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APPROACHES TO ODS PHASEOUT IN SMALL AND MEDIUM SIZED ENTERPRISES (SMEs)

(Submitted by UNDP and UNEP)

APPROACHES TO ODS PHASEOUT IN SMALL & MEDIUM SIZED ENTERPRISES: OVERALL RECOMMENDATIONS AND SUMMARY SECTORAL REVIEWS

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A. INTRODUCTION AND GENERAL CHARACTERISTICS OF SMEs

1. Although small and medium-sized enterprises (SMEs) comprise important sectors in many developing countries, historically low levels of assistance have been provided to this enterprise category for environmental activities, including stratospheric ozone protection. Across all sectors, the majority of investment projects approved by the Executive Committee to date have benefitted larger enterprises. However, it is increasingly evident that SMEs in Article 5 countries require more assistance if they are to make the transition to non-ODS technologies avoiding severe economic and social dislocations.

2. The consequences of SMEs being left behind in the ODS phaseout process include:
   - o the global ODS phaseout will be delayed;
   - o many SMEs may be forced to close down and unemployment will rise, especially since SMEs have proportionately and in total more employees than do larger companies;
   - o increased dependence on larger companies or on multinational subsidiaries;
   - o some SMEs may witness an increase in their ODS consumption if larger companies shift some CFC usage to SMEs, which would result in more difficult ODS elimination; and
   - o consumption of ODS in SMEs may continue to grow so long as CFC technologies remain cheaper than ODS replacement technologies.

3. To avoid the negative repercussions from a slow transition to ODS alternatives, increased resources are needed to assist the SME sector from within and outside the Multilateral Fund; this should be coupled with special measures made at the country level to help the SMEs. Because of their smaller-scale, SME ODS phaseout investment projects will never be as cost-effective as for larger companies. On the other hand, this very same SME feature provides greater flexibility and adaptability for SMEs to switch to new technologies and to respond to the requirements of their clients which, for example, could be either larger aerosol fillers themselves or

companies with their own special brand products. Therefore, it is necessary to develop new approaches that would lead to reasonably cost-effective ODS phaseout activities and effective support services and legislative measures to accelerate ODS phaseout by SMEs.

4. While agreeing that projects which will eliminate large amounts of ODS should be given priority, the Executive Committee, at its 13th Meeting, recognized the significant problems being faced by SMEs in several countries and requested that Implementing Agencies propose efficient and feasible strategies to address this problem. This paper, prepared by UNDP in collaboration with UNEP, summarizes the result of agency efforts in this regard.

5. There is no universally acceptable definition of SMEs. At the policy level, many developing country Governments define SMEs in terms of a combination of investment level, number of employees, sales revenues, etc. We will thus characterize and identify SMEs on a sectoral basis. There are, however, several general characteristics that SMEs normally have:
   - o a small production capacity;
   - o a low level of investment;
   - o a higher number of employees per unit of production compared to larger companies;
   - o a generally low level of health and safety standards;
   - o low awareness about environmental issues; and
   - o dependence on larger industries for the supply of products, raw materials, and "technology feedback".

6. When taken as a whole, the SME sector can be generalized as:
   - o comprising a large number of small enterprises overall, often constituting up to 80% of the total industry in many developing countries;
   - o representing a politically important socioeconomic sector and providing a source of significant employment in several developing countries;
   - o being geographically scattered, which makes individual SMEs difficult to identify and communicate with; and
   - o often consisting of enterprises that can be classified as belonging to both to the "formal" (registered) and the "informal" (unregistered) sectors.

B. BARRIERS TO ODS PHASEOUT IN SMEs

7. Several of the above characteristics create or enhance conditions that lead to barriers to successful ODS phaseout in SMEs. Specifically, the following are the main barriers that can prevent or slow their adoption of non-ODS technologies:

   a) Environment is not a priority concern Environmental issues in general, and ozone layer protection specifically, are not considered priorities given limited time, budgetary and human resources. SMEs are often too busy solving immediate problems and cannot concentrate on technological developments including conversion to non-ODS technologies and products.

b) Reluctant to change Many SMEs are already at the "edge of survival" and resist changing existing operating methods and technologies due to fear of the unknown.

c) Lack of industry organizations SMEs in many countries do not have or belong to formal organizations to represent their interests and, as a consequence, they have no focal point to assist them identify, obtain and channel assistance for potential ODS phaseout projects.

d) Low-level internal resources SMEs do not benefit from the "economies of scale" of larger companies and thus do not have the internal human and financial resources to initiate ODS phaseout programmes on their own.

