2015, as well as the levels achieved in 2002.

Medium specific effort options would include the more widespread recovery of refrigerant from domestic refrigerators (perhaps as a part of a wider refrigerator recycling program in large conurbations), where as those units in remote and sparsely populated areas would be considered as requiring high specific effort. In addition to all of the above, there needs to be recognition that in some refrigeration equipment, the refrigerant will either have been emitted, knowingly or unknowingly, prior to reaching a potential recovery unit or will not reach a recovery unit at all. This, in reality, is non-reachable unless steps are taken to improve education and to prevent such releases. However, since the majority of reachable banks fall into this category in current estimates for 2010 and 2015, this is clearly an area of potential policy dependence.

For foams, the definition of ‘reachable’ is more complex bearing in mind the differing nature and application of various foamed products. For the purposes of this study, only CFCs still in the supply chain would be considered as requiring low specific effort. Blowing agents contained in foams being used in the appliance, transport and building services sectors would be considered as medium specific effort if they were situated within or close to the major conurbations. An additional category - steel-faced building panels – has also been included as having the potential for recovery, although work is still on-going in developed countries to ascertain the economic viability of such recovery at the time of writing. Accordingly, this is group is included in the high specific effort category, along with those appliance, transport and building foams likely to be in remote or sparsely populated areas. In many instances, the re-use of appliances in developing countries makes the CFCs ‘reachable’ even after their nominal ‘end-of-life’ and this fact shows up in the results of the foam analysis. With a lack of significant reclamation and recycling in the foam sector, the only obvious source of virgin chemical is in the supply-chain to the industry. As an additional observation on foams, it should be noted that product lifetimes, particularly in building applications are considerably longer than for refrigeration applications. This means that many of the banks of blowing agents in use will not reach end-of-life until well after 2015 and do not therefore appear in the annual flow data set out in Chapter 4 /EOL05/.

The concept of ‘annual flows’ defines the amount of material which could potentially reach a recovery facility following decommissioning. It is essentially the reachable bank which is reaching end-of-life in a given year. However, the term end-of-life may refer to either equipment or the ODS contained within it. Accordingly, there will inevitably be a servicing component in the annual flow, particularly if there has been an equipment failure which has adversely affected the contained refrigerant. Distinguishing refrigerant arriving from servicing activities from that arising from equipment retirement is very difficult in practice, but it is believed that most refrigerant extracted in the servicing phase is either directly re-used or recycled.

4. CFC

4.1. Information from surveys and other data

The information submitted in the survey described above was analysed in a number of ways. It was not possible to establish direct correlations between the consumption and the amount recovered, or similar relations. Some limited information is shown in Table 3.

Table 3: Amount of CFC-12 recovered as per survey data in comparison to CFC consumption in the refrigeration servicing sector

Country	**CFC consumption in the refrigeration servicing sector as per 2004 CP data** [metric tonnes]	**Amount of CFC-12 recovered**[4] **during the last year** [metric tonnes]
Bahrain	64.30	0.00
Croatia	74.16	6.80
India	1,373.00	0.00
Kyrgyzstan	22.30	2.14
Macedonia	21.35	1.93
Malawi	7.20	0.50
Mexico	977.88	10.00
Mongolia	3.30	0.72
Togo	26.15	0.00
Venezuela*	1,590.57	0.20
Zambia	10.00	0.02
Zimbabwe	104.37	0.40

* 2003 CP data

The project proposals and project completion reports were searched to establish the amount of Recovery and Recycling equipment funded by the Multilateral Fund. The result by region is provided in **Figure 3**.

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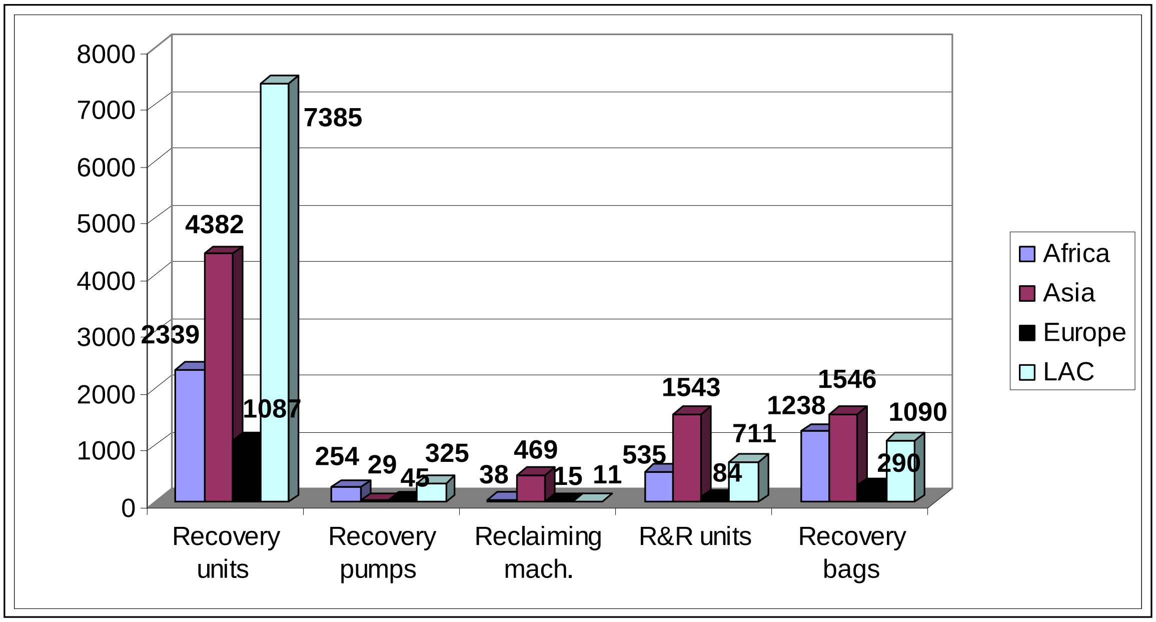
[4] The definition used for "recovered" in this table reflects the understanding of NOUs when reporting such data and might not be fully consistent with the related definition in Chapter 2

Figure 3: Amount of recovery and recovery & recycling equipment funded by the MLF, by region



4.2. Reachable banks and degrees of specific effort required for recovery

The initial series of six bar/line graphs illustrate the size of banks and those that are reachable for each of the six developing country regions covered by the study. A constant y-axis scale has been used to better illustrate the comparison between regions.

The graphs illustrate the basic finding that reachable CFC banks are declining with time as either CFCs are released or are relocated in land-fills and other such places that are unreachable in practical terms. Accordingly, any effort to recover the CFC banks will benefit from early action. It is noticeable that the rate of decline in regions with significant banks is generally less for foam blowing agents than it is for refrigerants, reflecting the slower release rates. Where there is significant foam usage in buildings, the level of reachable CFC drops below the total CFC in products. However, where the bulk of the CFCs in foams are in appliances, they remain reachable, even after nominal end-of-life (see Section 3.3) because of the level of re-use of appliances taking place in developing countries.

Figure 4: CFC Bank - Africa

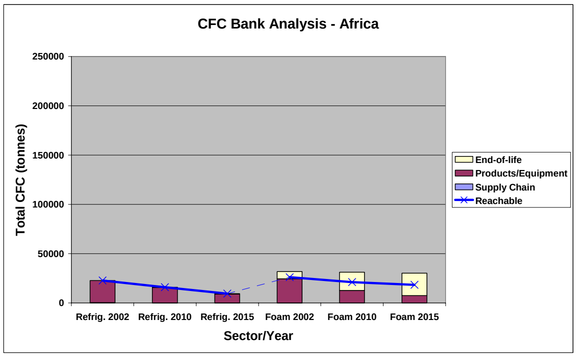


Figure 5: CFC Bank – Latin America and the Caribbean

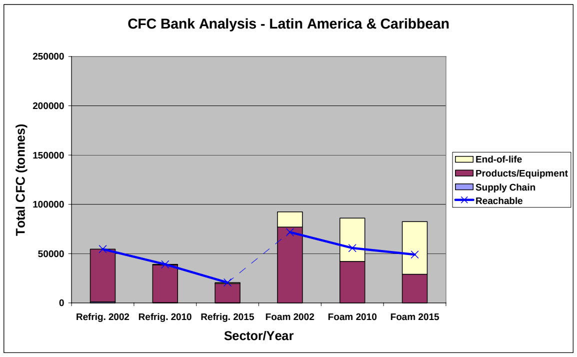


Figure 6: CFC Bank –
Eastern Europe and Central Asia

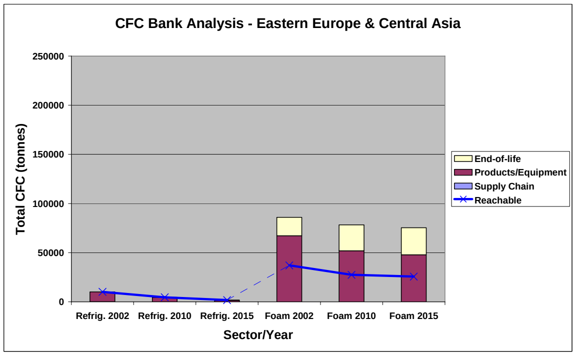


Figure 7: CFC Bank – South Asia

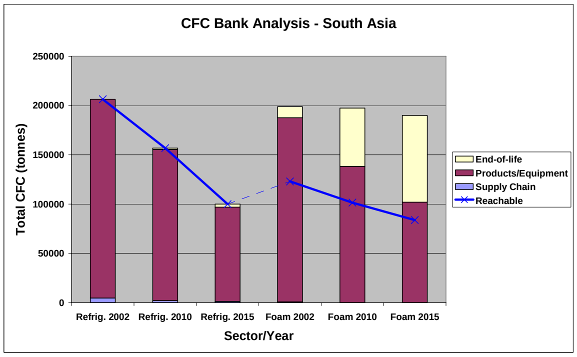


Figure 8: CFC Bank –
S-E Asia and Pacific

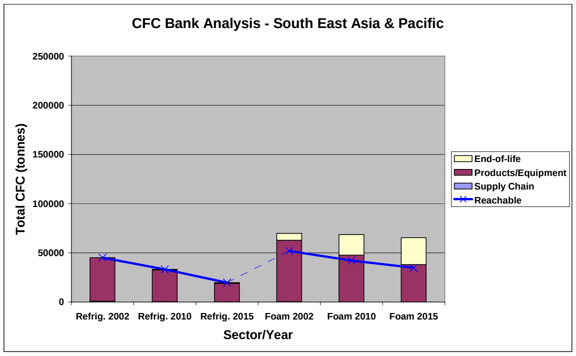
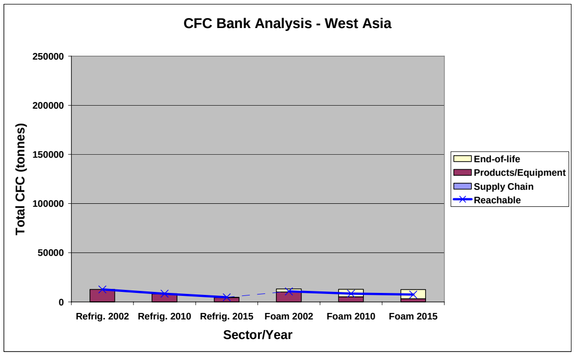


Figure 9: CFC Bank – West Asia



Another point of interest arising from the evaluation is that the major source of virgin materials (the bank in the supply chain) is very small in comparison with the other banks. This is based on the assumption that the supply chain for both applications (foam and refrigeration) is operated on a global average of 45 days of stock or thereabouts. This leads to a total assessment of virgin material in 2002 of 8,837 tonnes declining to 1,722 tonnes by 2015. In reality there is substantial variation at regional and national level depending on the length of the supply chain in question (including the presence of producers) and the stockpiling policy adopted. Often stockpiling is at its most significant during periods of market transition, where provisions for on-going use in future years is the driver, often to avoid premature equipment retirement. Table 4 below provides a comparison of actual collected data against that projected by the demand models for Argentina, Zambia and Thailand.

Table 4: Collected data vs. projected data for three countries

Source	Argentina	Thailand	Zambia
Reported:			
CFC-11 (2005)	243	Not reported	0
CFC-12 (2005)	1492	Not reported	0
Modelled:			
CFCs- Foam (2002)	<1	45	<1
CFCs- Refrigeration. (2002)	88	200	3

The presence of a CFC producer in Argentina means that considerable additional stock could be being carried within the country for the rest of the region. Accordingly, data on the precise location of virgin stocks needs to be handled carefully.

Although the bar/line graphs above provide a good overview of the overall dynamics of the banks in the six regions, it is more helpful to use a more directly comparable method to assess the overall distribution of reachable CFCs in 2010 and 2015. The following four pie charts illustrate the status of the reachable banks in 2010 and 2015 respectively. The first set of two charts indicates the change in regional share whilst the second two charts illustrate the change in product/equipment source. Although the change in regional split is only very marginal, it can be seen that the reachable bank declines by 27% in the five year period between 2010 and 2015.

Figure 10: Total reachable CFC banks in 2010 by region

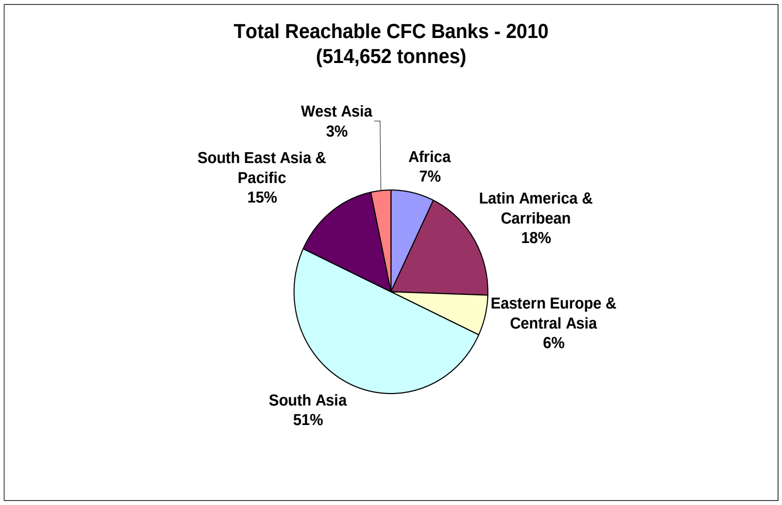
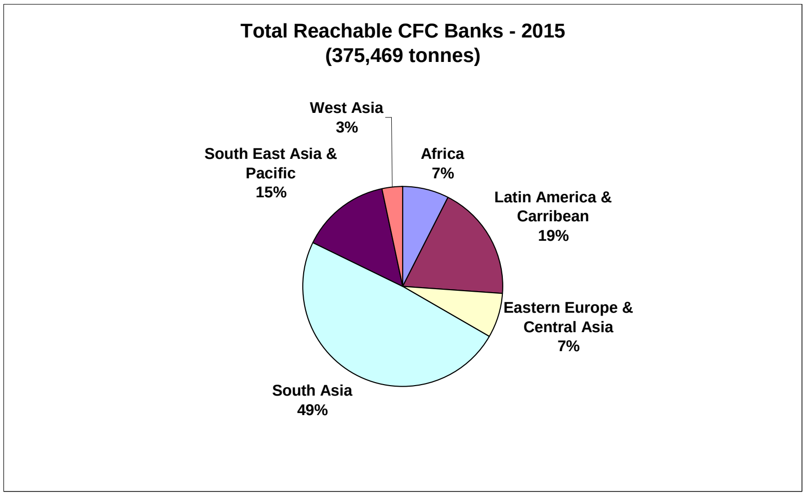


Figure 11: Total reachable CFC banks in 2015 by region



In terms of the product source, the reachable bank is very evenly split in 2010, but the balance shifts towards foams by 2015, a further indication of the slow loss rate from foams in comparison with refrigerant.

Figure 12: Total reachable CFC banks in 2010 by sector

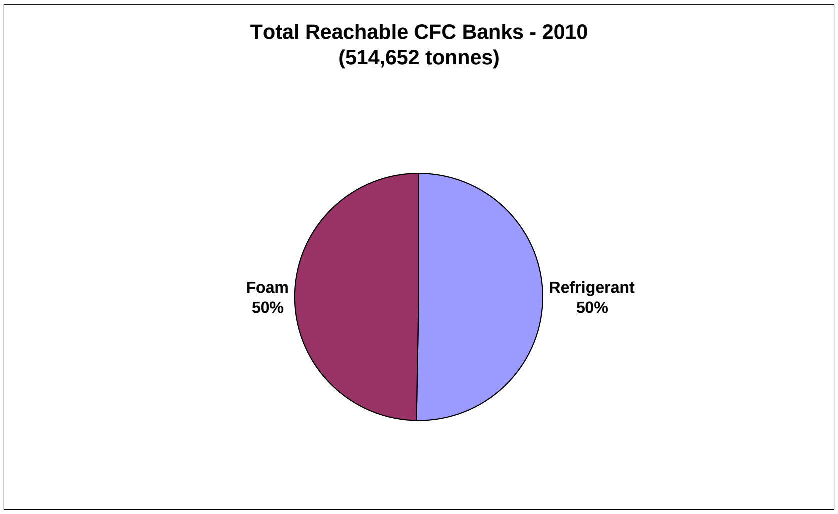
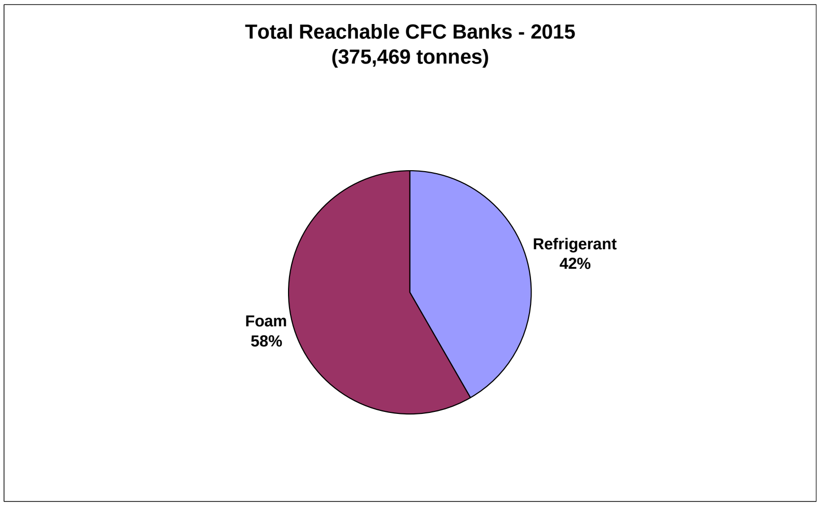


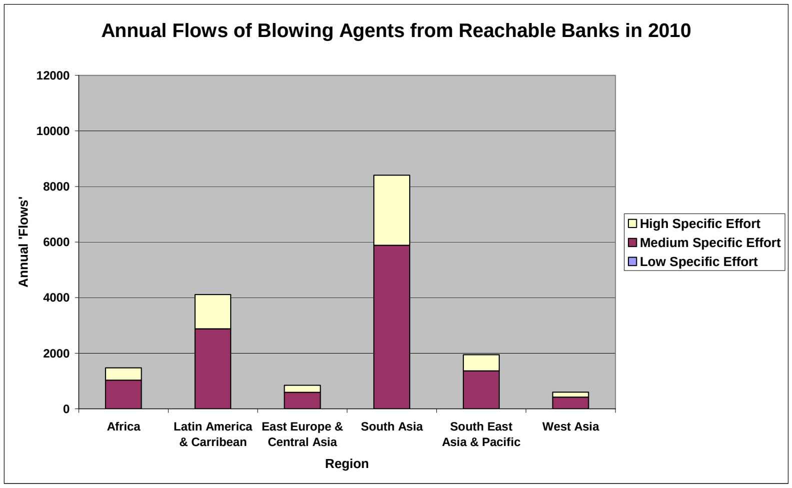
Figure 13: Total reachable CFC banks in 2015 by sector



4.3. Results from the analysis: annual material flows from easily reachable banks

As noted in Section 3, the annual 'flows' of refrigerant and blowing agent from reachable banks are based on differing perceptions of the recovery process. In the case of foams there is no realistic prospect of recovery for recycling or reclaim except perhaps in rare cases where CFC-11 might be used nationally within chillers. Accordingly, the bulk of blowing agents will either be released (often slowly from landfill) or recovered for destruction. The opportunity for such recovery and destruction from 'reachable' banks in 2010 varies by region and is shown in Figure 14. This is compared with the parallel assessment for refrigerant (Figure 15). In both graphs an initial attempt has been made to categorise the reachable banks in terms of low, medium and high specific effort. In addition, it has been assumed that 50% of all domestic and commercial refrigerators, 20% of industrial refrigeration units and chillers, and finally 75% of all mobile air conditioning systems have either not reached recovery units at all or have emitted their refrigerant prior to reaching such recovery units. This is in addition to any fugitive emissions that may occur during the recovery processes themselves. It should be noted that these assumptions are speculative and will be influenced substantially by commercial imperatives, regulatory frameworks and practices in specific countries. It is further assumed that 70% of refrigeration units are based in conurbations while 30% are distributed in remote regions. The same geographic spread is assumed for transport foams and those used for building services (e.g. pipe insulation)[5].

Figure 14: Annual flows of blowing agent from reachable banks in 2010



The foam assessment shows that none of the flows from reachable banks are in the low specific effort category. However, it is interesting to note that the majority is categorised as ‘medium’ rather than ‘high’. This partly reflects the fact that those blowing agents in buildings (currently in the ‘high’ category) will not be reaching end-of-life in 2010.

In contrast, the flows of reachable refrigerant are generally greater, at least in theory, than for foams, although in practice they may be smaller because of losses in refrigerant emissions that occur prior to reaching any recovery station. The proportions of recoverable materials (low, medium and high specific effort) could be boosted by efforts to reduce these prior losses.

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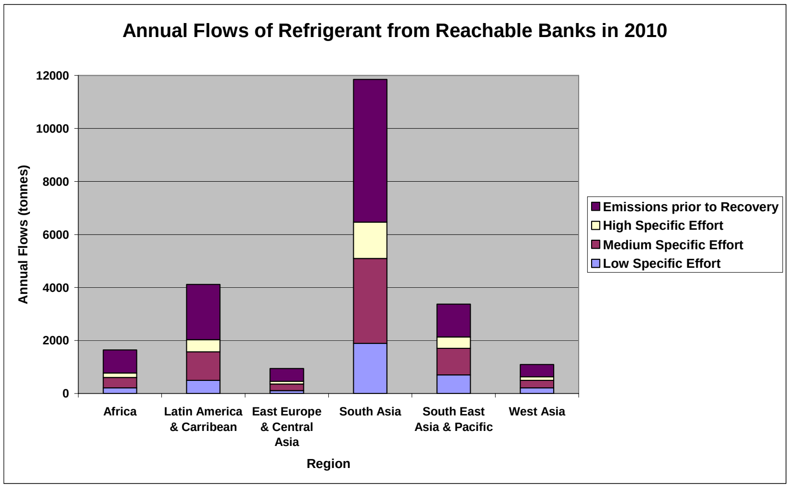
[5] It should be emphasized once more that the assessment of ‘medium’ and ‘high’ categories is relatively speculative. In terms of refrigerants, the assumptions in Annex II, tables II-1 to II-4only define the ‘low specific effort’ quantities about which there is greater certainty

Figure 15: Annual flows of blowing agent from reachable banks in 2015



The following pie charts illustrate the annual flow of reachable refrigerant by destination (Figure 16) and source (Figure 17):

