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PHASE-OUT PLAN FOR THE SOLVENT SECTOR IN CHINA

This paper consists of:

- Part A: Comments of the Fund Secretariat
- Part B: The document “Solvent Sector Plan for ODS Phase-out in China”
submitted by UNDP on behalf of the Government of China

Part A:

Comments of the Fund Secretariat

1. At the 21st Meeting of the Executive Committee in February 1997, US \$200,000 was approved for UNDP to prepare a solvent sector strategy for China. UNDP has now presented, on behalf of the Government of China, a solvent sector plan for ODS phaseout in China. Under the plan the Government of China would phase out the production and consumption of 4,532 ODP tonnes of solvents (11,504 metric tonnes) between 1999 and 2010 at a total requested cost of US \$144,796,000, inclusive of 10 percent support costs. Of this total, US \$114,448,000 is proposed for consumption phase-out and US \$30,347,000 is for production closure. CFC-113 would be phased out by 1 January 2006, TCA would be phased out by 1 January 2010 and CTC (110 ODP tonnes only) would be phased out by 1 January 2004. This phase out does not include CTC used as a process agent or feedstock.

2. The plan draws heavily on the halon sector strategy, especially regarding the implementation modalities. ODS phase-out contracts are proposed to be auctioned, and a voucher system is to be implemented for small enterprises. Reductions in consumption and production are programmed over the phase-out period together with proposed annual payments to be made on the basis of achievement of specified phase-out performance targets.

3. Detailed and comprehensive information is provided on financial administration, target-setting, performance measurement and auditing etc. However there is less substantive information on the technical aspects of the plan as they relate to establishing overall ODS consumption, consumption which is eligible for compensation, and the incremental costs of conversion of ODS-consuming enterprises. In this regard the plan appears to rely heavily on previous work undertaken by the Government of China in relation to the composition of the sector. It also utilises a desk analysis of approved projects in the solvent sector in China as the main basis for establishing the likely incremental costs of phase-out of consumption without significant additional technical investigation on the baseline situation of enterprises, particularly smaller consumers.

4. Comments are provided on four main areas covered in the plan:

- dealing with the solvent production sector
- establishing the overall level of ODS solvent consumption
- establishing the level of incremental cost which is eligible for compensation
- the implementation plan and performance indicators

The solvent production sector

5. While recognising that the government of China wishes to coordinate the phase-out of the producers and the consumers of solvents, production phase-out is already being addressed as part of the overall production sector discussions now in progress. If the timing of the consumption sector phase-out is to remain closely linked to decreases in production, then commencement of a

consumption sector phase-out plan will be dependent on the satisfactory conclusion of discussions on the production sector. No further reference to production will be made in these comments.

ODS solvent consumption in China

6. The level of consumption of ODS solvents in China, CFC-113, TCA and a very small quantity of CTC, is central to the determination of the incremental cost of phase-out. This is because the major part of the incremental costs requested in the plan is determined by multiplying the consumption in ODP tonnes, by the estimated cost effectiveness of phase-out activities in US \$ per kilogram of ODS to be phased-out. Because of this, it is essential that the level of consumption be established with a high degree of confidence. It is considered that additional work is needed to establish the level of consumption for the following reasons.

7. There appears to be a significant level of uncertainty in estimation of overall consumption. Little detail has been provided on the methodology used to establish and verify the consumption figures (e.g. whether they are based on factory production and/or reported consumption at the individual enterprise level). For TCA, the report indicates that total consumption was estimated from 1996 survey on the basis of a 15% sample of enterprises thought to be using TCA. The same survey is quoted as providing information that the small consumers comprised 22% of the CFC-113 consumption sub-sector and 22% of the TCA sub-sector. There are a total of 150 other large and medium-sized enterprises "almost all of which" have been identified through surveys, but a full or partial breakdown of their consumption figures is not included. While statistics are provided for the consumption of various major consuming cities (said to be 54% of total consumption) and for the larger enterprises (50 percent of total consumption), little concrete information is presented on the remainder of the sector, other than that extrapolated from the 1996 survey.

8. Further consideration is needed of the proportion of total consumption which would be eligible for compensation. It is acknowledged in the document that not all consumption may be eligible, however the conclusion that new ODS-based capacity, plus discounting for exports plus discounting for foreign investment amounts to only 10% of total 1997 consumption may not be valid. The implication of Decision 17/7 (on the ineligibility of ODS-based capacity installed after 25 July 1995) is that the only eligible increases in consumption over the level at July 1995 would be the additional consumption arising from de-bottlenecking of existing cleaning processes, or consumption arising from additional use of cleaning equipment which was underutilised at that time. From this total would need to be deducted the percentage which accounts for foreign ownership and exports.

9. The plan draws attention in general terms to the under-utilisation of solvent-consuming enterprises prior to 1995. However it also proposes that compensation be provided to phase out an increase in consumption of CFC-113 of some 42% between 1995 and 1999 (when CFC-113 phase out commences). Additionally, it is proposed that TCA consumption will be allowed to grow until 1 January 2002, an increase of some 66% over 1995 consumption. This growth would be ineligible for funding except that which utilises capacity already installed by 25 July 1995.

10. On the basis of Decision 17/7, consumption would need to use a 1995 baseline and could be escalated only to an extent commensurate with the unused capacity available on 25 July 1995. This could give different results to the consumption levels appearing in figures 1 and 3 of Chapter 3 and which form the basis of the phase-out programme and the request for funds.

Incremental costs

Overall funding level

11. The overall incremental costs requested for phase out of consumption in the solvent sector in China, including the requested 10% administrative fee, represents a cost effectiveness of around US \$23/kg, assuming that the consumption as stated is all eligible for funding. If not all the consumption was eligible, the figure would be higher.

12. The strategy reports potential savings to the Fund, however these are based on the proposition that in the absence of the strategy, all projects would be funded at the cost effectiveness limit. This is not the case with projects so far approved. The overall cost effectiveness of all phase-out approved by the Executive Committee to date for China in this sector, including all technical assistance projects and all agency support costs, is US \$16.8/kg. The average cost effectiveness of all approved investment projects on their own, without technical assistance projects or agency support costs included (as used by the Committee in its deliberations on individual projects) is US \$11.26/kg. This average includes both CFC-113 and TCA projects with a consumption as high as 76 ODP tonnes (C/E US \$4.06/kg: CFC-113) and as low as 4.5 ODP tonnes (C/E US \$10.4/kg: CFC-113). It also includes projects approved before the advent of C/E thresholds with cost effectiveness as high as US \$47/kg. If projects over the cost effectiveness limit of funding are not included, the average cost-effectiveness for approved projects becomes US \$9.2/kg.

13. As presently formulated the strategy does not demonstrate that the costs to the Fund would be lower than proceeding on a project-by-project basis. This is intended to be one of the benefits to the Fund of a sectoral phase-out strategy, in return for which the country has flexibility in the application of the funds approved.

Determining the incremental costs

14. Proposed incremental costs for investment project activities have been determined by estimating cost-effectiveness values for the conversion of enterprises in different sub-sectors and enterprise size groups, then multiplying these values by the relevant estimated consumption for the different sub-sectors and enterprises size groups. However both the levels of consumption (addressed in the section above) and the cost effectiveness figures appear at this stage to be open to question.

15. It is stated in the plan that cost effectiveness figures are derived from approved projects, and indeed, substantial detail is provided about a selection of those projects, including summaries of the relevant cost data. However the number of projects in the sample is small

(nine approved projects are listed). Reasons for the choice of these projects is not clear and the sample may not provide a sufficient basis for determining with confidence the overall conversion costs for the sector. The cost effectiveness for all CFC-113 projects is proposed to be US \$16.6/kg (compared to US \$11.26/kg for all approved projects). The cost effectiveness for all TCA projects is proposed to be US \$38/kg, which is virtually the threshold level (US \$38.5/kg). The costs for individual projects are said to have been derived “according to single phase-out project approved by MLF and the proposal of experts” (Annex 1 page 6). However there does not appear to be any further detail on the experts’ proposals.

16. For example, the incremental cost analysis for CFC-113 phase-out at small enterprises includes provision of a new cleaning machine at an assumed cost of US \$100,000 and an overall cost effectiveness of US \$36/kg. This appears not to have taken into account the project approved in 1994 for construction of a centre to manufacture ODS-free cleaning equipment specifically for this purpose, and which may be able to produce substantially less costly cleaning machines. It appears that other cost-models are also used to cost SME phase-out since the overall cost-effectiveness of CFC-113 phase-out in SMEs is proposed to be US \$ 16.6/kg (the same figure as for larger enterprises), but no details are provided.

17. More generally, the draft strategy does not provide any information on baseline conditions in enterprises, such as that described above, other than the statistical data from a 1996 report breaking up the sector into enterprise size and the type of cleaning activities undertaken. It is stated that that SME information is taken from this report and is based on a 15% sample.

18. Projects approved to date in the solvent sector have shown substantial variations in baseline equipment with corresponding differences in conversion solutions. For instance the quantities of solvent used without equipment, for “hand wipe” applications, will have a significant bearing on overall phase-out costs, as will the quantities of solvent which are pre-blended and packaged for sale to small users in spray or other applications. None of these activities will be phased out through the provision of new cleaning equipment as proposed in the ‘standard’ projects models that currently form the basis for calculation of conversion costs. A more thorough presentation of baseline data seems essential to establishing eligible costs to the MLF with the required degree of certainty.

19. Non-investment costs are requested in the form of technical assistance funds US \$6,000,000, UNDP audit funds US \$550,000 and a proposed 10 percent support cost to be apportioned between the Government of China and UNDP. While there are numerous reference in the document to activities that will be supported from the technical assistance funds, there is no specific listing of all activities included in the proposed US \$6 million expenditure. The best indication is gained from Section E of the proposed first biannual programme. A number of the activities proposed for funding are more in the nature of management activities which will be implemented by government agencies, including SEPA, and thus could be expected to come from support costs, for example, development of a management information system, study on managing imports and exports, development of voucher system for small consumers. Eligibility of others is dependent on the current baseline facilities in China (e.g. development of safety regulations and standards for new solvents). Yet others could involve double counting of funding received through existing projects (e.g. a technical centre in Tianjin to support alternative technologies for small consumers).

20. UNDP is seeking a total of US \$550,000 over the 10 year life of the plan, additional to its share of the proposed 10 percent support cost fee, to commission performance audits by independent consultants. For the halon sector strategy, the Executive Committee decided that separate funding should be provided for independent technical audits.

Implementation plan and performance indicators

21. The proposed implementation plan is broadly similar to the plan now being implemented for the halon sector. CTC consumption is proposed to be phased out by the end of 2003, CFC-113 consumption by the end of 2005 and TCA consumption by the end of 2009. Detailed intermediate steps and annual consumption targets have been established for each solvent. Limits on consumption are proposed to be implemented by means of production and import quotas. The initial performance targets appear ambitious. A tradable production quota is proposed to be in place by 1 July 1999 and import controls for CFC-113 by 1 January 2000.

22. ODS reduction contracts are to be auctioned to larger enterprises. Small enterprises are to be phased out with the use of vouchers which they can exchange for conversion equipment or technical support. As presently presented, the plan does not appear to exploit fully the potential of solvent suppliers as a means of phasing out small users, although the numbers of these suppliers are referred to in the document. Small enterprises, especially those in the informal sector with little equipment are often reliant on suppliers, so that if the supplier provides a new, non-ODS solvent, the end-user will phase-out automatically when no major technical changes are needed. As well as aiding implementation, this has cost benefits. Reference is made to the use of a limited number of dealers trained to recommend alternative technologies, but this is different to using suppliers' leverage with their customers as a means of 'driving' the phase-out. UNDP has subsequently advised that dealers and suppliers are intended to play a key role.

23. It is proposed that the programme will be implemented and managed largely by organisation within SEPA, with funds requested from either TA or support costs for this purpose. SEPA proposes to utilise two technical assistance centres, both of which have already been funded (the one in Tianjin by the MLF). SEPA proposes also to use a "domestic implementing agency" to undertake much of the routine administration of bidding for ODS reduction contracts and of the voucher system for small consumers. It is not clear what sort of company or organisation will undertake this role, for instance, whether it will be a government organisation.

This document forms Part B of document UNEP/OzL.Pro/ExCom/27/41:

“Solvent Sector Plan for ODS Phaseout in China”

(Submitted by UNDP)

SOLVENT SECTOR PLAN FOR ODS PHASEOUT IN CHINA

Executive Summary

1. A sector approach has been developed for complete ODS phaseout in the Solvent Sector in China and the proposal is presented herein. The Solvent Sector Plan, at a sector level, will:

- Ensure phaseout of ODS solvent production, import and consumption;
- Implement a timely and cost-effective, policy-based action plan,
- Implement and monitor the Solvent Sector Plan with performance indicators;
- Improve efficiency of funding allocation and implementation; and
- Improve planning and management of Implementation Programme.

2. ODS solvents in this Solvent Sector Plan are limited to CFC-113, TCA and CTC used for cleaning and solvent applications. The several defined essential uses for a portion of CFC-113 and TCA used as laboratory material and CTC for process agent applications are excluded. Because CTC is mainly used as raw material to produce other chemical products, its production phaseout and associated incremental costs will not be included. The application for phaseout of consumption of CTC and TCA as process agent will be prepared when technology and MLF guidelines are available and submitted as an addendum to this proposal.

3. The historical supply and consumption of ODS solvents in China are summarized below:

Table 1 Production, Consumption, Export and Import of ODS Solvent (tons)

		1995	1996	1997
CFC-113	Production capacity	7,750	6,750	6,750
	Production	3,472	3,637	4,538
	Import	177	141	167
	Export	46	23	18
	Consumption	3,603	3,755	4,687
TCA	Production capacity	2,800	2,800	2,800
	Production	1,023	994	1,044
	Import	4,078	4,718	5,843
	Export	174	267	170
	Consumption	4,927	5,445	6,717
CTC (solvents only)	Consumption	459	200	100
Total consumption (ODS)		8,989	9,400	11,504
Total consumption (ODP)		3,880	3,769	4,532

4. Growth in consumption over the period from 1995-1997 for CFC-113 and TCA averaged about 14-15% per annum, largely due to high growth in electronic and precision equipment industries. CFC113 consumption reached about 4,687 tons in 1997. Because of existing excess capacity, local producers were able to supply substantially all of this demand. For TCA the situation is substantially different. Consumption increased sharply to about 6,717 tons but local production was constrained by raw material supply. Thus, local production lagged considerable behind consumption, resulting in significant TCA imports that are likely to continue for some time.

5. It is estimated that there are more than 3,200 ODS solvents consumers in China, of which about 50 are classified as large consumers, about 150 are classified as medium consumers and about 3,000 are designated as small-scale consumers. The main cleaning applications can be classified into four groups: precision cleaning, PCB cleaning, metal cleaning and other usage. For phaseout, a variety of technologies are employed including no clean, aqueous, semi-aqueous and use of non-ODS solvent. In many cases, the likely funding availability will be below actual costs to be incurred, particularly if imported equipment is used. At the same time, locally available technology is limited.

6. Solvent supply is from much more limited sources. CFC-113 is supplied from one local producer (two plants) plus a small amount of imports, CTC is from local dealers largely from local sources, and TCA is supplied from three local producers plus a large amount of imports. Phaseout will be achieved by controlling imports, phased reduction of output and eventual closure and dismantling of production facilities. China has undertaken to limit consumption growth during 1997-1999 for CFC-113 and 1997-2001 for TCA at 5% per annum for both chemicals. Incremental cost calculations are based on this latter growth rate.

7. Given the complex structure and approach to phaseout, the Solvent Sector Plan has been developed on the basis of:

- 1) controlling and reducing aggregate supply (production and imports) of ODS solvent by policy and performance-based indicators, including quotas and bidding;
- 2) reducing aggregate ODS solvent supply on an annual basis to meet agreed production targets by production quotas;
- 3) promoting ODS consumers to undertake ODS reduction activities by actively participating in the bidding system for ODS Reduction Contracts (conversion to non-ODS technology);

- 4) implementing ODS Reduction Contracts with large and medium solvent users through local execution procedures under UNDP guidelines and the bidding system;
- 5) implementing ODS reduction in small scale users through the Alternative Technology Support System(ATSS) being developed that will rely on delivery of local technology/equipment to the many small users;
- 6) implementing ODS phaseout in small scale users by utilizing a voucher system to identify and register eligible small users and their eligible funding level based on threshold values that would enable them to go directly to the ATSS for phaseout actions and funding;
- 7) monitoring all ODS phaseout actions on reduced supply and consumption at the national level; and
- 8) implementing policies in regard to controlling imports, limiting production through quota system.

8. A phased approach will be used, first addressing phaseout of CFC-113 and CTC with large and medium users and developing the ATSS and voucher system, then gradually including phaseout implementation with the small scale users. TCA phaseout will start in 2002 and will also address large and medium users on a priority basis and then small scale users later. TCA has a later phaseout schedule, in part, because of its lower ODP value and its later phaseout target under the Montreal Protocol. CFC-113 will be phased out by 1 January 2006, CTC solvent by the 1 January 2004 and TCA by 1 January 2010.

9. The proposed incremental costs for implementing the Solvent Sector Plan for the period of 1999-2010 are summarized in Table 2 below. The annual production and consumption targets, ODS reduction to be achieved in each year, and the distribution of incremental costs on an annual basis for each solvent for the entire Solvent Sector Plan are outlined in Table 3.

Table 2 Incremental Costs for ODS Phaseout in Solvent Sector (US\$ 1,000)

	Incremental costs to China (US\$ 1,000)	Incremental costs to MLF (US\$ 1,000)
Approved projects by MLF	14,273	8,547
Incremental costs needed in future	210,952	144,796
In which replacement CFC-113 solvent	92,921	57,611
In which replacement CTC solvent	2,224	1,379
In which replacement TCA solvent	53,015	32,870
In which closure of TCA producing plants	5,635	5,635
In which Technical Assistance	6,000	6,000
In which Costs for UNDP-commissioned performance & financial audits		550
In which Management costs ¹	20,809	10,404
Sub-total	180,605	114,449
In which Closure of CFC-113 producing plants	27,589	27,589
In which Management costs	2,759	2,759
Sub-total	30,348	30,348

10. Since the Solvent Sector Plan critically depends on production quota reductions, it is essential that controls and funding for CFC-113 production closure and/or reduction would be available when the Solvent Sector Plan is approved. MLF funding for production closure/reduction for CFC-113 is covered by the CFC Production Sector Plan submitted to ExCom on August 19, 1998. If the latter proposal is approved at the same time or before the Solvent Sector Plan, then funding for production closure for CFC-113 would be included in the CFC Production Sector Plan. If the Solvent Sector Plan is approved before the CFC Sector Plan, then costs for CFC-113 production closure will be requested under the Solvent Sector Plan. Thus, funding for CFC-113 (and TCA) production closure/reduction incremental costs are included here as a possible funding option.

¹ The management costs requested are 10% of the total Solvent Sector Plan costs. Management costs include UNDP support costs and Domestic Technical Implementation Support Costs.