e) Inadequate information Due to their small size and limited human and financial resources, SMEs have great difficulties identifying information and financing sources, both of which are essential elements in the technology transfer process. Some progress has been made in this area. Virtually all of UNEP OzonAction clearinghouse services and publications have been disseminated to and used by SMEs. However, given their vast numbers, information on the need for ODS phaseout and its timing, how to access assistance from the Multilateral Fund and the National Ozone Units, technical options and sources of technology, equipment, and chemicals, etc. have not yet reached the majority of SMEs.

f) Inadequate technical skills The limited internal workforce in SMEs usually means that skills are focussed on narrow technical specialties required to meet immediate production runs. Little time is available to acquire the new skills required to undertake activities such as ODS phaseout projects. Examples of such missing skills include inadequate training in: CFC recovery and recycling; in the safety of alternative technologies, equipment and substances; in specifying technical assistance to design projects; and in lack of technology assessment capabilities. UNDP, UNEP and UNIDO have been assisting SMEs in this area.

g) Access to technology, equipment, and chemicals SMEs are usually ill-equipped to identify suppliers of new technology, equipment and chemicals. They often have to rely on their suppliers' advice about what new technology to adopt. Local dealers and importers often not very knowledgeable about new technologies. Additionally, SMEs do not always receive advice from larger suppliers since their small size and small sales potential does not merit the attention given to larger customers. SMEs therefore need improved access to mechanisms for technology transfer.

h) Access to financing The need of SMEs for financial assistance is large due to their small operating margins which makes them more risk adverse than larger companies when adopting new technologies. Financial institutions tend to not underwrite environmental technology transfer activities for SMEs. While SME awareness about available financial assistance under the Multilateral Fund is rising, the sheer number of SMEs involved requires more work in this area. Even when aware, the procedures for receiving assistance under the Multilateral Fund appear complicated for SMEs which desperately need a simpler application procedure.

8. There are however, positive characteristics of SMEs which could be potentially utilized for expeditious phaseout:
   - o technology employed by SMEs is usually not complicated and so adapting to non-ODS alternatives may not be difficult;
   - o the decision-making process is normally faster in smaller companies;
   - o SMEs largely depend on and are responsive to suppliers and their buyers who are large companies. Such large companies, through their corporate policies towards alternative non-ODS products, could play an important role in facilitating an early phaseout of ODS in the SMEs.

C. SUGGESTED MEASURES TO FACILITATE ODS PHASEOUT IN SMEs

Umbrella Approach to ODS Phaseout in SMEs

9. The umbrella approach - currently used in UNDP's programme for small foam companies in Malaysia and the Philippines and a World Bank project in Jordan - allows for implementation of projects in a large number of smaller enterprises using the same technical approach. This approach could be considered as one of the models for SME project implementation in the aerosol, foam, refrigeration and solvent sectors. However, this will necessitate adjustments in the project approval cost-effectiveness values for the sectors concerned.

10. Another model under the umbrella approach could include the following:
   - o a survey of the size, characteristics, consumption level, etc. of the SME population conducted nationally in cooperation with an Implementing Agency;
   - o a sector-wide project proposal is developed and proposed to the Executive Committee using a common technical approach;
   - o based on the cost-effectiveness thresholds established for the particular sector covered, an overall funding level is agreed upon by the Executive Committee;
   - o the approved funding could be co-managed by the Government and the implementing agency concerned. The selection of qualified SMEs for grants under this programme will be done by the Government with approval/endorsement by the concerned implementing agency. The implementing agency will be primarily responsible for technical programme review and evaluation and the Government will be responsible for fund disbursement and overall project monitoring and implementation in full accordance with the implementing agency financial rules and regulations;
   - o the Government ensures the sustainability of the ODS phaseout effort by devising appropriate incentives and legislative and regulatory techniques applicable specially to SMEs in that sector.

11. The above approach could be suitable for countries where ODS phaseout activities in the sector(s) are just starting or where the SMEs remain to be identified.

12. The advantages of this approach include a reduced workload on the Executive Committee by eliminating the need to examine each tiny SME project individually; and it gives Governments, and particularly national ozone units, the opportunity and related responsibility for managing ODS phaseout in an important socio-economic

enterprise category. Such an approach would require a detailed reporting requirement by the recipient Government through the implementing agency concerned.

13. A variant of the above approach would be based on group implementation to reduce overall incremental costs as follows:

- o a project for an umbrella programme will be developed for all the SMEs in the subsector concerned using the same ODS-replacement technology. The programme will cover all SMEs identified and baseline data collected.
- o programme cost-effectiveness will be approved/determined, on a special ad-hoc basis, by the Executive Committee based on the total ODP to be phased out in the subsector. The project review should take into account all the savings that will be realized from proposed group implementation (e.g. some rebate on bulk purchasing, local fabrication of needed equipment instead of imported equipment, shipment and installation costs, training, technology transfer and safety audit costs, etc).