Figure 16: Breakdown of total reachable refrigerant in 2010 by source

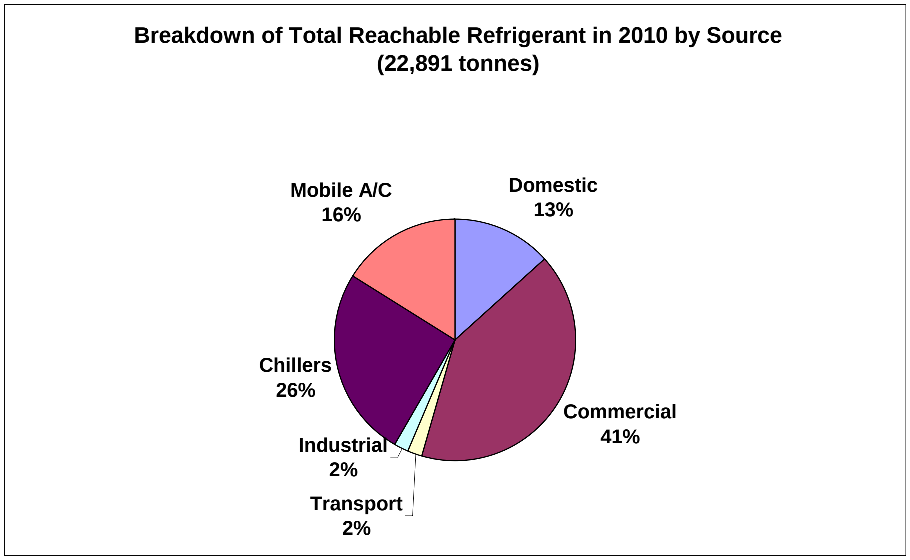
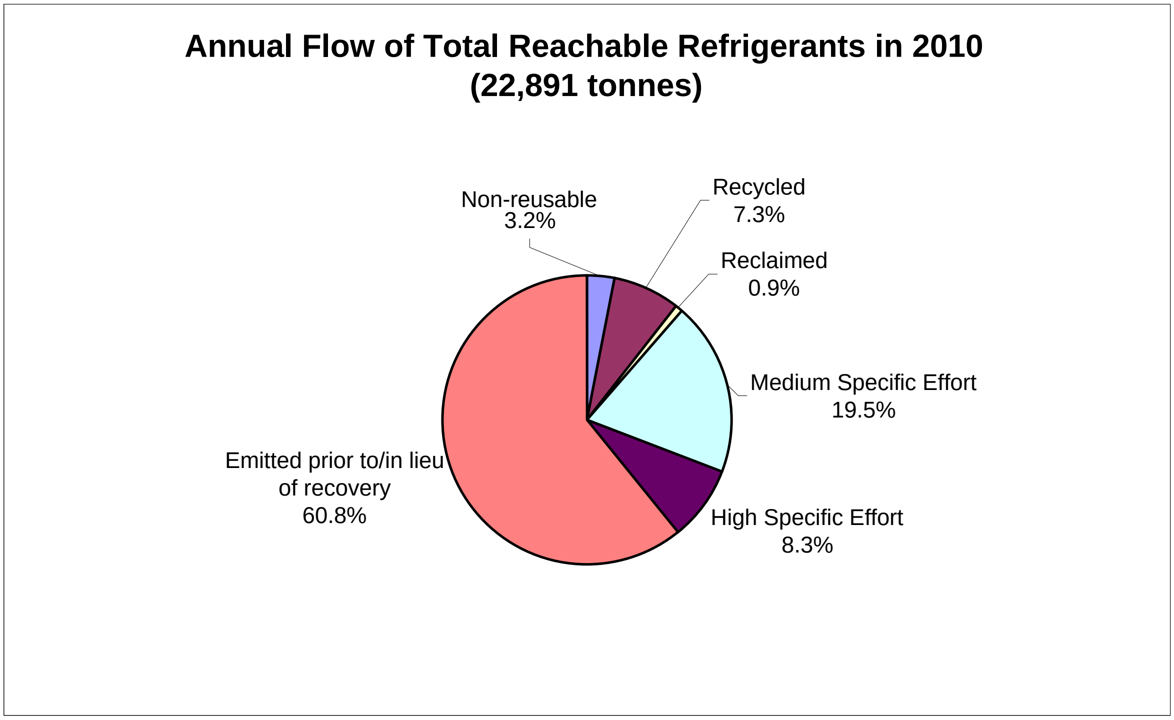
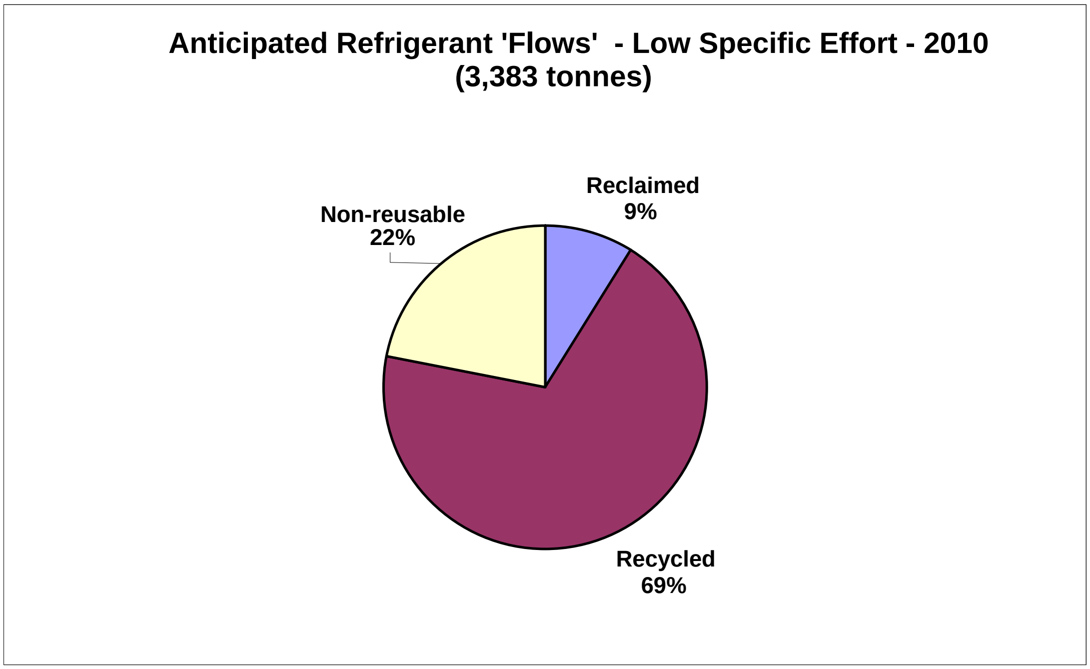


Figure 17: Breakdown of total reachable refrigerant in 2010 by source



The particular make-up of the low specific effort category is shown in Figure 18 below:

Figure 18: Anticipated refrigerant flows – low specific effort - 2010



It can be seen that the major proportion of recovered CFC in refrigeration in 2010 is expected to be recycled. Where demand for CFC refrigerants remains locally high, particularly to service high value equipment, it makes sense to optimise the reclamation and recycling of refrigerant to avoid the need for new production prior to 2010. It is estimated in the TEAP Supplementary Report that developing country demand for CFCs in the refrigeration sector will still be 6,000-8,000 tonnes in 2015 which is down from as high as 30,000 tonnes in 2010. With only 2,639 tonnes of material available in 2010 from recycling and reclaimed, according to the assumptions used here, the shortfall will need to be met from stockpiled quantities or increased levels of re-use and/or retrofit. Ultimately this demand will diminish as equipment is retired and the total refrigerant flow will need to be recovered if it is not to be vented. In the meantime, it can be seen that an estimated 744 tonnes of refrigerant (22% of the total low specific effort category) are non-reusable in 2010. The cumulative non-reusable material arising between 2002 and 2010 will be 3,000-3,500 tonnes[6]. From the models used for this study, the expected flows at country level will be in the range of 0-20 tonnes/annum at that time (see Table II-7 in Annex II). This compares reasonably with reported collections of stored waste in 2005 which are in the range of 0-10 tonnes for those countries that have reported.

Clearly there are opportunities to boost the recovery levels by up to a factor of 10 (depending on the sub-application mix in the country). This would be particularly aided by the adoption and enforcement of non-venting rules to keep the flows ‘reachable’, either as reclaimed material, recycled material or stored waste.

For foams, the situation is less well developed and there are no current provisions for managing reachable banks, even though the flows are similar to those observed in refrigeration. One of the complications for foams is that the cost of recovery is likely to be considerably higher than for refrigerant and the investment needed for equipment to manage the reachable banks (e.g. refrigerator recycling units) might only be justified in large conurbations. This is why these potential activities have been treated as medium specific effort options. Nonetheless, the annual flows are estimated to be as high as 250-350 tonnes/annum for countries such as Argentina and Thailand. Bearing in mind that a state-of-the-art refrigerator recycling plant will recover 150-200 tonnes of blowing agent per year, the larger conurbations might justify such an investment. Additionally, there is growing experience (e.g. in the United States) in manual techniques for separating and recovering/destroying foam which may have a particular place in developing countries.

Clearly, future policies and measures could be introduced to influence the increased adoption of recovery methods for both refrigerants and foam blowing agents. However, proposals in this area are beyond the scope of this report.

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[6] It should be noted that this amount of non-reusable CFC consists of quantities assumed for destruction, storage and …………..to be vented.

5. HALON

5.1. Introductory remarks

Halons are low-toxicity, chemically stable compounds that are used in fire protection applications. Halons are halogenated hydrocarbons, firstly introduced into commercial use during the 1960s, which exhibit exceptional effectiveness in fire extinguishing and explosion prevention and suppression. As long as halons remain contained in cylinders they are easily recyclable for reuse.

There are three types of halons:

- Halon 1211, a liquid steaming agent that is used predominantly in portable extinguishers. Most halon 1211 is widely dispersed in building and residential portable fire extinguishers averaging only a few kg each. This as well as the very significant reductions in halon 1211 consumption in developed and developing countries over the last years indicate that in such uses halon 1211 can be replaced by other technologies with little effort. Other halon 1211 has been centralised in military, aviation and large fire brigades. A number of uses, in particular in the aviation industry, might suffer in the mid-term from a potential shortage of halon 1211 due to the higher efforts associated with any replacement. Collection of the widely dispersed portable extinguishers may prove to be unproductive or uneconomic in some countries. National programs that require halon owners to donate substances and to pay for destruction have resulted in recovery of only a portion of the estimated banks, with unreported quantities likely emitted or lost to avoid the expense. On the other hand, national programs offering a bounty for recovered halon and financing of destruction have demonstrated higher recovery rates. halon 1211 is presently internationally available mainly from recovery only. China ceased production in 2005 and the Republic of Korea is reported to only provide a small production for direct consumption within their country. Beyond the need to support long-term requirements for halon 1211 such as in commercial aircraft, military applications, etc., destruction of some halon 1211 might be made cost-effective relative to other ODS depending upon economic offsets to the significant collection difficulties. However, at the current time, many halon banks are reporting a shortage of halon 1211.

- Halon 1301 has seen widespread use in fixed systems throughout the telecommunication, commercial, marine, defence and aviation industries. Demand for recovered halon 1301 continues. In existing installations, which often have a lifetime in the order of four or more decades, it can be very complex or impossible to replace halon 1301 without replacing the entire system. Collection and destruction of the halon 1301 bank does not appear viable because the available supply from recovery is necessary to support long-term critical uses.

- Halon 2402 that has primarily been used in the defence, industrial, marine, and aviation sectors in Russia and countries with close economic ties to the former Soviet Union. It was used in a wide range of applications, including those covered by halon 1301 and halon 1211. Presently recovered halon 2402 is apparently fully absorbed by the market, indicating a high demand.

The international prices for recovered and recycled halons dropped significantly as a result of a forced rapid phase-out in the European Union from 2000 onwards. The prices are likely to increase when production in China and Republic of Korea will further decline and stop. Based on the agreement between China and the Executive Committee, production of halon1211 stopped at the end of 2005 and the phase-out of halon1301 production, presently ongoing to 2009, might be accelerated to 2007. Republic of Korea is mainly producing halons for its own consumption with a very limited export. Hence, newly produced halon1211 will not any longer be available and global supply of halon1301 will be reduced significantly during the next couple of years. There is no production of halon2402 any longer as Russia stopped some years ago. Halons recovered from existing halon equipment and stockpiles will be the only available sources of halon supply when production ceased. The scarcity of available halon will increase but the trend is not pronounced yet.

5.2. Halons in the survey

Twenty-six countries replied to the survey initiated as per decision 47/26 of the Executive Committee. However, due to limitations in the data availability, the survey results are of substance only for eight countries. The complete replies to the survey are listed in the annex to this report.

For seven Article 5 countries, data was supplied on the amount of used halon available. The data supplied is shown in Table 5 below, provided in relation to the estimated halon bank of the country.

Table 5: Information from the survey related to halon

Country	**Substance**	**Collected used, contaminated, and stored** (metric tonnes)	**New (virgin) contaminated and stored** (metric tonnes)	**Total reported contaminated** (metric tonnes)	**Amount of halon recovered during the last available year** (metric tonnes)
Argentina	halon 1211	0.50	0.00	0.50	0.50
	halon 1301	3.00	0.00	3.00	3.00
	halon 2402	0.00	0.00	0.00	0.00
Bahrain	halon 1211	0.00	1.00	1.00	0.00
	halon 1301	0.00	0.00	0.00	0.00
	halon 2402	0.00	0.00	0.00	0.00
Fiji Islands	halon 1211	0.74		0.74	
	halon 1301	0.11		0.11	
	halon 2402				
India	halon 1211	N/A	N/A	N/A	0.00
	halon 1301	N/A	N/A	N/A	0.26
	halon 2402	N/A	N/A	N/A	0.00
Mexico	halon 1211		1,141	1,141	0.2
	halon 1301				
	halon 2402				
Papua New Guinea	halon 1211	0.3		0.30	
	halon 1301			0.00	
	halon 2402			0.00	
Zimbabwe	halon 1211	0.10	0.40	0.50	
	halon 1301	N/A	0.60	0.60	
	halon 2402	0.00	0.00	0.00	

5.3. Estimation of banks and their dislocation

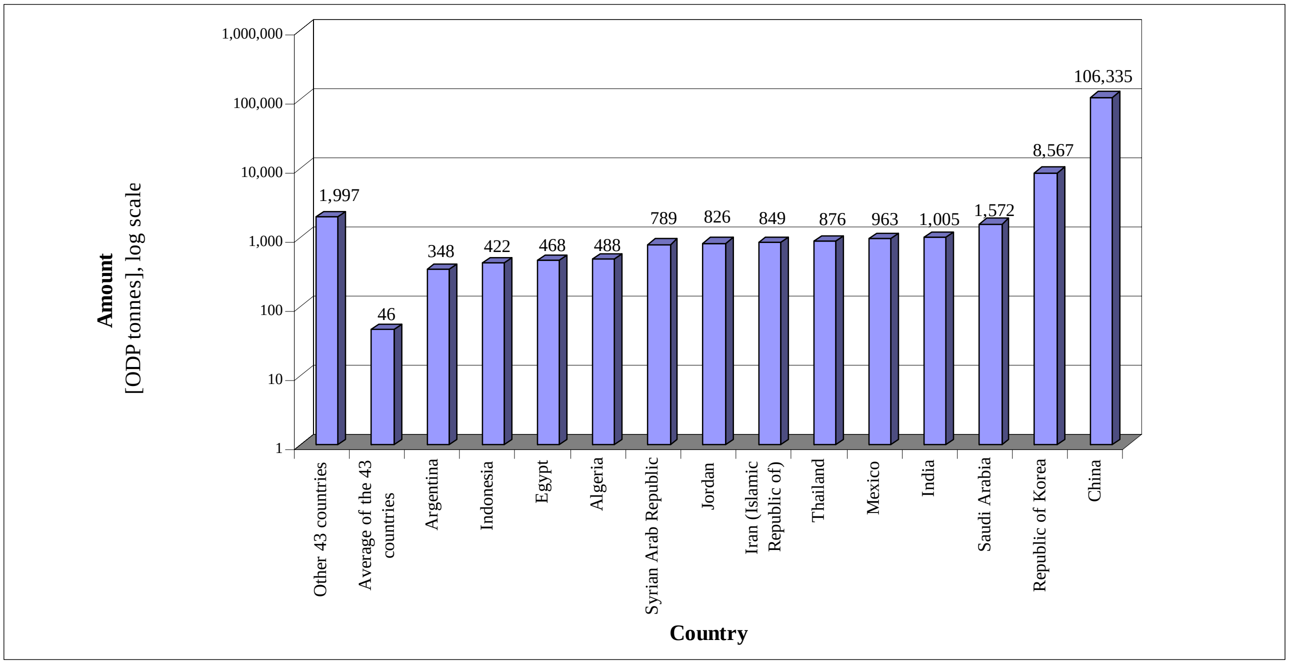
The methodology used to estimate the halon banks in individual countries is based on the halon 1211 and halon 1301 data contained in the TEAP Supplement /Supp05/. The estimate for halon 1211 and 1301 in all Article 5(1) countries was 41,835 metric tonnes and 5,650 metric tonnes respectively. The distribution per country is estimated based on each country's percentage of the total 10-year average of consumption reported separately for halon 1211 and halon 1301 in the Country Programme data reported to the Multilateral Fund Secretariat

5.3.1. Halon 1211

Halon contained in equipment is not recorded as import and, therefore, not as consumption. This might play an important role in the case of fire extinguishers using halon 1211, since there might be a significant quantity of such imports into countries where local fillers were or are not present or not occupying the market completely. Consequently, the amount of halon 1211 consumed by a particular country might be a good indicator of a halon bank, but not necessarily relating only to that country. For the lack of better data, for the purpose of this report it will be assumed that the bank is in the country where the halon was consumed.

Figure 19 provides an overview of the estimated halon1211 banks in the 13 highest consuming countries, as well as the average and total consumption of the remaining 43 countries. To be able to properly display the widely differing consumption data, the graph uses a logarithmic scale. It is obvious that the largest halon bank is located in China, followed by the halon bank in the Republic of Korea[7], having only about 1/10th of the size of China's. The global consumption of halon 1211 has steadily declined in the last 8 years from a high level of 35,139.45 ODP tonnes to 3,278.52 ODP tonnes in 2004.

Figure 19: Halon 1211 banks in high consuming countries



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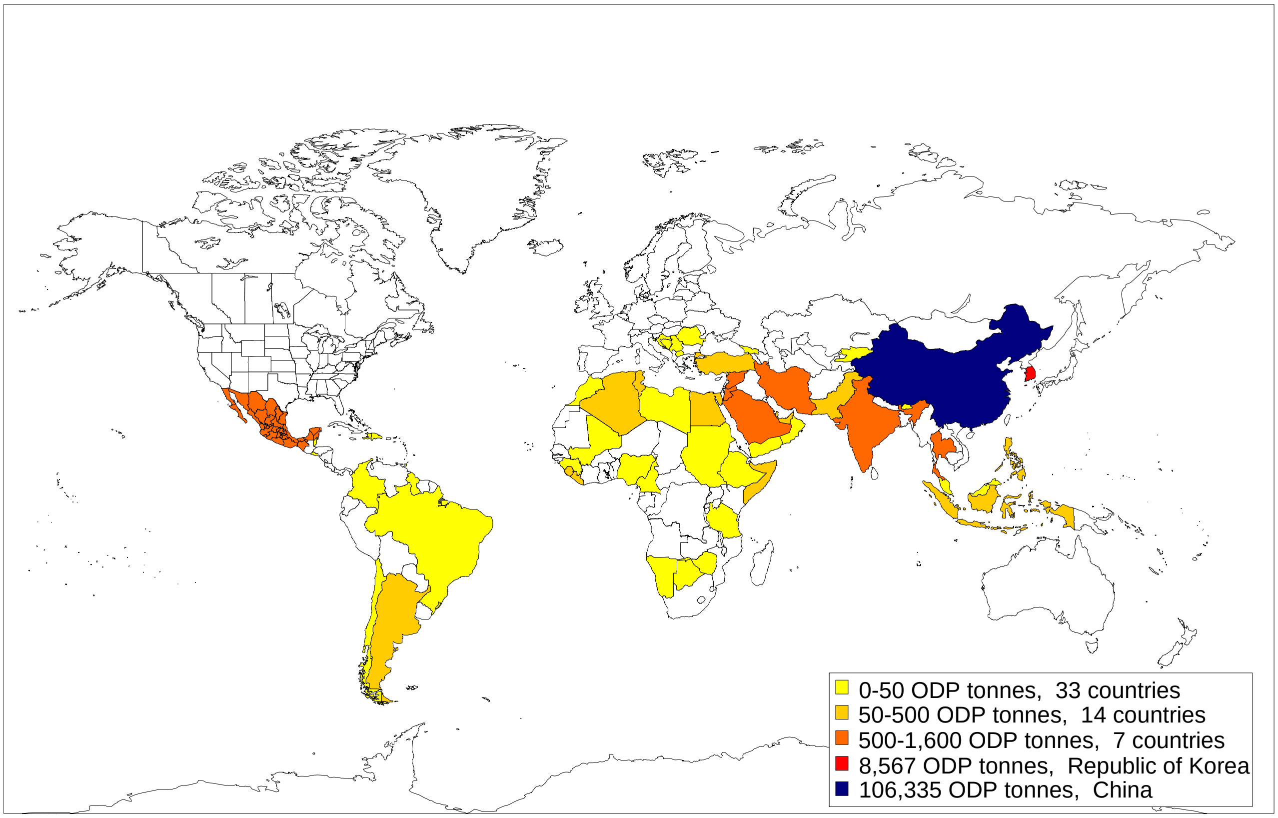
[7] It should be noted that the Republic of Korea, although being an Article 5 Country, has agreed not to request support from the Multilateral Fund.

The geographic distribution of the halon1211 banks is shown in the map below.

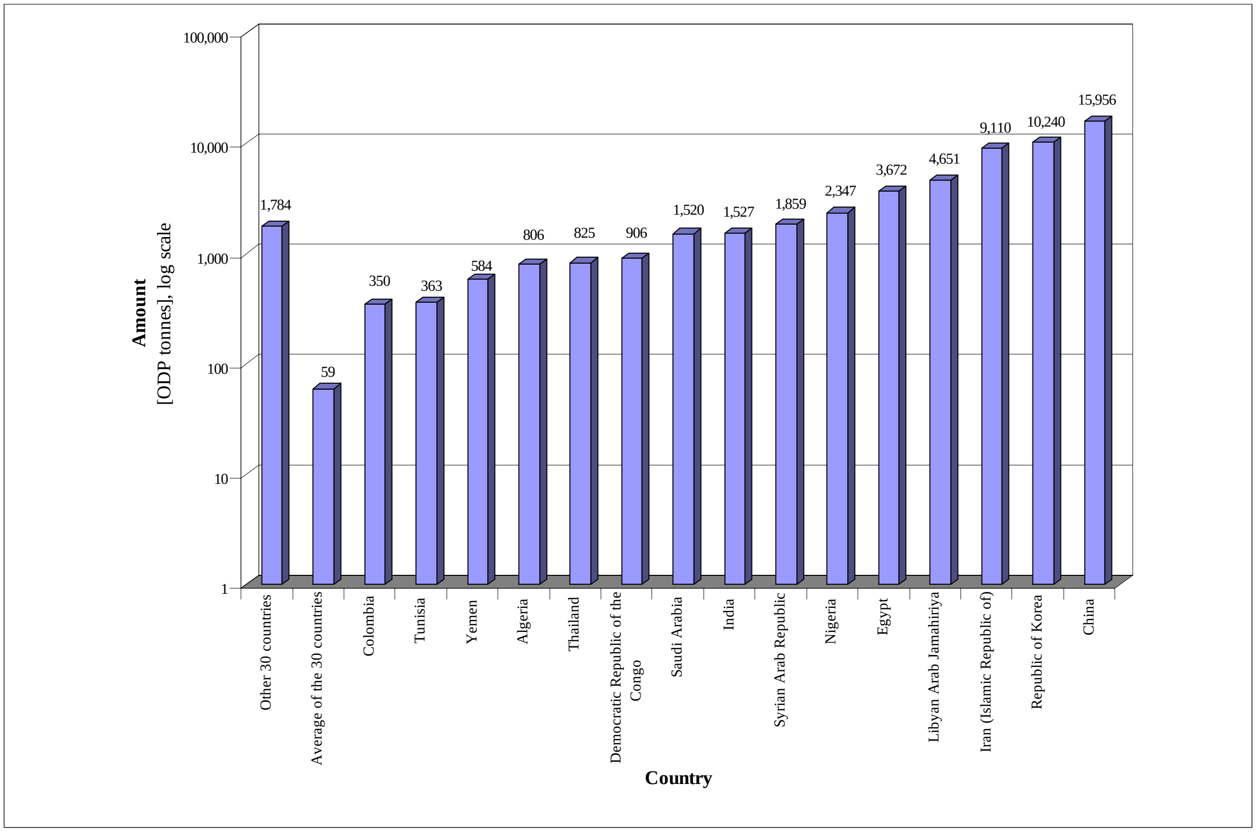
Figure 20: Geographic distribution of halon 1211 banks



5.3.2. Halon1301

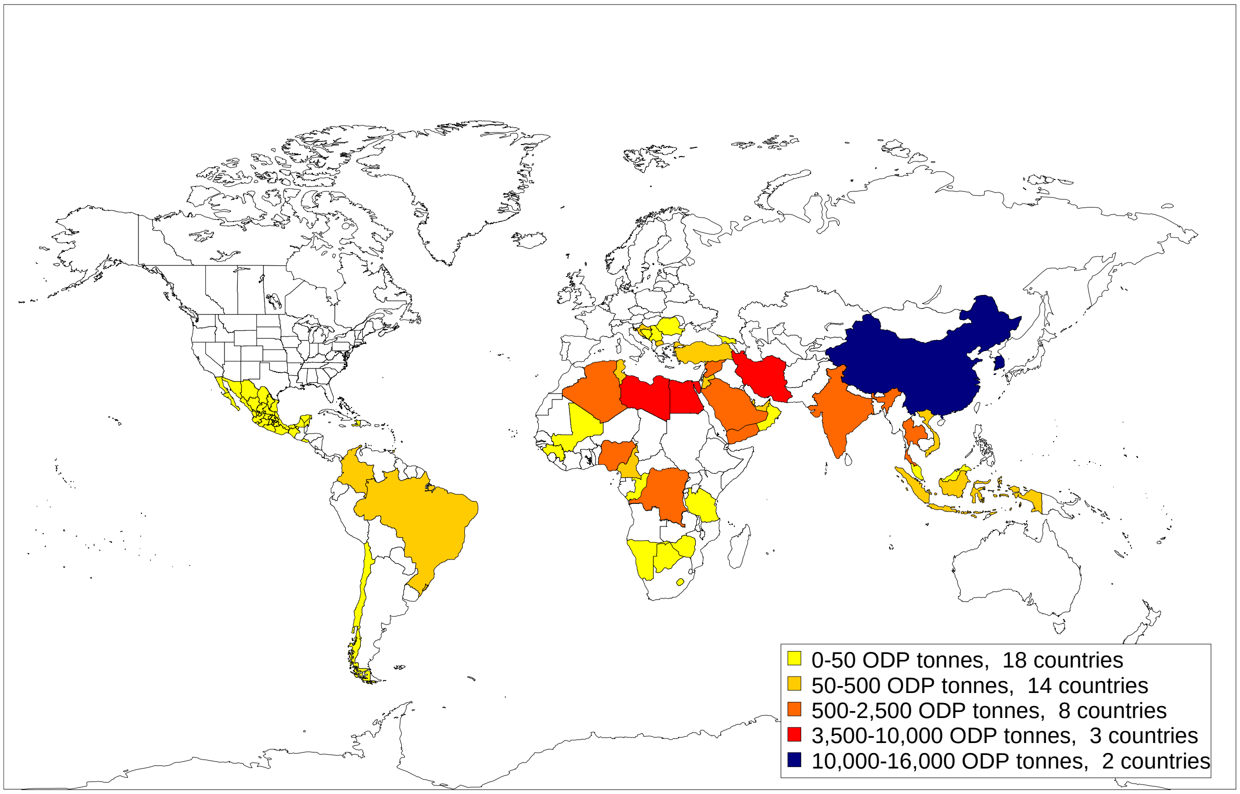
Figure 21 provides an overview of the estimated halon1301 banks in the 15 highest consuming countries, as well as the average and total consumption of the remaining 30 countries. To be able to properly display the widely differing consumption data, the graph uses a logarithmic scale. The global consumption has steadily declined in the last 6 years from a high level of 14,382.97 ODP tonnes to 5,664.94 ODP tonnes in 2004.