Table 3 Annual Breakdown of Eligible Incremental Costs for ODS Solvent Phaseout (US\$ 1,000)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<i>CFC-113</i>														
Consumption (tons)	4687	4921	5125	4125	3375	2750	2125	1375	688	0	0	0	0	0
Phaseout Target of Consumption (tons)			0	319	750	625	625	750	688	688	0	0	0	0
IC for Consumption	57,611		3,810	9,188	7,848	8,044	9,895	9,297	9,529	-	-	-	-	-
Production (tons)	4538	4921	5125	4125	3375	2750	2125	1375	688	0	0	0	0	0
Phaseout Target of Production (tons)			0	1000	750	625	625	750	688	688	0	0	0	0
<i>CTC</i>														
Consumption (tons)	100	100	100	100	100	100	50	0	0	0	0	0	0	0
Phaseout Target of Consumption (tons)			0	0	0	50	50	0	0	0	0	0	0	0
IC for Consumption	1,379		0	0	664	715	0	0	0	0	0	0	0	0
<i>TCA</i>														
Consumption (tons)	6717	7053	7405	7776	8165	7788	7411	6300	5188	4150	3113	2075	1038	0
Phaseout Target of Consumption (tons)			0	0	0	377	377	1112	1112	1038	1038	1038	1038	1038
Production (tons)	1044	1096	1151	1209	1269	1269	1267	1267	922	922	922	922	922	0
Phaseout Target of Production (tons)			0	0	0	63	68	70	419	77	81	85	89	1015
IC for Consumption	32,870		-	-	1,353	1,387	4,197	4,302	4,115	4,218	4,324	4,432	4,542	-
IC for Production	5,635		-	-	-	257	273	227	1,404	233	232	229	222	2,558
Sub-Total	38,505		-	-	1,353	1,644	4,470	4,529	5,519	4,451	4,556	4,661	4,765	2,558
Total Cost	144,796		5,346	19,744	14,800	16,217	20,843	20,213	20,341	8,384	5,616	5,182	5,296	2,814
Of which consumption	91,860		3,810	9,188	9,865	10,146	14,091	13,598	13,644	4,218	4,324	4,432	4,542	-
Of which production of TCA	5,635		-	-	-	257	273	227	1,404	233	232	229	222	2,558
Of which TA	6,000		1,000	1,000	1,000	500	500	500	500	500	500			
Of which Costs for UNDP commissioned performance & financial audits	550		50	50	50	50	50	50	50	50	50	50	50	0

Solvent Sector Plan – Executive Summary

Of Which Management Costs	10,404		486	1024	1092	1095	1491	1438	1560	500	511	471	481	256
<i>Sub-total</i>	<i>114,449</i>		<i>5,346</i>	<i>11,262</i>	<i>12,007</i>	<i>12,049</i>	<i>16,406</i>	<i>15,813</i>	<i>17,158</i>	<i>5,501</i>	<i>5,616</i>	<i>5,182</i>	<i>5,296</i>	<i>2,814</i>
Of which for CFC-113 Production	27,589		-	7,711	2,539	3,789	4,033	4,000	2,894	2,621	-	-	-	-
Of which management cost for CFC-113 Production	2,759		-	771	254	379	403	400	289	262	-	-	-	-
<i>Sub-total</i>	<i>30,348</i>		<i>-</i>	<i>8,483</i>	<i>2,793</i>	<i>4,168</i>	<i>4,437</i>	<i>4,400</i>	<i>3,183</i>	<i>2,884</i>	<i>-</i>	<i>-</i>	<i>-</i>	<i>-</i>

11. The Solvent Sector plan will be executed through a series of Implementation Programmes, starting shortly after ExCom approval. Because of the lag in ODS reduction results from conversion projects, the first Implementation Programme will cover two years as explained in the separate document “First Biannual Implementation Programme.”

12. A number of policy actions will be undertaken to support the Solvent Sector Plan, including controlling and banning imports of solvents, a quota and bidding system for controlling both domestic production and consumption and implementing the voucher system for small scale users.

13. The Solvent Sector plan will be managed in a two-tier system. Reduction of all ODS solvent production and reduction of ODS solvent consumption in the large and medium users will be managed through ODS Reduction Contracts using substantially the same procedures as used in the Halon Sector Plan already approved by ExCom. The Programme Management Office (PMO) of China State Environmental Protection Administration (SEPA) will employ a Domestic Implementing Agency (DIA) to handle day-to-day operations of these contracts using national project execution procedures as agreed with UNDP. Foreign Economic Cooperation Office (FECO), a department within SEPA, will establish and manage a Solvent Sector ODS Phaseout bank account that will handle all MLF fund for the Solvent Sector Plan. ODS phaseout of the small scale users will be implemented through the ATSS and the voucher system. Small scale users would be able to “cash” their approved vouchers by contracting with any ATSS participant for equipment, technology and technical assistance in switching to different non-ODS solvents and/or technology. The ATSS participants would then obtain reimbursements for the vouchers from DIA. PMO, with support of DIA and local agencies will undertake spot checking of the voucher system, with a target of verifying results at 20% of estimated small scale users. This management system will provide direct control over 100% of ODS solvent production phaseout and about 80% of ODS solvent consumption. Management control over the remaining 20% of consumption will be through the above indirect means.

14. The Solvent Sector Plan will be monitored by a MIS system similarly to that being used in the Halon Sector Plan (plus modification for reporting procedures for the small scale users).

15. UNDP will monitor the entire ODS Solvent Sector Plan through agreed national execution procedures and to fulfill its obligations to ExCom. UNDP will approve all

Implementation Programmes, all disbursements under ODS Reduction Contracts and all TA work and expenditures. UNDP will monitor disbursements under the voucher system at an aggregate level and at the enterprise level on a limited spot check basis. UNDP will undertake two audits of the Sector Plan. A financial audit will cover the ODS Phaseout bank account to be established and managed by FECO. A performance audit will cover results of the Implementation Programme using the agreed performance indicators. Both audits will be conducted by independent auditors selected by UNDP following established UNDP guidelines

SOLVENT SECTOR PLAN FOR ODS PHASEOUT IN CHINA

ORGANIZED BY:

STATE ENVIRONMENTAL PROTECTION ADMINISTRATION
MINISTRY OF INFORMATION INDUSTRY

COMPLETED BY:

CENTER FOR ENVIRONMENTAL SCIENCES, PEKING UNIVERSITY

December 30, 1998

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I. INTRODUCTION

A. Background

1.1 China joined the Vienna Convention for the Protection of the Ozone Layer in September 1989, and ratified the London Amendment of the Montreal Protocol on Substances that deplete the Ozone Layer in 1991 (hereinafter Montreal Protocol or MP). Since then, China has been committed to the phaseout of Ozone Depleting Substance (ODS) in accordance with its designation as an Article 5 country, as classified by the Montreal Protocol. In January 1993, the Chinese Government (hereinafter Government) approved the China Country Programme for phaseout of Ozone Depleting Substances (hereinafter Country Programme or CP), and started to implement ODS phaseout actions in China with the support of the Multilateral Fund (MLF) of the Montreal Protocol.

1.2 In 1992, the Government established a Leading Group for Ozone Layer Protection and its working office to organize phaseout actions. This Leading Group has overall responsibility for all phaseout activities. The Leading Group has assigned the State Environmental Protection Administration (SEPA) with management of the ODS phaseout programme in China. SEPA has established a Project Management Office (PMO) with administrative responsibility for implementing phaseout programmes/projects under the four MLF Implementing Agencies.

1.3 By August 1998, 23 ODS solvent phaseout projects are being implemented with the financing from MLF. Among them, four are technical assistance projects, one is for project preparation and 18 are investment projects. The total funds from MLF amount to US\$ 8.5 million. Implementation of these projects will phaseout about 710 tons of ODP. Two projects have been finished and completed phaseout 140 tons of ODP. The project-by-project phaseout approach has provided valuable experiences and does play a role in ODS phaseout in China. But due to the large number of enterprises in Solvent Sector, phaseout on a project-by-project basis is not an efficient way for ODS phaseout in Solvent Sector. Thus, a Sector Plan approach has been developed for the Solvent Sector and the proposal is presented herein.

1.4 The Solvent Sector Plan will:

- Ensure phaseout of ODS solvent production, import and consumption at sector level.

- Implement a timely and cost-effective action plan, that can be completed and monitored with indicators at the sector level.
- Improve efficiency of resources from MLF by reducing management and implementation costs and achieving cost savings on sector scale;
- Improve implementation of economic incentives and policies and remedy disadvantages of project-by project approach; and
- Improve comprehensive planning and management by concerned ministries and departments for taking action on phaseout plan.

B. Preparation of Solvent Sector Plan

1.5 In February 1997, at its 21st Meeting the Executive Committee (ExCom) approved *Study on Overall Phaseout Plan in Solvent Sector in China*. Subsequently, State Environment Protection Administration (SEPA) and Ministry of Information Industry (MII) jointly established a working group for Solvent Sector. Under the coordination of the working group and UNDP, a team was set up with experts from Peking University, Institutes under MII and UNDP. Investigations on production and consumption, and the study of the overall phaseout plan were carried out by this working group.

C. Principles

1.6 The Solvent Sector Plan has been developed on the basis of the Government's obligations under the Montreal Protocol, and *China's Country Programme for Ozone Depleting Substances Phaseout*, and also taking into account *Sector Plan for Halon Phaseout in China*. The Solvent Sector Plan is consistent with MLF's principles and guidelines, as well as related documents on incremental costs. This Solvent Sector Plan revises China's June 1995 report *ODS Phaseout Strategy for Electronic Cleaning and Other Industrial Cleaning*, and is being incorporated in parallel with the *CP Update*. The main principles are:

- Assuming MLF approves the Solvent Sector Plan and disburses funds according to the Annual Programmes, the Government commits to comply with the agreed overall and annual phaseout targets.
- The Government will phase out ODS in Solvent Sector in a cost-effective way.
- Development of ODS solvent producers and consumers must not be jeopardized by ODS

solvent phaseout.

- MLF should facilitate transfer of alternative technologies required for ODS solvent phaseout.

1.7 The contents of the proposal are:

- Chapter II: Current status of ODS production and consumption in Solvent Sector, including progress of ODS solvent phaseout to date
- Chapter III: Phaseout Strategy including: forecast of ODS consumption without control, phaseout targets, and actions controlling production, import and consumption
- Chapter IV: Policy actions to be adopted in the Solvent Sector Plan
- Chapter V: Incremental costs
- Chapter VI: Operating mechanism, monitoring, evaluation and reporting
- Chapter VII: Action Plan for implementation of Solvent Sector Plan

D. Announcements

1.8 Implementation of the Solvent Sector Plan will not affect implementation of projects already approved. The Solvent Sector Plan also takes into account solvent projects already approved by ExCom to avoid double counting.

1.9 ODS solvents in this Solvent Sector Plan are limited to CFC-113, CTC and TCA for cleaning and solvent applications. The several defined essential uses for a portion of CFC-113 and TCA used as chemical materials, and CTC for process agent applications are excluded.

1.10 Because CTC is mainly used as raw material to produce other chemical products, its production phaseout and incremental costs will not be included in this Solvent Sector Plan. The application for phaseout of consumption of CTC and TCA as process agent will be prepared when technology and MLF guidelines are available and will be submitted as an addendum to this proposal.

II. CURRENT STATUS

A. Sector Background

2.1 The Solvent Sector in China includes enterprises from electronics, post and telecommunication, aviation and astronavigation, light industry, textile, mechanics, medical appliances, automobiles, precision instruments industries, which use ODS as solvent and which produce ODS solvents. The two main ODS solvents are CFC-113 and TCA. A smaller amount of CTC (around 100 tons) is used as solvent. Some CTC (around 2,000 tons) and CFC-113 (25 tons) are used as process agent, which China has defined as essential uses. A negligible amount of CFC-11, used as solvent, will be phased out at China cost and is excluded in this Solvent Sector Plan.

2.2 PMO will be responsible for managing the Solvent Sector Plan. PMO will be assisted by a small working group that will provide support, including organization of research and development of substitutes and alternative technologies, management of recycling, as well as implementation, enforcement and monitoring of related policies and phaseout actions. The working group consists of officers from PMO and MII.

2.3 ODS consumed in the Solvent Sector accounted for about 5.2% of the country's total ODP consumption in 1997. However, there are more than 3,200 consumers in Solvent Sector, accounting for more than 60% of total number of ODS consumers in China, consuming about 11,500 tons annually of ODS solvents (1997 data). From this point of view, phaseout of ODS in Solvent Sector is essential for effective implementation of the Country Programme and necessary to achieve MP targets.

B. Current Status of Solvent Sector ODS Phaseout

2.4 Consumption of ODS solvent is shown in Table 1. The *Investigation Report of ODS Solvent Consumers* prepared by the Center for Environmental Sciences, Peking University found that China mainly produces and imports CFC-113 and TCA as solvent. CTC is mainly produced and imported as raw material for CFC production.

2.5 There are three kinds of enterprises in Solvent Sector: ODS solvent producers, ODS solvent dealers and ODS solvent consumers. The latter group is further subdivided into large, medium and small-scale users. The Solvent Sector Plan will address all three groups in the Action Plan.

2.6 Table 1 shows that ODS production and consumption in Solvent Sector have an increasing trend from 1995 to 1997. During the period, the annual growth rate of CFC-113 production is at about 14%. The growth rate in CFC-113 consumption has been at about the same level.

2.7 TCA consumption has also increased from 1995 to 1997, with an average growth rate of 15% per year. Production has been constant, and increased consumption has been supplied by imports, as domestic production is limited, in part, by raw material supply. The raw material constraint is currently being removed and it is possible that existing industry will be able to increase production and displace a portion of imports in the near future.

2.8 This rapid growth in solvent consumption reflects the high growth in electronics and precision machine industries and will set the strategy for ODS phaseout in Solvent Sector.

**Table 1 Production, Consumption, Export and Import of ODS Solvent
Unit (tons)**

		1995	1996	1997
CFC-113	Production capacity	7,750	6,750	6,750
	Production	3,472	3,637	4,538
	Import	177	141	167
	Export	46	23	18
	Consumption	3,603	3,755	4,687
TCA	Production capacity	2,800	2,800	2,800
	Production	1,023	994	1,044
	Import	4,078	4,718	5,843
	Export	174	267	170
	Consumption	4,927	5,445	6,717
CTC (solvents only)	Consumption	459	200	100
Total consumption (ODS)		8,989	9,400	11,504
Total consumption (ODP)		3,880	3,769	4,532

2.9 ODS Solvent Producing Enterprises. There are 36 CFC producing enterprises in China at present, of which three have the capability to produce CFC-113. Because of ODS phaseout and market competition, only two enterprises produced CFC-113 in 1997 (Changshu Refrigerants Factory and Changshu Yudong Chemical Plant). From 1997, Changshu Refrigerants Factory leased the production facilities of Changshu Yudong Chemical Plant thus from 1997 there is only one CFC-113 producer/marketer, but two manufacturing units. Three enterprises have the capability to produce TCA, and all of them produced TCA in 1997. Table 2 and 3 show basic information of ODS solvent producing enterprises. Ownership of ODS solvent producing enterprises include both private and collective ownership.

Table 2 CFC-113 Producers in 1997

Enterprise Name	Ownership 100% Chinese	Date of Commissioning	Production Capacity (tons)	Production (tons)
Changshu Refrigerants Factory	Private	1994	5,760	3,858
Changshu Yudong Chemical Plant	Collective	1991	990	680
Shanghai Shuguang	Collective	1994	1,000	0
Total			6,750 ¹	4,538

Table 3 TCA Producers in 1997

Enterprise Name	Ownership	Date of Commissioning	Production Capacity (tons)	Production (tons)
Changshu Refrigerants Factory	Private	June, 1994	1,000	516
Nantong Shiyang	Collective	July, 1987	800	335
Feicheng City	Collective	July, 1994	1,000	193
Total			2,800	1,044

2.10 ODS solvent dealers. There were over 160 ODS solvent dealers in China in 1997, of which 70 were located in Guangdong Province. Total sales of CFC-113 by dealers in 1997 amounted to more than 2,000 tons. The largest dealer sold about 200 tons CFC-113. Total sales

¹ Production capacity for Shanghai Shuguang was not included due to stopped production in 1997.

of TCA by dealers in 1997 were over 5,300 tons. The largest dealer sold about 1,100 tons TCA in 1997.

2.11 ODS Solvent Consumers. The *Strategic Study of ODS Phaseout in Electronic Cleaning and Other Industrial Cleaning* prepared by former Ministry of Electronics Industry (MII) found that there are more than 3,200 ODS solvents consumers in China. The main cleaning applications can be classified into four groups: Precision cleaning, PCB cleaning, metal cleaning and other kinds of usage. The classification is shown in Table 4 and solvent uses are shown in Table 5.

Table 4 Classification of Cleaning Applications

	Precision cleaning	Metal cleaning	PCB cleaning	Other Usage
Cleaning Applications	Electric elements, Tuner, Optical instruments, Sensitive materials, Liquid crystal, Camera, Semi-conductor, Picture tube, Thick film circuit, Medical devices	Vehicle parts, Air-conditioner, Compressor, Medical devices, Refrigerator components, Household appliances, Shaft bearing, Alloy materials, Mechanical parts, Metallurgic materials	Communication devices, Intelligence devices, Household appliances, Computers, High reliability PCBs	Dry cleaning, Correction fluids, heavy industries

Table 5 Main Use of ODS Solvent in China in 1997

	CFC-11	CFC-113	TCA	CTC
Precision cleaning		Yes	Yes	
Metal Cleaning		Yes	Yes	
PCB cleaning		Yes	Yes	
Other usage		Yes	Yes	Yes
Consumption (tons)	Negligible	4,687	6,717	~100

2.12 ODS solvent consumers are distributed in all kinds of industrial fields such as electronics, metal processing, post and telecommunication, household electronic appliance and light industry. Cleaning is a vital procedure in production. There are also essential uses such as process agents, and laboratory uses. But many enterprises are not clear about the cleaning process, some small

and medium consumers even do not know the composition of the solvents that they use. Some producers and distributors are not willing to give out end-users list, all of which brings difficulty to the investigation of consumers and breakdown of consumption of ODS solvents. Therefore, it is impossible to know the total structure of consumers of ODS solvents accurately.

2.13 Classification standard of ODS solvent consumers is shown in Table 6. This classification is based on ExCom Secretariat information. The term "large, medium and small enterprises" in this report actually represents "large, medium and small consumers". China's Solvent Sector Plan will classify CTC solvent users in the same way as CFC-113.

2.14 Consumption distribution of some CFC-113 and TCA solvent in 1996 is shown in Table 7 and Table 8, separately. For TCA, total consumption is estimated based upon a representative sampling of 15% of consumption. It was impossible to obtain a 100% sample as that requires obtaining confidential customer data bases from distributors, which are not available.

2.15 The survey team found a small number of CTC solvent users. The CTC consumption information is shown in Table 9.

2.16 Some enterprises' consumption varies from year to year. For example, one enterprise's consumption in 1995 was 18 tons, while it was only 5 tons in 1996, and in 1997, it increased to 20 tons. The cause is often wide variation in product market demand of the enterprises. Thus, many enterprises have an average solvent use below their installed cleaning capacity. This factor should be considered in calculating incremental costs for the conversion to non-ODS technology.

2.17 Consumption of CFC-113 of the top eight cities, covers 37% of national consumption. Among the eight cities, Shanghai, Shenzhen and Hangzhou have the biggest consumption. The consumption of Shanghai covers 17.5% of national consumption.

Table 6 Classification of ODS Solvent Consumers²
Consumption amounts (tons ODP)

	Large scale enterprises	Medium-sized enterprises	Small-sized enterprises
CFC-113, CTC	>17	3.5-17	<3.5
TCA	>2	0.6-2	<0.6

² Recommendations from ExCom Secretariat

Table 7 Classification of CFC-113 Solvent Consumers
Based on 1996 information

Size	Consumption (tons of ODS)					Number of enterprises	Percent of Consumption
	Precision	Metal	PCB	Others	Total		
Large	646	851	60	285	1,842	29	49%
Medium	488	298	175	136	1,097	132	29%
Small					816	>1500	22%
Total	39%	39%	8%	14%	3,755		100%

Table 8 Classification of TCA Solvent Consumers
Based on 1996 information

Size	Consumption (tons of ODS)	Number of enterprises	Percent of Consumption
Large	2,668	~40	49%
Medium	1,579	~190	29%
Small	1,198	>1,500	22%
Total	5,445		100%

Table 9 Classification of CTC Solvent Consumers
Based on 1997 information

Size	Consumption (tons of ODS)	Number of enterprises	Percent of Consumption
Large	10	~10	10%
Medium & Small	90	~100	90%
Total	100		100%

2.18 Based on MII statistics, the ratio of ineligible enterprises for CFC-113 and TCA is about 10% in 1997. This is due to foreign investments and enterprises built after July 25, 1995.

C. Progress of ODS Phaseout in Solvent Sector

2.19 China has introduced a range of measures related to ODS solvent phaseout. These measures to date include:

- In 1995, MII issued *Circular about electronic technology*, in which all levels of authorities of electronic industries and research institutes directly under MII were required to phaseout ODS actively by changing technology;
- In 1997, SEPA, National Planning Committee, National Economic and Trade Committee, and State Industrial and Commercial Administration jointly issued *Circular on Bans of Establishment of New Production Sites for Production and Consumption of ODS*;
- In 1997, SEPA issued *Circular on Enforcement of Declaration and Registration of Pollutants*;
- From February 1998, a specific column has been open in Electronic Trade Newsletter to publicize ODS solvent phaseout and development of alternative technologies;
- Several seminars on ODS cleaning alternative technologies were held for related enterprises with support from UNDP, Sweden, Japan and USA;
- Many activities promoting awareness were carried out via conferences, TV, newspapers, and other media.