14. Under this approach, all SMEs will be converted at the same time and be treated on the same and, wherever necessary, with the same monetary share and level of responsibility. At the Executive Committee level, only one project review is required with full details on incremental costs to be funded. Only one party will be accountable for the project funds covering the entire subsector. The subsector ODS phaseout can be completed faster than with individual project approval.

Possible Measures to be Taken at the Country Level

15. At the country level, through the Technical Committee or other organizations (e.g. Aerosol Association), the possibility of securing technical/financial assistance and other forms of cooperation from larger companies which have successfully completed their ODS phaseout should be explored. For example:

a) Awareness raising is key to initiate ODS phaseout activities in SMEs. Government, industry associations, buyers/suppliers of materials and products to SMEs, and NGOs could all play a vital role in awareness raising programmes which should be encouraged and financed in Article 5 countries.

b) Technology cooperation workshops which aim at sharing experiences on ODS phaseout in SMEs between developed and developing countries on the one hand, and among the Article 5 countries themselves on the other, should be encouraged.

c) Buyers/suppliers of material and products to SMEs should be encouraged to make it obligatory for SMEs to use non-ODS products and technologies.

d) Government policies and their role in ODS phaseout in SMEs are of paramount importance. Identification and surveys of ODS use in SMEs should be undertaken by Governments as a priority.

16. For ODS phaseout plans to be successful, it is essential that national legislation is clearly established and enforced. Initiatives towards such steps could be taken as

prerequisites for submitting full sector/subsector SME project proposals for funding by the Multilateral Fund.

17. In formulating project proposals for SMEs under any of the approaches outlined above, the experience of the implementing agencies shows that a different level of cost-effectiveness value for each subsector will need to be established. In the following sections, key sector-specific SME issues are highlighted and a possible range of cost-effectiveness values are suggested.

D. SECTOR-SPECIFIC OVERVIEW AND RECOMMENDATIONS: FOAMS

18. At its 14th Meeting, to address the small ODS consumer sectors in a cost-effective manner, the Executive Committee approved at its 14th meeting development of a strategy in the foam sector. Of the over 90 approved foam investment projects, 8 showed an ODS phaseout of 10 tonnes or less but they were not very cost effective. This paper was prepared by UNDP's foam sector expert in close cooperation with the Fund Secretariat, was discussed at the Interagency Consultants Meeting during 5-7 July in Paris and was formally submitted to the 17th Executive Committee where it could not be discussed due to lack of time. Since that full paper is on the agenda for the 18th Executive Committee Meeting, we provide here only a brief summary of the paper's analysis, conclusions and recommendations.

19. In foam, CFCs are mainly used as a blowing agent (non-insulating foams) or as a combined blowing/thermal insulation agent (insulating foams). Auxiliary functions include acting as a softener, as a heat sink, as a viscosity cutter and to impact the product surface. Due to these different functions, a universal replacement is not possible. Production equipment needs vary depending on whether the production process is continuous or discontinuous. In processing, the main distinction is between thermoplastic foams (polystyrene, polyethylene) and thermoset foams (polyurethane, phenolic) since the two groups have different equipment requirements: extruders/ expanders for thermoplastic foams and reactive mixture dispensers (and some handmix operations) for thermoset foams.

20. ODS replacement technologies in foams cover (a) direct physical and "drop-in" replacements needing no (or very minor) process adjustments; (b) indirect chemical replacements that function on the same process equipment with minimal adaptations; and (c) innovative processes based on different process approaches that could eliminate the need for a CFC replacement or change the requirements for such a substance.

21. As of January 1995, 104 foam investment projects (grant amount $51 million) had been approved, excluding polyol production and projects with refrigerant components (commercial/ domestic refrigeration), to phaseout 10,600 tonnes ODP. The four main categories of foam projects are:

- o extruded polyethylene/polystyrene foams (XPS/PE)
- o flexible polyurethane foams (slabstock/boxfoam process) (FS/B-PUF)
- o flexible/semi-rigid polyurethane foams (molded/integral Skin) (F/IS-PUF)
- o rigid polyurethane foam (molded, spray, panels, boardstock) (R-PUF)

22. Project costs comprise equipment, trials, technology transfer, training, installation of new/retrofitted equipment, contingencies and incremental operating costs/benefits. Aggregating these into two categories, equipment costs were 75%-80%, technology costs 11%-15% and contingencies 9%-10%. The effect of baseline ODS consumption on project cost-effectiveness shows a weak relationship for large ODS-users and a strong relationship for small ODS-users, thereby justifying special consideration for small sized ODS-users.