Figure 21: Halon 1301 banks in high consuming countries



The geographic distribution of the halon1301 banks is shown in the map below.

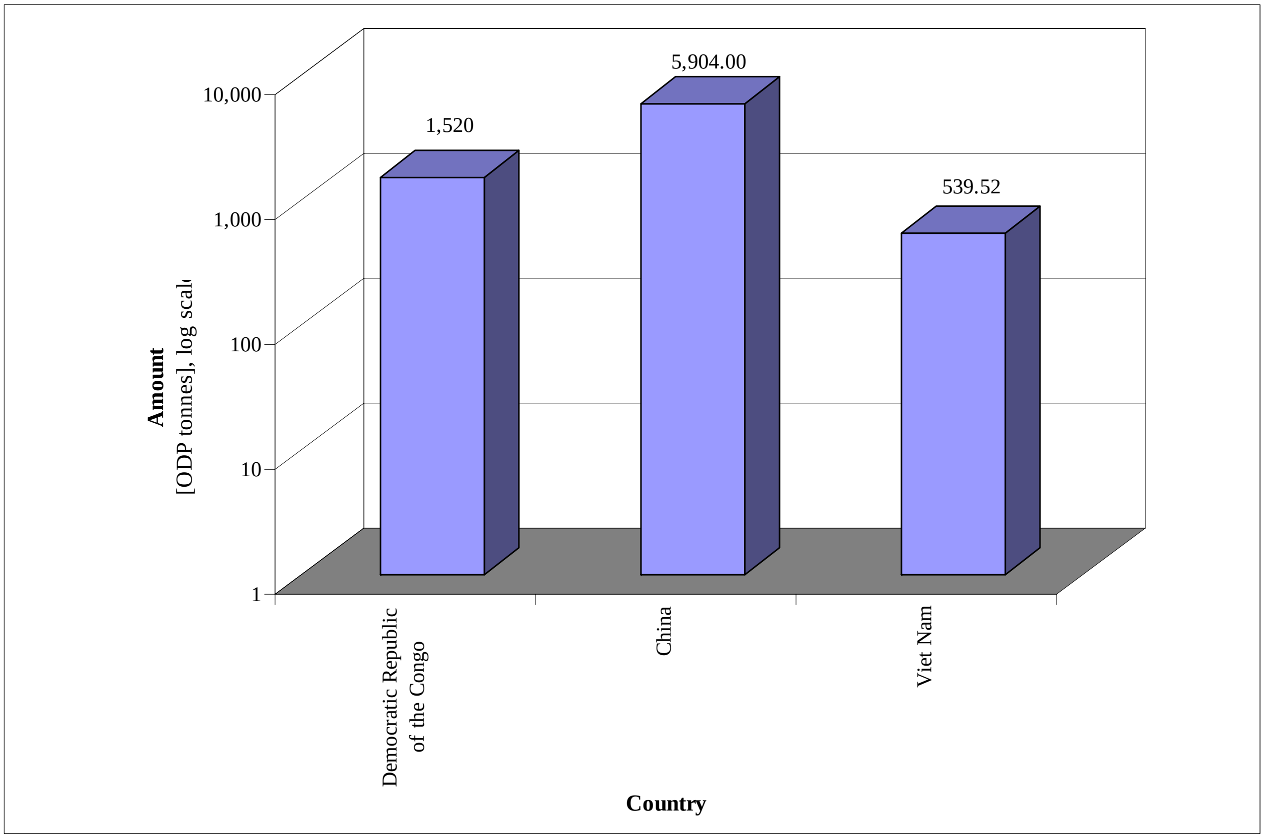
Figure 22: Geographic distribution of halon 1301 banks



5.3.3. Halon 2402

Figure 23 provides an overview of the estimated halon 2402 banks in the three Article 5 countries where halon 2402 is being consumed. All three countries show a decreasing trend in their consumption pattern.

Figure 23: Estimated halon 2402 banks



5.4. Unwanted halon

Given the important, partially critical uses to be supplied by recovered/recycled halon in the future, it is not expected that any other than contaminated halon will be considered as being unwanted. Therefore, all non-contaminated halon is considered for reuse/recycle/reclaim.

The annual share of contaminated halons in the relation to the halon in the bank was estimated using the following methodology:

- Occurrence of recovery of halon from the cylinder, at the end of useful life or intermediary stages such as for portable extinguisher maintenance and hydrostatic test of the cylinders;

- multiplied by the share assumed as being contaminated beyond reclamation; and
- multiplied by the estimated size of the halon bank in the respective country.

Table 6 provides the parameters used for this estimation.

Table 6: Parameters used for estimation

Substance	**Occurrence**	**Contaminated beyond recycling**
halon1211	1/7 years	15%
halon1301	1/20 years	10%
halon2402	1/10 years	15%

The results are shown in Figure 24 and Figure 25 both in ODP tonnes as well as in metric tonnes.

Figure 24: Global bank of halon and contaminated annual flows per substance in ODP tonnes

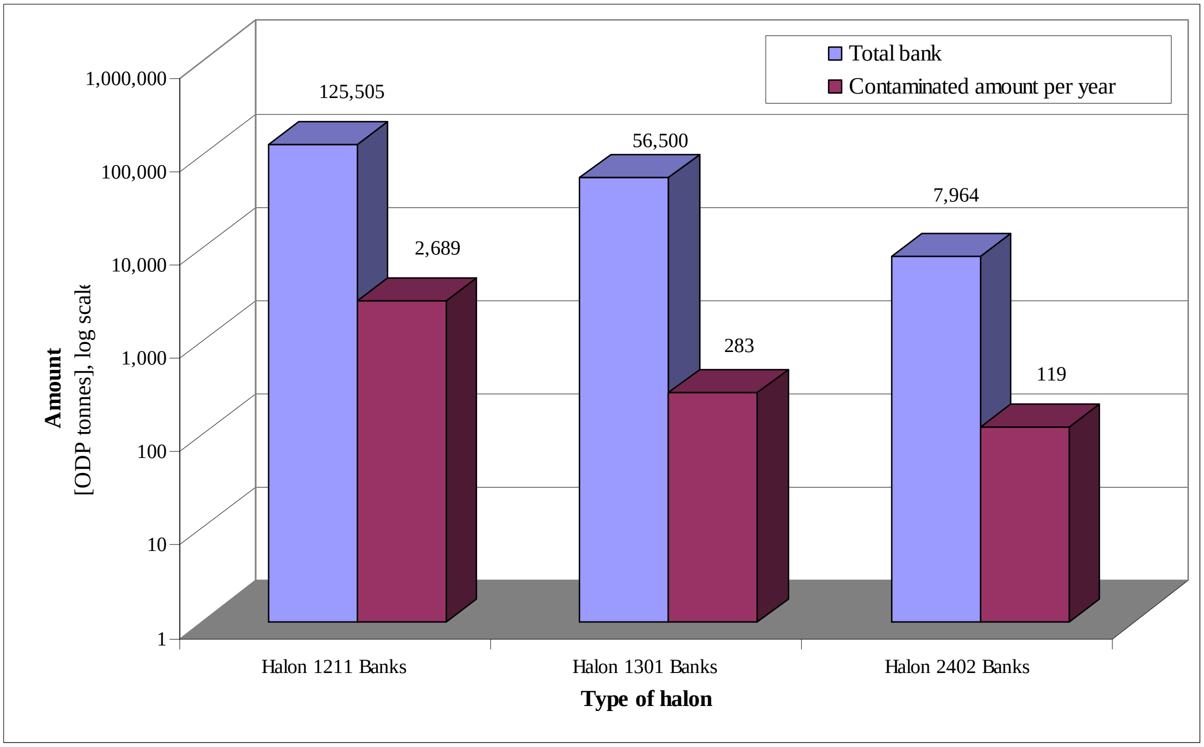
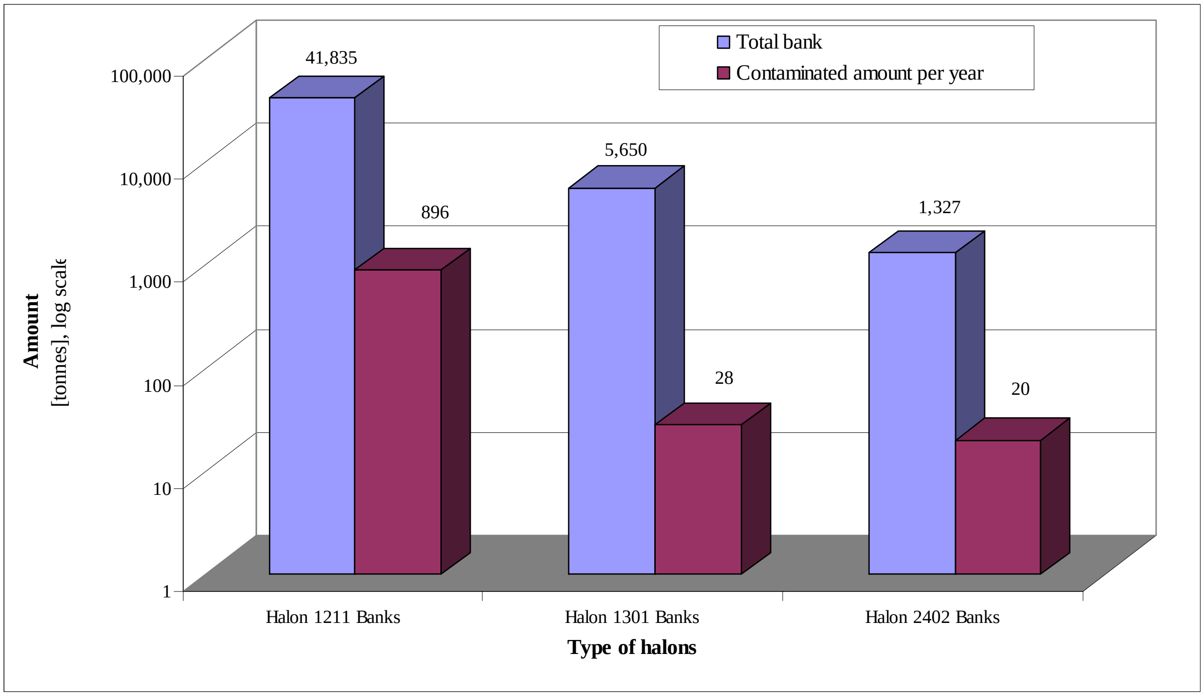


Figure 25: Global bank of halon and contaminated annual flows per substance in metric tonnes



For halon 1211 in 2010, the largest bank and therefore projected contaminated halon is by far in China, which would have approximately 85 % of the total contaminated halon 1211 in Article 5(1) countries, equating to approximately 762 MT per year of contaminated halon 1211. The next largest bank and projected contaminated halon is in the Republic of Korea which causes approximately an additional 7% (63 MT per year) of the annual total contaminated halon 1211 in Article 5(1) countries. A further 6 % of annual contaminated halon (54 MT per year) is contained in 11 countries with banks ranging from approximately 350 to 1600 ODP tonnes. The remaining approximate 2% of annual contaminated halon 1211 is originating from an additional 43 countries whose total banks are each below 50 ODP tonnes with approximately 18 MT per year of projected contaminated stocks.

For halon 1301 in 2010, the largest bank and projected contaminated annual halon amounts is also in China with approximately 28% or 8 MT per year of estimated contaminated halon 1301. However, unlike halon 1211, halon 1301 is also contained in significant quantities in 14 additional countries with banks ranging from approximately 350 to 10,000 ODP tonnes and projected contaminated annual halon flows ranging from approximately 0.2 to 5 MT per year. An additional 30 countries contain halon 1301 banks below 350 ODP tonnes averaging approximately 59 tonnes with a projected average of 0.02 MT per year of contaminated halon 1301.

Halons are anticipated to be required for years and decades to come. For example, commercial airframe manufacturers are still designing new aircraft such as the A 380 and 787 to rely on halon 1301 and continue to use halon 1211 in lieu of other potential alternatives. These aircraft will likely need to be supported throughout there lifetimes with at least halon 1301. Therefore, it is expected that non-contaminated halons will continue to be wanted for the foreseeable future.

6. CTC

CTC use falls into three main categories: use as a feedstock, use as a solvent, or use as a process agent.

When used as a feedstock, CTC is entirely transformed into other chemicals (both ODS and non-ODS). Apart from stray emissions through imperfect handling, there are no emissions from feedstock use, which is not controlled under the Protocol. There is no bank of unwanted CTC for disposal.

When used as a solvent in Article 5 countries, usually for metal cleaning, CTC is typically vented to the atmosphere or evaporates from open baths. In a small number of Multilateral Fund projects, it was reported that used, or dirty, CTC was disposed of locally without treatment. This practice ceased with conversion of the plants.

When used as a process agent, CTC theoretically operates as a reaction medium or solvent that facilitates a desired reaction and/or suppresses an undesired reaction but is not consumed in the process. Hence at the end of the process it remains unchanged and undiminished in the process equipment. In practice, almost all processes involve the loss of gasses or vapour during processing, almost always resulting in atmospheric emission (apart from any residual amounts that stay in the end-product). These losses can be substantial in poorly designed equipment. In Article 5 countries, the total consumption of CTC for process agent applications arises from losses during the process. It is not uncommon for the quantity of CTC used to be equal in magnitude to the quantity of the end product produced. The only CTC available for disposal from process agent uses is the quantity that might remain in the process equipment after the process has been discontinued. This is a ‘one-off’ occurrence and is very small compared to the overall consumption.

Implementing agencies have investigated the solvent and process agent sectors extensively in many Article 5 countries. Apart from some longstanding activities in one country that have been delayed through problems with data discrepancies, at present there is little additional new activity in the solvent or process agent sectors. CTC ‘consumption’ as currently defined by the Protocol has been more or less full addressed through national CFC phase-out plans, although implementation is ongoing and technological challenges remain for some applications. The implication of the foregoing is that, for the solvent sector and for the approved applications in the process agent sector, it is unlikely that there is a significant level of consumption not yet identified. Also, from these known uses there is no significant bank of unwanted or unused CTC for which destruction, either now or in the future, might be required.

The above discussion was focussed on the end-use of CTC. However CTC is the only ODS which is produced through co-production as a by-product in chlorine chemistry. Because of co-production, and since it will continue to be used as an uncontrolled substance in feedstock applications and, for the lifetime of existing plants, in process agent applications where emissions have been reduced to "negligible levels" it is the only ODS for which there will need to be on-going modalities under the Protocol to:

- define and separate uncontrolled, non-emissive uses from controlled emissive uses;
- establish and monitor 'negligible' levels of emissions from continuing, uncontrolled uses by all Parties;
- ensure to the maximum extent practicable that there is no diversion of CTC from uncontrolled to controlled uses in contravention of the Protocol phase-out; and
- ensure that future excess CTC arising from co-production is re-converted or disposed of through approved processes.

These issues are primarily for the Parties to the Montreal Protocol to address.

However, in the context of an expert meeting on destruction of unwanted ODS, the following points need to be recorded.

Firstly, as a result of co-production, especially in the production of HCFC-22 (which is increasing rapidly) and the significant decrease in the demand of CTC for feedstock uses, world wide co-production of CTC will exceed demand, leaving a bank that must be re-converted or destroyed. Bearing in mind local markets, production may already exceed demand in several important industrial areas. The study on global CTC production prepared by an industry expert and presented in Annex V indicates that CTC destruction is currently estimated to be 14,500 metric tonnes per year, compared to the overall estimated level of production of 184,000 metric tonnes per year. It is also estimated that the current minimum global capacity based on minimum CTC outputs from the various technologies in use is about 174,000 metric tonnes.

The requirement to destroy excess CTC has been recognised in one Fund project, namely Phase II of the China CTC production and consumption phase-out plan, where it was indicated by the World Bank that a substantial proportion of the compensation for the production part of the project would be to provide destruction facilities to cater for estimated future over production.

Secondly, the process agent applications currently listed by the Parties as approved process agent uses does not include all known applications that use CTC. For instance, the production in at least one Article 5 country of an intermediate chemical, DV acid chloride, used in the manufacture of agricultural chemicals, in which CTC acts partly as a process agent and partly as a feedstock, results in non-negligible atmospheric emissions. The CTC consumption in this application is not controlled under the Protocol.[8] There are likely to be other applications giving rise to such unwanted emissions.

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[8] At their 17th Meeting, the Parties did not include the production of DV acid chloride in the revised lists of process agent applications adopted in decisions XVII/7 and XVII/8

Thirdly, the mandate given to the Executive Committee under decision X/14 to determine emissions limits from process agent uses that are “reasonably achievable in a cost effective manner without under abandonment of infrastructure” does not include the requirement to reduce emissions to levels that are “negligible” or that are satisfactory from the perspective of ozone layer protection. For instance, the continuing use (and therefore emission) from China’s Phase II CTC production and consumption phase-out plan will be some 920 ODP tonnes annually.

It is noted that the global level of CTC production inferred from the 2000 Scientific Assessment Panel report is between 60,000 and 150,000 ODP tonnes greater than is accounted for in the Annex V industry study. However it is understood that the current work by the Scientific Assessment Panel to be reported to the Parties this year may result in better correlation of SAP and bottom-up production and emission data.

7. EXISTING UNWANTED ODS

The analysis in the chapters regarding CFC and halon predicts and quantifies annual streams of non-reusable ODS. The survey undertaken as a result of decision 47/52 of the Executive Committee brought little evidence of stored unwanted ODS. However, data provided by Japan and UNEP as well as prior anecdotal evidence points towards the current existence of certain quantities of unwanted ODS in Article 5 countries. These are predominantly used ODS from the refrigeration sector, either contaminated to an extent that it is locally unusable, or meant for destruction because of national or owner-specific policies.

In other cases, virgin ODS, in particular MeBr, has been reported as non-usable due to the passing of an expiry date on the packaging.[9] As such this issue provides an example of the need to consider policies for management and disposal of unwanted ODS, but seems to be related to a number of isolated cases and does not influence the quantitative assessments of annual waste streams made in this report.

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[9] Information provided by one MeBr manufacturer indicated that such expiry dates are used to ensure that the MeBr is used before the container might be affected by corrosion etc., while the MeBr itself remains in good condition. Since these expiry dates have passed, it might be challenging to dispose of the MeBr since safe transport without decanting might not be possible, and decanting facilities might not available.

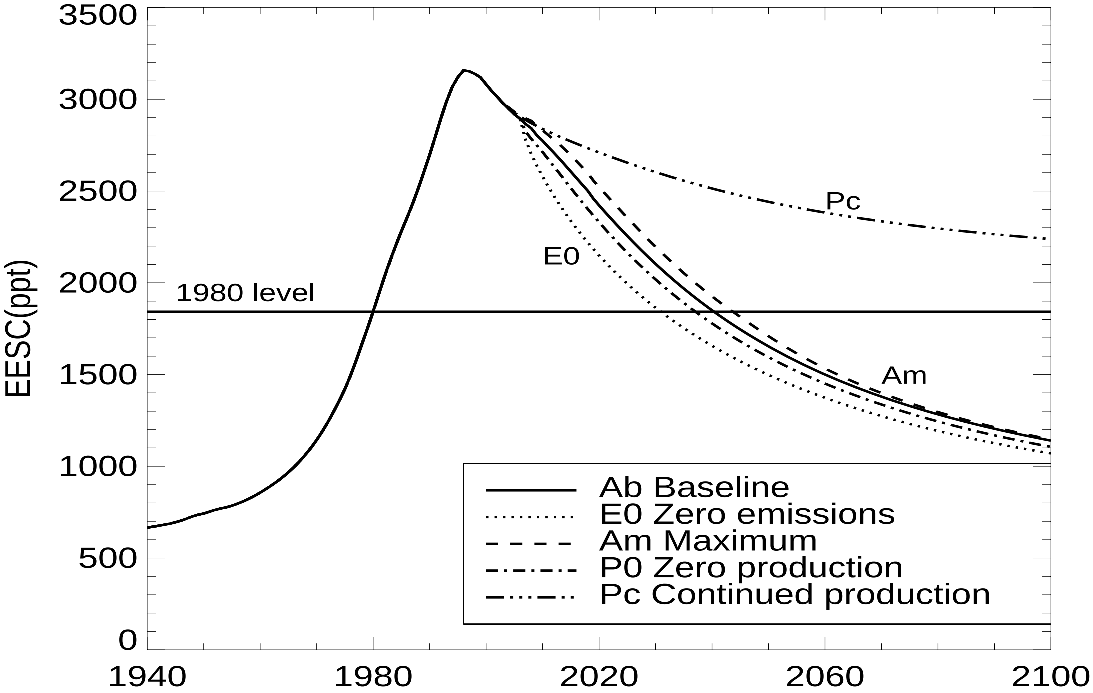
8. EFFECTS ON THE OZONE LAYER

8.1. Scope of likely impact on ozone layer recovery

It is relatively straight-forward to assume that reductions in emission from existing and future banks of ODS will result in a further acceleration of the recovery of the ozone layer. However, methods of assessing and quantifying such an acceleration have represented a substantial challenge to the scientific community.

In the first instance, there is a need to identify an appropriate measure of the likely future behaviour of the ozone layer. In the *Scientific Assessment of Ozone Depletion: 2002* (WMO,2003), the authors proposed the use of Equivalent Effective Stratospheric Chlorine[10] (EESC) as the basis for assessment. It was deemed that the measure of recovery of the ozone layer should be defined by the relationship of the atmosphere's current or projected EESC level against the corresponding level in 1980 (1830 ppt). In WMO (2003) five scenarios were evaluated as shown in the graph below:

Figure 26



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[10] EESC is the effective halogen abundance that characterizes the impact of (all types) of ODS emissions on stratospheric ozone

Estimates of future EESC based on the baseline scenario (Ab; solid line), the maximum scenario (Am ;long-dashed line), and the hypothetical cases of zero emissions in 2003 and thereafter (E0), and zero production in 2003 and thereafter of all anthropogenic ODS (P0). Also shown are results from the scenario with continued ODS production in the future at 1999 rates (Pc), production that is substantially larger than allowed in the fully revised and amended Montreal Protocol (Figure 1-23 from WMO, 2003).

The graph shows the EESC for different scenarios discussed in (WMO, 2003). The maximum (Am) and zero emissions (E0) scenarios show the range of possible future EESC values. The hypothetical zero emissions scenario gives the lower limit of chlorine/bromine loading governed only by the destruction of ODS in the atmosphere. The zero emissions scenario could be considered as the mitigation scenario with maximum impact. The maximum (Am) scenario gives the maximum EESC values based on an estimate of the maximum allowed production under the Montreal Protocol. The following table gives an estimate of the recovery dates for each scenario:

Table 7

Scenario	**Year of Recovery**
Baseline (Ab)	2044
Maximum (Am)	2049
Zero Emissions from banks	2039
Continued Production (Pc)	No recovery
Zero Emissions from all sources from 2003(E0)	2033

Immediately it can be seen that whilst the range of dates is significant, the impact of moving from the baseline assumption to zero release from all banks, as assessed in WMO (2003) was no more than 5 years.

8.2. Uncertainties in the assessment of banks and emissions

The assessment in reality is somewhat more complicated because the assessment of banks used in WMO (2003) has not been shown to accord with the bottom-up assessment of banks produced for the IPCC/TEAP Special Report (IPCC, 2005). In the case of CFCs, the banks derived in IPCC (2005) were up to four times bigger than for WMO (2003) Assessing a ‘business-as-usual’ emissions scenario using these larger banks suggests a recovery in 2046 (i.e. 2 years later than projected in WMO (2003)).

If emissions from servicing are taken into account, they will add to the emissions from the banks. In some instances the amount used for servicing over the entire period considered may be even larger than the amount present in the 2002 banks for in certain sub-sectors. Accordingly, the return of the EESC to 1980 values levels might be delayed by another two years at maximum compared to the ‘business-as-usual’ assessment in IPCC (2005). Destruction of all banks in refrigeration and AC equipment reaching end-of-life from 2008 onwards was estimated to have the consequence of returning the EESC to 1980 values by around the 2046.

Some emissions of banked CFCs (such as the slow emissions of CFC-11 from foams) could occur after ozone recovery. Such delay in emissions would reduce the effect of the banks on ozone recovery but would still contribute to the positive direct radioactive forcing as greenhouse gases. Thus the larger banks of some ODS estimated in IPCC (2005) could lead to a maximum delay in ozone recovery of the order of two to three years compared with the baseline scenario.

Although mitigation options were also studied in IPCC (2005), the long life-time of foams made it that there were few measures which would have significant impact on emissions reduction in the period to 2015. On the other hand, destruction of all banks in refrigeration and AC equipment reaching end-of-life from 2008 onwards was estimated to have the consequence of returning the EESC to 1980 values by around the 2046.

From the above analysis, it is clear that uncertainties in the assessment of current banks are as significant in their effects as globally applied mitigation strategies. It is therefore important that some of the sources of uncertainty are considered further. At their simplest, banks are defined by the difference between the cumulative production/consumption estimates and the emissions that have already taken place to atmosphere. Accordingly, both uncertainties in production/consumption data and in emissions estimates need to be considered.

With respect to production data, WMO (2003) relied heavily on industrial sources such as AFEAS. However, since then there have been concerns that reporting via AFEAS has not captured all developing country production, particularly with data relating to independent national producers. This has been shown by growing differences between nationally reported data collected by UNEP and the AFEAS global dataset.

Although this shortfall in production data will have served to create an under-estimate in WMO (2003) banks, those working with the UNEP dataset have also had difficulties because the UNEP data, unlike that of AFEAS, has no end-use analysis. This is significant when it comes to assessing emission rates at application and sub-application level.