2.20 In addition, under support of the Government, domestic research institutes and enterprises have begun to develop substitutes and alternative technologies and have made some progress that will lay a foundation for ODS solvent phaseout.

2.21 **Financing from MLF.** Altogether 23 projects have obtained grants from MLF for ODS solvent phaseout, among them, 18 are investment projects, one is for project preparation and four are technical assistance projects. There are two bilateral projects for ODS solvent phaseout.

Table 10 Financing for ODS Solvent Phaseout in China

	ODP Phaseout (Tons)	Grant (US\$ 1,000)
MLF	710	8,547
Of which investment projects	710	7,767
Of which others		780
Bilateral Funding	~12-15	1,012
Sino-Swedish Cooperation	~12-15	1,000
Sino-Japanese Cooperation	0	12

2.22 **Issues.** There are several issues to be addressed in implementation of the Solvent Sector Plan including:

- **Insufficient low cost alternative technologies available for China.** The alternative technologies for ODS solvent are complicated and multi-dimensional. Some enterprises may use an alternative solvent, some may use non-cleaning or aqueous cleaning and the proper alternative technology can only be found after careful diagnosis. With the present grant level, it is difficult for some enterprises to find reasonable alternative technologies, for example, one factory in Shanghai refused to accept a grant from MLF to phaseout CFC-113 used in high-voltage package cleaning. Because of the difference of size, technical levels and profit levels, some alternative technologies applicable abroad may not be applicable in China. For SMEs this issue is critical.
- **Enterprises have insufficient knowledge about ODS phaseout.** Enterprises do not have sufficient knowledge about ODS phaseout. Enterprises, especially SMEs, do not have sufficient knowledge about ODS phaseout policies and they also do not have sufficient knowledge about their obligations and rights in ODS phaseout. Enterprises do not have enough opportunities to get alternative technologies as they lack information on substitutes and alternative technologies because the network of research, propagation and education is not perfect.
- **Management capability of ODS solvent consumers need strengthening.** There are a large number of ODS solvent consumers distributed all over China and it is therefore difficult to manage the phaseout. These enterprises are also distributed in different industrial fields such as electronics, post and tele-communication, aviation and astronavigation, light industry, textile, mechanics, medical appliance, automobile and precision instruments, making it difficult to manage, monitor and enforce related policies. As China is accelerating its economic reforms, the transfer from planning economy to market economy will also decrease the government's ability to manage enterprises.
- **Project implementation period too long.** Until recently, projects usually have taken about three years or more from project preparation to commissioning. That is too long for a minor production process, as phaseout is likely to influence the enterprises' production. Sometimes phaseout interferes temporarily with production and makes it difficult to finish the project. In addition, realizing any operating cost reductions may take a few years after the project is completed. This all influence the willingness of enterprises to undertake phaseout projects.

2.23 The Solvent Sector Strategy is also facing the following issues:

- Because of lack of policy restraint, the project by project approach can not ensure ODS elimination by projects converting to ODS phaseout on national scale as consumption could be transferred to another enterprise.
- There will not be enough time to phaseout ODS solvent consumers through project by project approach.
- Project by project approach does not encourage strategic phaseout and does not realize cost savings on sector scale. China is in a period of fast and steady economic development. ODS phaseout in Solvent Sector will influence the development of some high-tech industries such as electronics, communication, aviation and astronavigation. How to eliminate ODS solvents in an effective way without a negative impact on economic development is an important issue.

III. PHASEOUT STRATEGY

A. Unconstrained Consumption of ODS Solvent

3.1 With the development of the economy, the Solvent Sector developed fast in recent years in China. Because of lack of complete statistical data on Solvent Sector, it is difficult to establish highly credible relevant relationships between ODS solvent production and consumption and other variables as the base for demand growth predictions. The first reason is the lack of measurement associated with previous ODS solvent production and consumption. The second is that the Solvent Sector includes many new and fast developing sectors (information sector for example), and it is difficult to estimate the development of these sectors. The third reason is that the ODS phaseout policies restricted ODS solvent consumption before. The statistics show that the growth rate of ODS consumption was about 13% p.a. between 1995 and 1997.

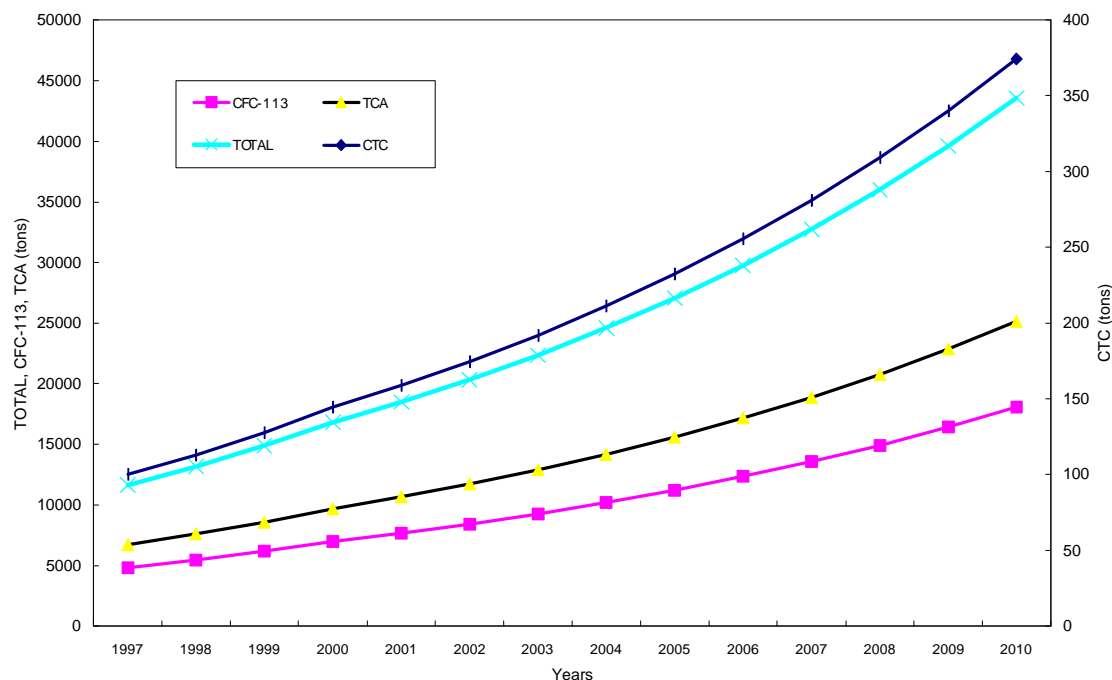


Figure 1 Unconstrained Demand on ODS Solvent Consumption

3.2 The “unconstrained” demand prediction in Figure 1 is based on the assumption that ODS

(CFC-113, CTC and TCA) solvent will keep 13% p.a. growth rate before 2000 and the growth rate will change to 10% p.a. after 2000. It is assumed that future market mix will be same as that of 1997.

B. Phaseout Strategy and Approach

3.3 Phaseout strategy has been established based on the historical development, present conditions of phaseout, future forecast on controlled production and consumption of ODS solvents and their substitutes and under the assumption that development of production performance of the industries that use solvent will not be adversely affected. The phaseout strategy is based on a controlled production and consumption growth rate for CFC-113 of 5% p.a. from 1997 – 1999. For TCA controlled growth of consumption from 1997 through 2001 is also 5% p.a. This consumption growth is substantially lower than unconstrained growth discussed in paragraph 3.2 above. The lower growth will be realized through policy actions and initial actions under the Solvent Sector Plan. Production of TCA up to the end of 2001, from existing facilities, will be allowed to increase without controls to maximize substitutes for TCA imports. This strategy will decrease overall incremental costs of TCA production phaseout but will not affect TCA consumption. The first year of controls for consumption of TCA is 2002, and production will be constrained starting in 2003. But the first significant drop in TCA production does not occur until 2005.

3.4 Phaseout strategy has been established based on the historical development, present conditions of phaseout, future forecast on production and consumption of ODS solvents and their substitutes and under the assumption that development of production performance of the industries that use solvent will not be adversely affected.

3.5 Solvent Sector Plan goals are:

- For CFC-113, start phaseout in 1999. From 1999 to January 1, 2006, decrease both CFC-113 production (including import) and consumption according to the Action Plan. Completely phaseout CFC-113 production and consumption by January 1, 2006.
- For CTC, In 2002, essential use permits will be implemented, with appropriate announcements made far in advance to ensure that the users have time to obtain their permits. Completely phaseout of CTC as a solvent by January 1, 2004.
- For TCA, start phaseout action in 2002 with first ODS reduction results in 2003 for

consumption. Freeze production and consumption of TCA by January 1, 2003 at level of 1,267 tons for production and 7,411 tons for consumption, to cut down TCA production (including import) and consumption. Completely phaseout TCA production and consumption before January 1, 2010. At the beginning of 2003, production and import controls will be implemented for TCA, with phasing down supply as needed through 2010 to meet MP production control limits.

3.6 Fig 2 and 3 show the phaseout profiles of ODS solvent production and consumption.

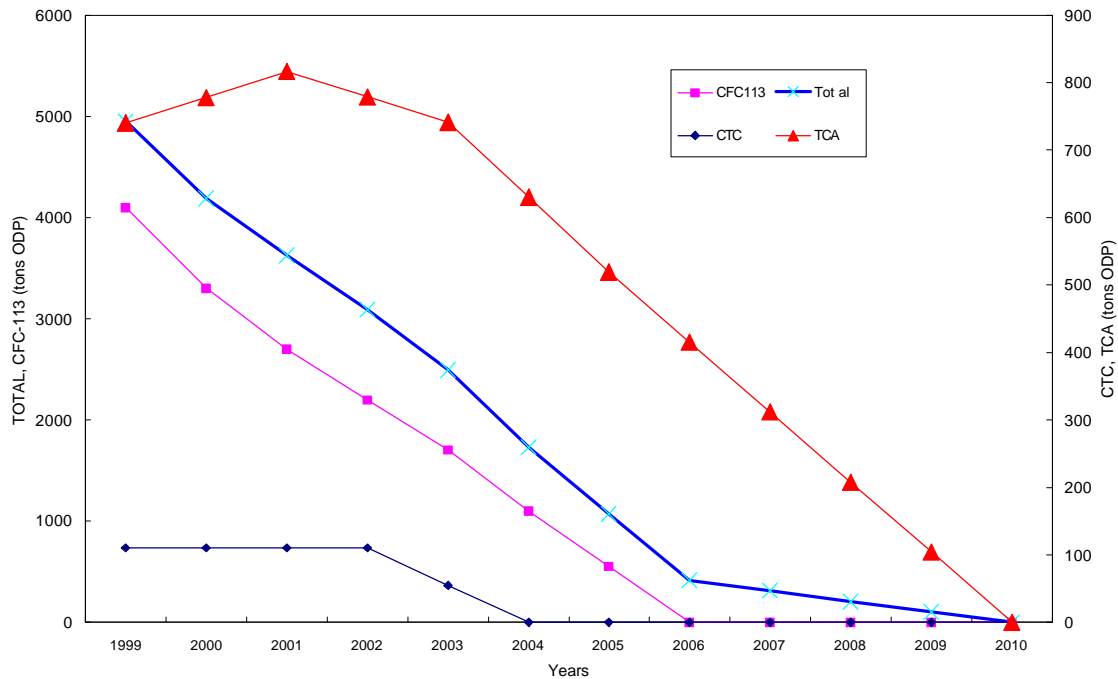


Figure 2 ODS Solvent Consumption Phaseout Profiles

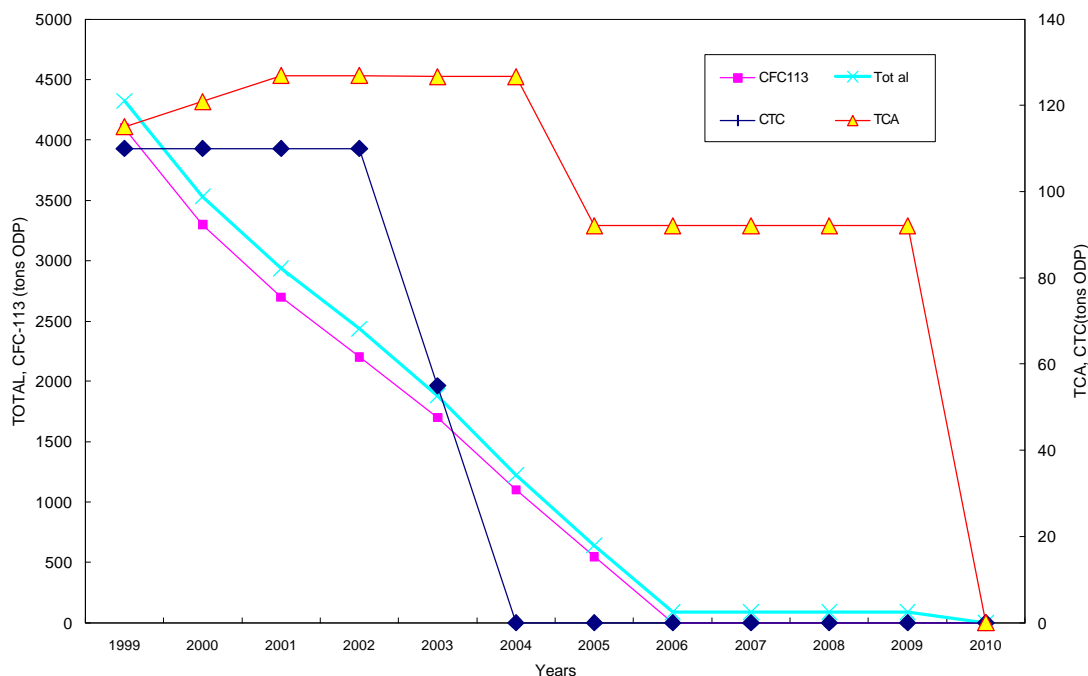


Figure 3 ODS Solvent Production Phaseout Profiles

3.7 Large, medium and small consumers will be treated differently to ensure the implementation of phaseout. Based on the phaseout timetable, large and medium sized consumers (about 200 enterprises) will be phased out first through a direct approach using a bidding system resulting in ODS Reduction Contracts very similar to the approach being used in the Halon Sector Plan. Small consumers will be phased out through an indirect approach using an Alternative Technology Support System (ATSS) supplying equipment, technical assistance, preferred technology options and design, and a Voucher System that will provide funding through the ATSS. Both the ATSS and Voucher System are described in more detail in Chapter VI. This indirect approach is the most effective way to reach the approximate 3,000 small users.

3.8 A synchronous phaseout strategy from producing plants and importers to final consumers will be adopted.

3.9 Different phaseout speeds in different sub-sectors and regions will be adopted. Some sub-sectors, such as compressor cleaning, liquid crystal, can likely be phased out first. Replacement technologies adapted to the national conditions in China will be chosen. For sub-sectors that use different alternative technologies, the pattern will be to adopt easier sub-sectors first, then more difficult ones, lower cost first, then higher cost ones. Local equipment will be used when such use gives lower phaseout cost.

3.10 Substitutes and replacement technology must:

- Be benign to Ozone Layer and environment and ensure worker safety and health.
- Discourage replacement with low ODP substance or high GWP substance.
- Provide equal cleaning or “no-clean” capacity with former ones and be cost effective.

3.11 Replacement technology for phaseout of ODS solvent in China can be classified as no-cleaning technology, aqueous cleaning technology, semi-aqueous cleaning technology and non-ODS solvent cleaning technology:

- **No-cleaning technology:** former cleaning objects can enter next process without cleaning treatments because of improved equipment or processes, designs of production facilities and improved elements' quality, having the same effective cleaning as those cleaned with ODS.
- **Aqueous cleaning technology,** including high purity water cleaning and water cleaning with added surface active agents
- **Semi-aqueous cleaning technology:** the cleaning process is done by an emulsion that is formed by water and solvent.
- **Non-ODS solvent cleaning technology.** Using non-ODS solvents to clean, the processes are similar to former ones.

C. Actions

3.12 To carry out the Solvent Sector Plan, the Government will take synchronous controls and phaseout measures in imports, production and consumption. That is, to phase out from up stream (producing plants and imports) to down stream (final consumers), to distinguish large, medium and small consumers, and to distinguish between domestic enterprises and foreign capital (or joint ventures). The key step is to reduce national level supply to meet agreed annual phaseout targets. Then ODS solvent users will be forced to take phaseout activities. Phaseout actions include:

- **Training and awareness campaigns:** Develop training and popularizing activities based on generalization and popularization of completed projects, to encourage enterprises to actively participate in ODS phaseout;
- **Technical Assistance:** Establish and strengthen technical assistance, through Alternative Technology Support System (ATSS), to provide enterprises with alternative choices and

technical consultation services;

- **Control Production and Imports of ODS solvent:** Apply quota to close (or reduce output of) enterprises producing ODS solvent. Establish registering rules on import and export of ODS solvent, to limit or prohibit import and export according to schedule; and
- **Control Consumption:** Provide consuming enterprises with alternative technologies to implement non-ODS cleaning technology. Phaseout large consumers first in accordance with the phaseout schedule under ODS Reduction Contracts. Implement ODS phaseout for small-scale users through the Voucher System, propagation, prohibition, and Alternative Technology Support System especially for small users. The ODS Reduction Contracts and the Voucher System will obligate the participating enterprises to stop using ODS solvent by a specific date.
- Continue introducing foreign alternative technologies and management experiences;
- Set up recycling stations where it makes sense to prevent ODS solvent emission;
- Promote research and development of substitutes and alternative technologies, promote marketing development of substitutes and alternative technologies;
- Formulate technical indexes, implementation standards and operating regulations of substitute and alternative technologies;
- Formulate and issue policies to ensure implementation of phaseout projects; and
- Set up an effective system of supervision and implementation, including introduction of management information system to ensure enforcement of phaseout plans.

IV. POLICIES

4.1 Due to the lack of readily available, low cost substitute technology and capital, and the need to maintain quality, market share and profitability, most enterprises will not change their cleaning solvents on a voluntary basis. Even though they can get some financial assistance from MLF, owing to their preferences for existing solvents and the disadvantages in changing technological processes (for example, operating cost might rise or product quality might suffer), many enterprises still have reluctance, or lack motivation to phase out ODS.

4.2 Therefore, to fulfill ODS solvent phaseout, besides the financial help from MLF, the Government will establish policies, promote transfer and dissemination of suitable substitute technologies and initiate training for workers. Only if the Government establishes and enforces policies and regulations, can it influence activities of enterprises and consumers to participate actively and quickly in the Solvent Sector Plan.

A. Policy Objectives

4.3 The objectives of phaseout policies are to:

- Ensure phaseout of ODS solvent production and consumption according to schedule;
- Provide an effective policy support for ODS solvent phaseout process;
- Encourage production of substitutes for ODS solvents; and
- Ensure normal development of those sectors with ODS solvents and improvement of living standards of their employees, at the same time fulfilling phaseout goals.

4.4 The policy results will be to:

- Control and eliminate ODS import, production and consumption; and
- Provide incentives to ODS solvents users to phaseout quickly.

B. Policy Design

4.5 China's policy design for ODS solvent phaseout will be based on:

- Chinese situation, especially recent reforms of economic system, characteristics of Solvent

Sector, and features of enterprises' activities, due to the transformation from a planning system to a market system;

- Framework of policies for ODS phaseout in Country Programme;
- Existing policy and regulatory system, keeping continuity and consistency of policies;
- Feasibility must be ensured and supervision and management must be available; and
- Economic efficiency and fairness must be considered.

4.6 China will adopt a package of various policy instruments to ensure achievement of a cost-effective ODS solvent phaseout. The policy instruments under design include control and command instruments, market-based instruments and voluntary agreements.

4.7 China's policies for ODS solvent phaseout will focus on controlling the manufacture and import of ODS solvent, to ensure the agreed goals. At the same time, they need to meet the demand for solvent of involved sectors by ensuring supply of alternatives and substitutes for ODS solvents.

4.8 **To control upstream supply**, a tradable production quota system is the key instrument in the policy framework. It will reduce the uncertainty in implementing the ODS phaseout strategy. Economic instruments (such as trading quota, bidding and investment subsidy) can stimulate the enterprises to change their activities and encourage the production of substitutes and alternative equipment. These policy actions will:

- Control production of ODS solvents through quota system;
- Control import and export of ODS solvents: to strictly control (or ban) ODS solvents trade, control supply of ODS solvents, to reduce ODS solvent consumption;
- Encourage manufacturers of cleaning equipment that uses ODS solvents to convert to the making of cleaning equipment that uses non-ODS solvents, through market forces;
- Ensure supply of substitutes for ODS solvents by developing domestic technology or importing technology, including a variety of solvents for different purposes and cleaning equipment; and
- Set up demonstration projects for ODS solvent recovery.