23. Based on the analysis of the 104 approved projects, the enterprise size is categorized as follows (in tonnes/yr):

ODS USERS	XPE/PS	FS/B-PUF	F/IS-PUF	R-PUF
LARGE-SIZE	> 150	> 150	> 30	> 30
MEDIUM-SIZE	25-150	25-150	10-30	10-30
SMALL-SIZE	< 25	< 25	< 10	< 10

24. For the above categories, the following are the cost-effectiveness thresholds or threshold ranges in US$ per kg.

ODS USERS	XPE/PS	F-PUF S/B	F-PUF M/IS	R-PUF
LARGE-SIZE	< 2	< 1	< 6	< 8
MEDIUM-SIZE	2 - 9	1 - 8	6 - 11	8 - 20
SMALL-SIZE	> 9	> 8	> 11	> 20

25. Factors that impact the costing of foam projects include the baseline situation (equipment, facilities, proficiency, product requirements), the choice, application and adaptability of the selected technology, the choice of equipment, and the support of the chemical supplier.

Recommendations

26. The foam sector should be divided into four categories and three ODS enterprise sizes. The large, medium and small-size enterprises have different sizes and different recommended cost-effectiveness thresholds based on the four subsectors covered. In summary, recommendations as to enterprise size (in ODP tonnes/yr) and the cost-effectiveness threshold (in US$/kg. ODP) are the following:

ODS USERS	XPE/PS		F-PUF/SB		F-PUF M/IS		R-PUF	
	size	C.E.	size	C.E.	size	C.E.	size	C.E.
LARGE-SIZE	>150	< $2	>150	< $1	>30	< $6	>30	< $8
MEDIUM-SIZE	25-150	< $9	25-150	< $8	10-30	< $11	10-30	< $20
SMALL-SIZE	<25	> $9	<25	< $8	<10	> $11	<10	> $20

27. Projects for SMEs should be grouped by foam subsector. If a country has over five SMEs per foam subsector, a group phaseout project per subsector should be prepared.

28. A group project should address the cost savings obtained through the following:

a) Choice of technology The technologies listed below are recommended and a deviation requires full justification:

	Category	Technology
a)	XPE/PS	LPG or butane
b)	F-PUF S	Methylene chloride
c)	F-PUF B	Methylene chloride, if needed supplemented with forced cooling
d)	F-PUF M/IS	Water-blown or HCFC-141b
e)	F-PUF	Water-blown or HCFC-141b

b) Baseline Equipment Existing equipment has to be used with reasonable retrofit costs. If no baseline pouring equipment is available (relevant for boxfoam and molded), the following equipment can be provided:
- Boxfoam (pumps for transfer of hazardous chemicals)
- Molded (air-operated dispensing equipment)

c) Procurement Potential effects from joint procurement and from potential local procurement for suitable items should be addressed.

d) Technology Costs The project should address:
- o The potential use of local chemical suppliers and/or local experts and lowered project costs;
- o The potential use of international experts for supervision only and the effect on the project costs;
- o The possibility of joint training sessions and cost savings;
- o Availability of existing and available experience in the same area, including but not limited to specifications, bids, training programs.

29. Recent technology developments and their impact on equipment specifications needs to be addressed. Questions that arise include:
- o Is the specification of high pressure equipment still justified?
- o Is it possible to specify differences in equipment requirements between the different types of molded foams such as flexible, rigid/general and refrigeration, integral skin/rigid/semi-rigid?

- What additional zero ODP technologies besides water, pentane and gaseous HFCs can be anticipated with sufficient assurance that equipment specifications could be designed keeping such technologies in mind as the likely permanent technology in the future?

30. It is recommended that group demonstration projects in all applicable foam subsectors be designed and approved. Suitable existing projects should be selected as examples for this activity.

E. SECTOR-SPECIFIC OVERVIEW AND RECOMMENDATIONS: REFRIGERATION

31. The refrigeration sector plays a critical role in the economies of many developing countries, several of whom rely on it for storage and shipment of agricultural export products that generate much-needed foreign exchange. In countries where tourism plays a major economic role, especially in small island countries, air-conditioning and refrigeration are essential for hotels, tour buses and other parts of the tourism infrastructure.

32. The refrigeration sector accounts for a relatively large share of the overall ODS consumption in many Article 5, para 1 countries. This is especially true for the low-volume ODS-consuming countries, where the refrigeration sector often represents 70% or more of the countries' total ODS consumption. For example, the refrigeration sector's share of national ODS consumption in ODP tonnes is 93.4% in Cuba, 71.2% in Ghana, 61.2% in Zimbabwe and 53.1% in Uruguay.