When assessing emissions, the longer the period of assessment the less the error. This is the case for both atmospheric assessments (often known as ‘inverse modelling’) and bottom-up sub-application assessments as carried out for IPCC (2005). Predicting the precise year that equipment will reach its end-of-life is much more difficult than predicting the 10 year window for that event. Accordingly, there is greater confidence in the IPCC (2005) bank assessments and emission estimates over longer periods. The same applies for the WMO (2003) estimates, although the ‘inverse modelling’ technique is highly dependent on the accuracy in assessment chemical lifetimes. Current estimates suggest that the range of uncertainty in lifetimes for CFC-11 is 30-75 years and for CFC-12 is 75-185 years. The net effect is to create an uncertainty in annual emission leading to a range in estimate from 35,000 tonnes/annum at the low end to150,000 tonnes/annum at the high end for CFC-11. In turn, the weakness of the bottom-up method rests in the accuracy of emission factors applied at application or sub-application level. Accordingly, much of the current efforts are being invested in improving practical knowledge in this area.

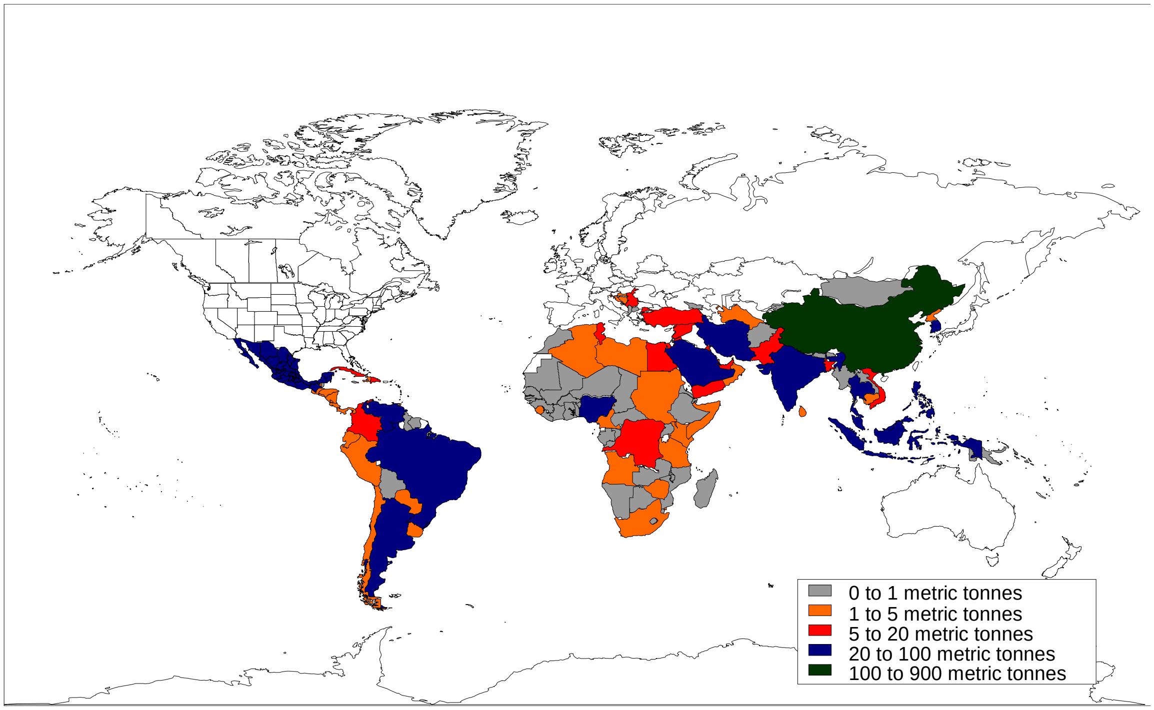
In view of the importance of these bank estimates to the assessment of the effectiveness of mitigation options in both developed and developing countries, a further workshop is scheduled at the next Open-ended Working Group to evaluate the discrepancies between approaches. This will be an important further input to the relevance of enhanced recovery methods in developing countries. In the meantime, most current assessments (including this one) are working from the bank data of IPCC (2005). On this basis the bank of (technically) reachable refrigerants and blowing agents identified in this report represented 31.9% of the total global bank of CFCs in 2002.

9. TRANSPORTATION ISSUES

9.1. Location of ODS banks

The banks of ODS are widely distributed. CFCs are existing in every country, both in refrigeration as well as in foam uses. Halons are consumed in 63 countries. Using contaminated ODS as an example, the average annual amount of contaminated CFC per country is 5.4 metric tonnes, the average amount of halon (excluding China) 2.9 metric tonnes. Depending on the effectiveness of collection of the contaminated ODS and the banks targeted, the amounts per country and, therefore, also the averages can vary significantly. The map presented below provides an impression of the distribution of annual flows of contaminated CFC and halon on the basis that annually 744 metric tonnes of contaminated CFCs and 945 metric tonnes of contaminated halon will be collected world wide.

Figure 27: Overview of distribution of annual flows within Article-5 countries of contaminated CFC and halon



Because of the small amounts of contaminated ODS per country, it might often be necessary to transport the ODS across national borders to more centralised reclamation or destruction facilities.

9.2. The applicability of the Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal presents the rules for the transportation of the hazardous waste and touches the issue of its management. The content of the Basel Convention defines conditions and possibilities for the waste movement in the international and regional aspect.

The definition of hazardous waste under Basel Convention includes the Ozone Depleting Substances, under the convention's categories Y41 and Y45[11] . Both disposals as well as recovery operations are covered. The regulations of the convention are broad, an overview is provided in the Annex.

The provision with the most significant impact on the extent of current and future requirements for the collection and disposition of non-reusable and unwanted ODS is the prohibition of transportation to/ from countries that are not party to the Basel Convention, and the right of parties to prohibit import to their territory. The exception for export to/import from non-Party is the existence of multilateral, regional and bilateral agreements. As to technical part requirements, potentially complications might be created due to the complex notification system (see Annex for description of the procedure of notification); according to the convention parties are requested not to export hazardous waste without a written consent from the importing country.

Until today there are 26 Parties to the Montreal Protocol who have not ratified the Basel Convention (see annex for a complete list of ratification). The following Article 5 Parties belong to that group: Afghanistan, Angola, Central African Republic, Republic of Congo, Fiji, Gabon, Grenada, Haiti, Democratic Peoples Republic of Korea, Laos, Myanmar, Niue, Palau, Sao Tome and Principe, Sierra Leone, Solomon Islands, Somalia, Sudan, Suriname, Tonga, Tuvalu, Vanuatu, Zimbabwe. It is to be expected that significant difficulties will arise for the movement of recovered ODS between any of these countries and signatories to the Basel Convention.

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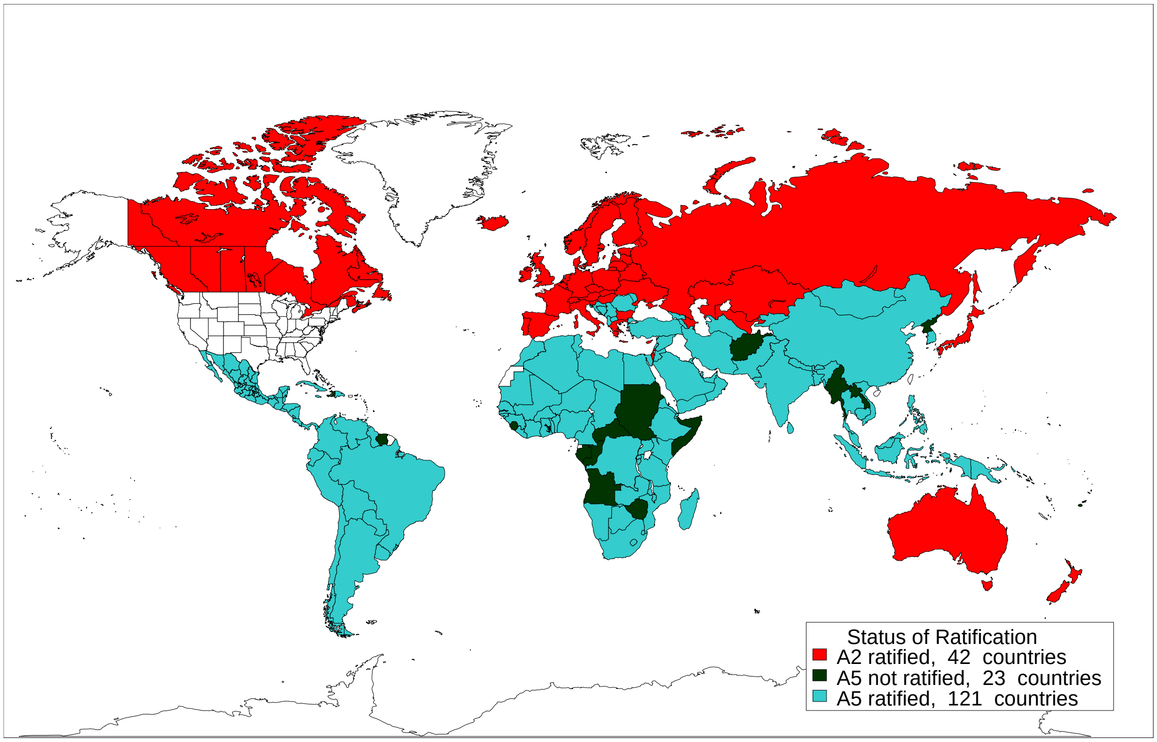
[11] Y41: Halogenated organic solvents; Y45: Organohalogen compounds other than substances referred to in this Annex.

Figure 28 shows the Status of Ratification of the Basel Convention by Article 5 countries.

Figure 28: Status of ratification of the Basel Convention



There are a number of multilateral, regional and bilateral agreements significant for the Basel Convention. The provisions of such agreements create additional restrictions for movement of hazardous waste.

a) Bamako Convention on the Ban of the Import Into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes Within Africa
b) Central American Agreement (Acuerdo Regional Sobre Movimiento Transfronterizo de Desechos Peligrosos)
c) The Waigani Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region.

The complete list of agreements is attached in the Annex.

As to the national regulations some of the states have exercised their right to completely prohibit the export of waste to their territory. From the information available it became clear that about 45 countries have prohibited without provisions for exceptions the import for final disposal, and 24 countries for recovery operations. In addition, some states have restriction on import, for example, by being parties to regional agreements.

In addition to the Basel Convention, several regional multilateral agreements restrict transportation of hazardous waste further, which might create obstacles when moving Ozone Depleting Substances. For example, two OECD decisions are aimed to control transboundary movement of hazardous waste for recovery operations within the OECD area (see annex). Bilateral agreements have in comparison a different function, they tend to regulate the transportation between countries.

Certain issues could not be clarified before the expert meeting due to time constraints, such as the effects of a combination of the provisions of regional agreements with those of the Basel Convention, in particular in case of the Bamako Convention.

However, according to anecdotal evidence collected during the preparation of this report regarding the implementation of the Basel Convention, it seems like the difficulties are created not that much by the provisions of the treaties, but rather by weak institutional performance and the absence of regulatory mechanisms in the countries. Even if the country is a party to the agreement it does not always incorporate the provision into the national legislation. This relates to both the Basel Convention itself as well as regional agreements.

Other anecdotal evidence suggests that transport of waste directly from developing countries to developed countries creates only little problems if both are parties to the Basel Convention. Significant problems might arise if one of the countries involved is a non-party, or if transit through other countries is involved. More clarifications might be beneficial in this area.

It should be noted that the procedure to obtain consent of the destination country before shipment might be cumbersome and inefficient if only small amounts of substance are involved.

10. INFLUENCING FACTORS

This chapter describes a number of issues which might have an influence on the amounts of reachable but non-recyclable ODS in the future. These issues have been brought to light from experience with implementation in non-Article 5 countries and Article 5 countries. To a large extent they refer in particular to the management of CFCs that have been used for refrigeration and, to a smaller extent, halon used as a fire suppressant, since ODS used in these two applications often fall into the category of being reachable with low effort, and both applications need decentralised collection and handling of the substances. The experts felt it would be meaningful to elaborate briefly on the issues, since it might be beneficial for policy makers to be aware of them.

The total amount of CFC and halon reachable with low specific effort consists of a portion for potential re-use and one which is non-reusable due to heavy contamination. The re-usable quantity might be recycled or reclaimed. Both the non-reusable quantities as well as those for reclamation need collection systems to accumulate quantities sufficient to allow effective processing. In the following paragraphs, these centrally performed activities, i.e. storage, reclamation and disposal or destruction, will be subsumed under the term “processing”.

The collection and transport of ODS for processing requires certain logistical conditions and infrastructure. However, experience has shown that even where logistics and infrastructure are in place, the additional effort associated with their use acts effectively as a disincentive to collection and return of used ODS. Experience in implementation in both non-Article 5 countries and Article 5 countries strongly suggests that the availability of infrastructure without specific incentives for its use leads only to premature deterioration of the infrastructure. The conclusion is that incentives beyond the general benefits of good practice are needed if recovery and subsequent processing of ODS is to be successful.

Incentives which are known to have produced positive results would include:

- enforced regulations, such as
    - no venting policies only,
    - no venting plus recovery/reclamation for reuse;
    - no venting plus recovery for destruction only;
- requirements for quantitative reporting of virgin and recovered refrigerant within the supply chain (including back from the technician to the reclamation facility);

- establishment of non-profit reclamation organisations[12];
- implementation and enforcement of domestic policies;
- incentives related to other objectives of national governments; e.g. energy efficiency benefits or GWP based credits, etc.
- avoiding contradictory incentives, in particular between those related to destruction and those related to reuse;
- supporting the establishment of infrastructure for collection and handling of ODS which can be used for alternatives as well as for ODS, to improve sustainability of its use.

The above range of incentives demonstrates the role that policy measures can play in creating or supporting successful recovery and processing of ODS. Experience also suggests that policies can be designed in a way that minimizes the incidence of mixing different unwanted ODS (which would be simpler for transport purposes), which would generally exclude them from subsequent reclamation efforts.

Infrastructure refers to:

- means (equipment, human capacity) to monitor ODS purity for recycling or reclamation, both during collection as well as, with higher accuracy, before distribution of reclaimed material;
- storage capacities for non-reusable CFC;
- the extent of a recovery cylinder network for a variety of refrigerants;
- the number of recovery as well as recovery and recycling units operating;
- availability of reclamation facilities with distillation processes;
- in case of export for processing (destruction, reclamation, …) abroad, the availability of suitable containers.

Even if carefully designed policies and infrastructure are in place, geographical conditions might make the collection of unwanted ODS so logistically complex that no significant amounts can be expected to be returned from the field. Depending on the conditions in each country, this can refer to the quantity of unwanted ODS, the location of the unwanted

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[12] Reclamation organisations should be set-up in a way that they are able to accept low purity ODS and those with a high level of contamination. Commercial operators are typically driven to collect unwanted ODS with only a small amount of impurities to optimize the financial viability of their operation. High purity requirements have been seen to be discouraging the proper handling of unwanted ODS. A number of possibilities to set-up suitable reclamation organisations are known, among them operation as a not -for-profit organisation

ODS within the country, e.g. in the difference between major conurbations vs. more remote areas, and the location of the country, itself.

The experts were of the opinion that, without considering geographical distribution, while the existing destruction capacities are, according to anecdotal evidence, well utilised today, the projected streams of both non-reusable ODS and ultimately, even currently reclaimed ODS could be accommodated in existing facilities.

Barriers for the establishment of an acceptable destruction scheme for non-reusable ODS were seen to be

- Non-availability of information regarding facilities that offer destruction services, impeding, inter alia, cost comparisons;

- Intricacies (whether perceived or actual) related to international transport and trade of the non-reusable ODS.

11. INFORMATION COVERAGE

A significant amount of information collected before and during the expert meeting was rigorously assessed for relevance and accuracy and, where appropriate, included in this report. Careful consideration was also given to the needs for additional information.

The information presented in this report can be divided into three groups:

- definitions
- quantitative information related to the assessment of the extent of current and future requirements for the collection and disposition of non-reusable and unwanted ODS in Article 5 Countries, associated with CFCs, halons and CTC
- information not related to the quantification of unwanted ODS, in particular regarding atmospheric and transport issues

The definitions are based on terminology generally used by the TEAP and its TOCs as well as IPCC terms. Since the task of this report required very exact use of terms, and since the underlying decision of the Executive Committee used terms which allowed interpretation, the experts agreed on a sufficient set of definitions to be used throughout the report.

In order to obtain the quantitative information needed by decision makers, two different approaches were undertaken to establish the underlying data. One approach was the collection and assessment of existing information. This included

- information from a survey undertaken for this report, provided by the National Ozone Units of the national governments, implementing and bilateral agencies as well as through case studies from the Government of Japan (see Annex III, IV);
- information from regular reporting under Article 7 of the Montreal Protocol and the country program reporting requirements under the Multilateral Fund;
- information from Multilateral Fund implementation activities, such as project proposals, project completion reports;
- evaluation reports from the Multilateral Fund;
- information provided by TEAP;
- other sources of information, in particular the IPCC/TEAP special report and TEAP supplement report.

The second approach was based on the utilisation of existing models, in particular for foam, halon and refrigerant banks. The models used have been established over a number of years, have been intensively peer reviewed and have been utilised by a number of studies similar in character to this report, such as IPCC, TEAP and TOC reports.

The amount of data collected in the survey for the halon and CTC sectors was insufficient for use as a basis for the analysis. Country program data was used extensively to support the model for the halon sector. For the CFC chapter, with very different use and emission patterns, the information collected was extensive, but proved to be inconsistent and too fragmented to be used in the quantitative analysis for more than cross-checking of the data delivered by the models, which was used as the basis for the analysis.

The experts were of the opinion that the approaches chosen for the different chapters to predict the extent of current and future requirements offered the best data quality achievable, leading to best possible estimates for the scenarios envisaged. Nevertheless, specific additional data could further improve the predictions by broadening the input into the model.

It was generally recognized and accepted that the global accuracy of such quantitative predictions would not be influenced significantly by policy changes in individual countries. The accuracy of the predictions would only be affected significantly if broad policy changes were introduced on a global scale. Such broad policy changes might include wide spread market changes based on factors outside the Montreal Protocol and the overall adoption of national policies to recover ODS classified as requiring medium or high effort and the like.

The experts felt that further data gathering regarding existing quantities of unwanted ODS might provide some additional insights. There was no indication that the quantities accumulated so far would significantly influence the treatment options resulting from the annual streams of locally unusable ODS as predicted in the chapters regarding CFC and halon.

The experts further believed that information regarding the infrastructure available in the different countries for handling, in particular, of contaminated refrigerants might benefit policy makers in better understanding the possible extent and limitations of collection efforts in Article 5 countries.

Apart from quantitative analysis, policy makers might be able to assess the impact of different policy options better if additional information were available regarding a number of issues. This regards:

- the organizational needs for cross-border transportation, including the impact on cost;
- cross links with other Multilateral Environmental Agreements, in particular the Stockholm Convention, and the potential to cross-link transportation and destruction with positive effects on sustainability.

12. CONCLUSIONS

An expert meeting to assess the extent of current and future requirements for the collection and disposition (emissions, export, reclamation and destruction) of non-reusable and unwanted ODS in Article 5 countries was organised by the Multilateral Fund Secretariat and took place in Montreal from 13-15 March 2006. During the meeting a draft report was written and mutually agreed by the participating experts. A discussion of the draft report among all attendees highlighted some potential issues, which were subsequently addressed in the report. The report was finalised and agreed to by all experts shortly after the expert meeting.

Definitions are critical to develop a thorough understanding of the issues considered in this report. The experts spend a considerable amount of time and effort to develop a consistent scheme of definitions.

The information collected from countries through reporting means, such as the survey undertaken, and project completion reports proved to be insufficient regarding quantity and consistency to be of use as a basis for this report. Instead, existing models for refrigerant and foam blowing agent banks were expanded and used, and the experts expressed a high confidence in the models used to predict quantities of foam, halon and refrigeration banks, which formed the basis for calculations of recoverable ODS.

CFC blown insulation will be in use until well after the year 2015 except for uses in refrigerators, transport and building services, where some decommissioning is already taking place and will continue to increase prior to 2015. Recovery of CFC from insulation foam would require a medium or high effort, and would be likely to need additional incentives. CFC recovered from foams is not likely to be recycled or reclaimed for the lack of suitable applications.

Refrigeration is an application where recovery and recycling schemes are or can be made economically viable and can extend the lifetime of existing refrigeration systems. Successful operation of such schemes would require a well coordinated effort in policy and subsequent infrastructure development.

Halons are expected to be used for decades to come to support existing long-term uses. Consequently, and because of the residual value due to high demand, recovery and reuse is expected to function well, although there are currently still problems in some banking systems in Article 5 countries.

There is no requirement for a system for collection and disposal of CTC from dispersed industrial facilities. There is likely to be an excess of CTC production in the near future. The excess will need to be destroyed, preferably at the production site. There are a number of significant ozone protection issues associated with the production, emission and destruction of CTC that will need to be addressed in other forums.

The quantitative results of the chapters on CFC, halon and CTC regarding banks and annual flows are displayed in the following table:

Table 8: Global Banks and annual flows for the three main groups of substances

Substance	**Annual virgin ODS for destruction** [metric tonnes/year]	**Anticipated contaminated ODS stream**[13] **annually** [metric tonnes/year]	**Total potential annual flow from reachable banks** [metric tonnes/year]	**Banks** [metric tonnes]
CFC	-	744 (2010)	36,400 (2010)	765,000 (2010)
halon	-	944 (2010)	6,392 (2010)	48,800 (2010)
CTC	14,000 (2005)	-	-	-
Total	14,000	1,688	42,792	813,800

In addition, there are existing banks of surplus or non-reusable ODS already accumulated today. The total quantity of non-reusable CFCs, all from refrigeration, that might accumulate by 2010 has been assessed as 3500 metric tonnes. The accumulation of other ODS has not been addressed quantitatively.

The atmospheric effects of the emission of ODS on the Ozone Layer were described briefly in this report on the basis of information contained in the IPCC/TEAP special report and the supplement report. The supplement report specified that the mitigation scenario (global) would produce an acceleration in the recovery of the ozone layer of about two years. Since banks in Article 5 (1) countries are a sub-set of this global evaluation, it would be expected that the mitigation measures would be proportionately less.

The amount of non-reusable ODS potentially collected annually has been calculated on a country-by-country basis. It is in eleven Article 5 countries larger than 20 metric tonnes per year, in the remaining ones smaller than this figure. In some countries annual quantities of non-reusable ODS will require stockpiling to reach quantities for shipment which are economically justifiable. The Basel Convention on Hazardous Waste is relevant for the transboundary transport of recovered ODS. Its provisions will increase the effort required for successful implementation of trans-boundary reclamation and/or destruction schemes.

In many cases, ODS recovery will not be achievable without additional stimulation. Such stimulation may arise from other environmental agreements and economic imperatives. Parallel environmental and economic benefits provide additional justification for action and may provide possibilities for financing.

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[13] Available ODS waste stream (non-reusable) from recovery

Report on the
EXPERTS MEETING
To Assess the Extent of Current and Future Requirements for the Collection and Disposition (Emissions, Export, Reclamation and Destruction) of Non-Reusable and Unwanted ODS in Article 5 Countries

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#	Annex
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VI	List of attendees at the Experts Meeting

Annex I

Literature list and list of relevant Executive Committee documents and decisions

References

Ashf04 **Ashford,** P., D. Clodic, A. McCulloch, L. Kuijpers, 2004: *Determination of Comparative HCFC and HFC Emission Profiles for the Foam and Refrigeration Sectors until 2015.* Part 1: Refrigerant Emission Profiles (L. Palandre and D. Clodic, Armines, Paris, France, 132 pp.), Part 2: Foam Sector (P. Ashford, Caleb Management Services, Bristol, UK, 238 pp.), Part 3: Total Emissions and Global Atmospheric Concentrations (A. McCulloch, Marbury Technical Consulting, Comberbach, UK, 77 pp.). Reports prepared for the French ADEME and the US EPA

EOL05 **UNEP TEAP,** 2005: *TEAP Progress Report, Volume 3, Report of the TEAP Task Force on Foams End-of Life Issues.* UNEP Nairobi, May 2005

Pal03 **Palandre,** L., A. Zhoughaib, D. Clodic, 2003: *Inventories of the world-wide fleets of refrigerating and air conditioning equipment in order to determine refrigerants emissions for the years 1990 to 2000.* Final Report by Ecole des Mines (funded by ADEME and GGEEC), June 2003, CEP, Ecole des Mines, Paris, 254pp.

SROC05 **IPCC TEAP,** 2005: *IPCC/TEAP Special Report on Safeguarding the Ozone Layer and the Global Climate System: Issues related to Hydrofluorocarbons and Perfluorocarbons.* Prepared by Working Group I and III of the Intergovernmental Panel on Climate Change and the Technology and Economic Assessment Panel under the Montreal Protocol (Metz, B., L. Kuijpers, S. Solomon, S.O. Andersen, O. Davidson, J. Pons, D. de Jager, T. Kestin, M. Manning, and L.A. Meyer (editors)). Cambridge University Press, Cambridge, UK, and New York, NY, USA, 488 pp.

Supp05 **UNEP TEAP,** 2005: *TEAP Supplement to the IPCC/TEAP Special Report on Safeguarding the Ozone Layer and the Global Climate.*
TEAP Task Force on Supplement to the Special Report (Kuijpers, L., P. Ashford, R. Peixoto (editors)), UNEP Nairobi, November 2005

List of relevant Executive Committee documents and decisions

Document / Decision	Reference	Date reference
Supplementary information mentioned in Document UNEP/OzL.Pro/ExCom/48/15	Global CTC production, consumption and destruction (David Sherry), extract from the supplementary information provided with the desk study on the evaluation of CTC process agents projects and phase-out agreements submitted to the 48th Meeting of the Executive Committee	March 2006
Decision 47/52	Mandate for the Expert Meeting and Report	November 2005
Document UNEP/OzL.Pro/ExCom/47/56	Proposed terms of reference, budget and modalities for a study regarding collection, recovery, recycling reclamation, transportation and destruction of unwanted ozone-depleting substances (follow-up to decision 46/36)	November 2005
Decision 46/36	Mandate for document UNEP/OzL.Pro/ExCom/47/56	July 2005
UNEP/OzL.Pro/ExCom/44/10	Final evaluation report on halon banking projects for countries with low volumes of installed capacities	November 2004
Document UNEP/OzL.Pro/ExCom/41/7	Final report on the evaluation of the implementation of RMPs	November 2003
Document UNEP/OzL.Pro/ExCom/40/8	Final report on the evaluation of the halon sector	June 2003

Annex II

Determination of CFC banks

This Annex II provides additional specific information related to the determination of CFC banks.