4.9 **To control down stream users**: Stimulate enterprises to eliminate ODS solvents and use substitutes, by developing and promoting use of alternative technology at affordable cost and at the same time depending on market forces. These policy actions will:

- Control final consumption of ODS solvents by strictly implementing Notice on banning newly-built equipment which produces or uses ODS to prohibit new users; and
- Encourage development or production of substitutes for ODS.

4.10 Information campaigns, training, education and technical assistance are important instruments to control ODS solvent production and consumption.

Table 11 Policy Framework for ODS Solvent Sector

Objective	Policy	Timetable	
		Issued	Implemented
Controlling Production	1. Ban: <i>Notice on banning newly-built equipment which produces or uses ODS</i>	Nov. 11, 1997	Nov. 11, 1997
	2. Quota system: The government will issue production quotas to those enterprises with permits, the government will promote manufacturer to phase out ODS by buying quotas from them.	6 mos. after Sector Plan approval	6 mos. after Sector Plan approval
	3. Final ban: After Jan. 1, 2004, except essential use, consumption of CTC solvents will be banned; After Jan. 1, 2006, except essential use, production, trade and consumption of CFC-113 solvents will be banned; After Jan. 1, 2010, except essential use, production, trade and consumption of TCA solvents will be banned.	3 mos. after Sector Plan approval	CTC: Jan., 2004 CFC-113: Jan., 2006; TCA: Jan., 2010;
Controlling trade	4. Management system for trade: Banning import of CFC-113 as solvent Controlling import and export of TCA as solvent	CFC113: Jan., 2000 TCA: Jan., 2002	Import: CFC-113: Jan., 2000 TCA: 2002
Controlling consumption	5. Ban: <i>Notice on banning newly-built equipment which produces or uses ODS</i>	Nov. 11, 1997	Nov. 11, 1997
	6. Notice: Export-oriented & foreign enterprises, as defined by ExCom eligibility guidelines, should phaseout ODS solvents by their own funds	July 1999 CFC113 TCA	July, 1999 Jan., 2006 Jan., 2009
	7. Establishment of standards and technical norms: Production safety regulations on using inflammable substances as solvents Environmental regulations on using toxic substances as solvents Related environmental regulations on solvents without ODS Technology identification of solvents without ODS Standards for quality identification of solvents without ODS	2000	2000
Ensuring supply of substitutes	8. Policies of encouragement: to encourage the development, production and management of substitutes	1999-2005	
Campaign and training	9. Publicizing the knowledge of ODS's effects, sponsoring technical training, project training, international and domestic workshop	1999-2005	

C. Description of Policy Instruments

4.11 Controlling production of ODS solvents will include:

(1) Ban. On November 11, 1997 SEPA, SPC, SETC and ICA issued a ban -- *Notice on banning newly-built equipment which produces or uses ODS*. The ban requires all regions not to build, enlarge or renovate ODS-producing equipment and other equipment using ODS as material, all levels of environmental bureaus must not approve the Environmental Impact Assessment reports of these projects; all levels of governmental planning, economic and trade administrations must not approve this equipment to be set up or put in use; all levels of financial and banking branches must not support the establishment of this equipment from the aspect of capital or policy. All departments and branches should abide by this regulation absolutely, especially all levels of Environmental Protection Bureaus (EPBs).

(2) Production Quota System for ODS Solvents. The production quota system includes:

- SEPA will issue annual ODS solvent production quotas to enterprises with ODS solvent-production. The production quota will be reduced year by year according to *Sector Plan for CFC Production Phaseout in China (closure part)*. ODS solvent production quotas will be determined according to the actual quantity of every enterprise's production in 1998.
- SEPA will repurchase quotas by means of bidding. This can help enterprises to reduce quota.
 - (a) Enterprises that own production quotas can trade quotas, which are not used that year. They should report their trade contracts (including quantity and price of trading) to SEPA. According to these reports, the quotas of next year will be issued.
 - (b) Enterprises producing ODS solvents should not produce more than quota permits.
 - (c) After quota reaches zero, production facilities will be closed and dismantled and production permit and quota will be withdrawn.

(3) Final Ban. ODS production and consumption will cease according to following targets:

- After January 1, 2004, except essential use, CTC solvent use will be banned.
- After January 1, 2006, except essential use, CFC-113 solvent production, trade and use will be banned.
- After January 1, 2010, except essential use, TCA solvent production, trade and use will be banned.

Each sector and region can set up ban on the basis of actual situation, and phaseout ODS

solvents before deadlines.

(4) Controlling Import and Export of ODS Solvents includes:

- Ban on import: After January 1, 2000, CFC-113 solvent import will be banned;
- Import management: Import controls for TCA will start by 2002.
- Export management: Export declaration system will be applied to ODS solvent export, in order to control and regulate ODS solvent production and consumption as a whole.
- Ban on export: After January 1, 2006, CFC-113 solvent export will be banned; after January 1, 2004, CTC solvent export will be banned.

4.12 Controlling the final consumption of ODS solvents will include:

(5) Ban: *Notice on banning newly-built equipment which produces or uses ODS*

(6) Notice: Export-oriented and foreign enterprises, as defined by ExCom eligibility guidelines, should phaseout ODS solvents with their own funds. Foreign enterprises and those enterprises mainly exporting their products to developed countries will be treated as enterprises in developed countries.

(7) Establishment of standards and technical norms. Because alternative technology for ODS solvents is complex and involves equipment renewal and technology redesign, product quality and safe production need to be assessed. New standards and regulations consistent with alternative technology need to be set up:

- Safety regulations for using inflammable substances as solvents;
- Restriction and management approaches for toxic solvents;
- Environmental regulations for using toxic solvents;
- Identification of non-ODS solvents, to prevent unqualified alternative technologies from entering market;
- Environmental standards for non-ODS solvents as substitutes for ODS solvents may increase air, water, waste or noise pollution or GWP; and
- Quality standards for products cleaned with non-ODS solvents;

4.13 Ensuring supply of substitutes non-ODS solvents includes:

(8) Policies to encourage development, production and trade of substitutes such as:

- **Encourage development of substitutes for ODS solvents:** Encouraging research institutes and other institutes to develop and search for alternative technologies, substances and equipment, by setting up special funding and credit policy;
- **Encourage production of substitutes:** Encouraging ex-ODS solvent manufacturers to produce substitutes by providing information and technology; and
- **Encourage trade of substitute** and alternative equipment to ODS solvent sellers and users.

4.14 Encouraging information availability includes:

(9) Policies for promotion and training such as:

- **Promotion policy:** Through various media, broadcast, TV and newspapers, disseminate knowledge of depletion of Ozone Layer by ODS and to raise public awareness.
- **Training policy:** Related departments, including EPBs, Information Industry Bureaus (IIBs), will provide training for officials to increase their awareness and management capacity, training for industrial technicians to enhance their understanding of alternative technologies and how to use them.
- **Training for project implementing:** During project implementation, the related persons will be trained.
- **International and domestic workshops.** A number of workshops will be held in the various key subsectors to publicize the need for Ozone Layer protection and phaseout of ODS, as well as the alternative technologies available to users, and who can help those ODS using enterprises in defining their phaseout options so that they can develop their plans and schedule of actions to be taken.

V. INCREMENTAL COSTS

A. Scope

5.1 This chapter discusses eligible incremental costs for ODS phaseout in the Solvent Sector and explains the results of calculations done with a computer-based model. The model is based on production and consumption in Solvent Sector, and includes a year-by-year phaseout of each ODS solvent. The detailed basis for the calculation, such as assumption, key inputs and calculation methodology, are described in Annex 1.

5.2 Based on approved projects, the total real incremental costs to China were estimated.

5.3 The incremental costs for phaseout of ODS solvents is estimated by solvents and is based on action plan for each solvent. The components of incremental costs are as follow:

CFC-113

- Incremental costs for phaseout of CFC-113 consumption;
- Incremental cost for closure of CFC-113 production³.

CTC

- Incremental costs for phaseout of CTC consumption;

TCA

- Incremental costs for closure of TCA producing plants;
- Incremental costs for phaseout of TCA consumption;

Supporting Activities

- Incremental cost for development and implementation of the Alternative Technology Support System (particularly to reach SMEs);
- Incremental costs for monitoring and management costs;
- Incremental cost for supporting activities (such as popularization of technique, implement

³ MLF funding for production closure/reduction for CFC-113 is covered by the CFC Production Sector Plan submitted to ExCom on August 19, 1998. If CFC Production Sector Plan is approved at the same time or before the Solvent Sector Plan, then funding for production closure for CFC-113 would be included in the CFC Production Sector Plan. If the Solvent Sector Plan is approved before the CFC Production Sector Plan, then costs for CFC-113 production closure will be requested under the Solvent Sector Plan.

strategy, publicity and management).

B. Factors Influencing Incremental Costs

5.4 Numerous factors influence incremental costs for ODS solvent phaseout, including:

- **The unconstrained growth rate of market demands of ODS solvents.** Initially, the smaller the changes of ODS solvent price, the more options of substitutes and replacement technologies, the lower the influence on incremental costs of potential increasing market demand rates. But later, the uncertainty of influence on incremental costs for phaseout of increasing demand rate increases, and it is difficult to forecast the extent of influence. (It is important for China to set up policy to reduce the uncertainty.)
- **Phaseout speed of ODS solvent production and consumption.** Speed mainly affects incremental costs for closure. The faster speed of phaseout plan, the earlier closure of the producing plants and the higher the incremental costs of premature retirement. However, the emission of ODS would be lower.
- **Choices of substitutes and replacement technology.** It is obvious that the choices affect incremental costs of ODS phaseout. But according to the principles of substitute and replacement technology as discussed in Chapter II, the optimum substitute and replacement technology for various cleaning technologies under current technical development can be determined.
- **Period of phaseout programme.** The shorter the period, the lower the cost to the enterprises; likewise, the longer the period, the higher the cost. Length of phaseout programme can also have an important effect on the enthusiasm on enterprises, which participate in phaseout activities. If the period is too long, the plants have to pay for idling loss.

C. Incremental Costs

5.5 Based on the overall ODS phaseout strategy in the Solvent Sector described in Chapter II, the incremental costs in China are given in Table 12.

Table 12 Incremental Costs for ODS Phaseout in Solvent Sector

	Incremental costs to China (US\$ 1,000)	Incremental costs to MLF (US\$ 1,000)
Approved projects by MLF	14,273	8,547
Incremental costs needed in future	210,952	144,796
In which replacement CFC-113 solvent	92,921	57,611
In which replacement CTC solvent	2,224	1,379
In which replacement TCA solvent	53,015	32,870
In which closure of TCA producing plants	5,635	5,635
In which Technical Assistance	6,000	6,000
In which Costs for UNDP-commissioned performance & financial audits		550
In which Management costs ⁴	20,809	10,404
Sub-total	180,605	114,449
In which Closure of CFC-113 producing plants	27,589	27,589
In which Management costs	2,759	2,759
Sub-total	30,348	30,348

5.6 Since the Solvent Sector Plan critically depends on production quota reductions, it is essential that controls and funding for CFC-113 production closure and/or reduction would be available when the Solvent Sector Plan is approved. MLF funding for production closure/reduction for CFC-113 is covered by the CFC Production Sector Plan submitted to ExCom on August 16, 1998. If the latter proposal is approved at the same time or before the Solvent Sector Plan, then funding for production closure for CFC-113 would be included in the CFC Production Sector Plan. If the Solvent Sector Plan is approved before the CFC Production Sector Plan, then costs for CFC-113 production closure will be requested under the Solvent Sector Plan. Thus, funding for CFC-113 (and TCA) production closure/reduction incremental costs are included here as a possible funding option.

5.7 As previously mentioned, instead of a project by project phaseout in the solvent sector, it is more practical and economical to phaseout as a sector. Economically, the incremental costs to phase out the sector should be lower, as a result of:

⁴ The management costs requested from MLF is 10% of the total Solvent Sector Plan Cost. The management costs include UNDP support costs and Domestic Technical Implementation support costs.

- a) The policies associated with the larger enterprises bidding to receive phase out support,
- b) The use of specifically qualified local equipment manufacturers who can meet the quality requirements at economically attractive costs,
- d) The increased use of “no-clean” technologies which have lower costs than the conversion from the use of ODS cleaning technology to ODS-free cleaning.
- e) The use of the Alternative Technology Support System

5.8 A comparison of incremental costs for phasing out consumption of CFC-113 and TCA and projected savings to MLF under the Solvent Sector Plan is shown below. MLF threshold values for funding do not reflect the full incremental costs to China, even after deducting the incremental operation costs from total incremental costs to China. Incremental costs under the Solvent Sector Plan are set at even lower levels than allowable MLF threshold values for the different size of enterprises. The estimated savings to MLF are US\$ 9.7 million for CFC-113 and US\$ 0.4 million for TCA

Table 13 Incremental Costs Comparison – CFC-113 (US\$ 1,000)

	Cost to China	IC at Full Threshold Value	IC at Requested Sector Plan Value	Savings to MLF
Large & Medium	72,478	52,504	44,937	7,567
Small	20,443	14,809	12,674	2,135
Total	92,921	67,313	57,611	9,702

Table 14 Incremental Costs Comparison – TCA (US\$ 1,000)

	Cost to China	IC at Full Threshold Value	IC at Requested Sector Plan Value	Savings to MLF
Large & Medium	41352	25,976	25,638	338
Small	11663	7,326	7,231	95
Total	53015	33,302	32,869	433

Table 15 Breakdown of Eligible Incremental Costs for Phasing Out ODS SOLVENTS (US\$ 1,000)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<i>CFC-113</i>														
Consumption (tons)	4687	4921	5125	4125	3375	2750	2125	1375	688	0	0	0	0	0
Phaseout Target of Consumption (tons)			0	319	750	625	625	750	688	688	0	0	0	0
IC for Consumption	57,611		3,810	9,188	7,848	8,044	9,895	9,297	9,529	-	-	-	-	-
Production (tons)	4538	4921	5125	4125	3375	2750	2125	1375	688	0	0	0	0	0
Phaseout Target of Production (tons)			0	1000	750	625	625	750	688	688	0	0	0	0
<i>CTC</i>														
Consumption (tons)	100	100	100	100	100	100	50	0	0	0	0	0	0	0
Phaseout Target of Consumption(tons)			0	0	0	50	50	0	0	0	0	0	0	0
IC for Consumption	1,379		0	0	664	715	0	0	0	0	0	0	0	0
<i>TCA</i>														
Consumption (tons)	6717	7053	7405	7776	8165	7788	7411	6300	5188	4150	3113	2075	1038	0
Phaseout Target of Consumption (tons)			0	0	0	377	377	1112	1112	1038	1038	1038	1038	1038
Production (tons)	1044	1096	1151	1209	1269	1269	1267	1267	922	922	922	922	922	0
Phaseout Target of Production (tons)			0	0	0	63	68	70	419	77	81	85	89	1015
IC for Consumption	32,870		-	-	1,353	1,387	4,197	4,302	4,115	4,218	4,324	4,432	4,542	-
IC for Production	5,635		-	-	-	257	273	227	1,404	233	232	229	222	2,558
SUB-TOTAL	38,505		-	-	1,353	1,644	4,470	4,529	5,519	4,451	4,556	4,661	4,765	2,558

Total Cost	144,796		5,346	19,744	14,800	16,217	20,843	20,213	20,341	8,384	5,616	5,182	5,296	2,814
Of which consumption	91,860		3,810	9,188	9,865	10,146	14,091	13,598	13,644	4,218	4,324	4,432	4,542	-
Of which production of TCA	5,635		-	-	-	257	273	227	1,404	233	232	229	222	2,558
Of which TA	6,000		1,000	1,000	1,000	500	500	500	500	500	500			
Of which Costs for UNDP- commissioned performance & financial audits	550		50	50	50	50	50	50	50	50	50	50	50	0
Of Which Management Cost	10,404		486	1024	1092	1095	1491	1438	1560	500	511	471	481	256
Sub-total	114,449		5,346	11,262	12,007	12,049	16,406	15,813	17,158	5,501	5,616	5,182	5,296	2,814
Of which for CFC-113 Production	27,589		-	7,711	2,539	3,789	4,033	4,000	2,894	2,621	-	-	-	-
Of which management cost for CFC-113 Production	2,759		-	771	254	379	403	400	289	262	-	-	-	-
Sub-total	30,348		-	8,483	2,793	4,168	4,437	4,400	3,183	2,884	-	-	-	-

VI. OPERATING MECHANISM

6.1 This chapter describes the operating mechanism, funding arrangements, and the responsibilities of the institutions involved in implementation of this Solvent Sector Plan.

A. Management

6.2 Similar to the *Sector Plan for Halon Phaseout in China*, Solvent Sector Plan for ODS Phaseout in China will be executed by SEPA on behalf of the Government. SEPA will be responsible for overall implementation of the Solvent Sector Plan and will supervise and manage operation through PMO. PMO will manage and coordinate execution of each year's Annual Programme. PMO will be assisted in implementation by a Domestic Implementing Agency (DIA)⁵, who will provide day-to-day operational management. The DIA will be selected by SEPA and UNDP, following a competitive bidding process among a shortlist of qualified firms. UNDP will review and approve the shortlist, TOR for DIA, bidding documents, bid evaluation and contract with selected DIA. Foreign Economic Cooperation Office (FECO), a department within SEPA, will establish and manage a Solvent Sector ODS Phaseout Account in a local bank acceptable to UNDP. UNDP will monitor overall implementation of the Solvent Sector Plan, including achieving Annual Programme indicators, replenish the ODS Phaseout Account, report to ExCom on implementation progress, and submit future Annual Programmes to ExCom. The first Annual Programme will cover two years, because of the average one year lag between investment funding and achieving ODS phaseout results.

6.3 Responsibilities of the several institutions involved in implementing the Solvent Sector Plan are described below:

Project Management Office (PMO). PMO is a substantive unit within SEPA with operational responsibility for implementation of China's Country Programme for ODS Phaseout, including the *Solvent Sector Plan For ODS Phaseout in China*. PMO's responsibilities include:

- Review of overall ODS Solvent Sector phaseout plan;

⁵ SEPA will sign a contract with the DIA following approval of funds for the First Biannual Programme. Contract signing will be a condition of first disbursement from UNDP to the ODS Phaseout Account.

- Prepare Annual Programmes and submit to ExCom through UNDP;
- Review and supervise implementation of all policies and regulations;
- Report to UNDP on programme implementation; including quarterly progress reports, quarterly and annual financial reports and quarterly budget revisions;
- Formulate and enforce policies and regulations on production quota system, and import quota system with line ministries ;
- Manage all TA activities;
- Approve all bid winners for ODS Reduction Contracts;
- Supervise and monitor DIA;
- Set up and manage an Alternative Technology Support System;
- Sign ODS Reduction Contracts with large and medium solvent users;
- Authorize all disbursements from the Solvent Sector ODS Phaseout Account, including:
 - a) Payments under ODS Reduction Contracts;
 - b) Technical Assistance activities;
 - c) Payments for ODS Reduction Vouchers from small scale solvent users;
 - d) Payment for technical implementation support services.
- Establish and implement a monitoring and reporting system including a Solvent Sector Management Information System (SSMIS) to track implementation of annual programmes and all activities related to ODS solvent phaseout; and
- Certify completed ODS solvent phaseout actions.; and
- Prepare and submit quarterly disbursement requests to UNDP for payment from UNDP into Solvent Sector ODS Phaseout Account.

PMO will be assisted by the working group established for the Solvent Sector.

Foreign Economic Cooperation Office (FECO). FECO, a department under SEPA, will be responsible for financial management, through its Financial Accounts Division, including:

- Manage Solvent Sector ODS Phaseout Account;
- Make payments from Solvent Sector ODS Phaseout Account, subject to PMO authorization including:
 - a) Payments under ODS Reduction Contracts;
 - b) Technical Assistance activities;
 - c) Payments for ODS Reduction Vouchers from small scale solvent users;
 - d) Payment for technical implementation support services; and

- e) Payment vouchers to ATSS participants according to payment requests prepared by DIA and authorized by PMO.
- Assist PMO and DIA in preparing annual and quarterly financial reports and budget revisions as required by PMO and UNDP.