33. Two principal categories exist for the refrigeration and air conditioning SMEs: organized equipment manufacturers (OEMs) and refrigeration servicing sector.

a) Organized equipment manufacturers These enterprises manufacture or assemble refrigeration and air conditioning equipment. The quality of the equipment produced varies considerably in developing countries; some enterprises rely on locally-produced components, others have the resources to learn about and obtain the newest components from the US and European markets. SME enterprises that fall under this classification include small scale manufacturers of domestic refrigerators, commercial refrigeration equipment, some transport and industrial refrigeration equipment, and mobile air conditioner installers.

b) Refrigeration servicing sector These usually comprise small companies that service existing refrigeration and air conditioning equipment. SME enterprises that fall under this classification include those servicing domestic refrigerators, commercial refrigeration equipment, room air-conditioners, mobile air-conditioners (MAC) and some industrial refrigeration equipment.

34. Cost-effectiveness of SME refrigeration investment projects: The Executive Committee adopted in March 1995 US$13.76/kg and US$15.20/kg respectively as cost-effectiveness threshold values for domestic and commercial refrigeration sectors for 1995. At present, other refrigeration subsectors do not have formal established

cost-effectiveness threshold values. Recognizing that there will always be a minimum threshold value (entry cost) for a CFC elimination project for SMEs, a somewhat different approach for SMEs is required.

35. The Study of the Financial Mechanism reported the indicative average cost effectiveness of investment projects for the refrigeration sector to be:

Sector	Technology	US$ per kg ODP	Share of MLF allocations
Domestic refrigerators	HFC and HCFC HFC and hydrocarbons	10.0 14.6	19% 32%
Commercial and industrial refrigerators	HFC and HCFC HFC and hydrocarbons	10.3 22.3	1% 1%
MAC	HFC-134a	25.0	5%
Servicing of refrigeration equipment	Recovery	5.0	< 1%

Source: Study of the Financial Mechanism, pg. 151

36. The following are the possible ODS phaseout approaches for SMEs in the refrigeration sector.

37. Organized Equipment Manufacturers

a) For an SME investment project involving both refrigeration and foam components, a cost-effectiveness threshold value of US$30/kg could be considered. This is based on a CFC consumption of 3 tonnes of CFC-11 and 1 tonne of CFC-12. For such an operation, typically, one would expect a total investment cost of US$ 120,000 to eliminate 4 tonnes of ODP, excluding any incremental operating costs or savings. This would comprise US$ 70,000 for CFC-11 replacement and US$ 50,000 for CFC-12 replacement.

b) For an SME which has a consumption of up to 1 tonne of CFC-12 only and with no CFC-11 consumption (e.g. insulating panels are bought ready-made), a cost-effectiveness threshold value of US$40/kg could be considered.

38. Refrigeration Servicing Sector For SMEs in this subsector, the following equipment and supporting activities could be provided: recovery/recycling equipment; leak detectors; information and training (e.g. better practices and maintenance procedures for operation and servicing, improved leak detection, and recovery/recycling techniques to reduce unnecessary emissions).

39. In summary, the cost-effectiveness threshold for SMEs could be established at US$ 20-40/kg, depending on the type of business engaged in by the SME.

40. Recommendations: The Executive Committee may wish to consider:

a) Equipment manufacturers/assemblers: investment projects
   - o for an SME investment project involving both refrigeration and foam components, a cost-effectiveness threshold value of US$30/kg.
   - o for an SME investment project involving only a refrigeration component, a cost-effectiveness threshold value of US$40/kg.

b) Servicing sector: Support projects with limited investment components related to demonstration projects that:
   - o provide servicing sector SMEs with demonstration recovery and recycling equipment and leak detectors.
   - o promote better practices and maintenance procedures for operation and servicing, improved leak detection; and recovery/recycling techniques. This could include developing practical and easy-to-understand technical information expressly for the servicing sector audience, and disseminate it to SMEs at the local level through outreach campaigns, seminars and workshops organized by SME-oriented industry associations or technical assistance programmes, NGOs and national ozone units.

41. The cost-effectiveness thresholds for such activities would be quite low for such projects/activities in the servicing sector and therefore should be considered without employing any threshold values.

F. SECTOR-SPECIFIC OVERVIEW AND RECOMMENDATIONS: AEROSOLS

42. The cost of ODS phaseout in the aerosols sector on a per kg. basis is, in general, lower than in other sectors for mid-to-larger size enterprises. This fact has resulted in implementing agencies and countries being encouraged to target CFC usage in the aerosols sector as soon as possible so as to provide a very cost-effective use of available funding resources.

43. The size of the aerosols sector in terms of a country's overall ODS consumption varies considerably between Article 5, para 1 countries, being 2.2% in Zimbabwe, 5.2% in Cuba, 7.3% in Uruguay, 8.4% in India, 21% in Tunisia and 31% in Indonesia.

44. In many Article 5 countries, the aerosols sector often comprises a large number of small-scale enterprises, many of which are family-owned and often unregistered. These SMEs operate in both the formal and informal economy. Many countries have a large informal aerosol industry, which frequently serves as an important source of employment. In Indonesia, for example, many aerosol enterprises are SMEs that operate in the informal sector, requiring a different approach to reach and convert them to non-ODS alternatives. Since SMEs operating in the informal sector are reluctant to become legal entities, which is a precondition for receiving financial assistance, a different approach to reaching them is needed.