II.1 Methodology used

II.1.1 Refrigeration

The advanced TIER2 method, using the RIEP program (Refrigerant Inventories and Emissions Predictions) /Pal03/ has been applied in this study. This had originally been developed under the support of the French government (ADEME) and has been adopted since as a basis for benchmarking its own models by the United States EPA amongst others.

In order to calculate the refrigerant inventories in equipment with high accuracy, the first step required is to gather reliable data for the equipment numbers. Annual statistical data are available for nearly all mass-produced equipment, some are publicly available, and some marketing studies can be purchased from specialised companies. This bottom-up method applies the following steps: (1) determination of the annual sales of new equipment and the amount of the different refrigerants charged into it, (2) the determination of all the fleets of equipment in the different sub sectors, which yields a cumulative value for the refrigerant bank for the specific application. Once this is known per year, the entire life cycle of a product can be described in time, and also for all product types in an aggregated manner; furthermore, the amounts of refrigerant in equipment by type of refrigerant and per country can be presented. For countries where only few specific equipment data is available, some general data for these countries (such as data on energy production and consumption, population, and economic parameters) can be used to create ratios between the number of refrigerating equipment and these data, e.g. ratio between equipment, GDP and population. The refrigerant equipment data so derived can then be used in the RIEP program.

In a first instance, the results on the banks in equipment and the related emissions (global inventories) were published for the year 2000 (global inventories) and for 2015, as a result of a project carried out for the US EPA /Clo03/. In a second instance the method has been used to determine equipment inventory (bank) data for the years 2002 and 2015 (predictions) for all refrigerant types in all refrigeration and air conditioning sub sectors. These data have been used in the IPCC /TEAP Special Report on Ozone and Climate /SROC05/. The data on banks and emissions per refrigerant type and per sub sector are explicitly given in an annex to the TEAP supplement Report to the Special Report /Supp05/. It should be mentioned that these data concern banks in equipment and the related emissions from the equipment during the operational period and at end of life, which is not vented.

For this study the following banks (inventories) have been determined: (1) the bank of virgin CFC material, before it is applied in the equipment, (2) the bank of CFC refrigerant in equipment, and (3) the bank containing CFC refrigerant, which is not re-used after that the equipment has reached its end of life.

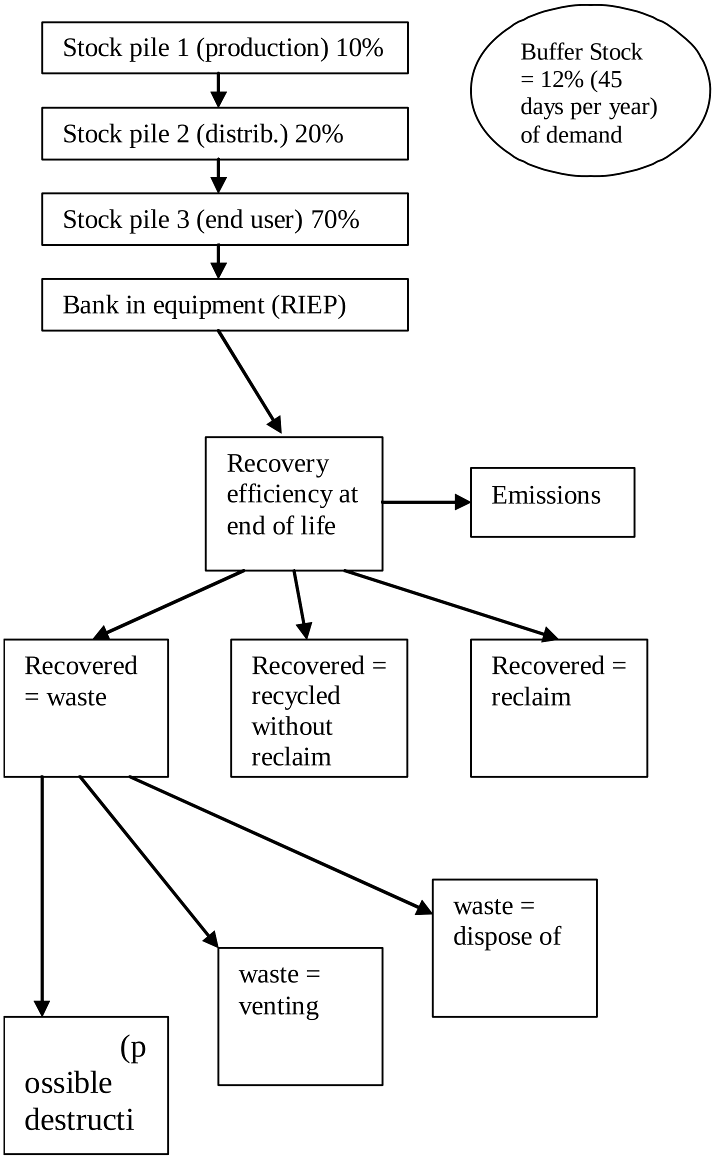
In this study the banked virgin CFC refrigerant is estimated at 45 days of demand for refrigerant (for both the servicing and the charging of new equipment, i.e., in case there is a manufacturing operation in a country).

The banked amounts in equipment are as published in /Supp05/. At the end of the life of the equipment, a certain recovery efficiency is assumed (which is different per sector and in time) as a result of which certain amounts are emitted and the remainder is further processed. Part of this amount is recovered, part is reclaimed (actually, it is assumed that this is a very small part), the remainder is considered as waste, or rather, as non-usable refrigerant, because it cannot be re-used as a chemical or it cannot be re-used under specific sub sector and country conditions, which amount also varies in time. Part of this amount is assumed to be vented again, the remainder is then assumed to be disposed of and stored. For the sub sector, the emissions at end of life plus the emissions during operation (leakage and during servicing are not considered here), plus the amount that is vented from the non-usable stream are equal to the emissions as given in the Supplement Report /Supp05/.

Changes have only been introduced in the chiller sub sector compared to the assumptions for the Special Report and the Supplement Report, and this was based upon more recent data received on production and consumption of CFC-11 and CFC-12: (1) a new subdivision between CFC-12 and CFC-11 refrigerants (leading to a different percentage of CFC-11 and CFC-12 chillers in the total) was applied, and (2) a higher average cooling capacity for the centrifugal chillers has been taken into account.

The flow scheme below presents in Figure II- 1 the different streams and is, in fact, the same as the flow diagram presented in the main body of the report.

Figure II- 1



Dependent on the sub-sector, the assumptions vary. Table II- 1 through Table II- 4 present the assumptions (in percentages).

Table II- 1: Recovery efficiency at end of life

Year	Domestic	Commercial	Transport	Industry	Chillers	Mobile AC
2002	0 %	0 %	0 %	5%	5 %	0 %
2010	5 %	10 %	5 %	50 %	50%	5 %
2015	5 %	10 %	5 %	50%	50%	5 %

Note: For the “Latin America and Caribbean” group and the “South Asia” group, higher recovery efficiency is taken into account for chillers (15 %) and industry (10 %) in the year 2002

Table II- 2: Percentage of recovered refrigerant seen as non-usable (going to “waste”)

Year	Domestic	Commercial	Transport	Industry	Chillers	Mobile AC
2002	100 %	80 %	80 %	30 %	30 %	90 %
2010	100 %	30 %	60 %	10 %	10 %	80 %
2015	100 %	30 %	60 %	10%	10 %	80 %

Table II- 3: Percentage of recovered refrigerant going to “recycling (in the equipment)”

Year	Domestic	Commercial	Transport	Industry	Chillers	Mobile AC
2002	0 %	20 %	20 %	70 %	70 %	10 %
2010	0 %	60 %	40 %	80 %	80 %	20 %
2015	0 %	60 %	40 %	80%	80 %	20 %

Table II- 4: Percentage of recovered refrigerant that is “reclaimed”

Year	Domestic	Commercial	Transport	Industry	Chillers	Mobile AC
2002	0 %	0 %	0 %	0 %	0 %	0 %
2010	0 %	10 %	0 %	10 %	10 %	0 %
2015	0 %	10 %	0 %	10 %	10 %	0 %

Dependent on the type of equipment and the structure of servicing, the recovered refrigerant at the end of life of the equipment is considered as non-reusable for the domestic sub sector and, to a large degree, for the MAC sub sector. For larger refrigerating capacity equipment (such as chillers and industrial equipment) the refrigerant is mainly recycled for use in other equipment. For the transport and commercial refrigeration sub sectors, where equipment has a lower value and a shorter lifetime, owners and contractors are still interested in re-using the refrigerant.

In this part of the study, destruction of recovered refrigerant is not taken into account. For the time being, the amount that could possibly be destroyed is considered as part of the refrigerant that is non-usable and that is disposed of.

II.2.1 Foams

Three elements of blowing agent information have been considered for this report:

- Annual consumption in 2002, 2010 and 2015 to derive supply chain stockpiles;
- banks within products/equipment in use;
- banks remaining in products/equipment already disposed of.

The source information used for this assessment has been the dataset generated in support of the development of the IPCC/TEAP Special Report on Ozone and Climate /SROC05/. Much of this data was originally generated during a project conducted for AFEAS in the period from 1998-2000 and was then validated and updated during the preparation of the 2002 UNEP TOC Foams Assessment Report in which 2001 consumption data was assembled in parallel using regionally spread experts. The dataset was extended – particularly in its assessment of future emissions and end-of-life management options in 2004 in order to better quantify banks in the period following decommissioning of foam.[1]

The original dataset was established using eleven global regions. Since these do not equate precisely to the regional network being used for this report, the volumes previously established at the original global region level have been assigned to countries on the basis of the number of dwellings in each countries (2000 data from the UN Global Survey). The data has then been reconstituted according to the country make-up of the regional networks (see Appendix II-3 A to Appendix II-3 J).

The data-set spans eighteen different foam sub-sectors, each of which has a differing consumption and emission profiles. Indeed, the supply chain will also vary, bearing in mind that some smaller foam uses are supplied via ‘intermediate’ systems houses where some pre-blending and formulating of systems (including blowing agents) can occur. In order to keep the evaluation in line with that conducted in the refrigeration sector, the three supply-chain stockpiles: - production, distribution (inc. systems houses) and end-user were evaluated separately. Table II- 5 illustrates the assumptions used by foam sub-sector.

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[1] Previously, it had been assumed that all remaining blowing agents would be released at end-of-life.

Table II- 5: Assumptions used by foam sub-sector

Sub-sector	Producer/Importer	Distribution	End-user
	(%)	(%)	(%)
Domestic Appliance	50	0	50
Other Appliance	40	20	40
Reefers	40	20	40
PU Boardstock	50	0	50
PU Continuous Panel	50	0	50
PU Disc. Panel	40	20	40
PU Spray	33	33	33
PU Block – Pipe	40	20	40
PU Block – Slab	40	20	40
PU Pipe-in-pipe	40	20	40
PU One Component	33	33	33
XPS Board	50	0	50
PE – Pipe	50	0	50
PE – Slab	50	0	50
PF Boardstock	50	0	50
PF Disc. Panel	40	20	40
PF Block – Pipe	40	20	40
PF Block – Slab	40	20	40

As with the refrigeration sector, it is assumed that the supply chain carries 45 days of supply. Although, the supply chain for the foam sector is potentially more concentrated than for the refrigeration sector, the overall volumes are generally less. The assessment is set up in such a way that sensitivity analyses to this assumption can be conducted relatively easily. However, even if the supply chain was carrying 90 days of stock, the overall size of the stockpiles would be relatively small in relation to other banks.

With respect to end-of-life assumptions, four options have been considered: re-use, landfill, shredding without blowing agent recovery and shredding with blowing agent recovery. Since the choices made vary with foam sector, region and time, the number of permutations (324) is too large to cover in the main text. In addition, only three of the options lead to post-decommissioning banks. In the case of shredding with recovery, it is assumed that all shredded and recovered material is ultimately destroyed. Accordingly, there are only three end-of-life scenarios with attributed banks. However, the end-of-life banks are aggregated in the tables contained within the main text in this Appendix. Similarly, the data relating to the two CFCs evaluated (CFC-11 and CFC-12) are aggregated in the text but separated in the tables in the relevant Annex A1-3 to this Appendix. In general the lifetime of foams in buildings is assumed to be 50 years. Other applications, including refrigeration, insulated transport and building services (signified by the cream shading in Table II- 5 are assumed to have a 15-year lifetime. In view of these assumed lifetimes, it is clear that CFC-containing foams from buildings will not be decommissioned prior to 2015, which is the latest year assessed in this work.

II.2.2 Estimation of banks and their location

II.2.1 Refrigeration

The banks as defined above have been determined for the refrigeration and AC sector for all Article 5(1) countries, i.e., the bank of virgin material, the banks in equipment, and banks stored that are not used or non-usable. For the latter case the annual amounts disposed of are given, as well as the cumulative amount (assuming a continuing storage process between 2002 and 2015). Amounts of CFC-11 and CFC-12 have been calculated separately, but have been aggregated for the presentation in this report.

Countries have been grouped in six regions following the composition of the UNEP networks (where the two regions for Africa have been merged). The groups and the countries belonging to these groups are given in Appendix II- 1.

Table II- 6 gives the totals per region for the different banks (separately for the two scenarios). In Table II- 6Table II-6 it can be observed that the annual amounts disposed of in containers (Recovered ODS-bank) vary between 20 and 30 tonnes. It forms a strong contrast with the region covering both China and India where this annual amount varies between approximately 2,000 and 3,000 tonnes (with 200,000 tonnes in inventory in equipment in the year 2002 and almost 100,000 tonnes in the year 2015 still). This is further elaborated in section II.3.1.

Table II- 6 is based upon detailed calculations for all the regions, the results of which can be found in Appendix II-2 A to Appendix II-2 F.

In order what this means per country, there countries have been selected, i.e., Argentina, Zambia and Thailand. For these three countries results are given in Table II- 7.

Table II- 6: Global results for CFC banks (refrigeration) in the different stages of the process (metric tonnes)

CFCs virgin bank	Africa	Latin America and Caribbean	Eastern Europe and Central Asia	South Asia	South East Asia and pacific	West Asia	TOTAL
2002	446	1,478	168	7,063	924	242	10,321
2010	142	635	50	3,292	390	79	4,588
2015	86	369	23	1,733	225	45	2,482
CFCs In-product bank							
2002	23,906	56,870	10,783	215,681	47,125	13,626	367,992
2010	16,806	40,660	5,084	167,616	34,961	9,271	274,397
2015	9,814	23,121	1,959	106,142	20,679	5,319	167,033
CFCs available ODS waste (non-recyclable) from recovery; annually							

2002	3	20	1	97	17	5	*143*
2010	56	116	31	375	118	37	*733*
2015	*39*	*89*	*15*	*361*	*117*	*28*	*648*

Note:
-Virgin bank is the total amount of refrigerant in production, distribution and end users stockpile;
In-product bank is the amount of refrigerant in the equipment;
-available ODS waste stream (non-recyclable) from recovery is the amount of refrigerant disposed of after recovery at the end of life of the equipment;
-available ODS waste stream (non-recyclable) from recovery is expressed either as a cumulated amount year after year, or as an annual amount of CFCs.

Table II- 7: CFC Banks (refrigeration) at different stages in the process for Argentina, Zambia and Thailand (metric tonnes)

Virgin bank all CFCs (before equipment)	**Argentina**	**Zambia**	**Thailand**
2002	88	3	200
2010	26	1	84
2015	13	<1	57
In product bank all CFCs			
2002	4893	144	10971
2010	3369	111	9099
2015	1765	75	6229
Cumulated available ODS waste stream (non-reusable) from recovery all CFCs			
2002	<1	0.0	<1
2010	27	<1	48
2015	64	1	115
Annually available ODS waste stream (non-reusable) from recovery all CFCs			
2002	0.1	0.0	0.3
2010	7	<1	11
2015	4	<1	9

III.2.2 Foam

There is considerable regional variation in the use of foams based on climatic conditions. However, even in cold climates, the use of insulation foams is less well established in developing countries than in the developed world. Nonetheless, the shear scale of some countries means that there is an established use pattern for the majority of foam sub-sectors and all of these have been assessed.

The life-time of use for foams dictates to a large degree the location of the banks within a country. For virtually all building-related foams the blowing agent will still be in-situ – even at 2015. However, foams in appliances, transport and building services applications are likely to have already been decommissioned prior 2002 or will be decommissioned during the period covered by this study. This explains the more significant proportional changes that are observed in foam sub-sectors addressing these uses and the resultant changes in Banks 2 and 3 within

Table II- 8 and

Table II- 9.

As was noted in Section II.1.2, re-use is considered as an end-of-life option. This is a very prevalent option for domestic refrigerators both in developed and developing countries. In developed the practice is typically to provide a secondary refrigerator, but in developing countries, it can often be recognised as an extension of the lifetime of the refrigerator or the transfer of the unit to a second user.

In terms of ‘easily reachable’ CFCs within banks, current wisdom would suggest that only the appliance, transport and building services foams would automatically classify. Work is continuing in developed countries to establish the viability of recovering steel-faced panels (mostly continuous panel) from buildings and this may add to the definition of reachable banks (Bank 4). However, banks of blowing agent within other building applications – most notably PU spray foams and pipe-in-pipe – would be considered ‘unreachable’ in all practical terms.

With these observations in mind,

Table II- 8 provides the global banks for different parts of the process broken down according to the regional network structure.

Table II- 9 separates the same data out for the three highlighted countries (Argentina, Zambia and Thailand).

Table II- 8: Global results for banks in the different stages of the foam life-cycle

CFCs Virgin bank (metric tonnes)	Africa	Latin America and Caribbean	Eastern Europe and Central Asia	South Asia	South East Asia and Pacific	West Asia	TOTAL
2002	97	6	44	781	338	41	1307
2010	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0
CFCs in-product bank (metric tonnes)							
2002	24413	76888	67055	186904	62456	10079	427794
2010	12706	42094	51917	138342	47729	5249	298036
2015	7582	29147	47866	101894	38033	3366	227888
CFCs available ODS waste stream (non-reusable) from recovery cumulated amount (metric tonnes) End-of-Life							
2002	7277	15499	18940	11131	7040	3203	63090
2010	18441	43936	26315	59104	20624	7696	176114
2015	22549	53295	27544	88089	27286	9144	227907
Reachable Bank 4 (metric tonnes)							
2002	26148	71739	37093	123030	51778	10722	320510
2010	21174	55684	27491	101557	42122	8557	256585
2015	18397	49022	25682	83784	34735	7491	219111
CFCs Flow 5 Annual Reachable Banks Reaching E-o-L (metric tonnes)							
2002	1172	2587	2074	2876	1432	485	10626
2010	1479	4111	851	8406	1948	598	17393
2015	625	697	235	3559	1326	207	6649

Note:
-Virgin bank is the total amount of blowing agent in production, distribution and end users stockpile;
-In-product bank is the amount of blowing agent in products and equipment;
-Recovered ODS-bank is the amount of blowing agent which has exceeded the lifecycle of the product/equipment (it includes that which may be re-used);
-Bank 4 is the assessment of technically reachable banks based on experiences and expectations (including steel faced panels) in developed countries.
-Flow 5 is the flow of reachable banks reaching end-of-life (including those that may be re-used) for a given year

Table II- 9: Banks at different stages in the foam life-cycle for Argentina, Zambia and Thailand

Virgin bank all CFCs in supply chain (metric tonnes)	Argentina	Zambia	Thailand
2002	<1	<1	45
2010	0	0	0
2015	0	0	0
In-product bank all CFCs in products/equipment (metric tonnes)			
2002	6448	73	8176
2010	3531	38	6285
2015	2444	17	5005
Cumulative Recovered ODS-bank all CFCs End-of-Life (metric tonnes)			
2002	1300	17	806
2010	3685	53	2556
2015	4469	71	3439
Cumulative Bank 4 of Reachable CFCs (metric tonnes)			
2002	6017	79	6720
2010	4670	67	5481
2015	4111	57	4506
Annual Flow 5 of Reachable CFCs reaching E-o-L (metric tonnes)			
2002	201	3	178
2010	345	5	257
2015	58	3	176

Note:
-Virgin bank is the total amount of blowing agent in production, distribution and end users stockpile;
-In-product bank is the amount of blowing agent in products and equipment;
-Recovered ODS-bank is the amount of blowing agent which has exceeded the lifecycle of the product/equipment (it includes that which may be re-used);
-Bank 4 is the assessment of technically reachable banks based on experiences and expectations in developed countries;
-Flow 5 is the flow of reachable banks reaching end-of-life (including those that may be re-used) for a given year.

II.3. Estimation of annual amounts and their location

II.3.1 Refrigeration

It is assumed that all refrigerant remaining within current equipment is ‘reachable’. Therefore, Table II- 6 and Table II- 7 refer to annual flows arising from available ODS waste stream (non-reusable) from recovery without the need to further assess the reachable element of these flows – as is required in the case of foams.

Table II- 6 is based upon detailed calculations for all the regions, the results of which can be found in Appendix II-2 A to Appendix II-2 F.

Annual amounts for available ODS waste stream (non-reusable) from recovery are largest in the South Asia region, which includes countries such as China, India and the Republic of Korea. The annual amounts are calculated between approximately 200 and 300 tonnes for the year 2010, and between 140 and 210 tonnes for the year 2015 (equals ODP tonnes). In the regions Latin America and Caribbean, and South East Asia and the Pacific, the amounts are roughly 25%-35% of the former ones (they are calculated between approximately 80 and 120 tonnes for Latin America and the Caribbean for the year 2010, and between 55 and 80 tonnes for South East Asia and the Pacific for the year 2010). After the year 2010 the amounts are calculated to decrease by about 25% compared to the year 2010, which is mainly due to the fact that the amount of CFC equipment disposed of decreases (the assumptions for recovery, recycling etc. are kept constant during 2010-2015).

In this case the annual amounts per country are extremely small, and it makes sense to look at cumulative amounts. During the period 2002 and 2010 the amounts transferred to available ODS waste stream (non-reusable) from recovery in the African region are calculated between 130 and 190 tonnes, whereas the amounts between 2010 and 2015 are calculated between 170 and 260 tonnes (the latter values are the difference between the amounts for 2002-2015 and 2002-2010 in the relevant tables). In the case of Zambia the cumulative amount for the period 2002-2010 is calculated between 680 and 980 kg, for the period 2010-2015 it is calculated between 780 and 1170 kg. This demonstrates that, for small countries, it may be more useful to look at both annual and cumulative amounts.

II.3.2 Foams

The annualised flows of CFCs within reachable banks hits a peak of around 17,000-17,500 tonnes in the 2008-2012 period reflecting the decommissioning of domestic refrigerator stock at end-of-life. Clearly, this reflects a technical potential rather than an economic reality. The geographic spread of these flows indicates that nearly 50% will occur in South Asia. The problems of geographic spread and economies of scale are illustrated in

Table II- 9, which indicates that the annual flows at country level peak in the 200-400 tonne per annum range, with parts of Sub-Saharan Africa having flows in single figures.