The Domestic Implementation Agent (DIA). DIA will carry out day-to-day management tasks, including:

- Operate the annual bidding process and evaluating bid documents to select winners;
- Facilitate procurement actions under the ODS Reduction Contracts;
- Supervise implementation of ODS Reduction Contracts and ODS Voucher System;
- Review disbursement requests from beneficiaries and prepare disbursement requests to PMO for authorization;
- Submit regular report to PMO on status of enterprise project implementation;
- Prepare disbursement (replenishment) requests for submission by PMO for payment by UNDP;
- Assist PMO and FECO in preparing quarterly and annual reports on the Solvent Sector ODS Phaseout Account including quarterly budget revisions as required by PMO and UNDP; and
- Identifying and alerting PMO to any issues regarding enterprise-level activities.

Alternative Technology Support System.(ATSS) An Alternative Technology Support System will be set up by PMO for the purpose of providing enough alternative technology options and support for ODS consumers to meet their production demand during the process of ODS solvent phaseout. While the ATSS is designed to serve all users, its primary focus is to service the small scale users. The system will consist of (a minimum of) two alternative technology support centers and a limited number of local manufacturers designing and producing alternative cleaning equipment at affordable costs, a limited number of dealers who are trained in the ability to recommend alternative technologies and/or systems, and a limited number of local manufacturers who are skilled at developing and producing alternative solvents. Industrial associations will also be included to assist in identifying small scale users, promoting phaseout actions, and assisting small scale users in preparing ODS vouchers. The alternative technology support centers, so far one in Shanghai funded by the Swedish Government and one in Tianjin funded by MLF, will provide services such as design and engineering services, technical consulting, and technical supervision. The knowledge and competence of the ATSS will be developed through TA programmes, raising the ATSS' credibility within various solvent sub-

sectors and helping them to improve the different services provided to the ODS solvent consumers. The support system also includes development of a promotion and delivery system to reach the many solvent users. Phaseout actions under the ATSS will use a voucher system for payment of technical service, equipment and non-ODS solvents delivered to eligible small scale users.

Beneficiaries. Beneficiaries include eligible ODS solvent producers and consumers, the Alternative Technology Support System, and institutions that are selected to implement TA activities.

Figure 4 shows the relationship between different institutions involved in management of ODS phaseout in the Solvent Sector.

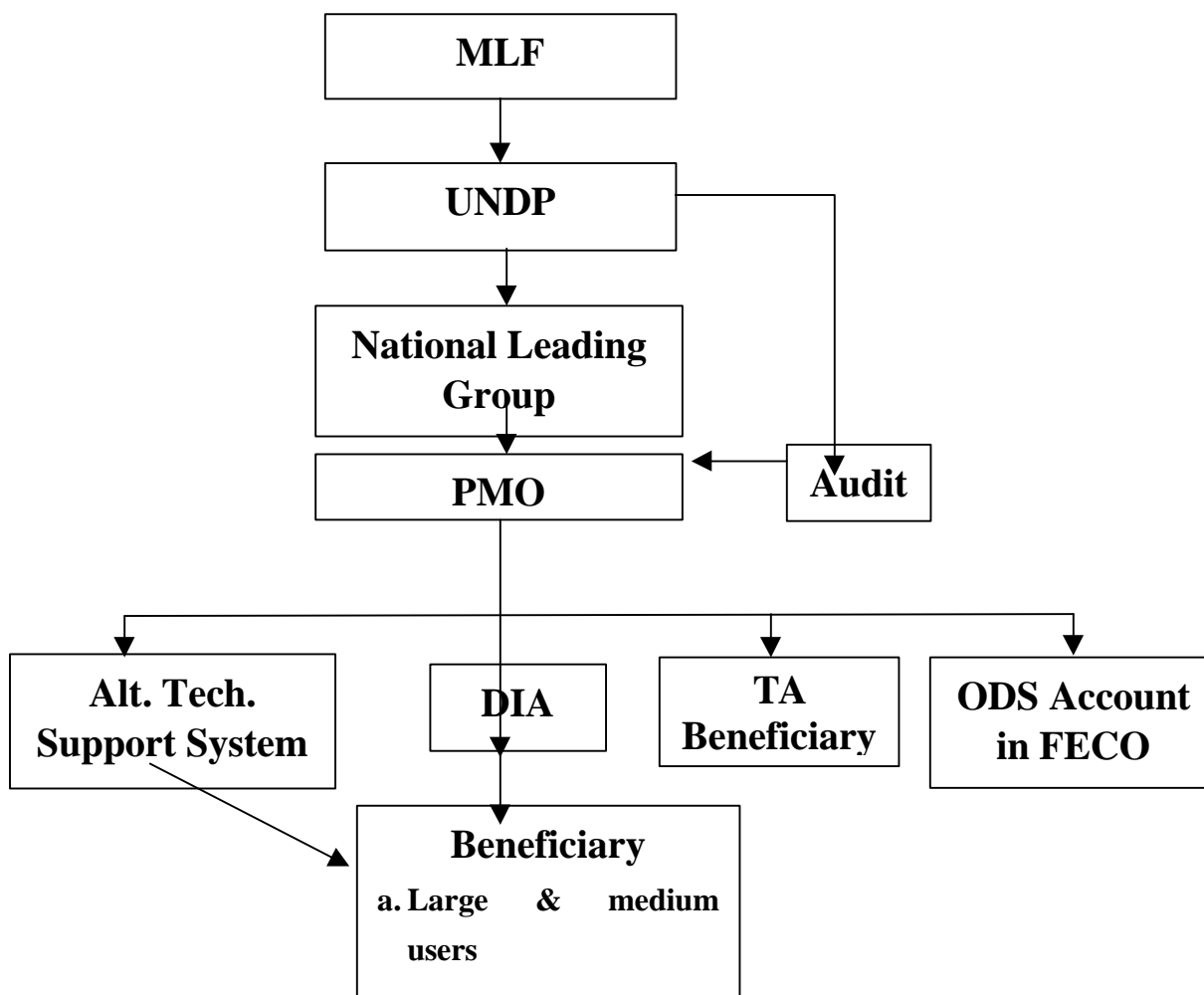


Figure 4 Relations between related institutions

B. Operation

Large and Medium ODS Solvent Consumers and Producers

6.4 Phaseout operations under the Solvent Sector Plan will be carried out with two methodologies:

- A bidding system for solvent producers and large and medium solvent users; and
- A voucher system for small solvent users.

These methodologies are described below:

6.5 ODS phaseout in large and medium solvent users and producers will be implemented through a bidding system to reach the approximately 200 large and medium solvent users and the several solvent producers. The bidding system for large and medium users is similar to the procedures being used successfully under the Halon Sector Plan. The DIA operates the bidding process annually. Each successful bidder will enter into an ODS Reduction Contract with PMO. The ODS Reduction Contract will specify the terms and conditions under which ODS reduction will be accomplished. Procurement under all ODS Reduction Contracts will be done in accordance with agreed UNDP procedures.

Small Solvent Consumers

6.6 ODS phaseout in small solvent users will be implemented through a voucher system to reach the approximately 3,000 enterprises. Operation of the voucher system is outlined below:

- 1) PMO/DIA will broadcast the information of phasing out of ODS solvent and notify the industrial associations (IA) to assist in identifying and developing the list of small users. Each small user will be primarily responsible for identifying itself, preparing its own voucher application and submitting it to the industrial association for processing;
- 2) Industrial associations will assist in ensuring the small users' eligibility for support and assist users in preparing vouchers applications. PMO approves the voucher applications sent to them by the industrial associations and instructs DIA to issue the vouchers;
- 3) DIA issues the voucher through the industrial associations to the small users;
- 4) The small users that obtains the certified voucher can buy equipment, non-ODS solvent or technical support from the designated dealers, suppliers or technology center under

the ATSS, using their vouchers. "Encashment" of the voucher will obligate the small scale user to stop using ODS solvent within an agreed period (no more than 12 months) as a condition of payment (or receipt of services/equipment);

- 5) The designated dealers, suppliers or technology center that collect vouchers would get payment for their collected vouchers from DIA;
- 6) DIA will collect vouchers and prepare disbursement request; and
- 7) DIA will prepare reports to PMO on results and payments under the voucher system.

6.7 PMO ensures that the dealers, equipment suppliers and technology suppliers under the ATSS are qualified to supply the services for which they are to supply.

C. Approval and Funding Arrangements

6.8 UNDP and SEPA will sign a Solvent Sector Plan Project Agreement, which will set forth the terms under which the Annual Programmes, as approved by ExCom, would be carried out and monitored. That Agreement will also set forth the terms under which grant resources approved by ExCom will be disbursed and monitored. The Agreement will become effective when the following conditions are met:

- (a) The first Biannual Programme for the ODS Solvent Sector has been agreed by UNDP and approved by ExCom and funding for approved amount has been received by UNDP;
- (b) Solvent Sector Plan Project Implementation Manual has been adopted by PMO and approved by UNDP;
- (c) Regulations for a production quota system for the ODS Solvent Sector have been promulgated by China and confirmation that they have entered into effect;
- (d) A qualified DIA has been selected by PMO and UNDP;
- (e) Contracts between PMO and DIA are acceptable to UNDP; and
- (f) TOR for Alternative Technology Support System agreed by UNDP.

6.9 Funds for the ODS Solvent Sector Plan would be approved in two steps:

- (a) The Government, through UNDP, requests ExCom to consider this overall Solvent Sector Plan and agree to fund ODS solvent phaseout with annual advances as described herein provided that China meets the agreed annual phaseout targets and other performance indicators. At the same time, the Government requests ExCom to fund the 1999/2000 Biannual Implementation Programme which has been submitted as a separate document; and
- (b) The Government, through UNDP, would submit its future annual requests for funds to the

appropriate meeting of ExCom to implement annual phaseout plans for subsequent years beginning with the 2001 Annual Programme. These Annual Programmes would also be consistent with the agreed overall Solvent Sector Plan. For example, UNDP would submit the 2001 Annual Programme to ExCom in time to allow for funding approval by January 1, 2001. ExCom would be asked to approve funding at the levels agreed to in this Solvent Sector Plan based upon achievement of previous phaseout targets.

6.10 Funding approval would be based on achievement of ODS solvent phaseout targets and other key performance indicators (production and consumption targets for previous year not exceeded):

- (1) The 2001 annual programme funding request would be based upon the annual progress report of 1999 (note the one year lag); and
- (2) Annual programme funding requests for the years 2002-2010 would be based upon achievement of ODS solvent phaseout targets of the previous year and the semi-annual progress report of the current year of submission.

6.11 In the unlikely event that China were to fall short of phaseout targets for a given year (ODS supply (imports plus production) and consumption exceed targets), UNDP and SEPA would agree on remedial actions. New funding requests to ExCom would go forward only after phaseout targets had been met. Remedial actions have been built into the ODS solvent production quotas regulations and import quotas regulation, and would go into effect if ODS solvent phaseout targets were not achieved. Production quota and import quota equal to the national production targets and import targets respectively are allocated annually to producers and import companies. Producers exceeding production quota and import companies exceeding import quota in a given year would be fined according to the quota regulations and their subsequent year's quota would be proportionally reduced. For example, if a producer exceeded its ODS solvent production quota in 2001 by 100 tons, its quota for 2002 would be reduced by 100 tons and it would also pay a monetary fine. Depending on circumstances that cause delay in programme implementation, other specific remedial actions would be agreed between UNDP and SEPA as the need arises.

6.12 By the time any excess targets (including production and import) for a previous year are confirmed, the current year's Annual Programme would most likely already be funded and be underway. Thus, the proposed approach to remedial action is to bring the programme back on-track by the end of the current year. That is, cumulative supply (imports plus production) and consumption for the previous and current years would not exceed the combined targets for those

two years. The remedial actions taken to assure this result would be submitted along with next year's funding request to ExCom. ExCom would then be in a position to either approve funds or condition release of funds for the next year's Annual Programme upon evidence that the remedial actions were successful and that the combined two year supply and consumption did not exceed combined targets. This approach to remedial action allows the programme to maintain momentum and keeps the phaseout schedule on track even if difficulties arise in a particular year.

6.13 If after two years the programme is still not be back on-track, continued funding of the programme would be suspended until a satisfactory remedial action plan is agreed with UNDP and is being implemented. Under this plan, grant funds would be approved for Annual Programmes and advanced through UNDP to SEPA to achieve specific targets. As such, SEPA requests use of these funds to achieve those targets even in the face of short term delays. However, if it becomes clear that a delay is persistent and the phaseout targets would not be achieved, funds proportional to phaseout shortfall would be reimbursed to the MLF.

6.14 Annual Programmes would comprise of the following sections:

- (1) ODS Solvent Sector phaseout schedule;
- (2) Performance of activities of previous years and any agreed remedial actions for the current year (not required for the 1999 and 2000 biannual programme);
- (3) Performance of activities of current year (not required for the 1999 and 2000 biannual programme);
- (4) Objectives of following year's annual programme -- its phaseout targets and funding requirements for different activities in the following year;
- (5) Description of activities in following year -- policies to be implemented and TA activities.

6.15 PMO/UNDP would approve TA activities consistent with the Annual Programme based on agreed terms of reference up to the level of TA funding approved under the Annual Programme for that year. TA funds approved in the annual programme that are not committed during that Annual Programme would be carried forward to the next annual programme.

D. Monitoring and Reporting

6.16 PMO will formulate and implement the ODS Solvent Sector Annual Programmes. PMO will report to UNDP on implementation progress under the Solvent Sector Plan. DIA will

implement the Annual Programmes, track implementation of ODS solvent reduction projects and submit written progress reports to PMO four times a year. PMO will also track implementation of policy measures and TA activities. Initially, some reporting tables, which have been agreed between UNDP and PMO, will be prepared by PMO. These tables will be revised each year as needed during Annual Programme preparation as more experience is gained.

6.17 UNDP will report twice annually to ExCom based on indicators agreed in the Annual Programme. A mid-year progress report will be submitted each year along with the Annual Programme funding request for the next year. The end-of-year report will be submitted along with UNDP's performance audit report. UNDP will also monitor implementation of Annual Programmes including, periodic visits to PMO, review of performance under the Annual Programmes, spot checks of programme records in PMO/DIA and random visits to ODS Solvent Sector enterprises. UNDP will also assist PMO in preparing Annual Programmes.

E. Disbursement Mechanism

6.18 **UNDP disbursement to the Government.** Following ExCom approval of funds for Annual Programme implementation and effectiveness of the Agreement, UNDP will transfer grant funds quarterly to China by depositing them in a bank account (ODS Phaseout Account) set up and managed by FECO. There would be four quarterly disbursements into the ODS Phaseout Account for each Annual Programme's activities. Disbursement conditions and amounts to be disbursed are:

First Quarterly Disbursement – 100% of annual funds for TA activities and 40% of funds allocated to enterprise activities

Conditions:

- Annual Programme has been approved by ExCom and UNDP and funds received by UNDP;
- SEPA confirms that ODS solvent supply and consumption have not exceeded supply and consumption targets set for the preceding programme year or ODS solvent supply and consumption of the first nine months of the preceding programme year has not exceeded 80 percent of the supply and consumption targets set for the preceding programme year (not applicable to 1999); and
- Any other conditions as specified in the current Annual Programme.

Second Disbursement – 20-30% of funds allocated to enterprise activities depending on

progress

Conditions:

- Signed ODS Reduction Contracts for a minimum of 25% of agreed phaseout actions under the Annual Programme;
- Regulations on production quota are effective (1999 only); and
- Progress report on Annual Programme implementation is satisfactory to UNDP.

Third Quarterly Disbursement – 20-30% of funds allocated to enterprise activities depending progress

Conditions:

- SEPA reports that actual ODS solvent supply and consumption have not exceeded the supply and consumption target set for the preceding year (not applicable to 1999);
- Signed ODS Reduction Contracts or appropriate government actions (e.g., quota allocation) which indicate that supply and consumption targets for the current programme year will be met;
- Progress report on Annual Programme implementation is satisfactory to UNDP.
- Any other conditions as specified in the current Annual Programme.

Fourth Quarterly Disbursement - balance of funds allocated to enterprise activities

Conditions:

- Progress report on Annual Programme implementation is satisfactory to UNDP;
- SEPA announces production quota and import quota for the following year to remaining ODS solvent producers and import companies;
- Production audit (for 1999 only) and performance audits (2000 and after) and financial audits are satisfactory to UNDP;
- Annual Programme for following year agreed with UNDP and ready for submission to last annual meeting of ExCom for funding approval.

6.19 If UNDP finds implementation progress unsatisfactory, further disbursements would be suspended. UNDP would resume disbursements only after SEPA and UNDP agree on remedial actions to rectify implementation deficiencies (also see paragraph 6.11-6.13).

6.20 Disbursement of management costs for domestic technical implementation support services will be effected according to a schedule agreed between UNDP and PMO.

6.21 **Disbursement from ODS Phaseout Account to grant beneficiaries.** Grant funds will be allocated to recipients through voucher system and bidding system.

The voucher system will be used to allocate grant funds for:

- Funding ODS vouchers with small scale users through the Alternative Technology Support System.

Operating mechanism of the voucher system is described in detail in the Implementation Manual.

6.22 A bidding system, based on experiences from the *Sector Plan For Halon Phaseout in China*, will be used to allocate grant funds for:

- Reducing ODS solvent producers' production quotas⁶. The bidding under this contract will actually be a negotiated price for reducing CFC113 production and reducing TCA production since there is only one CFC113 producer and three TCA producers;
- Phasing out solvent use of large and medium sized ODS solvent consumers;
- Firms executing TA;

Operating mechanism of the bidding system is described in the bidding section of the Implementation Manual.

6.23 After bidding is concluded, winning enterprises will sign ODS Reduction Contracts with PMO. As defined in the Agreement, under an ODS Reduction Contract, PMO agrees to pay the beneficiary a specified amount per unit of ODS solvent consumption (or production) to be reduced. In this way, grant allocation and payment are directly linked to enterprise-level ODS solvent phaseout, as agreed upon in the Annual Programme. The ODS Reduction contracts will specify the date by which the enterprises agrees to stop using ODS.

6.24 Based on a series of surveys, SEPA has identified almost all of the large and medium sized ODS solvent consumers. However, only a small part of the small consumers has been identified because of their large number, wide dispersion and unstable consumption. During implementation of the Solvent Sector Plan, all small ODS solvent consumers that can be found will be located through industries associations, ODS solvents and equipment dealers, and enterprises already undertaking ODS phaseout projects. PMO will coordinate this effort. Grants will be allocated to small ODS solvent consumers by a Voucher System. At the same time,

⁶ This item will be modified if CFC-113 production closure is funded under CFC Production Sector Plan.

technical services and information on alternative technologies, equipment and solvents will be provided through the Alternative Technology Support System helping small consumers convert their ODS cleaning processes. TA activities such as training and information and awareness building campaigns will also be conducted to help small ODS solvent consumers. Small users who might not be identified via industrial associations, dealers and enterprises undertaking projects will have to phase out their ODS solvents by themselves. But they can buy alternative solvents and equipment in market to maintain their normal production.

6.25 Grant funds will be disbursed directly from the ODS Phaseout Account to recipients based on terms contained in ODS Reduction Contracts or, in the case of TA activities, the terms contained in the consultant contracts or under the Voucher System through the ATSS. For example:

- (a) **Closure projects** -- ODS reduction contracts will specify disbursement as follows:
 - (1) 10 percent -- initial payment upon signing of ODS Reduction Contract;
 - (2) 70 percent -- payment following dismantling of production equipment;
 - (3) 20 percent -- payment upon PMO's confirmation that enterprise decommissioning is completed.
- (b) **ODS production quota reduction projects** -- ODS Reduction Contracts will specify disbursement as follows:
 - (4) 30 percent -- initial payment upon signing of ODS Reduction Contract;
 - (5) 40 percent -- payment upon PMO's confirmation that an enterprise's ODS solvent production of the first nine months of the current year has not exceeded 80 percent of its production target of the current year;
 - (6) 30 percent -- payment upon PMO's confirmation that the enterprise does not exceed its production target of the current year.
- (c) **ODS large and medium consumers' conversion projects** -- ODS Reduction Contracts will link disbursement to purchasing of equipment necessary for cleaning process conversion. ODS Reduction Contracts would confirm eligibility of enterprises and expenditures.
 - For enterprises with large level consumption, which account for about 50% of the total consumption and whose number is about 50, the Halon Sector Plan model will be used. That is, one project will be undertaken for each winning enterprise. UNDP procurement procedures for international competitive bidding will be followed. DIA will supervise, monitor and audit the implementation of each of those projects. UNDP will monitor as appropriate.