45. The size of individual SME aerosols enterprises can vary considerably. For example, in Ecuador, SMEs who have approved Multilateral Fund investment projects have a consumption range of 0.1 - 60 tonnes CFC per year. SMEs often form a large percentage of enterprises operating in this sector; in China, most of the country's 150 aerosol product enterprises have a small production capacity (under 500,000 cans/year, and some produce only 100,000 cans/year). A further complication that arises is that many aerosols SMEs are small family-operated and owned businesses, such as in Malaysia, that are extremely secretive with their information.

46. The conditions of these plants varies widely. China's aerosols SMEs, similar to those in many other developing countries, are characterized by very simple and crude production facilities, with manual filling machines with propellant feeding pumps driven by non-explosion-proof motors. Ventilation and lighting facilities in such conditions are not suitable for filling operations using flammable propellants.

47. Definition of an SME in the aerosols sector It is difficult to arrive at a universal definition of an aerosols SME. Enterprise size, the number of cans filled per year, and the weight of the CFC used jointly define an aerosols SME. This complexity is illustrated by the following examples:

Description	**Company A**	**Company B**
Product	Contact cleaner	Perfume
Cans filled per month	10,000	100,000
CFC used (tonnes/yr)	60	9.6
Type of equipment	Manual	Manual
Total employees	10	40-60
Sales (US$/year)	< 400,000	> 1,000,000
Size	Small company with large consumption	Large company, low consumption

Source: UNDP Aerosols Workshop

48. Another example has two enterprises with identical CFC consumption levels, but different size characteristics:

Description	**Company A**	**Company B**
Product	Aerosol	Perfume
Units filled per year	100,000	5,000,000
CFC used (MT/year)	50	50
Type of equipment	Semi-automatic	Automatic
Total employees	5	10-15

49. The following classification scheme for aerosols enterprises is thus recommended:

Classification	Tonnes consumed per year
Small-size enterprises	upto 20 tonnes
Medium-size enterprises	20 - 100 "
Larger-size enterprises	above 101 "

50. Cost-effectiveness of SME aerosols investment projects At present, the most acceptable cost-effective CFC alternative is hydrocarbon technology, which entails stringent safety measures that have to be taken by the enterprise and a different (higher) level of skills that employees need in order to run the new equipment. The minimum net investment cost involved is estimated at between US$ 50,000 - 110,000, depending on existing equipment and production volume. This implies a cost-effectiveness range of US$ 8-9/kg could be considered for SMEs in the aerosol sector.

51. The range of cost effectiveness within a group project also varies considerably, for example in the Ecuador project:

Company	Type	CFC use in 1992 (MT)	Incremental Cost (US$)	US$/kg ODS to be phased-out
Camposa	Small	5	53,000	10.600
Pro Quim	Small	6	49,000	8.167
Laboratorios Windsor	Medium	60	51,000	0.850

Source: ExCom/9/15 (except "Type" column)

52. Recommendations: The Executive Committee may wish to consider:

a) For SMEs operating in the formal sector: investment projects
   - o adopting a cost-effectiveness threshold value for SMES of US$ 7-10/kg as compared to the US$4.40/kg figure used for larger enterprises. The funding has to be enough to cover the safety costs involved in the conversion.
   - o in limited cases, establishing regional filling centres to assist SMEs. However, for most countries, this approach is not feasible.

b) For SMEs operating in the formal and informal sectors, support the following activities:
   - o organizing safety training workshops on ODS replacement technologies and equipment requirements; "matchmaking" workshops to facilitate industry partnerships; and "case study" workshops to transfer peer experiences from developed countries or more advanced developing countries.
   - o developing practical and easy-to-understand technical information expressly for formal and informal SME audiences, and disseminate it to SMEs at the local level through outreach campaigns, seminars and workshops organized by:

SME-oriented industry associations; SME-oriented technical assistance programmes (e.g. APCTT); NGOs; and national ozone units.

G. SECTOR-SPECIFIC OVERVIEW AND RECOMMENDATIONS: SOLVENTS

53. The solvent sector consists of solvent users engaged in the manufacture of products such as jewelry, cardiac pacemakers, airplane parts, belt buckles, printed circuit boards, artificial limbs, etc. It also has various service industry users such as nuclear cleanups, PCB spill remediation, medical/surgical preparation, custom breast replacement, cleaning large electric motors while in operation, etc. The user base in most countries has a few large users, a large number of mid-sized users, and often significant numbers of very small users.