Appendix II- 1: Distribution of Article 5(1) countries over the regions (UNEP networks), as studies in this report

SOUTH (10 countries)	CENTRAL (10 countries)	CARIBBEAN (13 countries)	ENGLISH (26 countries)	FRENCH (27 countries)	(12 countries)	(11 countries)	(13 countries)	(13 countries)
Argentina Brazil Bolivia Chile Colombia Ecuador Paraguay Peru Uruguay Venezuela	Costa Rica Cuba Dominican R El Salvador Guatemala Haiti Honduras Mexico Nicaragua Panama	Antigua & Barbuda Bahamas Barbados Belize Dominica Grenada Guyana Jamaica St Kitts St Lucia St Vincent Suriname Trinidad & Tobago	Angola Botswana Egypt Eritrea Ethiopia Gambia Ghana Kenya Lesotho Liberia Libya Malawi Mauritius Mozambique Namibia Nigeria Sierra Leone Seychelles Somalia South Africa Sudan Swaziland Tanzania Uganda Zambia Zimbabwe	Algeria Benin Burkina Faso Burundi Cameroon Cape Verde Central African R Chad Comoros Congo Congo (D. Republic) Cote d'Ivoire Djibouti Equatorial Guinea Gabon Guinea Bissau Guinea Madagascar Mali Mauritania Morocco Niger Rwanda Sao Tome & Principe Senegal Togo Tunisia	Bahrain Iraq Jordan Kuwait Lebanon National Authority of Palestine Oman Qatar Saudi Arabia Syria United Arab Emirates Yemen	Brunei Cambodia Fiji Indonesia Laos Malaysia Myanmar Philippines Singapore Thailand Vietnam Pacific Island Countries (14 countries) Cook Islands Fiji Kiribati Marshall Islands Federated States of Micronesia Nauru Niue Palau Papua New Guinea Samoa Solomon Islands Tonga Tuvalu Vanuatu	Afghanistan Bangladesh Bhutan China India Iran (Islamic Republic) Korea (D. Rep. of) Korea (Rep. of) Maldives Mongolia Nepal Pakistan Sri Lanka	Albania Armenia Bosnia & Herzegovina Croatia Georgia Kyrgyzstan Former Yugoslav Rep of Macedonia Moldova Romania Serbia & Montenegro Turkey Turkmenistan

Appendix II-2 A: Banks of CFCs (refrigeration)

West Asia

Virgin bank (metric tonnes)	Domestic	Commercial	Transport	Industrial	Chillers	Mobile AC	Total
2002	27	28	6	28	102	52	242
2010	3	13	1	14	47	-	79
2015	2	7	0	10	26	-	45
In-product bank (metric tonnes)							
2002	3,318	896	198	1,572	5,153	2,490	13,626
2010	2,617	600	72	1,273	3,740	969	9,271
2015	1,653	295	8	937	2,426	-	5,319
Recovered ODS-bank annual amount (metric tonnes)							
2002	-	-	-	1	4	-	5
2010	10	2	0	3	13	9	37
2015	10	2	0	3	13	-	28

Appendix II-2 B: Banks of CFCs (refrigeration)

Eastern Europe and Central Asia

Virgin bank (metric tonnes)	**Domestic**	**Commercial**	**Transport**	**Industrial**	**Chillers**	**Mobile AC**	**Total**
2002	13	83	4	17	12	39	168
2010	1	31	1	11	6	-	50
2015	1	12	0	9	3	-	23
In-product bank (metric tonnes)							
2002	3,562	3,627	140	846	771	1,836	10,783
2010	1,238	1,997	49	685	429	687	5,084
2015	539	658	5	543	214	-	1,959
Recovered ODS-bank annual amount (metric tonnes)							
2002	-	-	-	0	1	-	1
2010	13	8	0	1	2	7	31
2015	5	7	0	1	2	-	15

Appendix II-2 C: Banks of CFCs (refrigeration)

South Asia

Virgin bank (metric tonnes)	**Domestic**	**Commercial**	**Transport**	**Industrial**	**Chillers**	**Mobile AC**	**Total**
2002	275	3,499	67	116	2,552	554	7,063
2010	7	2,103	15	61	1,106	-	3,292
2015	6	1,315	1	44	367	-	1,733
In-product bank (metric tonnes)							
2002	22,626	125,992	2,128	3,872	39,338	21,724	215,681
2010	15,953	111,579	798	3,646	25,865	9,774	167,616
2015	13,864	73,979	89	2,709	15,502	-	106,142
Recovered ODS-bank annual amount (metric tonnes)							
2002	-	-	-	4	93	-	97
2010	22	182	4	7	104	57	375
2015	20	229	2	7	104	-	361

Appendix II-2 D: Banks of CFCs (refrigeration)

South East Asia and Pacific

Virgin bank (metric tonnes)	Domestic	Commercial	Transport	Industrial	Chillers	Mobile AC	Total
2002	109	348	7	40	350	69	924
2010	28	178	2	24	159	-	390
2015	15	109	0	19	82	-	225
In-product bank (metric tonnes)							
2002	8,736	12,239	227	2,416	20,739	2,768	47,125
2010	7,919	10,324	82	2,110	13,363	1,163	34,961
2015	4,413	6,672	9	1,723	7,862	-	20,679
Recovered ODS-bank annual amount (metric tonnes)							
2002	-	-	-	1	17	-	17
2010	32	19	0	3	55	9	118
2015	37	22	0	3	55	-	117

Appendix II-2 E: Banks of CFCs (refrigeration)

Latin America

Virgin bank (metric tonnes)	Domestic	Commercial	Transport	Industrial	Chillers	Mobile AC	Total
2002	132	857	20	121	136	212	1,478
2010	74	424	4	70	62	-	635
2015	63	215	0	56	36	-	369
In-product bank (metric tonnes)							
2002	7,617	26,340	633	7,072	6,800	8,409	56,870
2010	6,214	18,818	229	6,276	5,100	4,021	40,660
2015	4,540	10,025	26	5,151	3,380	-	23,121
Recovered ODS-bank annual amount (metric tonnes)							
2002	-	-	-	4	15	-	20
2010	17	46	1	7	17	28	116
2015	17	47	0	7	17	-	89

It should be emphasised that these flows include those domestic refrigerators destined for re-use and therefore do not reflect the precise number of refrigerators which would reach a refrigerator recycling plant should it be installed. In practice, the flow would be dependent on the bounty placed on the recovery of CFCs – otherwise the continued flow to re-use would remain. In some parts of the world, there may be value in ‘concentrating’ the recovery process in order to remove energy-inefficient appliances from the use-phase. This has already happened in California and some other US states for energy security reasons and has also been postulated for some developing countries such as Colombia. Such concentration of recovery may assist in reaching critical mass for some regions.

One of the complications of the foam sector is that the period of decommissioning for building products is in a completely time period than for appliances. Accordingly, a second ‘flow’ of CFC-containing foams could be expected in several regions of the world between 2030 and 2050. However, with some of these foams being ‘unreachable’ and the period over which recovery might be spread being long, it is unlikely that peak flows will ever exceed those observed for appliances.

Appendix II-2 F: Banks of CFCs (refrigeration)

Africa

Virgin bank (metric tonnes)	Domestic	Commercial	Transport	Industrial	Chillers	Mobile AC	Total
2002	83	141	11	39	56	116	446
2010	24	64	2	25	26	-	142
2015	16	34	0	20	15	-	86
In-product bank (metric tonnes)							
2002	7,617	6,750	335	1,710	2,809	4,685	23,906
2010	6,214	4,876	121	1,504	2,079	2,011	16,806
2015	4,540	2,663	14	1,231	1,366	-	9,814
Recovered ODS-bank annual amount (metric tonnes)							
2002	-	-	-	1	2	-	3
2010	17	12	1	2	7	18	56
2015	17	13	0	2	7	-	39

BLOWING AGENT STOCKPILE, BANK AND 'FLOW' DATA FOR THE A5(1) REGIONS CONSIDERED FOR THE YEARS 2002, 2010 AND 2015 (WHERE APPROPRIATE) AND SEPARATED FOR CFC-11 AND CFC-12

Appendix II-3 A : 2002 - CFC-11 & CFC-12 Stockpiles

Blowing Agent Stockpile Data - Regional Networks

Year 2002

Blowing Agent CFC-11

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
Supply Chain	Stockpile 1	18	20	325	141	2	44	***552***
	Stockpile 2	4	4	130	55	2	8	***203***
	Stockpile 3	18	20	325	141	2	44	***552***
	Sub total	***41***	***44***	***781***	***338***	***6***	***97***	***1306***

Blowing Agent Stockpile Data - Regional Networks

Year 2002

Blowing Agent CFC-12

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
Supply Chain	Stockpile 1	0	0	0	0	0	0	***0***
	Stockpile 2	0	0	0	0	0	0	***0***
	Stockpile 3	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***

Appendix II-3 B: 2002 – CFC-11 Banks (including E-o-L)

Blowing Agent Bank Data - Regional Networks

Year 2002

Blowing Agent CFC-11

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
End-of-Life	Re-use	1823	4185	6437	2294	9010	4246	***27994***
	Landfill	1345	13696	4532	4624	6295	2967	***33459***
	Shredded	35	1059	162	121	194	65	***1637***
	Sub total	***3203***	***18940***	***11131***	***7040***	***15499***	***7277***	***63090***
Rigid PU - Appliance	Dom. Appliance	6600	12779	73979	15107	41860	17121	***167446***
	Other Appliance	0	918	4834	81	2510	1	***8345***
	Reefer	0	216	10387	0	0	1	***10604***
	Sub total	***6601***	***13913***	***89200***	***15188***	***44371***	***17123***	***186396***
Rigid PU - Construction	Boardstock	346	19591	362	0	0	644	***20942***
	Cont. Panel	359	10510	12380	4668	1604	667	***30189***
	Disc. Panel	1278	6649	14183	16468	16754	2692	***58022***
	Spray	833	4160	32970	12948	13225	1867	***66004***
	Block - Pipe	262	644	330	5214	0	563	***7012***
	Block - Slab	399	1193	501	7946	0	857	***10897***
	One Component	0	0	0	0	0	0	***0***
	Pipe-in-Pipe	0	2232	35907	24	934	0	***39098***
	Sub total	***3478***	***44979***	***96633***	***47268***	***32517***	***7290***	***232164***
XPS	Boardstock	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Polyethylene	Pipe	0	0	0	0	0	0	***0***
	Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Phenolic	Boardstock	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	TOTAL	***13281***	***77831***	***196964***	***69496***	***92387***	***31690***	***481650***

Appendix II-3 C: 2002 - CFC-12 Banks (including E-o-L)

Blowing Agent Bank Data - Regional Networks

Year **2002**

Blowing Agent **CFC-12**

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
End-of-Life	Re-use	0	0	0	0	0	0	***0***
	Landfill	0	0	0	0	0	0	***0***
	Shredded	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Rigid PU - Appliance	Dom. Appliance	0	0	0	0	0	0	***0***
	Other Appliance	0	0	0	0	0	0	***0***
	Reefer	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Rigid PU - Construction	Boardstock	0	0	0	0	0	0	***0***
	Cont. Panel	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Spray	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	One Component	0	0	0	0	0	0	***0***
	Pipe-in-Pipe	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
XPS	Boardstock	0	8163	1071	0	0	0	***9234***
	Sub total	***0***	***8163***	***1071***	***0***	***0***	***0***	***9234***
Polyethylene	Pipe	0	0	0	0	0	0	***0***
	Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Phenolic	Boardstock	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	TOTAL	***0***	***8163***	***1071***	***0***	***0***	***0***	***9234***

Appendix II-3 D: 2002 – CFC-11 Annual “Flows” (no CFC-12 expected)

Blowing Agent 'Flow' Data - Regional Networks

Year **2002**

Blowing Agent **CFC-11**

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
End-of-Life	Re-use	0	0	0	0	0	0	***0***
	Landfill	0	0	0	0	0	0	***0***
	Shredded	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Rigid PU - Appliance	Dom. Appliance	459	1716	2468	880	2398	1113	***9034***
	Other Appliance	0	165	74	13	189	0	***441***
	Reefer	0	27	299	0	0	0	***326***
	Sub total	***459***	***1908***	***2841***	***893***	***2587***	***1113***	***9801***
Rigid PU - Construction	Boardstock	0	0	0	0	0	0	***0***
	Cont. Panel	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Spray	0	0	0	0	0	0	***0***
	Block - Pipe	10	50	13	200	0	22	***294***
	Block - Slab	17	117	22	339	0	37	***531***
	One Component	0	0	0	0	0	0	***0***
	Pipe-in-Pipe	0	0	0	0	0	0	***0***
	Sub total	***27***	***166***	***36***	***539***	***0***	***58***	***826***
XPS	Boardstock	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Polyethylene	Pipe	0	0	0	0	0	0	***0***
	Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Phenolic	Boardstock	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	TOTAL	***485***	***2074***	***2876***	***1432***	***2587***	***1172***	***10626***

Appendix II-3 E: 2010 – CFC-11 Banks (including E-o-L)

Blowing Agent Bank Data - Regional Networks

Year 2010

Blowing Agent CFC-11

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
End-of-Life	Re-use	4381	7798	34284	5932	26224	10744	***89362***
	Landfill	2993	17093	22020	13593	16349	7098	***79146***
	Shredded	322	1424	2800	1098	1363	599	***7606***
	Sub total	***7696***	***26315***	***59104***	***20624***	***43936***	***18441***	***176114***
Rigid PU - Appliance	Dom. Appliance	1979	2365	32408	5197	11280	5879	***59108***
	Other Appliance	0	20	2972	1	544	0	***3537***
	Reefer	0	8	3634	0	0	0	***3643***
	Sub total	***1979***	***2393***	***39014***	***5198***	***11823***	***5880***	***66287***
Rigid PU - Construction	Boardstock	331	18657	346	0	0	615	***19948***
	Cont. Panel	382	10138	13053	4883	1541	711	***30708***
	Disc. Panel	1361	6533	14675	17238	16095	2867	***58768***
	Spray	742	3690	31305	11516	11719	1660	***60632***
	Block - Pipe	186	280	219	3635	0	398	***4718***
	Block - Slab	268	350	313	5236	0	575	***6742***
	One Component	0	0	0	0	0	0	***0***
	Pipe-in-Pipe	0	2188	38408	24	916	0	***41535***
	Sub total	***3270***	***41835***	***98319***	***42531***	***30271***	***6826***	***223052***
XPS	Boardstock	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Polyethylene	Pipe	0	0	0	0	0	0	***0***
	Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Phenolic	Boardstock	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	TOTAL	***12944***	***70543***	***196436***	***68353***	***86030***	***31146***	***465453***

Appendix II-3 F: 2010 – CFC-12 Banks (including E-o-L)

Blowing Agent Bank Data - Regional Networks

Year 2010

Blowing Agent CFC-12

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
End-of-life	Re-use	0	0	0	0	0	0	***0***
	Landfill	0	0	0	0	0	0	***0***
	Shredded	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Rigid PU - Appliance	Dom. Appliance	0	0	0	0	0	0	***0***
	Other Appliance	0	0	0	0	0	0	***0***
	Reefer	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Rigid PU - Construction	Boardstock	0	0	0	0	0	0	***0***
	Cont. Panel	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Spray	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	One Component	0	0	0	0	0	0	***0***
	Pipe-in-Pipe	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
XPS	Boardstock	0	7689	1009	0	0	0	***8697***
	Sub total	***0***	***7689***	***1009***	***0***	***0***	***0***	***8697***
Polyethylene	Pipe	0	0	0	0	0	0	***0***
	Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Phenolic	Boardstock	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	TOTAL	***0***	***7689***	***1009***	***0***	***0***	***0***	***8697***

Appendix II-3 G: 2010 – CFC-11 Annual 'Flows" (no CFC-12 expected)

Blowing Agent 'Flow' Data - Regional Networks

Year **2010**

Blowing Agent **CFC-11**

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
End-of-Life	Re-use	0	0	0	0	0	0	***0***
	Landfill	0	0	0	0	0	0	***0***
	Shredded	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Rigid PU - Appliance	Dom. Appliance	564	743	6947	1215	3907	1406	***14782***
	Other Appliance	0	19	398	1	204	0	***622***
	Reefer	0	7	1015	0	0	0	***1022***
	Sub total	***564***	***769***	***8360***	***1216***	***4111***	***1406***	***16426***
Rigid PU - Construction	Boardstock	0	0	0	0	0	0	***0***
	Cont. Panel	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Spray	0	0	0	0	0	0	***0***
	Block - Pipe	13	27	17	272	0	27	***356***
	Block - Slab	21	56	29	459	0	46	***611***
	One Component	0	0	0	0	0	0	***0***
	Pipe-in-Pipe	0	0	0	0	0	0	***0***
	Sub total	***34***	***82***	***46***	***732***	***0***	***73***	***967***
XPS	Boardstock	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Polyethylene	Pipe	0	0	0	0	0	0	***0***
	Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Phenolic	Boardstock	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	TOTAL	***598***	***851***	***8406***	***1948***	***4111***	***1479***	***17393***

Appendix II-3 H: 2015 – CFC-11 Banks (including E-o-L)

Blowing Agent Bank Data - Regional Networks

Year **2015**

Blowing Agent **CFC-11**

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
End-of-Life	Re-use	5133	8612	50154	7403	31645	12952	***115899***
	Landfill	3543	17448	32508	18276	19541	8727	***100042***
	Shredded	468	1484	5427	1607	2110	870	***11966***
	Sub total	***9144***	***27544***	***88089***	***27286***	***53295***	***22549***	***227907***
Rigid PU - Appliance	Dom. Appliance	413	450	5671	1121	170	1435	***9260***
	Other Appliance	0	0	651	0	8	0	***659***
	Reefer	0	0	0	0	0	0	***0***
	Sub total	***413***	***450***	***6323***	***1121***	***177***	***1435***	***9918***
Rigid PU - Construction	Boardstock	321	17809	336	0	0	597	***19063***
	Cont. Panel	373	9887	12730	4762	1503	693	***29948***
	Disc. Panel	1328	6371	14311	16811	15697	2796	***57314***
	Spray	688	3422	29026	10677	10866	1540	***56219***
	Block - Pipe	107	182	119	2047	0	229	***2683***
	Block - Slab	137	181	147	2591	0	292	***3348***
	One Component	0	0	0	0	0	0	***0***
	Pipe-in-Pipe	0	2161	37931	23	904	0	***41019***
	Sub total	***2953***	***40011***	***94600***	***36912***	***28970***	***6147***	***209593***
XPS	Boardstock	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Polyethylene	Pipe	0	0	0	0	0	0	***0***
	Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Phenolic	Boardstock	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	TOTAL	***12510***	***68005***	***189011***	***65319***	***82443***	***30130***	***447419***

Appendix II-3 I: 2015- CFC-12 Banks (including E-o-L)

Blowing Agent Bank Data - Regional Networks

Year 2015

Blowing Agent CFC-12

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
End-of-life	Re-use	0	0	0	0	0	0	***0***
	Landfill	0	0	0	0	0	0	***0***
	Shredded	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Rigid PU - Appliance	Dom. Appliance	0	0	0	0	0	0	***0***
	Other Appliance	0	0	0	0	0	0	***0***
	Reefer	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Rigid PU - Construction	Boardstock	0	0	0	0	0	0	***0***
	Cont. Panel	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Spray	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	One Component	0	0	0	0	0	0	***0***
	Pipe-in-Pipe	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
XPS	Boardstock	0	7405	971	0	0	0	***8376***
	Sub total	***0***	***7405***	***971***	***0***	***0***	***0***	***8376***
Polyethylene	Pipe	0	0	0	0	0	0	***0***
	Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Phenolic	Boardstock	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	TOTAL	***0***	***7405***	***971***	***0***	***0***	***0***	***8376***

Appendix II-3 J: 2015 – CFC-11 Annual 'Flows' (no CFC-12 expected)

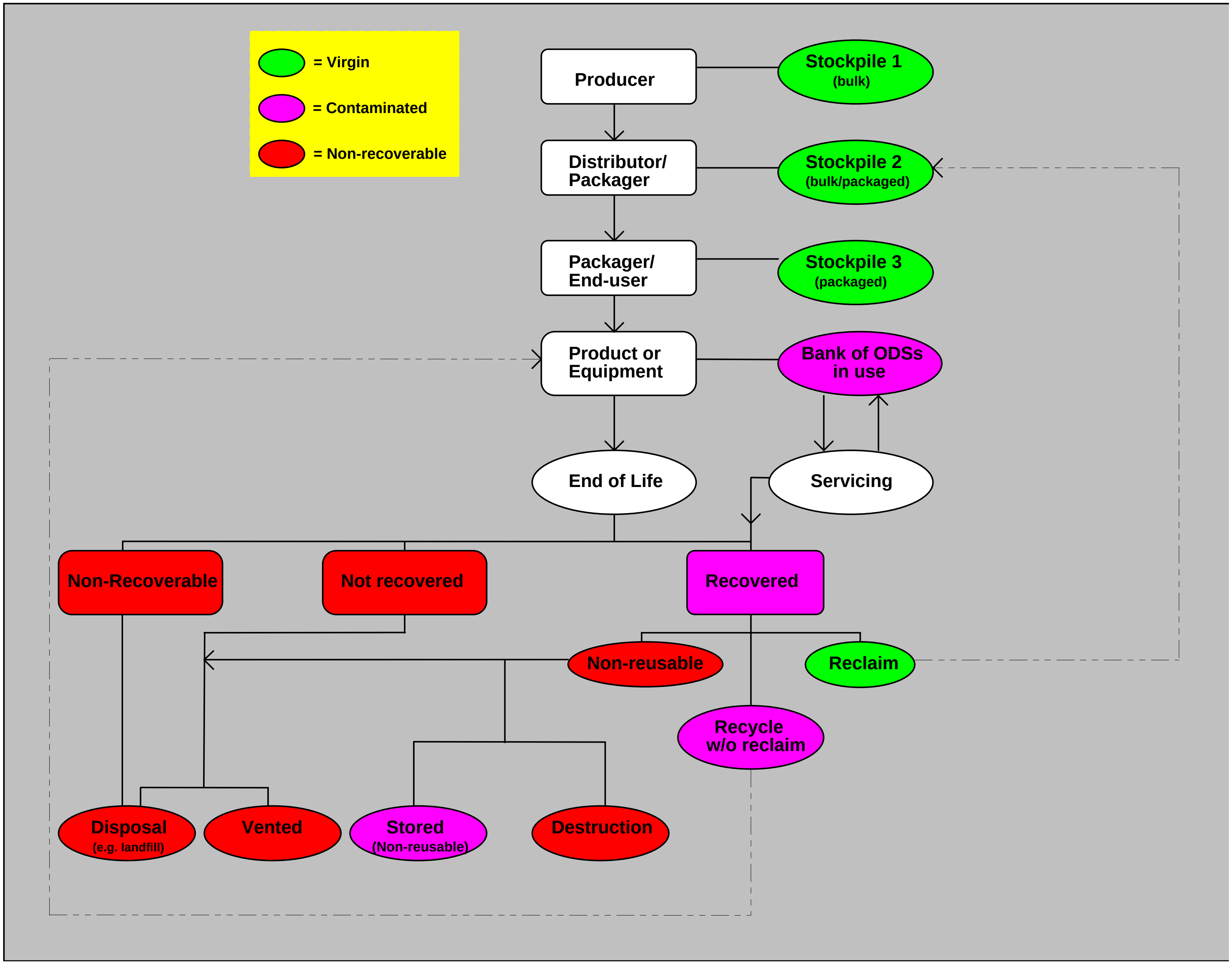
Blowing Agent 'Flow' Data - Regional Networks

Year **2015**

Blowing Agent **CFC-11**

		West Asia	E. Europe & Centr. Asia	South Asia	SEA & Pacific	L. America & Carrib.	Africa	*TOTAL*
Housing Stock ('000)	**(2000)**	14491.1	36546.5	638290.7	121290.0	125886.4	157003.4	***1093508.1***
Population (million)	**(2000)**	95.5	136.1	2753.2	525.1	512.4	797.4	***4819.54***
End-of-Life	Re-use	0	0	0	0	0	0	***0***
	Landfill	0	0	0	0	0	0	***0***
	Shredded	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Rigid PU - Appliance	Dom. Appliance	164	186	2918	496	667	533	***4963***
	Other Appliance	0	1	399	0	30	0	***430***
	Reefer	0	1	193	0	0	0	***193***
	Sub total	***164***	***188***	***3510***	***496***	***697***	***533***	***5587***
Rigid PU - Construction	Boardstock	0	0	0	0	0	0	***0***
	Cont. Panel	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Spray	0	0	0	0	0	0	***0***
	Block - Pipe	16	17	19	309	0	34	***395***
	Block - Slab	27	29	31	521	0	58	***666***
	One Component	0	0	0	0	0	0	***0***
	Pipe-in-Pipe	0	0	0	0	0	0	***0***
	Sub total	***43***	***47***	***50***	***830***	***0***	***93***	***1062***
XPS	Boardstock	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Polyethylene	Pipe	0	0	0	0	0	0	***0***
	Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
Phenolic	Boardstock	0	0	0	0	0	0	***0***
	Disc. Panel	0	0	0	0	0	0	***0***
	Block - Pipe	0	0	0	0	0	0	***0***
	Block - Slab	0	0	0	0	0	0	***0***
	Sub total	***0***	***0***	***0***	***0***	***0***	***0***	***0***
	TOTAL	***207***	***235***	***3559***	***1326***	***697***	***625***	***6648***

Appendix II-4: Flowchart on recovery and recycling



Annex III

MULTILATERAL FUND
FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL
Secretariat
1800 McGill College Ave, 27th Floor, Montreal, Quebec, Canada. H3A 3J6
Tel: (514) 282-1122 Fax: (514) 282-0068

Questionnaire on non-usable CFCs, Halons, and CTC

General data
Country: ______________________________
NOU / implementing or bilateral agency submitting the data:
Name of person: ______________________________
Institution: ______________________________
Town, country: ______________________________
Phone no.: ______________________________ E-mail:
____

Definitions: In this context, the following definitions are being used:

Used ODS: ODS which have been used for their intended purpose and have been recovered; typically valid for CFCs in refrigeration as well as halons

Not usable due to contamination:
Used ODS which have been recognized as containing contaminants to a degree that the ODS cannot be used as intended, even after all recycling and reclamation possibilities in the country have been employed. Such contaminants might be other ODS, HFC, and acid from compressor burn. This might in particular be valid for CFCs in refrigeration as well as halons

CFCs

- How much used CFC has been collected, can not be used in the country due to contamination, and is now stored in the country (metric tonnes)
    - CFC-11: _______________ metric tonnes;
    - CFC-12: _______________ metric tonnes;
    - Other CFCs: _______________ metric tonnes;
    - Where is it stored (one or several dealers, wholesaler, user, central collection site, other)?

      ____

- How much new (virgin) CFC has been stockpiled in the country (metric tonnes)
    - CFC-11: _______________ metric tonnes;
    - CFC-12: _______________ metric tonnes;
    - Other CFCs: _______________ metric tonnes;
    - Where is it stored (one or several dealers, wholesaler, user, central collection site, other)?