- For enterprises with medium level consumption, which account for about 30% of the total solvent consumption and whose number is about 150, DIA will undertake one project for each of those enterprises and implement the projects. Competitive bidding procedures will be followed according to procurement procedures as agreed between UNDP and PMO. PMO will conduct supervision of these projects on a spot basis to include at least 50% of enterprises. UNDP will monitor as appropriate.
 - For enterprises with small level consumption, which account for about 20% of the total solvent consumption and whose number is about 3,000, DIA/PMO will manage and implement ODS phaseout through the Voucher System. No specific procurement action will be required. Maximum voucher value will be agreed between UNDP and PMO in each Annual Implementation Programme. DIA will monitor the small enterprises that use vouchers with the assistance of the ATSS. DIA/PMO will conduct a minimum level of spot supervision. UNDP will monitor primarily at the DIA/PMO/ATSS level only.
 - The classification of large, medium and small ODS users is based on that of ExCom Secretariat;
 - Procedures for CTC consumers will be the same as for CFC-113 consumers.
- (d) **Alternative Technology Support System activities** – development of the ATSS will be supported under the TA programme.
- (e) **TA activities** -- grant funds will be disbursed to consultant firms or institutions in charge of training, information campaigns and formulation of technical codes and regulations, based on performance. The industrial associations, and ODS solvent and equipment dealers will be trained to promote and deliver related information to small users.

F. **Audit**

6.26 Two audits will be commissioned by UNDP each year. A financial audit of the ODS Phaseout Account will be conducted by a qualified independent auditing firm. An independent performance audit of the Annual Programme will be carried out by a qualified, independent auditing firm. Funding for these two audits will be requested from ExCom as a separate line item in each year's Annual Programme. The audits could be carried out under the contract with the same firm.

VII. ACTION PLAN

7.1 This chapter presents the Action Plan for phaseout ODS in the Solvent Sector in China. The Action Plan includes:

- a) Action to achieve the agreed phaseout of ODS solvents;
- b) Policy actions to control imports/exports, production and consumption;
- c) Development of an Alternative Technology Support System;
- d) Technical assistance;
- e) Incremental Costs; and
- f) Management.

7.2 **Objective:** China will phaseout total production and consumption of CFC-113 by January 1, 2006; phaseout total production and consumption of TCA by January 1, 2010; phaseout CTC consumption as solvent before January 1, 2004. The production quota system and bidding system will gradually decrease production and imports of CFC-113 and TCA, and bidding system of consumption will gradually decrease consumption of CFC-113, TCA and CTC.

7.3 The proposed Action Plan is as follows:

The Alternative Technology Support System will be initiated early in Stage 1 (and will cover all three solvents in regard to design/technology).

CFC-113:

Stage I (1999-Jan. 1, 2003):

Production and consumption will be reduced from 5,125 tons to 2,125 tons.

Stage II (2003-Jan. 1, 2006):

Production and consumption will be phased out completely by January 1, 2006. Import and production of CFC-113 will be controlled by the quota system.

CTC:

Stage I (1999-Jan. 1, 2003):

Consumption will be limited under 100 tons.

Stage II (2003-Jan. 1, 2004):

Consumption as solvent will be completely phased out by January 1, 2004.

TCA:**Stage I (1999-Jan. 1, 2003):**

Production and consumption will be allowed to grow by market forces for the next three years, without new facilities installed.

Stage II (2003-Jan. 1, 2006):

Production and consumption will be frozen by January 1, 2003 at average level of 1998-2000. Import and production of TCA will be controlled by the quota system. Import and production of TCA will be registered.

Stage III (2006-Jan. 1, 2010):

Production and consumption will be phased out completely before January 1, 2010.

During the three stages, the following actions will be conducted:

Stage I

7.4 Phaseout Stage I will start after ExCom approves this Solvent Sector Plan and end on January 1, 2003. Production, consumption, phaseout targets and required incremental costs are listed in Table 16.

7.5 The Government will:

- Introduce a quota system to control the CFC-113 production and import. The basis of the quota system is described in "Sector Plan for Phaseout CFC Production in China";
- Register import and export of TCA;
- Set up an Alternative Technology Support System;
- Start recycling CFC-113; and
- Develop policies and regulation to support overall phaseout.

Stage II

7.6 Stage II will start on January 1, 2003 and end on Jan. 1, 2006. Production, consumption, phaseout targets and required incremental costs are listed in Table 16.

7.7 The Government will:

- Completely phaseout CFC-113 production and consumption by closing production lines of CFC-113 and ban imports;

- Completely phaseout CTC consumption by ban on consumption;
- Introduce a quota system to control the TCA production and import. Basis of the quota system is same as CFC-113; and
- Freeze TCA production and consumption.

Stage III

7.8 Stage III will start on January 1, 2006 and end on January 1, 2010. The production, consumption, phaseout targets of TCA and required incremental costs are listed in Table 17.

7.9 The Government will:

- Completely phaseout TCA production and consumption by closing the production lines of TCA and ban import.

Table 16 Phaseout Targets for CFC-113 and CTC (USD 1,000)

CFC-113	1999	2000	2001	2002	2003	2004	2005	2006
Production (tons)	5,125	4,125	3,375	2,750	2,125	1,375	688	0
Import	0	0	0	0	0	0	0	0
Consumption (tons)	5,125	4,125	3,375	2,750	2,125	1,375	688	0
Phaseout of Production (tons)		1,000	750	625	625	750	688	688
Phaseout of Consumption (tons)		1,000	750	625	625	750	688	688
Incremental Costs for phaseout consumption	3,810	9,188	7,848	8,044	9,895	9,297	9,529	-
CTC								
Consumption (tons)	100	100	100	100	50	0	0	0
Phaseout of Consumption (tons)	0	0	0	50	50	0	0	0
Incremental costs	0	0	664	715	0	0	0	0
Cost of TA	1,000	1,000	1,000	500	500	500	500	500
Costs for UNDP-commissioned performance & financial audits	50	50	50	50	50	50	50	50
Management Costs for above actions	486	1024	1092	1095	1491	1438	1560	500
Costs for CFC-113 Production Closure	-	7,711	2,539	3,789	4,033	4,000	2,894	2,621
Management Costs for CFC-113 Production Closure	-	771	254	379	403	400	289	262
Total Incremental Costs	5,346	19,744	13,446	14,573	16,373	15,685	14,822	3,934
Main actions	ATSS; Quota system; Management system for trade;				Final prohibition of CTC: after January 1, 2004; Final prohibition of CFC-113: after January 1, 2006			

Table 17 Phaseout targets for TCA (USD 1,000)

TCA	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Consumption (tons)	8,165	7,788	7,411	6,300	5,188	4,150	3,113	2,075	1,038	0
Production (tons)	1,269	1,269	1,267	1,267	922	922	922	922	922	0
Phaseout of Production (tons)		377	377	1,112	1,112	1,038	1,038	1,038	1,038	1,038
Phaseout of Consumption (tons)		0	2	0	346	0	0	0	0	922
Incremental Costs for phaseout production	0	257	273	227	1404	233	232	229	222	2558
<i>Incremental Costs for phaseout consumption</i>	<i>1,353</i>	<i>1,387</i>	<i>4,197</i>	<i>4,302</i>	<i>4,115</i>	<i>4,218</i>	<i>4,324</i>	<i>4,432</i>	<i>4,542</i>	<i>0</i>
<i>Cost on TA *</i>							<i>500</i>	<i>0</i>	<i>0</i>	<i>0</i>
<i>Costs for UNDP-commissioned performance & financial audits *</i>							<i>50</i>	<i>50</i>	<i>50</i>	<i>0</i>
<i>Management Costs *</i>							<i>511</i>	<i>471</i>	<i>481</i>	<i>256</i>
<i>Total Incremental Costs</i>	<i>1,353</i>	<i>1,644</i>	<i>4,470</i>	<i>4,529</i>	<i>5,519</i>	<i>4,451</i>	<i>5,616</i>	<i>5,182</i>	<i>5,296</i>	<i>2,814</i>
Main Actions		Supporting net system; Permit system; Quota system; Management system for trade; Final prohibition: after Jan. 1, 2010;								

* Incremental Costs for supporting activities before 2007 are included in Table 16.

ANNEX 1

SUMMARY OF INPUTS AND CALCULATION METHODOLOGY

I. Key Model Inputs

Key model inputs include:

- Production, consumption, import and export of Ozone Depleting Solvents;
- Information on approved projects and cost effectiveness;
- Comparison of incremental costs to MLF and China;
- Model assumption for incremental costs calculation.

Table 1 Key Inputs on Production and Consumption (tons in 1997)

	CFC-113	TCA	CTC ¹
Production	4,538	1,044	
Import	167	5,843	
Export	18	170	
Consumption	4,687	6,717	100
Total in ODS	11,504		
Consumption in ODP	3,750	672	110
Total in ODP	4,532		

¹ Production and import for CTC are mainly used for raw material. There is no information available for CTC production and import on solvent uses.

Table 2 Information on approved projects by December 1998

1	Consumption of 1997 (tons ODP) (1=2+3+4)	4532
2	Of which CFC-113 (tons ODP)	3750
3	Of which TCA (tons ODP)	672
4	Of which CTC (tons ODP)	110
5	ODP to be phaseout by approved projects (tons) (5=6+7)	760
6	Of which CFC-113 (tons ODP) (including to be phased out with refrigeration projects and MAC Sector Plan)	735
7	Of which TCA (tons ODP)	25
8	Of which to be phaseout with refrigeration and MAC projects (8=9+10)	147 ²
9	Of which CFC-113	146 ³
10	Of which TCA	1
11	Incremental costs approved (KUSD)	8,547
12	Number of projects	23
13	Of which Number of TA projects	4
14	Weighted average Cost effectiveness(\$/KGODP)	15.73 ⁴
15	Completed phaseout (ODP tons)	140
16	Of which includes CFC-113	140
17	Remaining Consumption to be phased out	
18	Of which CFC-113 (tons ODP) [18=2*1.05 ² -(6-16)]	3,505
19	Of which CTC (tons ODP) (19=4)	110
20	Of which TCA (tons ODP) [20 = Annual phaseout _i / Annual phaseout _i = Consumption _(i-1) - Consumption _i / (1+5%)]	8,165
21	Phaseout cost effectiveness for the remaining consumption	
22	CFC-113	\$16.6/Kg ODP
23	TCA	\$38.0/Kg ODP
24	CTC	\$12.1/Kg ODP

² Incremental Costs for phasing out are included in the Refrigeration Sector and MAC Sector.

³ 96 tons to be phased out with Refrigeration Sector and 50 tons phased out with MAC Sector Plan approved in Nov. 1998.

⁴ The project that includes CFC-12 as refrigerant was excluded in the calculation of the Cost effectiveness.

Table 3 Comparison on Incremental costs to MLF and China (US\$)

Enterprise	Incremental Costs to China	Incremental Costs to MLF	MLF/China
1.	1,035,800	725,100	70%
2.	356,000	325,000	91%
3.	479,000	284,900	59%
4.	480,147	394,700	82%
5.	493,771	409,000	83%
6.	179,300	138,400	77%
7.	143,338	104,700	87%
8.	473,000	378,000	80%
9.	1,132,600	283,150	20%
Total	4,772,955	2,950,767	62%

Information in Table 3 come from MLF approved projects. Most projects approved are for phaseout of CFC-113. It is assumed that TCA and CTC has the same level of costs to China.

Enterprise name list for Table 3

Enterprise	
1.	Fujian Putian Vikay Electronics Co. Ltd.
2.	Shanghai Automation Instrumentation Factory
3.	Baoshi Electronics Corporation Shijazhuang Manufacturing Operations
4.	Chengdu Qianfeng Radio Instrument Factory
5.	Nanjing Wire Works
6.	Shanghai Sixth Radio Factory
7.	Hunan Computer Factory
8.	Shanghai No 8 Radio Factory
9.	Shanghai Railway Communication Equipment Factory

Model Assumption

- 1997 prices as 1999 prices;
- Price of related materials are assumed to remain constant over time;
- Discount rate is 7%;
- Inflation rate is 2.5% per year after 1999;
- 2 years to enforce single consumption phaseout project;
- Phaseout costs for implementing replacement technology;

- Phaseout rates of various solvents;
- Incremental costs of other technical assistance;
- Incremental cost for UNDP-commissioned performance and financial audits is \$50,000 per year.
- Management costs for UNDP support costs and Domestic Technical Implementation Supporting Services are calculated at 10% of compensation phaseout costs for consumption, TCA production and TA.

II. Specific Model Inputs and Calculation Methodology By Cost Component

1. Premature Closure of TCA Producers

Model Inputs

- Production capacity of TCA in China is 2,800 tons;
- After 1998, the average lifetime remaining of production factories is 17 years;
- Price for TCA is \$1570/ton in 1997;
- Compensation profit rate is 22.5% of sales price.
- 1 year to implement closure projects;
- After 1997, the growth rate of controlled production for current producers is 5%;
- After 1999, the import of CFC-113 will be banned; but import of TCA will continue to 2009. For reducing import of TCA, the production of TCA will reach the maximum limitation of MP.

The price of CFC-113 and TCA, profit rate and labor compensation were based on the data survey from all producers.

Calculation Methodology

All parameters and methodology for calculating the incremental costs for closure are the same as the CFC Production Sector Plan.

Note

Since the Solvent Sector Plan critically depends on production quota reductions, it is essential that controls and funding for CFC-113 production closure and/or reduction would be available

when the Solvent Sector Plan is approved. MLF funding for production closure/reduction for CFC-113 is covered by the CFC Production Sector Plan submitted to ExCom on August 16, 1998. If the latter proposal is approved at the same time or before the Solvent Sector Plan, then funding for production closure for CFC-113 would be included in the CFC Production Sector Plan. If the Solvent Sector Plan is approved before the CFC Production Sector Plan, then costs for CFC-113 production closure will be requested under the Solvent Sector Plan. Thus, funding for CFC-113 (and TCA) production closure/reduction incremental costs are included here as a possible funding option.

2. Conversion of CFC-113, CTC and TCA users

Model Inputs

CFC-113

Consumption of CFC-113 in 1997	3,750 tons ODP
Remaining Consumption to be phased out	3,505 tons ODP
Phaseout by approved projects in 1999-2000	595 tons ODP
Annual CFC-113 export after 1999	0 tons.
Annual CFC-113 import after 1999	0 tons.
Phaseout CFC-113 consumption in year 2000	~500 tons ODP
Phaseout CFC-113 consumption from 2001-2002	~1000 tons ODP per year
Phaseout CFC-113 consumption from 2003-2005	~510 tons ODP per year

CTC

Consumption of 1997	110 tons ODP
Consumption without phaseout project at end of 1997	110 tons ODP
Phaseout by approved projects in 1998-2002	0 tons ODP
Phaseout total CTC consumption on 2003 and 2004	55 tons ODP per year

TCA

Consumption of 1997	672 tons ODP
Consumption without phaseout project at end of 1997	647 tons ODP
Phaseout by approved projects in 1999-2000	25 tons ODP
Annual import after 1999	Increase based on consumption demand, it was estimated over 7500 tons in year 2001.
Annual export after 1999	Estimated it would be very small

Calculation Methodology

Incremental Costs required to MLF

Calculation of incremental costs for ODS solvent consuming plants is based on its **annual phaseout amount** and **weighted average phaseout cost per unit**. Detail calculating equation is:

$$IC = R1 * \Sigma \text{ weighted average phaseout cost } * \text{ annual phaseout amount}$$

where IC is incremental costs; R1 refers to eligible proportion, R1 is 90% for CFC-113 and TCA, 100% for CTC.

Annual phaseout amount is determined according to phaseout strategy.

Average phaseout cost per unit for CFC-113 is determined according to the phaseout costs of single project and the distribution of CFC-113 solvent consumption in China. Single project is determined according to single phaseout project approved by MLF and the proposal of experts. Detail phaseout cost per unit of CFC-113 solvent consumption for different alternative technologies can be found at Annex 2.

Annual Phaseout Amount

The amount available for consumption is determined for each year based on the phaseout scenario, which translates into production reductions and import limitation. Produced CFC-113 and TCA are used for solvents, there are very small amount of CFC-113 and TCA for essential use. The amount of reduction of consumption of CFC-113 is same as the amount of reduction of production of CFC-113. CTC will be phased out in 2004 with total 100 tons.

Weighted average phaseout cost per unit

Phaseout cost per unit consumption for calculating **weighted average phaseout cost per unit** is given as follow, for different cleaning objectives and different replacement technology.

Table 4 Classification of Phaseout Cost Per Unit (\$/Kg ODP)⁵

	Precision cleaning			Metal Cleaning			PCB cleaning			Others	
Large	aqueous cleaning	semi-aqueous cleaning	solvent cleaning	aqueous cleaning	semi-aqueous cleaning	solvent cleaning	no cleaning	aqueous cleaning	semi-aqueous cleaning	solvent cleaning	all replacement technologies
	11.3	33.4	18.8	10.4		14.3				8.0	
medium	aqueous cleaning	semi-aqueous cleaning	solvent cleaning	aqueous cleaning	semi-aqueous cleaning	solvent cleaning	no cleaning	aqueous cleaning	semi-aqueous cleaning	solvent cleaning	all replacement technologies
	12.3	33.4						17.3	19.7	10.4	
Small	all replacement technologies										
	25.0										

Assumed that synchronous phaseout is carried out among large and medium enterprises. The **weighed average phaseout cost** for large and medium size enterprises is

$$\text{Weighted Average phaseout cost} = \mathbf{S} \text{ phaseout cost of certain replacement tech. } \times \text{ percent of certain technology}$$

The phaseout cost of different replacement technologies is shown in Table 4. The percentage of certain technology can be calculated with information in Table 9 in the "Solvent Sector Plan".

Cost effectiveness for small size enterprise is shown in Annex 2. Considering small percentage of small size enterprises are currently without equipment, the phaseout cost effectiveness is assumed to be the same as large and medium size enterprises.

- Average phaseout cost per unit for TCA is the established threshold.
- Average phaseout cost per unit for CTC is the same value of CFC-113 at ODS level.

⁵ Source information shown in Annex 2.

Table 5 Average requested costs for phaseout of ODS consumption

	Phaseout costs (\$/Kg ODP)	Phaseout costs (\$/Kg ODS)
CFC-113		
Large and Medium	16.6	13.3
Small	16.6	13.3
TCA	38	3.8
CTC	12.1	13.3

Incremental cost to China

Based on approved projects (Table 3), the incremental costs to China for phaseout of solvent consumption is 1.62 times of incremental costs to MLF. The cost effectiveness of China is shown in Table 6.

Table 6 Average costs for phaseout of ODS consumption to China

	Phaseout costs (\$/Kg ODP)	Phaseout costs (\$/Kg ODS)
CFC-113		
Large and Medium	26.9	21.6
Small	26.9	21.6
TCA	61.6	6.16
CTC	19.6	21.6

3. Incremental costs for Domestic Technical Implementation Supporting Services.

These costs will be considerably higher than in other sectors, given the larger number of SMEs. These costs to MLF are estimated at 3% of compensation phaseout cost for large and medium users, TA cost and production closure costs; and 6% for phaseout small-scale solvent users for conversion. These costs to China are estimated at about 15% of incremental conversion.

4. Incremental costs for UNDP-commissioned performance & financial audits

These costs will also be considerably higher than in other sectors, given the larger number of SMEs. These costs to MLF are estimated at \$50,000 per year.

5. Incremental costs for technical assistance

TA mainly includes:

- Incremental cost of ATSS;
- Technical support to the development of phaseout policies;
- Technical support to the development of new standards;
- Technical support to minimizing emission;
- Training and public awareness propagation; and
- Technical support to those technical centers and equipment makers in the Action Plan, who will work with the enterprises and provide the key assistance and effort in the phasing out of the various solvent sub-sectors.

III. Incremental Costs

Table 7 Incremental Costs for ODS Phaseout in Solvent Sector

	Incremental costs to China (US\$ 1,000)	Incremental costs to MLF (US\$ 1,000)
Approved projects by MLF	14,273	8,547
Incremental costs needed in future	210,952	144,796
In which replacement CFC-113 solvent	92,921	57,611
In which replacement CTC solvent	2,224	1,379
In which replacement TCA solvent	53,015	32,870
In which closure of TCA producing plants	5,635	5,635
In which Technical Assistance	6,000	6,000
In which Costs for UNDP-commissioned performance & financial audits		550
In which Management Costs ⁶	20,809	10,404
Sub-total	180,605	114,449
In which Closure of CFC-113 producing plants	27,589	27,589
In which Management Costs	2,759	2,759
Sub-total	30,348	30,348

⁶ The management cost requested on MLF is 10% of the total Solvent Sector Plan Cost. Management costs include UNDP support costs and Domestic Technical Implementation support costs.