54. While the definition of "small user" varies from country to country, generally in developing countries it has been estimated that 2/3 of solvents consumption is by enterprises whose annual consumption is less than 2.5 tonnes of CFC-113 and 10 tonnes of TCA. In the China country programme, 63% of the users were considered to be "small" users, and the India CP estimates that about 70% are small users, outside of the pharmaceutical subsector. Because markets have developed in this manner, it is a common practice to move solvents from producer to industrial consumers through a distribution chain. As a result, there is a general difficulty in identifying the small users.

55. Prior to the Montreal Protocol, the mid-sized CFC-113 user in a batch vapor degreaser was consuming 10-20 tonnes/yr (8-16 tonnes/yr ODP), depending on volume of manufacture and conservation practices. The average in-line, or continuous, vapor degreasing operation consumed 25-30 tonnes/yr (20-24 tonnes/yr ODP). After the Montreal Protocol, developed country users employed conservation measures to control losses and wasteful emission uses, and found they could reduce their consumption by 20-40% on a sustainable basis. The comparable usage rates of TCA were 5-10 tonnes/yr for batch units (0.5-1 tonne/yr ODP) and 15-20 tonnes/yr for in-line units (1.5-2 tonnes/yr ODP).

56. While developing countries had similar equipment in well capitalized factories, often they did not have some of the containment features, nor did they have good control of other emissive uses. There was also locally produced equipment which did not always meet international standards in the area of emission control. Thus, the losses were higher for the average user, and especially so in tropical countries.

57. An analysis of approved CFC-113 investment projects shows that about half are in the low to middle part of the range, and half in the upper end of the range. Since the larger users are often multinationals, only a few large users should be expected. The few projects for the smaller users gives strong support to the ExCom's concern on how to address this subsector.

58. Analysis of approved TCA investment projects shows that the "average" usage range (corresponds closely to the mid-sized range) only contains three projects. All the rest are larger, and there are none approved in the small-size range. Thus, prior to the

cost effectiveness guidelines, there was little effort to develop projects for the SME TCA users. The new cost effectiveness guidelines will virtually eliminate efforts to develop projects to phaseout SME TCA usage, the reason being the very low ODP of TCA mathematically reduces the cost effectiveness of projects to a substantial extent. For example, if two identical aqueous replacement processes to clean metal parts were placed in two separate enterprises, one using TCA and one using CFC-113, each project would have essentially the same cost, but when cost effectiveness is calculated, the TCA project would be at least 8 times less cost-effective than the CFC-113 project.

59. The analysis also shows that for CFC-113, cost effectiveness begins to transition upward when usage falls below about 20 tonnes/yr ODP, and breaks out asymptotically when usage falls below about 5 tonnes/yr, which encompasses the small consumers and the lower range of the mid-sized consumers. It is difficult to define a transition level for TCA, but the cost effectiveness breaks upwards asymptotically when consumption falls below 3 tonnes/yr, which is within the full range of the small and mid-sized consumers.

60. Since ODS solvents are relatively expensive as compared to the many non-ODS industrial grade cleaners, they are often used only when necessary by the small scale sector, and there is usually some form of equipment involved in order to contain them and control any wasteful use. These small users can consume from 1-3.5 tonnes/yr ODP of CFC-113 and under 0.3 tonne/yr ODP of TCA. Below this consumption level, there are also a large number of very small users who use no equipment, buy their needed materials by the bottle or pail, and have very little knowledge or resources available regarding how to substitute safely.

61. ODS Replacement Technologies They are usually not "drop in" replacements. Normally equipment must be replaced or retrofitted to accommodate the new cleaning agents. The only real "drop ins" are extremely expensive PFCs, HCFCs, and HFCs, and due to their high cost, the equipment must usually be retrofitted anyway, to contain the losses and thus minimize the operating costs. The replacements are no-clean, aqueous, semi-aqueous, non-chlorinated solvent, and chlorinated solvents. No-clean usually requires upstream process and materials changes. Aqueous and semi-aqueous normally require new equipment and water treatment facilities (inlet and/or outlet), non-chlorinated solvents are either flammable, toxic, or very costly and require new or retrofitted equipment, depending on the circumstances. Chlorinated solvents are normally more toxic, and require modifications to contain or control personnel exposure. Many of the technologies have safety and environmental issues that have to be addressed.

62. Cost Effectiveness The cost effectiveness of solvents projects has been an issue in general, and in the small user subsector in particular. The CowiConsult report (March 1995) in their analysis of 225 investment projects, of which 10% (23) were in the solvents sector, showed that the cost effectiveness for the solvents sector averaged US$44/kg.