      ____

- How much used CFC collected that could be reused (i.e. was or can be recycled/reclaimed in the country) but was so far not reused (amount in metric tonnes, reason for non-use)
    - CFC-11: amount: _____ metric tonnes; Reason: _______________
    - CFC-12: amount: _____ metric tonnes; Reason: _______________
    - Other CFCs; amount: _____ metric tonnes; Reason: _______________

  Additional remarks:

  ____

Changes in the latest year where data is available

- How much CFC-12 has been recovered from refrigeration systems in the last year where data is available? ____________________________metric tonnes. Which was that year?___________
- How much of that CFC-12 has not been reused in the last year where data is available? __________ metric tonnes.
  Of that amount:
  - How much of the CFC that has not been reused in the last year where data is available could not be reused because of contamination beyond the local/national recycling or reclamation capabilities? _______________ metric tonnes.
  - How much of the CFC that has not been reused in the last year where data is available has already been destroyed? _______________ metric tonnes.
- Can you provide any additional information which might be relevant? (you can also attach an additional sheet, if needed) ____
  ____

Halons

- How much used halon has been collected, can not be used in the country due to contamination, and is now stored in the country (metric tonnes)
  - Halon 1211: __________________ metric tonnes;
  - Halon 1301: __________________ metric tonnes;
  - Halon 2402: __________________ metric tonnes;
  - Where is it stored (one or several dealers, wholesaler, user, central collection site, other)?
    ____
- How much new (virgin) halon has been collected, can not be used in the country due to contamination, and is now stored in the country (metric tonnes)
  - Halon 1211: __________________ metric tonnes;
  - Halon 1301: __________________ metric tonnes;
  - Halon 2402: __________________ metric tonnes;
  - Where is it stored (one or several dealers, wholesaler, user, central collection site, other)?
    ____
- How much halon collected that could be reused (i.e. was or can be recycled/reclaimed in the country) but was so far not reused (amount in metric tonnes, reason for non-use)
  - Halon 1211: amount: ____metric tonnes; Reason: __________________
  - Halon 1301: amount: ____metric tonnes; Reason: __________________
  - Halon 2402: amount: ____metric tonnes; Reason: __________________

  Additional remarks:
  ____

  ____

Changes in the latest year where data is available

- How much halon has been recovered in the last year where data is available?
  - Halon 1211: amount: ________metric tonnes;
  - Halon 1301: amount: ________metric tonnes;
  - Halon 2402: amount: ________metric tonnes;

  . Which was that year?___________

- How much of that halon has not been reused in the last year where data is available?
    - Halon 1211: amount: ________metric tonnes;
    - Halon 1301: amount: ________metric tonnes;
    - Halon 2402: amount: ________metric tonnes;

Of that amount:

- How much of the halon that has not been reused in the last year where data is available could not be reused because of contamination beyond the local/national recycling or reclamation capabilities? ______________ metric tonnes.
- How much of the halon that has not been reused in the last year where data is available has already been destroyed? ______________ metric tonnes.
- Can you provide any additional information which might be relevant? (you can also attach an additional sheet, if needed)? ____

____

CTC

- Do you have any relevant data regarding CTC use or storage in your country?
  Yes / No (please circle correct answer)

Only if you answered "yes", please continue answer the following:

- How much unwanted CTC (unwanted: unlikely to be consumed by the market) is being stored? _________________ metric tonnes;
- How much unwanted CTC (unwanted: unlikely to be consumed by the market) was actually added to that amount in the last year where data is available? _________________ metric tonnes. Which was that year?__________
- Can you provide any additional information which might be relevant? (you can also attach an additional sheet, if needed) ____

____

Thank you for taking the time to complete this survey. Please e-mail the survey to Secretariat@unmfs.org or fax it to the Secretariat's fax number, +1 (514) 282-0068. The deadline is 15 February 2006.

Please fill out the information below so that we can keep track of the incoming surveys:

Date:
Number of pages being sent including additional sheets:

SURVEY ON NON-USABLE CFCs, HALONS, AND CTCs

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Argentina	CFC-11	There is no data available yet as recycling/reclaiming centers are currently being set up, but there have been requests. (in last Dec. 3.0 t of CFC to be recycled)		243,40	Data are the closing stocks at the end of 2005, as reported by the producer and only one importer. We are waiting for the reports from other importers. CFC are stored by the importers and the producer.		Estimates given by the producer, which wil be one of the reclaimers, amount 80tons to be recylced per year.						
	CFC-12			1.492,40				N/A					
	Other CFCs:												

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	0,50	Halon bank deposits. Halon bank is operational since January 2005	0,00		0,50		0,50	2005		0,00	0,00	
	Halon 1301	3,00		0,00		1,70		3,00	2005		0,00	0,00	
	Halon 2402	0,00		0,00		0,00		0,00	2005		0,00	0,00	

		Relevant data regarding use and storage					
		Yes	No	Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	CTC	x		0,48	0,32	2005	Data provided by one producer CTC uses: 1. feedstock by FIASA (CFC manufacturing) and Petrobras (oil refining comp., in the naphta reforming unit). Cons for 2005 was: FIASA:2460t and Petrobras: 15T 2. Lab uses. Cons for 2005 was 5.472t

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	CFC-11	0,00		0,07		0,00							
Bahrain	CFC-12	0,00		6,97	several dealers	0,00		0	2005	0	0	0	
	Other CFCs:	0,00				0,00							
	CFC-115			0,52									

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	0,00		1,00	Yateem Oxygen (importer)	0,74	stored for BDF future uses in the central gov. stores	0,00	2005	0,00	0,00	0,00	

Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1301	0,00		0,00		62,16	38MT stored at BDF 13MT transferred to Saudi Arabia 11.16MT will be transferred to the gov. central stores	0,00	2005	0,00	0,00	0,00	Reclaimed Halon 1301 in BDF is waiting for recycling once a busget for storage cylinders is allocated by BDF
	Halon 2402	0,00		0,00		0,00		0,00	2005	0,00	0,00	0,00	

	Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	Yes	No				
CTC		x				

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpiled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Bolivia	CFC-11	no data available	Central Collection Centre (Cochabamba, Santa Cruz, La Paz)	0,00		no data available							
	CFC-12	no data available		0,00		no data available		no data available		no data available	no data available	no data available	
	Other CFCs:	no data available		0,00		no data available							

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	0,00		0,00		0,00	no imports of halons in Bolivia	no data available			no data available	no data available	
	Halon 1301	0,00		0,00		0,00		no data available					
	Halon 2402	0,00		0,00		0,00		no data available					

	Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	Yes	No				
CTC		x				

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpiled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Brazil	CFC-11	N/A		N/A		N/A							
	CFC-12	0,30	Reclaim Center 2005	N/A		0,72	Reclaimed din the Reclaim Center 2005	0,72	2005	0,00	0,30	N/A	There is about 9,200 tonnes of CFC12 and 303.03 tonnes of CF11 stored in domestic refrigerators, MAC, chillers and others.
	Other CFCs:	N/A		N/A									

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	N/A		N/A		N/A		0,001	2005	N/A	N/A	N/A	
	Halon 1301	N/A	N/A	N/A		N/A		19,00	2005	N/A			
	Halon 2402	N/A		N/A		N/A		0,08	2001	N/A			

	Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	Yes	No				
CTC		x				2,780.00 tonnes of CTC were produced in 2004. From 2005 on, Dow Chemical is importing CTC as feedstock to produce perclorothilene.

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpiled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Canada	CFC-11		One of three RMC Collection Service Provide locations, 2 in Ontario and 1 in Nova Scotia	495,00	End-user sites as stand-by inventory	No info readily available							
	CFC-12			64,00				68	2005		no info available	68	
	Other CFCs:												
	R502			175,00									
								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	Virtual inexistent. Halons are used in "exclusive services". Thus, contamination rarely occurs because cylinders cannot be switched from one service to another (portable to fixed) o vice-versa. The only contamination that occurs is the over-pressurisation with notrogen, but nitrogen does not mix with halons and is thus easy to separate from the halons. The other type of contamination would be the odd cylinder that a poor quality recycler would have filled with more than one halon, but this contamination would be the exception to the rule (and minimal, not to say inexistent, quantities.)		No new (virgin) halon has been manufactured in or imported into Canada since January 1, 1994. So, all the halon used in Canada comes from recovery/recycling/regeneration. A fixed fire-extinguishing system only uses "military specs" halons. The halons are stored in cylinders and the cylinders are coupled to a manifold that will distribute the halons whe a fire triggers the explusion of the halons. All the time that no fire occurs, the halons are quietly sitting in their cylinders (this goes on for up to 12 years, where a hydrotest is required to requalify the halon cylinder). In anticipation of a fire or a hydrotest, some companies protect their facilities with two "charges" of halons, one on load and one in reserve.		No data available, but i is known that some quantities of halons were collected over the years and sent to the USA for destruction.							No data. Since the prohibition to charge fixed sytems (effective January 2005), the users of halons are moving away from halons. This is done in two ways: (a) the user replaces the halons with an alternative; (b) the user keeps the halons until a fire and then replaces the halons.
	Halon 1301												
	Halon 2402												
		Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info						
		Yes	No										
	CTC												

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpiled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Costa Rica	CFC-11	no data available	Central Collection	no data available		no data available							
	CFC-12	no data available		no data available		no data available		no data available		no data available	no data available	no data available	
	Other CFCs:	no data available		no data available		no data available							
								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	no data available		no data available		no data available		no data available		no data available	no data available	no data available	
	Halon 1301	no data available		no data available		no data available		no data available					
	Halon 2402	no data available		no data available		no data available		no data available					
		Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info						
		Yes	No										
	CTC		x										

								Changes in the latest year, where data is available

Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	CFC-11	0,20		2,00		0,20	Establishement of RRR centers is ongoing						
Croatia	CFC-12	0,80	several users, central collection site	40,00	several dealers, wholesaler, user	6,00		6,8	2004	6,8	0,8	0	
	Other CFCs:					0,00							

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211												
	Halon 1301												
	Halon 2402												

	Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	Yes	No				
CTC	**x**		N/A	N/A		

Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	Changes in the latest year, where data is available How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	CFC-11	no data available	Central Collection	no data available		no data available							
Dominican Republic	CFC-12	no data available		no data available		no data available		no data available		no data available	no data available	no data available	
	Other CFCs:	no data available		no data available		no data available							

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	no data available		no data available		no data available		no data available		no data available	no data available	no data available	
	Halon 1301	no data available		no data available		no data available		no data available					
	Halon 2402	no data available		no data available		no data available		no data available					

	Relevant data regarding use and storage		be consummed by the market) stored - MT -	consummed by the market) added to that amount in the last year	Which year	Any other relevant info
	Yes	No				
CTC		**x**				

Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	Changes in the latest year, where data is available How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	CFC-11												

El Salvador	CFC-12	0,47	several dealers	81,00	several dealers	3,62		N/A	2000	N/A	N/A	N/A	Quota of CFC-12 imprts decreased, the workshops prefer to use virgin than reused, 2006 quota is 48 ODP, so it is probable that from 2006 to have more recovering of CFC12
	Other CFCs:												
	R502												
								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	**Where stored**	**Collected new (virgin) contaminated, and stored - MT -**	**Where stored**	**Reusable collected, not reused so far - MT -**	**Additional remarks**	**How much halon has been recovered during the last available year - MT -**	**Which year**	**How much of that recovered halon has not been reused during the last available year - MT -**	**Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -**	**Already destroyed - MT -**	**Any other relevant info**
	Halon 1211												
	Halon 1301												
	Halon 2402						no imports						
		Relevant data regarding use and storage		**Unwanted (unlikeley to be consummed by the market) stored - MT -**	**Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -**	**Which year**	**Any other relevant info**						
		Yes	No										
	CTC												

Country	**Product**	**Collected used, contaminated, and stored - MT -**	**Where stored**	**Stockpiled new (virgin) - MT -**	**Where stored**	**Reusable collected, not reused so far - MT -**	**Additional remarks**	**Changes in the latest year, where data is available** **How much CFC-12 has been recovered from refrig. systems during the last available year - MT -**	**Which year**	**How much of that recovered CFC has not been reused during the last available year - MT -**	**Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -**	**Already destroyed - MT -**	**Any other relevant info**
	CFC-11	0,00											
Fiji Islands	CFC-12	0,00		0,50	The cylinder is stored at the warehouse of Agehem Limited in Wailada Lami, Suva (dealer)	2,00	There is no demand for CFC in iji and most CFC12 eq. have been retrofitted to zone friendly gas. 90% of CFC recovered in Fiji is from used cars imported from Japan	0,81	2005	0,81		0,00	
	Other CFCs:	0,00											
	CFC-115												
								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	**Where stored**	**Collected new (virgin) contaminated, and stored - MT -**	**Where stored**	**Reusable collected, not reused so far - MT -**	**Additional remarks**	**How much halon has been recovered during the last available year - MT -**	**Which year**	**How much of that recovered halon has not been reused during the last available year - MT -**	**Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -**	**Already destroyed - MT -**	**Any other relevant info**
	Halon 1211	0,74	The halon cylinders were collected by the Fiji NOU on a voluntary scheme in 2001 to be stored at the central storage facility in Walu Bay Suva. We are currently liasing with the Dept. of Env. & heritage Australia and Dascem Australia to send these cylinders for destruction										
	Halon 1301	0,11											
	Halon 2402												
		Relevant data regarding use and storage		**Unwanted (unlikeley to be consummed by the market) stored - MT -**	**Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -**	**Which year**	**Any other relevant info**						
		Yes	No										

	CTC	x		0,3	0,1	2005	About 0.2MT (60%) of the CTC currently found in Fiji are in secondary schools laboratory waiting proper disposal. And 0.1 MT of CTC were confiscated from a fishing vessel that illegally imported CTC in Fiji. The matter has been reported to the police and the CTC are in Fiji Islands Customs Service custody.

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
France	**Different data sent**												

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	CFC-11												
Guinea-Bissau	CFC-12												
	Other CFCs:												
								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	**Where stored**	**Collected new (virgin) contaminated, and stored - MT -**	**Where stored**	**Reusable collected, not reused so far - MT -**	**Additional remarks**	**How much halon has been recovered during the last available year - MT -**	**Which year**	**How much of that recovered halon has not been reused during the last available year - MT -**	**Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -**	**Already destroyed - MT -**	**Any other relevant info**
	Halon 1211												
	Halon 1301												
	Halon 2402												
		Relevant data regarding use and storage		**Unwanted (unlikeley to be consummed by the market) stored - MT -**	**Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -**	**Which year**	**Any other relevant info**						
		Yes	No										
	CTC												

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	CFC-11	N/A	About 50 MT of CFC12 and 20 MT of CFC11 would be collected which would not be used in India by 2008	N/A	About 300 MT of CFC11 and CFC12 would be stockpilled by 2008		No collection has been made However, 50 Tons of CFC-12 and 10 Tons of CFC-11 would be collected for recycling and re-use.						
India	CFC-12	N/A		N/A				0,00	2005	0,00	0	0,00	CFCs would be collected from commercial refrigerators, A/Cs and MVACs etc. (the data for future years could be collected)
	Other CFCs:	N/A		N/A									
								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	**Where stored**	**Collected new (virgin) contaminated, and stored - MT -**	**Where stored**	**Reusable collected, not reused so far - MT -**	**Additional remarks**	**How much halon has been recovered during the last available year - MT -**	**Which year**	**How much of that recovered halon has not been reused during the last available year - MT -**	**Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -**	**Already destroyed - MT -**	**Any other relevant info**
	Halon 1211	N/A	In future years, out of the installed extinguishers and	N/A	There is no production and	0,00		0,00	CY 2005	N/A	0,00	0,00	

	Halon 1301	N/A	fire protection system, some halon would be collected which would not be used in the country due to contamination	N/A	There is no production and import of new halon. In view of this, the same may be treated as NIL	0,26	Information is being collected under the halon management and banking project	0,26	CY 2005	N/A	0,00	0,00	Once information is collected by Centre for Fire, Environment and Explosives Safety (CFEES), data could be submitted on the above.
	Halon 2402	N/A		N/A		0,00		0,00	CY 2005	N/A	0,00	0,00	

	Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	Yes	No				
CTC						

								Changes in the latest year, where data is available					
Country	**Product**	**Collected used, contaminated, and stored - MT -**	**Where stored**	**Stockpilled new (virgin) - MT -**	**Where stored**	**Reusable collected, not reused so far - MT -**	**Additional remarks**	**How much CFC-12 has been recovered from refrig. systems during the last available year - MT -**	**Which year**	**How much of that recovered CFC has not been reused during the last available year - MT -**	**Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -**	**Already destroyed - MT -**	**Any other relevant info**
	CFC-11												
Italy	CFC-12	2,23	Central collection site	14,71	Central collection site	1,07	Waiting to be manufactured	17,65	2005	11,03	0,49	0,00	
	Other CFCs:												
	R502			0,07									

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	**Where stored**	**Collected new (virgin) contaminated, and stored - MT -**	**Where stored**	**Reusable collected, not reused so far - MT -**	**Additional remarks**	**How much halon has been recovered during the last available year - MT -**	**Which year**	**How much of that recovered halon has not been reused during the last available year - MT -**	**Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -**	**Already destroyed - MT -**	**Any other relevant info**
	Halon 1211												
	Halon 1301												
	Halon 2402												

	Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	Yes	No				
CTC		x				

								Changes in the latest year, where data is available					
Country	**Product**	**Collected used, contaminated, and stored - MT -**	**Where stored**	**Stockpilled new (virgin) - MT -**	**Where stored**	**Reusable collected, not reused so far - MT -**	**Additional remarks**	**How much CFC-12 has been recovered from refrig. systems during the last available year - MT -**	**Which year**	**How much of that recovered CFC has not been reused during the last available year - MT -**	**Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -**	**Already destroyed - MT -**	**Any other relevant info**
	CFC-11	N/A		N/A		1.935,00	Lack of demand for reuse. The data is from FY 2002 to FY 2004 (Fiscal Year is from April of the year to March of the next year)._ The data is summed up as total of CFCs collected from commercial refrigerators, A/Cs and MVACs (excluding household refrigerators and A/Cs)						
Japan	CFC-12	N/A		N/A				615,00	FY2004	563,00	0,00	480,00	105 MT of CFC was colected in the previous year and stored at the end of the previous year by recovery operators 83 MT of the CFC that has not been reused in the last year where data is available has been stored at the end of the year by recovery operators. Those CFCs were collected from commercial refrigerators, A/Cs and MVACs (excluding household refrigerators and A/Cs)
	Other CFCs:	N/A		N/A									
	CFC-115												

								Changes in the latest year, where data is available					

		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	N/A		N/A		4,00	Lack of demand for reuse. The data is as of march 2005. Those halons were collected and stored mainly by manufacturers of fire-fighting eq. not due to contmination but due to lack of demad for reuse.	0,20	FY2004 (April2004-March 2005)	0,20	0,00	2,60	Detailed info provided separately
	Halon 1301	N/A		N/A		416,00		118,00		18,00	0,00	4,60	
	Halon 2402	N/A		N/A		20,00		5,00		5,00	0,00	2,80	

		Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
		Yes	No				
	CTC		x				

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC-12 has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Kyrgystan	CFC-11	0,00		0,00		0,00							
	CFC-12	0,56		0,00		1,33	in frig systems of owners and mechanics servicing the eq., who has plans to sell or reuse them	2,1398	2005	0,846	0,156	0	At oresent timpe, we do not have eq. for destroying CFC
	Other CFCs:	0,00	facilioties of several users	0,00		0,00							

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211												
	Halon 1301												
	Halon 2402												

		Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
		Yes	No				
	CTC						

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC-12 has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Macedonia	CFC-11			1,00		0,60							
	CFC-12				users			1,931	2004				
	Other CFCs:												
	R502												

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211					1,00							
	Halon 1301					0,60	The old systems with halons were replaced by new alternatives. This amount could be recycled.						
	Halon 2402												

		Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
		Yes	No				
	CTC		x				

Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpiled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	Changes in the latest year, where data is available					
								How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC-12 has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	CFC-11	0,00		3,00		0,00							
Malawi	CFC-12	0,00		6,80		0,50		0,5	2005	0	0		
	Other CFCs:	0,00		0,00	several dealers	0,00	R&R was not adequately practised due to other logistic problems. The technicians were not familiar with the use of the equipment and the recycling centre was not active. Now we have trained our refrigeration technicians last year and this year on good refrigeration practices and we are in the processes of revamping the recovery networks in the country. A recycling centre has been established and we hope records will be available once this programme is operational._With the trainings we hope the number of recovered CFCs will increase because we have a lot of equipment that is using CFCs in the country and when doing retrofitting the CFCs will be recovered and stored pending distruction						
	R502												

		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	Changes in the latest year, where data is available					
								How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	0,00		0,00		0,00		0,00		0,00			
	Halon 1301	0,00		0,00		0,00		0,00		0,00			
	Halon 2402	0,00		0,00		0,00		0,00		0,00			

		Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
		Yes	No				
	CTC		x				

Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpiled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	Changes in the latest year, where data is available					
								How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC-12 has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	CFC-11	N/A		355,70		N/A							
Mexico	CFC-12	0,50	Collection centers (Energy Savings Trust Fund Centers)	3.783,60	CFCs Production Plant (Quimobasicos)	10,00	The CFC recovered from old eq. that have been destroyed has no market, and also there is still virgin gas available within the country	10,00	July-Dec 2005	10,00	N/A	0,00	
	Other CFCs:	N/A		N/A		N/A							

Changes in the latest year, where data is available

	Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Halon 1211			1.141,00	several dealers (estimations from National halon Bank)	N/A		0,2	2005				
Halon 1301												
Halon 2402												

	Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	Yes	No				
CTC		x				

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC-12 has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	CFC-11	N/A		0,25	the single CFC11 user (until the end of the products lifetime)	N/A							
Mongolia	CFC-12	N/A		N/A		N/A		0,719	2005	N/A	N/A	N/A	Recovered CFC-12 from refrig. System is reused.
	Other CFCs:	N/A		N/A		N/A							
	R502												

							Changes in the latest year, where data is available					
	Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Halon 1211	N/A		N/A		N/A		N/A		N/A	N/A	N/A	
Halon 1301	N/A		N/A		N/A		N/A		N/A	N/A	N/A	
Halon 2402	N/A		N/A		N/A		N/A		N/A	N/A	N/A	

	Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	Yes	No				
CTC		x				

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	CFC-11	no data available	Central Collection	no data available		no data available							
Nicaragua	CFC-12	no data available		no data available		no data available		no data available		no data available	no data available	no data available	
	Other CFCs:	no data available		no data available		no data available							

							Changes in the latest year, where data is available					
	Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Halon 1211	no data available		no data available		no data available		no data available		no data available	no data available	no data available	
Halon 1301	no data available		no data available		no data available		no data available					
Halon 2402	no data available		no data available		no data available		no data available					

	Relevant data regarding use and storage		Unwanted (unlikeley to be consummed by the		

		Yes	No	Unwanted (unlikeley to be consummed by the market) stored - MT -	market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	CTC		x				

Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	Changes in the latest year, where data is available					
								How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC-12 has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Papua New Guinea	CFC-11		R12 and R502 -at a user that is trying to phase out ODS use in the Co.										
	CFC-12	0,10											
	Other CFCs:												
	R502	0,03											

	Product	Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	Changes in the latest year, where data is available					
								How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	0,3											
	Halon 1301												
	Halon 2402												

		Relevant data regarding use and storage					
		Yes	No	Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	CTC						

Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	Changes in the latest year, where data is available					
								How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Peru	CFC-11	final enquiries are being made	Central Collection	fin. enq. are being made		no data available							
	CFC-12	final enquiries are being made		fin. enq. are being made		no data available		no data available		no data available	no data available	no data available	
	Other CFCs:	final enquiries are being made		fin. enq. are being made		no data available							

	Product	Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	Changes in the latest year, where data is available					
								How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	data in process		data in process		data in process		no data available		no data available	no data available	no data available	
	Halon 1301	data in process		data in process		data in process		no data available					
	Halon 2402	data in process		data in process		data in process		no data available					

		Relevant data regarding use and storage					
		Yes	No	Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
	CTC		x				

Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	Changes in the latest year, where data is available					
								How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Togo	CFC-11	0,00		0,00		0,00							
	CFC-12	0,00		0,00		0,00		0,00		0,00	0,00	0,00	
	Other CFCs:	0,00		0,00		0,00							

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	0,00		0,00		0,00		0,00		0,00	0,00	0,00	
	Halon 1301	0,00		0,00		0,00		0,00		0,00	0,00	0,00	
	Halon 2402	0,00		0,00		0,00		0,00		0,00	0,00	0,00	
		Relevant data regarding use and storage		Unwanted (unlikeley to be consumed by the market) stored - MT -	Unwanted (unlikeley to be consumed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info						
		Yes	No										
	CTC			0	0								

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpiled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
United States	**Data on ODS imports**												

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpiled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC-12 has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Venezuela	CFC-11	unknown		40,00		1,00	they need marketing						
	CFC-12	0,70	INGARSICA, Caracas	700,00	PRODUVEN (pruducer) and 3 wholesalers	0,25		0,2	2002	0	0	0	There are near 32MT of CFC11 and 100 MT of CFC12 contained in Chillers older than 20 years, which are still working; 400 MT in domestic units and nearly 700 MT in mobil A/C
	Other CFCs:			0,00									
	R13					0,13							
								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	0,00		0,00		0,00		1,00	2004	0,80	0,00	0,00	
	Halon 1301	0,00		0,00		0,00		0,12	2004	2,42	0,00	0,00	
	Halon 2402	0,00		0,00		0,00		0,00	2004	0,00			
		Relevant data regarding use and storage		Unwanted (unlikeley to be consumed by the market) stored - MT -	Unwanted (unlikeley to be consumed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info						
		Yes	No										
	CTC		x										

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpiled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC-12 has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Zambia	CFC-11	0,00		0,00		0,00							
	CFC-12	0,00		0,00		0,00		0,02	1995	0	0	0	Most of the recovered gases (R12) is recycled bac into the repaired systems/units
	Other CFCs:	0,00		0,00		0,00							
	R502												

								Changes in the latest year, where data is available					
		Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
	Halon 1211	0,00		0,00		0,00		N/A		N/A	0,00	0,00	Zambia uses mostly alternative substances to halon.
	Halon 1301	0,00		0,00		0,00		N/A		N/A	0,00	0,00	
	Halon 2402	0,00		0,00		0,00		N/A		N/A	0,00	0,00	

	Relevant data regarding use and storage					
	Yes	No	Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
CTC		x				

								Changes in the latest year, where data is available					
Country	Product	Collected used, contaminated, and stored - MT -	Where stored	Stockpilled new (virgin) - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much CFC-12 has been recovered from refrig. systems during the last available year - MT -	Which year	How much of that recovered CFC-12 has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Zimbabwe	CFC-11	0,00		1,00									
	CFC-12	1,00	At workshops in the country and the Central Collection Centre in Harare	0,15	At Technical Colleges in major towns	0,40	R&R machines are not operational, they are to be commissioned soon	0,4	2005	0,4		0	All the recovered CFs are kept for recycling as soon as the equipment is commissioned
	Other CFCs:												
	R502												

							Changes in the latest year, where data is available					
	Collected used, contaminated, and stored - MT -	Where stored	Collected new (virgin) contaminated, and stored - MT -	Where stored	Reusable collected, not reused so far - MT -	Additional remarks	How much halon has been recovered during the last available year - MT -	Which year	How much of that recovered halon has not been reused during the last available year - MT -	Due to contamination beyond local/nat. recycl. and recl. Capailities - MT -	Already destroyed - MT -	Any other relevant info
Halon 1211	0,10	local authorities, dealers, users	0,40	users and several dealers	0,40							
Halon 1301	N/A		0,60		0,60	Local authorities have banned the use of halons						
Halon 2402	0,00		0,00									

	Relevant data regarding use and storage					
	Yes	No	Unwanted (unlikeley to be consummed by the market) stored - MT -	Unwanted (unlikeley to be consummed by the market) added to that amount in the last year where data available - MT -	Which year	Any other relevant info
CTC		x				

Annex IV

Information Paper on ODS Disposal Needs and Practices in Article 5 Countries

Prepared by the Ministry of the Environment of Japan

This paper introduces examples of actual destruction of ODS and other examples that indicates actual and potential ODS disposal needs in Article 5 countries. These cases have been identified through interviews with the Ozone Officers, servicing workshop owners, halon banks and other stakeholders in some countries.