Table 8 Incremental Costs Comparison – CFC-113 (US\$ 1,000)

	Cost to China	IC at Full Threshold Value	IC at Requested Sector Plan Value	Savings to MLF
Large & Medium	72,478	52,504	44,937	7,567
Small	20,443	14,809	12,674	2,135
Total	92,921	67,313	57,611	9,702

Table 9 Incremental Costs Comparison – TCA

	Cost to China	IC at Full Threshold Value	IC at Requested Sector Plan Value	Savings to MLF
Large & Medium	41352	25,976	25,638	338
Small	11663	7,326	7,231	95
Total	53015	33,302	32,869	433

Table 10 Breakdown of Eligible Incremental Costs for Phasing Out ODS SOLVENTS (US\$ 1,000)

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<i>CFC-113</i>														
Consumption (tons)	4687	4921	5125	4125	3375	2750	2125	1375	688	0	0	0	0	0
Phaseout Target of Consumption (tons)			0	319	750	625	625	750	688	688	0	0	0	0
IC for Consumption	57,611		3,810	9,188	7,848	8,044	9,895	9,297	9,529	-	-	-	-	-
Production (tons)	4538	4921	5125	4125	3375	2750	2125	1375	688	0	0	0	0	0
Phaseout Target of Production (tons)			0	1000	750	625	625	750	688	688	0	0	0	0
<i>CTC</i>														
Consumption (tons)	100	100	100	100	100	100	50	0	0	0	0	0	0	0
Phaseout Target of Consumption (tons)			0	0	0	50	50	0	0	0	0	0	0	0
IC for Consumption	1,379		0	0	664	715	0	0	0	0	0	0	0	0
<i>TCA</i>														
Consumption (tons)	6717	7053	7405	7776	8165	7788	7411	6300	5188	4150	3113	2075	1038	0
Phaseout Target of Consumption (tons)			0	0	0	377	377	1112	1112	1038	1038	1038	1038	1038
Production (tons)	1044	1096	1151	1209	1269	1269	1267	1267	922	922	922	922	922	0
Phaseout Target of Production (tons)			0	0	0	63	68	70	419	77	81	85	89	1015
IC for Consumption	32,870		-	-	1,353	1,387	4,197	4,302	4,115	4,218	4,324	4,432	4,542	-
IC for Production	5,635		-	-	-	257	273	227	1,404	233	232	229	222	2,558
SUB-TOTAL	38,505		-	-	1,353	1,644	4,470	4,529	5,519	4,451	4,556	4,661	4,765	2,558
Total Cost	144,796		5,346	19,744	14,800	16,217	20,843	20,213	20,341	8,384	5,616	5,182	5,296	2,814

Of which consumption	91,860		3,810	9,188	9,865	10,146	14,091	13,598	13,644	4,218	4,324	4,432	4,542	-
Of which production of TCA	5,635		-	-	-	257	273	227	1,404	233	232	229	222	2,558
Of which TA	6,000		1,000	1,000	1,000	500	500	500	500	500	500			
Of which Costs for UNDP-commissioned performance & financial audits	550		50	50	50	50	50	50	50	50	50	50	50	0
Of Which Management Costs	10,404		486	1024	1092	1095	1491	1438	1560	500	511	471	481	256
Sub-total	114,449		5,346	11,262	12,007	12,049	16,406	15,813	17,158	5,501	5,616	5,182	5,296	2,814
Of which for CFC-113 Production	27,589		-	7,711	2,539	3,789	4,033	4,000	2,894	2,621	-	-	-	-
Of which management cost for CFC-113 Production	2,759		-	771	254	379	403	400	289	262	-	-	-	-
Sub-total	30,348		-	8,483	2,793	4,168	4,437	4,400	3,183	2,884	-	-	-	-

Annex 2

Incremental Cost at Enterprise Level

Incremental cost analysis for phase-out CFC-113 solvent consumption at large enterprise level

Precision Cleaning Processes

Alternate of Aqueous cleaning Technology (For example: Shanghai Novel CPT Corp. Factory)

One time Expenditure

Description	Value (US\$)
One set in-line aqueous/alkali cleaning system and installation	580,000
One set D.I in-line wash-rinse mask cleaning system and installation	471,000
Trial runs and product losses	29,000
Ventilation modifications	45,000
Shipping, insurance	73,000
Training and technology transfer	10,000
Contingencies, 10 percent	121,000
Total:	1,329,000

Incremental operating costs (or savings)

Item	Pre-project costs (US\$)	Post-project costs (US\$)
73300 Kg CFC-113	146,600	
164400 Kg TCA	197,300	
512000 Kg Alkali, Antirusting agent etc.		281,900
Pre-project total cost (US\$)	343,900	
Post-project total cost (US\$)		281,900

Annual net saving on operating cost: US\$ 62,000

Net Present Value of saving, 4-years: US\$ 196,400

Total project cost and cost effectiveness

Incremental capital costs US\$	132,900
Saving on operating cost (Net Present Value, 4-years) US\$	196,400
Net project investment	849,450
ODP eliminated Kg	73,000
Cost Effectiveness (US\$/Kg)	11.33

Alternate of semi-aqueous cleaning technology (For example: Fujian Putain VIKAY Electronics)

One time Expenditure

Description	Value US\$
One set semi-aqueous batch cleaner and installation	65,000
1 Dryer	15,000
Trail runs and product losses	3,000
Site preparation and modification	8,000
Shipping and Insurance	13,000
Training/Technology transfer/startup	7,000
Acceptance checking of machines including testing samples	5,000
Dry spray application system to replace solvent based LCD	100,000
Subtotal	216,000
Contingency, 10 percent	21,600
Total	237,600

Incremental operating costs (Savings)

Item	Pre-project costs (US\$)	Post-project costs (US\$)
17000 Kg CFC-113	38,250	
2500 Kg semi-aqueous cleaning agent		30,000
Incremental D.I water costs		3,600
Total pre-project costs (US\$)	38,250	
Total post-project cost (US\$)		33,600

Annual saving on operating cost: US\$ 4,650

Total project costs and cost effectiveness

Incremental capital costs US\$	237,600
Incremental operating costs US\$	-4,650
Net project expense US\$	232,950
ODP eliminated Kg	17,600
Cost effectiveness (US\$/Kg)	13.24

Alternate of solvent cleaning (For example: Fujian Putain VIKAY Electronics)

One time Expenditure

NO.	Description	Qty	Impact from MLF US\$
1	Replace of 3 existing CFC-113 vapor cleaners with new units designed for co-solvent use with enhanced cooling, heating and freeboard modifications to minimize emission		270,000.00
2	Startup trial and material losses		7,000.00
3	Site preparation and modification Electrical/piping/mechanical work Ventilation modification Scrap value (old cleaner)		16,000.00
6	Shipping and Insurance		27,000.00
7	Training/Technology transfer/startup		13,000.00
8	Acceptance checking of machines		11,000.00

	including testing samples		
Sub total			344,000.00
	Contingency, 10%		34,400.00
Total			378,400.00

Incremental operating costs (or savings)

Solvent costs per year	Pre-project costs	Post-project costs
50,000Kg CFC-113 (\$2.25/Kg)	112,500.00	
1000Kg co-solvent (\$12/Kg)		12,000
6000Kg HCFC-225 (\$36/Kg)		216,000.00
900 Kg HCFC-225		32,400
Subtotal	112,500.00	260,400

Annual incremental operating costs: US\$ 147,900

Incremental Net Present Value, 4-years: US\$ 468,800

Total project costs and Cost Effectiveness

Incremental capital costs US\$	378,400.00
Incremental operating cost (Net Present Value, 4-years) US\$	468,800
Net project expenses US\$	847,200
ODP eliminated Kg	38,400
Cost Effectiveness US\$/Kg	22.06

Metal parts cleaning process**Alternate of aqueous cleaning technology (For example: Huanshi Dongbei Refrigeration Co.)****One time expenditure**

NO.	Description	Unit	Unit costs (US\$)	Qty	Costs (US\$)
1	Training and engineering				
1.1	Material compatibility, process development, preparation of technology documentation, reliability testing for five new aqueous cleaning processes	wk	200	10	2,000
1.2	International consultant: material compatibility, installation assistance, following-up, etc.	wk	6,000	2	12,000
2	Aqueous cleaning systems				
2.1	Aqueous closed cleaning machine with spraying and ultrasonic including a washing tank, tap water rinsing tank, D.I water rinsing tank, double hot air drying station, D.I water treatment plant and a transport system for machining and assembling shops	Ea	140,000	2	280,000
2.2	Aqueous tunnel washer for assembling shop (conveyer speed: 1.6-1.9m/min, size of shell is 200mm*152mm*220mm)	Ea	45,000	1	45,000
2.3	Installation costs (electrical, piping and compressed air supply, etc.) including installation assistance from the supplier	Ea	5,000	3	15,000

2.4	Dehydration and drying air system with a molecular sieve	Ea	10,000	1	10,000
3	Miscellaneous				
3.1	Waste treatment (additional costs)		2,000	1	2,000
3.2	Shipping and insurance	Set	25,000	1	25,000
3.3	Contingency, 10%				39,100
Total					430,100

Incremental operating costs (or savings)

NO.	Description	Unit	Unit costs (US\$)	Qty	Pre-project costs	Post-project costs
A.	Solvent/media costs per year					
A.1	CFC-113 (3 cleaning machines)	Kg	2.000	32,000	64,000	
A.2	CFC-11	Kg	2.400	12,000	28,800	
A.3	Detergent (3 new machines)	Kg	1.000	8,000		8,000
A.4	Inhibitor	Kg	2.000	2,000		4,000
A.5	Water for two CFC-113 cleaning machines (cooling system) (4m ³ /h, 2 shifts)	m ³	0.100	19,200	1,920	
A.6	Water for three new cleaning machines (5.0L/h for washing tank, 300.0L/h for tap water rinsing tank and 5.0L/h for D.I water tank, 4,464m ³ in 2 shifts)	m ³	0.100	4,464		446
	Sub total				94,720	14,446
B.	Electricity costs per year					
B.1	RS-1 (2 cleaning machines, 2.0kWh, 2 shifts, 300 days)	KW h	0.110	19,200	2,112	
B.2	Transport system for shell cleaning (2.0 kWh, 2shifts)	KW h	0.110	9,600	1,056	
B.3	2 New aqueous cleaning machines for machining and assembling shops (size of tank 680*400*400mm), (16.0kWh*2=32.0kWh, 2shifts)	KW h	0.110	153,600		16,896
B.4	Aqueous tunnel washer for assembling shop (conveyer speed: 1.6-1.9m/min, size of shell 200*152*220mm), (14.0kWh, 2 shifts)	KW h	0.110	67,200		7,392
	Sub total				3,168	24,288
C	Labor					
C.1	Labor costs	W/ m	375	72	27,000	27,000
	Sub total				27,000	27,000
Total					124,888	63,734

Annual saving on operating costs: US\$ 61,154

Total project costs and Cost Effectiveness

Incremental capital costs US\$	430,100
Saving on operating costs US\$	61,154
Net project expense US\$	368,946
Implementing Agency Support Cost, 13%	47,950
Total project costs	416,900
ODP eliminated Kg	25,600
Cost Effectiveness (US\$/Kg)	16.28

Alternate of solvent cleaning (For example: Yuhuan Compressor Factory)**One time Expenditure**

Equipment Item	Qty	Unit costs (US\$)	Total costs (US\$)	Necessary contrib. US \$	Grant from MLF (US\$)
Technology transfer fee: including design, training, trial production, performance test changes	1	500,000	500,000	200,000	300,000
Aluminium injection casting machine for the cylinder head	1	50,000	50,000		
Machining center for aluminum cylinder head	1	80,000	80,000	40,000	
Cleaning machines for piston, bearing cylinder valve plate and connecting rod (ultrasound)	2	140,000	280,000	60,000	220,000
Cleaning machines for crankcase, and crankshaft (jet spray)	1	100,000	100,000	30,000	70,000
Cleaning machines for rotor (ultrasound)	1	140,000	140,000	60,000	80,000
Cleaning machines for stator (ultrasound)	1	140,000	140,000	140,000	0
Cleaning machines for piston pins, screws, bolts, valve leaves, muffler, etc. (ultrasound)	1	140,000	140,000	60,000	80,000
Modification of washing machine for shells	1	30,000	30,000		30,000
Modification of washing machine for stamped parts	1	30,000	30,000		30,000
Modification of assembly line	1	30,000	30,000		30,000
Modification 10 stator coil inlay machines	10	30,000	300,000	300,000	0
Oil charging, purification system with pumps and piping	1	90,000	90,000		90,000
Plastic injection casting machine with necessary dies and tools for the production of plastic mufflers	1	150,000	150,000	100,000	50,000
Modification of tools, fixture, casting moulds		200,000	200,000	100,000	100,000
New dies, tools, gangs and fixtures for machining, stamping, and assembly	1	200,000	200,000	100,000	100,000
Vacuum dehydrator equipment (high dryness)	2	200,000	400,000	394,400	5,600
Modification of calorimeter	1	50,000	50,000		50,000
Modification of noise tester	1	20,000	20,000		20,000
Modification of life test equipment	2	5,000	10,000		10,000
Laboratory equipment for testing oil and refrigerant compatibility, humidity, cleanness, etc.	1	50,000	50,000		50,000
Commissioning/start-up services, engineering and construction work	1	40,000	40,000	16,318	23,682
Total			2,900,000	1,600,718	1,339,282

Incremental operating costs (or savings) US\$

Annual Incremental operating costs: 0

Incremental Net Present Value, 4-years: 0

Total project costs and cost effectiveness

Budget line	Costs (US\$)

11-50 International consultant	19,950
21-00 Subcontract (know-how transfer)	300,000
Training on HCFC-134a compressor manufacturing, 2 technicians)	0
49-00 Equipment	1,039,282
51-0 Miscellaneous	
10% contingency fund on capital cost	105,923
99-99 Subtotal	1,465,155
Implementing Agency Support Cost, 13%	190,470
Total	1,655,625
ODP eliminated Kg	116,600
Cost Effectiveness US\$/Kg	14.27

PCB Cleaning process

Alternate of Organic solvent cleaning technology (Shanghai Sixth Radio Factory)

One time Expenditure

Description	Costs US\$
1 4-sump Precision ultrasonic cleaner, installed (Equip with cooling and fire suppression)	101,000
1 Centrifugal dryer	15,000
Trial runs, and product losses	5,000
Ventilation modification	7,000
Shipping and Insurance	7,000
Training, Technology transfer and startup	15,000
Contingency, 10%	15,000
Total Investment Costs	165,000

Incremental operating costs (or savings)

Descriptions	Pre-project costs US\$	Post-project costs US\$
21500 Kg CFC-113	55,900	
5000 Kg organic solvent		47,500
Total pre-project costs US\$	55,900	
Total post-project costs US\$		47,300

Annual saving on operating costs: US\$ 8,400

Saving on operating costs of Net Present Value, 4-years: US\$ 26,600

Total Project costs and cost effectiveness

Incremental capital costs US\$	165,000
Saving operating costs, 4-year Net present value US\$	26,600
Net project expense US\$	138,400
ODP Eliminated Kg	17,200
Cost effectiveness US\$/Kg	8.05

Incremental cost breakdown for phase-out CFC-113 solvent consumption at medium size enterprise level

Precision cleaning process

Alternate of aqueous cleaning technology (For example: Hunan computer Factory)

One time expenditures

Item	Costs US\$
1 4-sump Precision ultrasonic cleaner, installed	86,500
Dryer	8,000
Trail runs and product losses	5,000
Ventilation modification	7,000
Shipping, insurance and installation	10,000
Training and Technology transfer	10,000
Subtotal	126,500
Contingencies, 10%	8,200
Total	134,700

Incremental operating costs (or savings)

Item	Pre-project costs US\$	Post-project cost US\$
26000 Kg CFC-113	26,000	
Alkali, Antirusting agent etc.		10,000
Extra of water and electricity consumption etc.		10,000
Pre-project costs US\$	26,000	
Post-project costs US\$		2,000

Net saving on operating costs per year: US\$ 6,000

Saving on operating costs, 4-years Net present value: US\$ 19,200

Total project costs and cost effectiveness

Incremental capital costs US\$	134,700
Saving operating costs US\$	6,000
Net project expense US\$	128,700
ODP eliminated Kg	10,500
Cost effectiveness US\$/Kg	12.26

Alternate of semi-aqueous cleaning technology (For example: Shanghai Eighth Radio Factory)

One time expenditures

Item	Costs US\$
1 4-sump Precision ultrasonic cleaners, installed (equip with cooling, walking conveyor with rotating baskets and spray under immersion, including waste water treatment unit at \$25,000 for recycling/purifying rinse water)	105,000
1 Dryers	16,000
Trial runs and product losses	4,000

Re-route conveyors to consolidate flow, ventilation modifications and other site preparation	8,000
Shipping and insurance	3,000
Training and technology transfer	4,000
Subtotal	140,000
Contingencies, 10%	14,000
Total	154,000

Incremental operating costs (or savings)

Item	Pre-project costs US\$	Post-project costs US\$
6000 Kg CFC-113	13,500	
1600 Kg Organic cleaner		15,200
Pre-project total costs US\$	13,500	
Post-project total costs US\$		15,200

Incremental operating costs per year: US\$ 1,700

Incremental operating costs, 4-year Net present value: US\$ 5,400

Total project costs and cost effectiveness

Incremental capital costs US\$	154,000
Incremental operating costs, 4-years Net present value US\$	5,400
Net project expense US\$	159,400
ODP eliminated Kg	4,800
Cost Effectiveness US\$/Kg	33.21

Alternate of solvent cleaning technology (For example: Shanghai Automation Instrumentation Factory)**One time expenditures**

Descriptions	Qty	Impact from MLF US\$
Low emission co-solvent vapor degreasers, with power covers, freeboard chiller, and indexes conveyor	1	90,000.00
Conversion of batch unit to low emission, co-solvent system	1	38,000
Trail runs, and product losses		10,000.00
Ventilation modification		15,000.00
Shipping and insurance		7,000.00
Training/technology transfer/startup		10,000.00
Miscellaneous		20,000.00
Subtotal		190,000.00
Contingencies, 10%		19,000.00
Total		209,000.00

Incremental operating costs (or savings)

Cost of solvent per year	Pre-project costs (US\$)	Post-project costs (US\$)
19,500Kg CFC-113 (\$2.25/Kg)	43,900.00	
3000Kg formulated organic cleaner, etc		27,000
600Kg Co-solvent halogenated (\$36/Kg)		22,000.00
600 Kg Co-solvent-organic		5,400
Subtotal	43,900.00	54,400

Incremental operating costs per year: US\$ 10,500

Incremental operating costs, 4-year Net present value: US\$ 33,300

Total project cost and cost effectiveness

Incremental capital cost US\$	209,000.00
Incremental operating costs (4-year Net present value) US\$	33,300
Net project expense US\$	242,300
ODP Eliminated Kg	10,700
Cost Effectiveness US\$/Kg	22.64

PCB cleaning process**Alternate of aqueous cleaning technology (For example: Shanghai railway communication equipment factory)****One time expenditure**

Item	Costs US\$
1 batch semi-aqueous cleaner	60,000
1 D.I water system	20,000
1 Dryer	9,000
Trail runs and product losses	2,000
Site preparation	7,000
Shipping and insurance	5,000
Training, technology transfer and startup	7,000
Miscellaneous	12,000
Subtotal	122,000
Contingencies, 10%	12,000
Total	134,000

Incremental operating costs (or savings)

Item	Pre-project costs US\$	Post-project costs US\$
7775 Kg CFC-113	22,100	
Water cost		10,000
Extra Power Consumption		2,840
Pre-project costs US\$	22,100	
Post-project costs US\$		12,840

Saving on operating costs per year: US\$ 9,260

Incremental operating savings, 4-year Net present value: US\$ 29,350

Total project costs and cost effectiveness

Incremental capital costs US\$	134,000
Saving operating costs per year US\$	9,260
Net project expense US\$	124,740
ODP Eliminated Kg	7,200
Cost effectiveness US\$/Kg	17.3