63. Analysis of approved projects to date shows that the current limit of US$19.73/kg ODP is adequate for projects eliminating over 20 ODP tonnes/yr of CFC-113. However, with respect to TCA, the number of approved projects are too few to statistically derive suggested CE values for various TCA consumption volumes. The current limit of US$38.6/kg ODP could be nearly adequate for volumes over 7 ODP tonnes/yr. In the lower range (under 1 ODP tonne/yr), the data is insufficient to reach a conclusion on an effective CE limit (a limited aqueous technology could run US$ 50-70/kg. ODP while a chlorinated solvent retrofit at $38.6/kg. ODP would be adequate.

64. There are also issues regarding safety and environmental impact. Chlorinated replacements are many times more toxic than the ODS they are replacing. Without training or education and without projects, many SME TCA users are simply converting to trichlorethylene (TCE) or perchlorethylene (PCE) which is environmentally wrong. The use of water/detergent can cause heavy metals in the waste streams which must be removed. The use of semi-aqueous solutions must address flammability on the solvent side. The use of flammable solvents can be effective with safe equipment designs.

65. User Identification In many countries the large multinational users have phased out or are doing so, and larger identified users are generally joint ventures with activities underway. They have the engineering resources to identify alternative technologies, and make a selection based on their safety, environmental, quality and cost needs. SMEs are still unidentified in general, and the issue is how to reach and address their phaseout needs.

66. One option to reach SMEs is through seminars, surveys, and questionnaires to known users or industry groups. The results have not been productive to date. Also, there have been mixed results from requesting distributors to cooperate by sharing their customer lists. Another technique, being considered by Indonesia and discussed in Malaysia, is to involve the various suppliers and distributors in training the retailers regarding the safe and environmentally secure way to use the replacement products. This programme impacts primarily upon small users who use no equipment and those who use cold cleaning equipment. With appropriate training material that the retailers can take with them, it is possible for the end users to be converted by the retailers. When the users return to purchase a container(s) of ODS, the retailer can: (a) refer to the applications literature and show the end user the options to be tested by the user for that particular application; and (b) inform the user of the deadline when the current ODS will no longer be available.

67. There are some large corporations (among others) who are still using small quantities of ODS contained in some "custom blends" that they purchase from local chemical supply houses. These local "formulators" make these proprietary, specialty blends to meet very specific needs for end users. Rather than trying to identify and then phaseout the various end users, an umbrella programme is being discussed in the Philippines, where the formulators can be phased out with minimal, but appropriate, safety and ventilation equipment installed so that they can adopt the flammable and more toxic substitutes into their custom blends.

68. Recommendations It is recommended that solvents users be divided into 3 categories for both TCA and CFC-113. There are insufficient data for CTC classification.

a) For CFC-113, it is recommended that the breakpoint for volume be as shown below, together with the thresholds as indicated. The ODP cost-effectiveness threshold for large users could remain at US$19.73/kg, and that for medium-size users should be raised to US$26/kg. and for small-scale users should be set at US$35/kg.

ODS Users Group	CFC-113	
	ODP t/yr	C.E.
Large	>17	20
Medium	>3.5 to 17	26
Small	<3.5	35

b) For TCA, it is recommended that the existing CE limit of US$38.6 be maintained for large users, that the CE limit for medium size enterprises be set at US$65/kg. and that for small-scale enterprises be set at a maximum of US$100/kg. The proposed CE limits for mid and small scale enterprises should be considered as demonstration projects until we have a significant number of approved and implemented projects to test these limits.

ODS Users Group	TCA	
	ODP t/yr	C.E.
Large	>2	38.6
Medium	>0.6 to 2	65
Small	>0.15 to 0.4	100

69. For a medium-size TCA operation (0.6-2.0 ODP tonnes), the cost of an aqueous cleaning machine including a transport system and a DI plant costs $80,000, giving a CE range varying from $40-130/kg. The average value has been set at $65/kg. pending the results from projects that would be approved under this recommendation. Based on the same criteria, the average CE level for small-scale TCA users (under 0.4 ODP tonnes) should be set at $100/kg., the same maximum level as in mid-1994, pending the conclusion of approved projects in this area.

70. It is recommended that some projects be prepared, per the above options, especially for the small user who has no equipment, using the upstream retailer training approach, with the assistance of producers and distributors to ensure that the retailers are identified and trained. For the small user who has equipment, it is recommended that the Malaysian model be developed for the users with very low consumption of TCA (under 0.2 MT ODP) and CFC-113 (under 1 MT ODP). This should give economies of scale through volume purchases.

71. For the small users who are using specialty formulations containing ODS, it is recommended that an umbrella project be developed as a pilot in which the custom formulation user subsector is phased out by offering substitutes to the blenders and having them change the formulations to meet both the needs of their customers and the needs of the environment.

72. For the small-scale TCA users, given the small amount of ODP being eliminated at very high cost, consideration is also needed as to the priority that should be accorded to immediate project approval and implementation as compared to approval at a later stage.

(SMEREP-4)