List of Identified Cases

Actual cases of ODS destruction

Country	Substance	Quantity	Type
Indonesia	CFC12	21 MT	Surplus
Thailand	HCFC22	1 MT	Recovered refrigerant
China	HCFC22, etc.	200 MT	Production process residue
China	CTC	Variable	Surplus (by-product)

Actual ODS disposal needs

Country	Substance	Quantity	Type
Indonesia	CFC11/CFC12	1 MT	Refrigerants mixture
Indonesia	MCF	74 MT	Surplus caused by end use phase-out
Indonesia	CFC11	11 MT	Contamination
Nepal	MBr	2 MT	Obsolete pesticide
Philippines	CFC12, etc.	5 MT	Customs confiscation
Philippines	Halon 1211	2 MT	Recovery without reuse options
Sri Lanka	CFC113	1 MT	Surplus caused by end use phase-out
Cuba	CTC	100 MT	Equipment replacement
Cambodia	CFC12, etc.	23 kg	Refrigerants mixture

Potential ODS disposal needs

Country	Substance	Quantity	Type
Philippines	CFC11	86 MT +	Expected surplus
Korea, R.	CFC12	N/A	Recovered MAC refrigerant

Note: MT represents metric tonnes in this paper.

* For the purpose of this study, the term, ODS "disposal" is used to mean **options to take care of any ODS that is excluded from the end-users' market** of a certain country for any reason, including contamination, erroneous mixture, lack of quality warrant, no access to refined reclamation technology, etc. In this paper, "disposal" does **not** include "**long-term storage**" since it does not guarantee following treatments within a definite timescale such as reuse, reclamation, destruction or export to other countries.

It should be noted that it is **not** the purpose of this paper to define sometimes controversial terms, ODS “disposal” or “unusable ODS”, under the Montreal Protocol or the policies of the Multilateral Fund for the Implementation of the Montreal Protocol.

1 Actual ODS destruction cases identified in A5 countries in the Asia regions

Case 1
Indonesia
21 MT of CFC12

One servicing company based upon Kalimantan Island of Indonesia retrofitted CFC-based equipment installed at one oil company. As a result, 21 MT of CFC was recovered.

The company stored the recovered CFC for the time being. After consultation with the Government of Indonesia about how to deal with it, the company decided to export the 21 MT of CFC to Australia for destruction on an experimental basis in cooperation with the government. The expense was covered by the company.
1.5 years passed since the recovery of CFC without preceding experience of a similar case in Indonesia.

The preparatory work involved the purchase of a certified cylinder from Germany to contain CFC during transportation (the transportation of the cylinder took about one month by ship), notifying the port of call (Singapore) of the intention of CFC transportation and obtaining the permit under the Basel Convention, and getting the permit from the Indonesian government for exportation.

In October 2005, the exported CFC was received by the Refrigerant Reclaim Australia. As a result of gas chromatography analysis that was carried out in Australia, the content was confirmed to contain 80 % CFC12 and 18% HCFC22. The CFC was destroyed with the argon plasma arc plant at the Australian National Halon Bank.
It took about 6 months from the preparatory work to the destruction of CFC.

The total cost involved for the exportation of the 21 MT of CFC-12 from Indonesia for destruction in Australia in this particular case is reported to be approximately US$ 500,000 (figure still being under confirmation).

Case 2
Thailand
1 MT of HCFC22 and HFC

A Japanese company in Thailand had been looking over 3 years for disposal options for HCFC22 and R410A (HFC32/125) recovered from air conditioners in the pre-shipment quality check process. When gas leakage is found from end products prior to shipment, the refrigerant is recovered during repair but the product is refilled with new refrigerant instead of the recovered refrigerant for quality assurance.

In accordance with the policy of the headquarters of the company in question, the company's plants in Thailand as well as in other countries are recovering the refrigerant that would otherwise be released into the atmosphere and also seeking for access to appropriate disposal of the refrigerant recovered at its own plants or the market.

The company is aware of the existence of retailers in Thailand who would buy the recovered refrigerant from them. However, the company has decided to destroy the refrigerant, as its social responsibility policy, instead of selling it in a country without a sophisticated reclamation system.

Although the company first contacted local cement companies for refrigerant destruction service, they did not agree to ODS destruction due to the concern that ODS destruction in the cement kiln would damage the kiln[*]. The company considered exporting the refrigerant to Japan for destruction but concluded that it was not practicable due to expected complexity of procedures. Eventually, the company requested the industrial waste management center, which is funded by the Thai government, to investigate necessary conditions for the destruction of the refrigerant. The conditions were verified by technical engineers of the company and the headquarters in Japan before and after the start of the operation.

At present, the destruction is being conducted in the center on an experimental basis at a destruction capacity of 1 kg/hr. Capacity of total waste incineration in the center is 40-50 tons/day. 900 kg of the refrigerant (15 cylinder tanks) that had been stored over the 3-year period was transported to the center and 500 kg has been destroyed already (as of February 2006). The cost of destruction that was conducted on a trial basis was 15,000 Baht/t (planned to be raised when business operation starts), which is being covered by the company.

The company is starting the recovery practice during service operation, which will increase the destruction need of the refrigerant up to 1-1.5 MT.

Case 3
People's Republic of China
200 MT of recovered HCFC, etc.

A Japanese company in the People's Republic of China has been destroying HCFC22 and other HCFCs (HCFC124, 124a, etc.), which are recovered in the process of manufacturing fluoropolymers since 2003. Approximately 200 MT of HCFCs has been recovered so far (100 MT in 2005), which is currently decomposed voluntarily together with by-product gases in the devoted destruction facility based on submerged combustion technology that is installed in the plant. The destruction plant is capable of decomposing 360 kg/h; however, there is no excessive capacity to accommodate ODS from external sources at present.

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[*] This technical concern has been taken care of in the existing cement kiln ODS destruction facilities in Japan and Europe; acidic by-products such as HCl or HF are neutralized in the alkaline environment within the kiln and Cl concentration can be controlled below the cement-quality damaging levels through the controlled injection of ODS into the system. Dioxin is also in control below concern levels in existing facilities.

Case 4
People's Republic of China
CTC (amount depends on the level of CTC being absorbed by non-ODS chemicals)

A sector plan for phase-out of ODS process agent applications (Phase II) and corresponding CTC production in the People's Republic of China was approved in principle at the 47th Meeting of the Executive Committee. The objective of the project is to archive the additional reduction of 10,775 ODP tones of CTC production after the agreed reduction under the Phase I project. Although the demand for CTC for feedstock in China will increase in the coming years, it will not be able to absorb all the CTC co-produced by chloromethane (CM) producers. Hence, disposal of surplus CTC is the only option for complying with the Montreal Protocol; funding was requested to finance on-site incinerators plus the operating cost to destroy the surplus CTC at 4 eligible CM producers.

2 Actual ODS disposal needs identified in A5 countries

Case 1
Indonesia
1 MT of mixed refrigerant (CFC11 and CFC12)

One servicing company based upon Jakarta, Indonesia, is storing 1 MT of mixed refrigerant of CFC11 and CFC12. This mixture happened as a result of accidental confusion during service operation. In the absence of measures to separate this mixed refrigerant, the company stores the cylinder for an indefinite period without access to reclamation or destruction options.

Case 2
Indonesia
74 MT of MCF

One private company stores 73,710 kg of MCF for an indefinite period without domestic demand after phase-out of MCF use or access to destruction.

Case 3
Indonesia
11 MT of contaminated CFC11

Recently, the Government of Indonesia identified 11 MT of contaminated CFC11 at Pt Ajinomoto in East Java Province. The details will be investigated.

Case 4
Nepal
2 MT of MBr

Nepal identified the existence of approximately 2 MT (43 cylinders of 50 kg capacity) of obsolete MBr, which has been stored as expired in the country on the understanding that the effective life of MBr or container expires approx. 2 years after production[*].

Case 5
Philippines
5 MT of confiscated refrigerant (CFC12, etc.)

5.5 MT of refrigerant (in 454 disposable cylinders of 30 lbs. capacity) has been confiscated at the customs of the Philippines as a successful enforcement of the customs inspection upon refrigerant import. The refrigerant in question was labeled as HFC134a, whose import is not prohibited, but turned out to be a mixture of CFC12 and HFC134a.

The government took a decision (DENR-EMB Case No. ODS 004-04, dated 30 June 2004) to direct a trading company to reship the refrigerant immediately back to the country of origin. However, until now, the reshipment has not been effected with the goods lying in the customs' warehouse.

Including the case quoted above, the Government of the Philippines have identified 13 cases of mislabeled refrigerants, i.e. CFC12 labeled as HFC134a, in 2003 and 2004. Most of them resulted in the re-sending of the substance to the country of origin.

However, the re-sending does not necessarily solve the problem but pass the problem on to the country of origin if the refrigerant in question is a mixture, for instance of HFC134a, CFC12, HCFC22 and hydrocarbon, as was the case in some confiscations.

Such re-sent substance is useless in the country of origin as well, if it does not have or use sophisticated reclamation facilities.

Case 6
Philippines
2 MT of halon 1211

The Philippines have had only the use of halon 1211 with no use of halon 1301 or halon 2402. Its halon bank has been recovering halon 1211 from portable fire extinguishers in the past. The halon bank is capable of recovering halon but is not equipped with a halon reclamation facility.

Under the regulation of the country, it is already prohibited to produce or sell halon-based fire extinguishers. In this situation, the halon bank is storing the recovered halon 1211 (approximately 2 MT) in the plant premises. The quality of the recovered halon is not guaranteed.

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[*] It is suggested by chemical company that container was marked with a "Use By" date, not because of expiration of the contents, but because of concern that it might begin to deteriorate and develop leaks.

In the recent years, replacement of halon-based fire extinguishers for alternatives is promoted in the Philippines, assumedly as ISO 14000s are introduced in increasingly more and more companies and organizations.

Case 7
Sri Lanka
1 MT of CFC113

A government-owned pharmaceutical company in Sri Lanka has a stock of 13 cylinders (each containing 100 kg) of CFC113 which was supplied by the Government of Japan in the early stage of the factory operation. CFC113 had been used for cleaning purposes but the company stopped using the chemical due to environmental concerns.

The company now seeks assistance from the Sri Lankan NOU to dispose of the stocked ODS in an environmental friendly manner. Sri Lanka does not have any use of CFC113 or an access to ODS destruction.

Case 8
Cuba
100 MT of CFC12

The Government of Cuba replaced 3 million CFC12-based domestic refrigerators as part of its initiative to improve energy efficiency in the country. It is estimated that approximately 100 MT of CFC12 is stocked. Cuba is considering the measures to destroy it.

Case 9
Cambodia, 23 kg of mixed CFC12 and HFC 134a

The Government of Cambodia identified 22.6 kg of mixed CFC12 (89 %) and HFC134a (9.1%) contained in two cylinders at Banteay Menchey Province. They were recovered at a servicing workshop in August 2005 from cars that were brought in for air conditioning repair.

3 Potential ODS disposal needs identified in A5 countries in the Asia regions

Case 1
Philippines
86 MT or more of CFC11

In the Philippines, it is expected that at least 86 MT of CFC11 will be recovered as a result of the approved chiller conversion project. Most of the recovered CFC11 will be out of use, since the project leads to the significant reduction of CFC11-based chillers in the country.

Case 2
Republic of Korea
CFC12

Without an ODS recovery and destruction regulation in place yet, the Ministry of Environment of the Republic of Korea is currently working to draft a law for motor vehicle recycling, which is expected to be in place in July 2007.

Although at present the refrigerant recovered from end-of-life motor vehicles at motor vehicle disposal facilities are reused or released to the atmosphere, such refrigerant will need to be reused, reclaimed or destroyed.

Annex V

Main Characteristics of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal and Similar Agreements

This appendix lists certain selected conditions of the Basel Convention relevant for the transport of used ODS. It should be used as general information only.

Prohibition

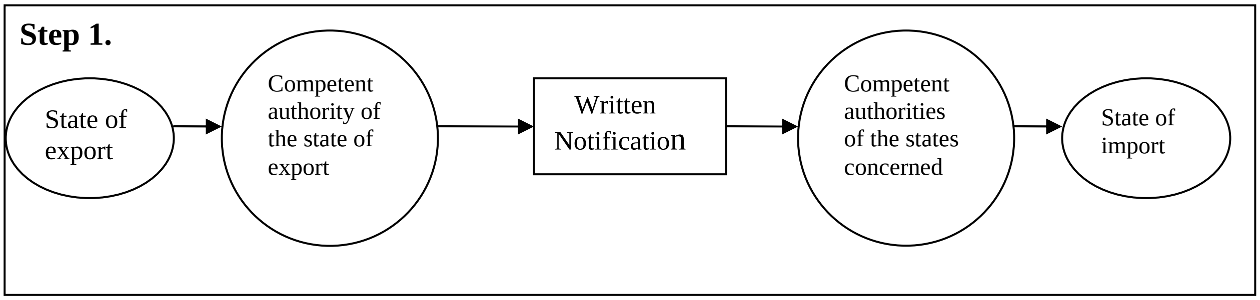
a) Any Party has a right to prohibit import of hazardous and other waste, but needs to inform about it to the relevant institution;
b) Parties have no right to export hazardous waste to the countries that have prohibited their import and have informed about it other Parties;
c) Parties have no right to export hazardous waste without a written consent from the importing country (more on the procedure of notification below);
d) Parties have no right to import from or export to a non-party of the Convention.

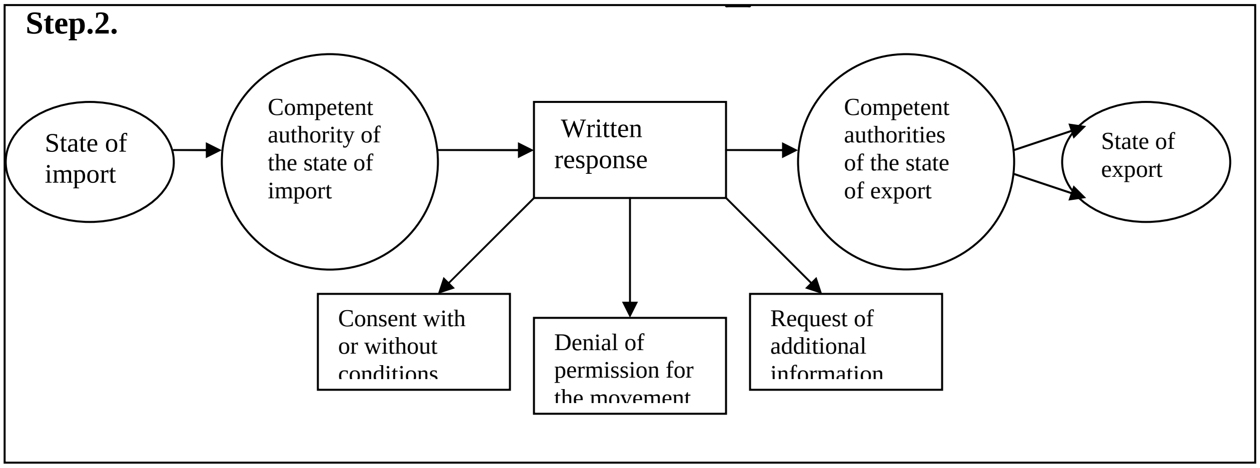
Exception: Multilateral, regional and bilateral agreements. According to the Convention parties may have such agreements with both parties to the Convention as well as non-parties. In both cases the provisions of those agreements shall include principles that are environmentally sound, to a degree not lower then in the Basel Convention. The provisions of the Basel Convention shall not restrict the transboundary movement of waste taking place under such agreements as long as the environmental sound management is ensured.

Notification system

The notification procedure for the movement of the waste employs several steps. Every party shall establish a competent authority (even more than one, if necessary), being a governmental body with the responsibility for receiving of and responding to the notifications.

The procedure consists of two steps, illustrated in the following figures:





The movement of the waste cannot begin until the state of export receives two documents i.e. written confirmations that:

a) The notifier (competent authority) has received the written consent of the state of import;
b) The notifier has received from the state of import confirmation of the existence of a contract between two sides (Environmental Sound Management should be mentioned).

The procedure is similar for transit movement of waste. If the transit of hazardous waste involves non-parties to Basel, the first step described above shall take place.

Status of Ratification of Basel Convention

World Countries	Status of ratification
Afghanistan	2
Albania	1
Algeria	1
Andorra	1
Angola	0
Antigua and Barbuda	1
Argentina	1
Armenia	1
Australia	1
Austria	1
Azerbaijan	1
Bahamas	1
Bahrain	1
Bangladesh	1
Barbados	1
Belarus	1
Belgium	1
Belize	1
Benin	1
Bhutan	1
Bolivia	1
Bosnia and Herzegovina	1
Botswana	1
Brazil	1
Brunei Darussalam	1
Bulgaria	1
Burkina Faso	1
Burundi	1
Cambodia	1
Cameroon	1
Canada	1
Cape Verde Islands	1
Central African Republic	0
Chad	1
Chile	1
China	1
Colombia	1
Comoros	1
Congo, Dem Rep	1
Congo, Rep	0
Cook Islands	1
Costa Rica	1
Cote d'Ivoire	1
Croatia	1

Annex V

World Countries	Status of ratification
Cuba	1
Cyprus	1
Czech Republic	1
Denmark	1
Djibouti	1
Dominica	1
Dominican Republic	1
Ecuador	1
Egypt	1
El Salvador	1
Equatorial Guinea	1
Eritrea	1
Estonia	1
Ethiopia	1
Fiji	0
Finland	1
France	1
Gabon	0
Gambia	1
Georgia	1
Germany	1
Ghana	1
Greece	1
Grenada	0
Guatemala	1
Guinea	1
Guinea Bissau	1
Guyana	1
Haiti	2
Honduras	1
Hungary	1
Iceland	1
India	1
Indonesia	1
Iran	1
Iraq	0
Ireland	1
Israel	1
Italy	1
Jamaica	1
Japan	1
Jordan	1
Kazakhstan	1
Kenya	1
Kiribati	1
Korea, Dem Rep	0
Korea, Rep	1

World Countries	Status of ratification
Kuwait	1
Kyrgyz Republic	1
Laos	0
Latvia	1
Lebanon	1
Lesotho	1
Liberia	1
Libyan Arab Jamahiriya	1
Liechtenstein	1
Lithuania	1
Luxembourg	1
Macedonia	1
Madagascar	1
Malawi	1
Malaysia	1
Maldives	1
Mali	1
Malta	1
Marshall Islands	1
Mauritania	1
Mauritius	1
Mexico	1
Micronesia	1
Moldova	1
Monaco	1
Mongolia	1
Morocco	1
Mozambique	1
Myanmar	0
Namibia	1
Nauru	1
Nepal	1
Netherlands	1
New Zealand	1
Nicaragua	1
Niger	1
Nigeria	1
Niue	0
Norway	1
Oman	1
Pakistan	1
Palau	0
Panama	1
Papua New Guinea	1
Paraguay	1
Peru	1
Philippines	1

Annex V

World Countries	Status of ratification
Poland	1
Portugal	1
Qatar	1
Romania	1
Russia	1
Rwanda	1
Samoa	1
San Marino	0
Sao Tome and Principe	0
Saudi Arabia	1
Senegal	1
Serbia and Montenegro	1
Seychelles	1
Sierra Leone	0
Singapore	1
Slovakia	1
Slovenia	1
Solomon Islands	0
Somalia	0
South Africa	1
Spain	1
Sri Lanka	1
St Kitts and Nevis	1
St Lucia	1
St Vincent and the Grenadines	1
Sudan	0
Suriname	0
Swaziland	1
Sweden	1
Switzerland	1
Syria	1
Tajikistan	0
Tanzania	1
Thailand	1
Togo	1
Tonga	0
Trinidad and Tobago	1
Tunisia	1
Turkey	1
Turkmenistan	1
Tuvalu	0
Uganda	1
Ukraine	1
United Arab Emirates	1
United Kingdom	1
United States	2
Uruguay	1

World Countries	Status of ratification
Uzbekistan	1
Vanuatu	0
Venezuela	1
Vietnam	1
Yemen	1
Zambia	1
Zimbabwe	0
	0- no
	1- yes
	2- signature

Source: www.basel.int

Multilateral, Regional, Bilateral agreements

Regional agreements:

There are several regional agreements that can potentially play a role when transporting waste between countries of different regions. Three of them are in force.

a) Bamako Convention on the Ban of the Import Into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes Within Africa.

The aim with the Convention is to prohibit hazardous waste to Africa from non-contracting parties. The Convention was ratified by 21 African countries.

b) Central American Agreement (*Acuerdo Regional Sobre Movimiento Transfronterizo de Desechos Peligrosos*)

Parties to this agreement prohibit both import and transit of hazardous waste to Central America from countries not parties to this agreement. Parties to the agreement are: Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua and Panama.

c) The Waigani Convention to Ban the Importation into Forum Island Countries of Hazardous and Radioactive Wastes and to Control the Transboundary Movement and Management of Hazardous Wastes within the South Pacific Region

The Convention has two basic provisions. It prohibits import of hazardous waste to the Pacific Island Developing Parties from outside of the Convention area. [1]

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[1] The convention area includes: American Samoa , The Commonwealth of Australia, Cook Islands , Federated States of Micronesia , Fiji, French Polynesia , Guam , Kiribati , Republic of Marshall Islands, Nauru , New Caledonia and Dependencies , New Zealand , Niue, Northern Mariana Islands, Republic of Palau , Papua New Guinea , Pitcairn , Solomon Islands, Tokelau , Tonga

The second provision prohibits other parties (meaning Australia and New Zealand) to export waste to the territories that are covered by the Convention, except for Australia and New Zealand.

So far twelve counties have ratified the agreement: Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Nauru, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu, Australia and New Zealand.

The definitions of “hazardous waste” used in all three agreements are similar to the one used by the Basel Convention. They include the terms Y41 (Halogenated organic solvents) and Y45 (Organohalogen compounds).

Multilateral agreements:

a) OECD Council Decision C(92)39/Final and OECD Council Decision C (2001) 107/Final

Both decisions are aimed to control transboundary movement of hazardous waste for recovery operations within the OECD area. The second one supersedes the first one. Two OECD countries fall under Article 5: Turkey and Mexico

b) Customs Union (Russia, Belarus, Kazakhstan, Tajikistan)

The agreement became a base for Eurasian Economic Community. The Union (later the Community) develops cooperation between four countries and regulates procedures for movement of goods within those states through elimination of the obstacles for free trade of goods.

Bilateral agreements:

- According to the Basel Secretariat[2], so far there are 11 bilateral agreements (1 never implemented)

- 10 remaining agreements are: Australia- Democratic Republic of East Timor, Canada-USA, Costa Rica- USA, Germany- Afghanistan, Germany-KFOR/NATO, Germany-Zimbabwe, Malaysia-USA, Mexico-USA, Netherlands-Netherlands Antilles and USA-Philippines.

- There are many other similar agreements completed.

The available texts of the agreements do not follow the same model: some can have more specifications, while others do not.

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[2] http://www.basel.int/article11/index.html

Annex VI

MULTILATERAL FUND
FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

Secretariat

1800 McGill College Ave, 27th Floor, Montreal, Quebec, Canada. H3A 3J6
Tel: (514) 282-1122 Fax: (514) 282-0068

EXPERTS MEETING
To Assess the Extent of Current and Future Requirements for the Collection and Disposition (Emissions, Export, Reclamation and Destruction) of Non-Reusable and Unwanted ODS in Article 5 Countries

Monday, 13 March – Wednesday, 15 March 2006

List of Attendees

Consultants

Mr. Paul Ashford
Mr. Denis Clodic
Mr. Lambert Kuijpers
Mr. Daniel Verdonik

Experts

Mr. Michael Bennett
Mr. Klas Berglof
Mr. Salomon Gomez Batista
Ms. Emma Palumbo
Mr. Walter Hugler Quintanilla
Mr. Miguel Quintero
Mr. Valery Smirnov
Mr. Nils Stig Wikstrom

From the Multilateral Fund Secretariat

Ms. Maria Nolan
Mr. Ansgar Eussner
Mr. Eduardo Ganem
Mr. Tony Hetherington
Ms. Roxana Ionescu (consultant)
Mr. Andrew Reed
Mr. Stephan Sicars
Ms. Anna Vartanyan (consultant)
Mr. Cristobal Vignal (consultant)

From the Executive Committee

Mr. Scott Wilson, Canada (co-opt by Australia)
Ms. Magna Luduvice, Brazil
Ms. Maria Graciela Garau,Argentina (co-opt)
Dr. Arumugam Duraisamy, India
Dr. Sachidananda Sataphathy, India
Mr. Alessandro Giuliano Peru, Italy
Ms. Beatrice Vincent, France (co-opt)
Mr. Juergen Usinger, Germany (co-opt)
Ms. Junko Nishikawa, Japan
Mr. Wataru Ono, Japan
Mr. Agustin Sanchez-Guevara, Mexico
Dr. Nelson Espinosa Pena, Cuba (co-opt)
Mr. Husamuddin Ahmadzai, Sweden
Mr. Khaled Klaly, Syria
Mr. Tom Land, United States of America

From the Implementing Agencies

Mr. Alejandro Ramirez-Pabon, UNDP
Mr. Jim Curlin, UNEP
Mr. Guido Sonnemann, UNEP
Mr. Ryuichi Oshima, UNIDO
Mr. Vladimir Bysyuk, UNIDO
Mr. Viraj Vithoontien, World Bank