Alternate of semi-aqueous cleaning technology (For example: Shanghai computer factory)**One time expenditures**

Item	Costs US\$
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Replace existing ultrasonic tooltronics vapor defluxer with batch semi-aqueous emulsion cleaner and stand-alone dryer	90,000
Scrap out Tooltronics vapor defluxer & inoperative Hollis vapor defluxer	1,000
Ventilation system upgrade	10,000
Trail runs, and product losses	4,000
Shipping and insurance	5,000
Training/Technology transfer/Startup	15,000
Miscellaneous	15,000
Subtotal	140,000
Contingency, 10%	14,000
Total	154,000

Incremental operating costs (or savings)

Item	Pre-project costs US\$	Post-project costs US\$
7775 Kg CFC-113	19,127	
375 Kg semi-aqueous solvent		5,625
Extra Power Consumption		2,840
Pre-project costs US\$	19,127	
Post-project costs US\$		8,465

Saving on operating costs per year: US\$ 10,662

Incremental operating savings, 4-year Net present value: US\$ 33,806

Total project costs and Cost Effectiveness

Incremental capital costs US\$	154,000
Saving operating costs per year US\$	10,662
Net project expense US\$	143,338
Grand of MLF	124,700
ODP Eliminated Kg	6,330
Cost Effectiveness US\$/Kg	19.7

Alternate of organic solvent cleaning technology (For example: Shanghai Sixth Radio Factory)**One time expenditure**

Item	Costs US\$
1 4-sump Precision ultrasonic cleaner, installed (equip with cooling and fire suppression)	90,000
1 Centrifugal dryer	10,000
Ventilation modifications	6,000
Trail runs, and product losses	3,000
Shipping and insurance	6,000
Training/Technology transfer/Startup	10,000
Subtotal	125,000
Contingency, 10%	12,500
Total	137,500

Incremental operating cost (or savings)

Item	Pre-project costs US\$	Post-project costs US\$
15500 Kg CFC-113	40,300	
3500 Kg organic cleaner		33,250
Pre-project costs US\$	40,300	

Post-project costs	US\$		33,250
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Saving on operating costs per year: US\$ 7,050

Incremental operating savings, 4-year Net present value: US\$ 22,350

Total project costs and Cost Effectiveness

Incremental capital costs	US\$	137,500
Saving operating costs per year	US\$	7,050
Net project expense	US\$	130,450
ODP eliminated	Kg	12,500
Cost Effectiveness	US\$/Kg	10.44

Incremental cost analysis for phase-out CFC-113 solvent consumption at small enterprise level

PCB Cleaning Processes

Alternate of Semi-Aqueous cleaning Technology

One time Expenditure

Description	Value (US\$)
1 semi-aqueous batch cleaner	100,000
Startup trials and materials losses	5,000
Training/Technology transfer/Startup	5,000
Electrical, piping & Mechanical work	2,000
Subtotal	112,000
Contingency, 10%	11,200
SUBTOTAL	123,200

Incremental operating costs (or savings)

	Incremental costs	Pre-process costs	Post process costs
Labor costs		6,500	6,500
Energy costs		8,000	2,000
Test costs			2,000
3400kg CFC-113 (2.5/kg)		8,500	
Dupont cleaning agent			5,000
risen, carbon			500
TOTAL PRE-PROJECT COSTS PER YEAR		23,000	
TOTAL POST PROJECT COSTS PER YEAR			16,000
TOTAL ANNUAL INCREMENTAL	-7,000		
NET PRESENT VALUE, 4-YEAR	-24,408		

Total project cost and cost effectiveness

DESCRIPTION OF COST	VALUE(US\$)
CFC-113 CONSUMPTION	2.72 TONS ODP
Incremental (capital) Costs	112,000
Incremental Operating Savings(4 year)	-7,000
Contingency (10%)	11,200
Total Project Cost	98,792
Cost effectiveness	\$36.32/kgODP

SOLVENT SECTOR PLAN FOR ODS PHASEOUT IN CHINA

FIRST BIENNIAL IMPLEMENTATION PROGRAMME

(July 1, 1999 – June 30, 2001)

December 30, 1998

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Solvent Sector Plan

First Biannual Implementation Programme

A. Phaseout Scope and Approach

1. The Solvent Sector Plan uses a phased, performance-based approach as described in detail in the "Solvent Sector Plan For ODS Phaseout in China" to phaseout supply and consumption of CFC-113, CTC and TCA in non-essential cleaning applications. The Solvent Sector Plan also includes development and implementation of an Alternative Technology Support (and delivery) System (ATSS) that will be used to undertake ODS phaseout in small scale solvent users. The scope of the First Biannual Implementation Programme includes:

- i.) Develop the Alternative Technology Support System (ATSS) for all solvents and technologies;
- ii.) Undertake and complete ODS Reduction Contracts with about 20 large and medium sized enterprises to eliminate consumption of 1,375 tons (in which 681 tons from ongoing approved projects) CFC-113;
- iii.) Undertake and complete ODS Reduction Contracts for reduced production of 1,375 tons CFC-113;
- iv.) Undertake technical assistance activities described in Table 2; and
- v.) Undertake policy actions described in Table 2.

B. Actions and Proposed Funding

2. Solvent consumption phaseout requires implementation of investment projects at the enterprise level, with, on average, a one year lag between local funding approval at enterprise level and commissioning of non-ODS technology system. Thus, this First Biannual Implementation Programme covers funding for two years, with the first ODS phaseout results being achieved in the second year. Implementation of production reductions (and/or closures) will be phased in to match the decrease in ODS consumption for a given year. Activities and proposed funding for the First Biannual Implementation Programme are summarized below in Table 1 and shown, respectively, for each 12 month period. Details are given in Table 2. Performance indicators are shown in Table 3.

Table 1 Activities and Proposed Funding (US\$1,000)

Enterprise Level Actions	July 1, 1999 – June 30, 2001
ODS Consumption Reduction Contracts estimated 5-10 Large users of CFC-113 and estimated 5-10 Medium users of CFC-113	1381 tons ¹
Costs for Consumption Phaseout	\$16,922
Technical Assistance (including ATSS) and Policy Actions	\$2,000
Costs for UNDP-commissioned performance & financial audits (\$50,000 per year)	\$100
Management Costs ²	\$2,056
ODS Production Quota Reduction Contract ³ (CFC-113)	1,375 tons
Cost for Production Phaseout	\$8,981
Management Costs for Production Phaseout	\$898
<i>Total Proposed Funding</i>	<i>\$30,957</i>
<i>In which Consumption and Management Costs</i>	<i>\$21,078</i>
<i>In Which Cost for CFC-113 Production Phaseout and Management Costs</i>	<i>\$9,879</i>

3. China is applying for US\$ 30.96 million from the Multilateral Fund as proposed in the overall Solvent Sector Plan to implement the First Biannual Implementation Programme. Of the total, US\$9.88 million represents CFC-113 production closure costs and related 10% management costs. It is expected that the two year funding request will be approved in full with payments to UNDP in four separate payments:

- 1st payment for first 6-month expenditures - shortly after ExCom approval;
- 2nd payment for second 6-month expenditures – 6months after ExCom approval.

¹ About 700 tons of consumption will be completed in the second 12-month period. The national consumption reduction is the same as production reduction. It is 1,375 tons, in which 681 tons will be phased out by on going approved projects.

² Calculated at 10% of compensation phaseout cost, TA cost and production closure costs for TCA.

³ Incremental cost for CFC-113 closure is included in the CFC Production Sector Plan. This cost is included here as an option in case CFC Production Sector Plan is not approved before or at the same time as the Solvent Sector Plan.

- 3rd payment for the third 6-month expenditures – 12 months after ExCom approval;
- 4th payment for the fourth 6-month expenditures – 18 months after ExCom approval. The second, third and fourth payments would require no further documentation to trigger release of fund from MLF.

4. At conclusion of the First Biannual Implementation Programme, China will have reduced CFC-113 production and consumption to 4,125 tons (from baseline of 5,125 tons in 1999) during the period July 1, 2000 to June 30, 2001.

C. Enterprise Level Actions

5. Enterprise level activities focus on identifying, funding and implementing about 20 large and medium sized projects during 1999-2000, plus identifying investment projects that would be funded in the Second Implementation Programme. Project identification will be carried out in several ways. UNDP will take an active supporting role in identification/development of phaseout projects, but the principal focus will be on use of local resources including PMO, DIA, MII, technical institutions and local consultants. Promotional work will include informing dealers, equipment manufacturers, provincial level industrial bureaus and use of media outlets. The projects to be implemented would represent sufficient CFC-113 production and consumption phaseout amounts to meet the agreed phaseout targets in the Implementation Programme. The number of ODS Reduction Contracts is estimated to be about 20, including large and medium solvent users. No small scale users will be targeted in this First Biannual Implementation Programme.

D. Policy Actions

6. The following policies will be promulgated to support implementation of the First Implementation Programme and the overall Solvent Sector Plan:

- (a) *Bidding* -- A bidding system for consumption phaseout will be implemented following approval of this Implementation Programme. Preparatory work has been underway since early 1998. Recipient enterprises will be determined through a bidding procedure administrated by DIA/PMO. The lowest bidders will be awarded grant funds after bid evaluation. (Unsuccessful bidders would be eligible to participate in the future bidding.) PMO will sign ODS Reduction Contracts with the winning enterprises.
- (b) *Tradable production quota* -- A regulation on a tradable production quota will be implemented following approval of Implementation Programme. A draft regulation will be prepared and reviewed by UNDP. The production quota will cap solvent production at the national level and violators will be severely

penalized. This is the key policy instrument for accomplishing the phaseout objective. The Government can promote ODS phaseout by buying quotas from them. It will also offer ODS solvent producers flexibility as the regulation will allow producers to trade their quota among themselves. This would induce enterprises to participate actively in the implementation process of the solvent phaseout plan.

(c) *Banning newly-built equipment which produces or uses ODS:*

On Nov. 11, 1997, SEPA and others ministries promulgated “The Notice on banning newly-built enterprises which produce or use ODS”. To implement the Notice SEPA will disseminate details of the Notice to all prospective consumers through various channels (news media, bulletin, propaganda.)

The Notice established that --

- Newly-built enterprises which produce or use ODS are prohibited;
 - Enterprises that do not have an ODS production license now are not permitted to produce ODS solvent; and
 - Local electronic bureaus and environmental protection bureaus will jointly inspect consumers on a regular basis. If any consumer uses ODS solvent illegally after declaration of the Notice, the consumer will be penalized.
- (d) Phaseout for enterprises ineligible under MLF guidelines with respect to foreign ownership or export share of output should phaseout ODS solvent by their own resources and on a schedule consistent with the overall solvent phaseout schedule.
- (e) Controlling supply and use of ODS solvent - The following regulation will be implemented to control supply and use of solvent:
- (i) Imports: after January 1, 2000, CFC-113 import will be forbidden;
 - (ii) Export management: export declaration system will be applied to ODS solvent export, to control and regulate ODS solvent production and consumption as a whole;
 - (iii) Ban on use of new solvent with higher ODP: after January 1, 2000 solvent users will not be permitted to switch to different solvent with higher ODP.
- (f) Establishment of standards and technical norms - These standards are described below and in Table 2.

E. Technical assistance (TA) activities

7. TA activities will concentrate on:

- (i) Strengthening the overall institutional framework;
- (ii) Strengthening management, monitoring and evaluation capabilities of participating institutions;
- (iii) Training enterprise managers, technical personnel and decision makers at various levels;
- (iv) Developing the Alternative Technology Support System.
- (v) Developing the voucher system for small scale solvent users .

8. All terms of references and work schedule will be agreed with UNDP prior to initiating work.

9. Main TA activities include:

- (a) *Development of a Management Information System (MIS) for ODS solvent phaseout in the solvent sector* - The MIS is an important tool in management and supervision of all phaseout activities. It is used to monitor performance in the solvent phaseout and to generate progress reports on implementation of the solvent sector plan required by ExCom and UNDP. An information management center will be established in PMO with sub-station in MII.
- (b) *Study on managing imports and exports of ODS* - China's CFC-113 production is substantially sufficient to meet domestic demand and thus China imports very small quantity of CFC-113. But TCA production in China is small and imported amount is large. Both CTC production and imports are large (primarily for raw material use), as CFC production is reduced, management of CTC supply will become critical in ensuring CTC uses as solvent does not increase. Monitoring of TCA imports will become increasingly important to achieve the phaseout targets. This study will look comprehensively at China's solvent import and export regime and design feasible policy, regulations and procedures for improved management of solvent trade that could be implemented at the earliest possible date.
- (c) *Training of personnel involved in implementation of phaseout activities* - It is necessary to provide training for: 1) environmental staff and decision makers to increase their recognition and management capacity, 2) industrial managers and technicians to enhance their understanding of alternative technology and to master

how to use it, 3) ODS dealers to deliver information on update alternative non-ODS solvent technology to their users, especially for SME. Training is needed to prepare enterprises to bid in the following year, to supervise solvent production and consumption, to manage and monitor ODS import and export, and to learn operating procedures in the solvent sector phaseout approach. This type of training will need to be repeated every year in the first few years of implementation.

(d) *Establishment of standards and technical norms:*

- 1). Production safety regulations on using flammable substances as solvent;
- 2). Environmental regulations on using toxic substances as solvents;
- 3). Related environmental regulations on solvents without ODS;
- 4). Technology identification of solvent without ODS;
- 5). Standards for quality identification of solvents without ODS.

(e) *Preparation for the development of a solvent management plan* - The Solvent Sector Plan lays out principles for establishment of a solvent management plan. This represents only the first stage of development to initiate all preparatory work. Issues and activities are highlighted below:

- (i) Rapid phaseout of ODS solvent production in China will cause demand after 2000 to be covered increasingly by substitutes. This makes it imperative that preparation work for the development of ODS substitutes to start in 1999. Preparation of the plan will draw on experiences from developed countries.
- (ii) Determine essential and necessary usage in the solvent sector.

(f) *Developing Alternative Technology Support System* - The two technical support centers, one in Shanghai funded by Sweden Government and one in Tianjin funded by MLF, will provide services such as technical consulting and support. Several equipment suppliers will be identified and pre-qualified to supply required small scale equipment at affordable prices and with suitable technology. The support system also includes development of a promotion and delivery system to reach the many small solvent users.

(g) *Developing Voucher System for small scale solvent users* - A voucher system will be used to identify and pre-qualify eligible small scale users and to provide a mechanism for implementing and funding eligible phaseout activities through the ATSS. PMO/DIA will manage and monitor the ATSS and voucher system.

Operational details of the voucher system will be develop and agreed with UNDP during the First Biannual Implementation Programme.

10. The above policy initiatives, enterprise-level and technical assistance activities are summarized in Table 2 below.

Table 2 Implementation Programme (July 1,1999 – June 30, 2001)

SOLVENT PHASEOUT TARGETS & ACTIVITIES						
	MLF \$ million Requested	Start of programme (MT)	Reduction Target (MT)	End of programme (MT)	Key Actions Required	Key Dates
CFC-113 Production phase-out target		5,125	1,375	3,750	Reduction of output of CFC-113 producers	July 1 2000.- June 30, 2001
o.w. Export			0			
Domestic consumption			3,750			
Consumption phaseout target			1,375 ⁴ reduction		Conversion of ODS solvent enterprises to non-ODS solvent	July 1, 1999 - June 30, 2001
Policy Initiatives						
1. Bidding System					1. Establish bidding system operating procedures; 2 Determine winning enterprises 3 Sign ODS reduction contracts with winners; 4 Implement ODS reduction contracts. 5. Train enterprises for bid preparation	1.System in place by July 1, 1999 2. Before July 1, 1999 for 1 st year contracts 3. By July, 2000 for 2 nd year contracts 4. According to each contract

⁴ In which 681 tons ODP will be phaseout with on going projects.

2. Tradable production quota for ODS producers					Set up total amount of ODS solvent annual production quota ; Issue annual production quota to ODS solvent producers for 2000	System in place by July 1, 1999
3. Notice on banning newly-built enterprises which produce or use ODS					<ul style="list-style-type: none"> . Promotional campaign, through various channels; . Joint supervision of Notice by local Electronic Bureaus and EPBs. 	
4. Notice: Foreign enterprises should phaseout ODS solvent by own resources.					Monitor consumption under MIS	From 2000 onwards
5. Controlling import and export of ODS solvent					<ol style="list-style-type: none"> 1. Ban on CFC-113 import; 2. Export management. 	By January 1, 2000
6. Establishment of standards and technical norms					<ol style="list-style-type: none"> 1. Regulations on using flammable substances as solvents; 2. Environmental regulations on using toxic substances as solvents. 	From July 1999 to June 2001

Enterprise-level Activities						
	Estimated MLF \$ million. Requested	Number of enterprise	Number of enterprise targeted	Number of enterprises remaining at end of period	Key Actions Required	Key Dates
1. Reduction of CFC-113 Production	8.981	1	1	0	Negotiate ODS Reduction Contract	<ol style="list-style-type: none"> 1. Contracts signed by January.,2000 2. Completed no later than June 2000
2. Conversion of ODS consumers	16.922	~200	~20	~180	Sign ODS reduction contract (20)	<ol style="list-style-type: none"> 1. Bid winners and contracts signed by July 1999 2. Completed in about 12 months
Subtotal	25.903					
TECHNICAL ASSISTANCE ACTIVITIES						
ACTIVITIES	MLF funding requested (US\$'000)	Actions Required			Key Dates	
1. MIS development	200	MIS center will be located in PMO, with substations in MII and in the MOF			<ol style="list-style-type: none"> 1. Started preparatory work in mid-1998. 2. Start operational in July 1999 3. Need further Improvements During 1999 and 2000. 	
2. Import & Export Management Study	200	Investigate ODS solvent import and export situation and develop feasible options for improved management			<ol style="list-style-type: none"> 1. Contract signed by July 1, 1999. 2. Complete report in 2000. 	

3. Training	700	Training on supervision of ODS solvent production and consumption, the management of ODS solvent production quota system, and operating manual as well.	1. Start in early 1999 for the bidding of 1999.
4. Developing Alternative Technology Support System (ATSS)	200		Quarterly payment during July 1, 1999 – June 30, 2001
5. Establishment of standards and technical norms	700	by qualified institution	1. Contract to be signed by July 1, 1999 2. To be completed in 24 - 36 months
Subtotal	2,000		
AUDIT ACTIVITIES AND MANAGEMENT COSTS			
ACTIVITIES	MLF funding requested (US\$ 1,000)	Actions Required	Key Dates
1. Financial Audit and Performance Audit	\$100	UNDP to commission independent audits according to UNDP guidelines.	Audit on annual basis. Completed within 6 months of each year end.
2a. Management cost for UNDP and Domestic Implementation	\$2,056		Quarterly payment during July 1, 1999 – June 30, 2001
2b. Management costs for CFC-113 production phaseout	\$898		
Subtotal	\$3,054		
TOTAL for phaseout activities	\$30,957		

Table 3 Implementation Programme (July 1999-June 2000) Proposed Performance Indicators

Solvent Phaseout Targets				
Solvent sub-sector	Start of program (MT)	Reduction Target (MT)	End of program (MT)	Indicators to be reported on in semi-annual progress reports
CFC-113 Production phaseout target	5125	500	4625	<ul style="list-style-type: none"> • Production levels (national aggregate)
Of which Export		0		<ul style="list-style-type: none"> • Exports and imports (national aggregate)
Domestic consumption	5125		4625	
Consumption Phaseout target		500		<ul style="list-style-type: none"> • Consumption levels (production plus imports minus exports)
Number of ODS Reduction Contracts	Large (5-10) Medium (10-20) Small (0)			
Policy Initiatives				
Initiatives				Indicators to be reported on in semi-annual progress reports
1. Bidding system				<ul style="list-style-type: none"> • Bidding system's operating procedures finalized • Winning enterprises for 1999-2000 selected • Enterprises trained for bid preparation for 2000-2001 bidding

2. Tradable production quota for ODS producers				<ul style="list-style-type: none"> • Production quota regulation promulgated and effected; • Annual production quota to ODS solvent producers for 1999-2000 issued • Production reports from enterprises received
3. Notice on banning newly-built enterprise which produces or uses ODS solvent				<ul style="list-style-type: none"> • Promotional campaigns on the ban; • Local Electronic Bureaus and EPB engaged in overseeing ban enforcement.
4. Developing ATSS				
5. Establishment of standards and technical norms.				