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Executive Committee of
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Implementation of the Montreal Protocol

Eighth Meeting
Montreal, 19-21 October 1992

UNDP PROGRESS REPORT

**EXECUTIVE COMMITTEE OF THE INTERIM MULTILATERAL FUND
FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL**

(Eighth Meeting, 19 - 21 October 1992)

**PROGRESS REPORT
OF THE
UNITED NATIONS DEVELOPMENT PROGRAMME**

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A. COUNTRY ACTIVITIES

Argentina

UNDP technical assistance will be associated with the country programme formulation exercise that will be initiated through the World Bank.

Bangladesh

The Government has identified a national consulting firm "Planning and Development Services Limited", headed by Dr. Fasih Uddin Mahtab to prepare the ODS Reconnaissance Study and the Country Programme. UNDP is awaiting Government's submission of final budget estimates so that approval can be given and work started. One problem is that the national consulting firm is requesting much more money than allocated. It is expected that the country programme would be ready for submission to the Tenth Meeting of the Executive Committee. UNDP has arranged for two government officials to attend the 1992 International CFC and Halon Alternatives Conference (29 September - 1 October 1992, Washington, D.C.) and have follow-up discussions with implementing agencies on their work programmes.

China

Following the First National Workshop on the Country Programme held in Beijing during 1-4 June 1992, the Second National Workshop, chaired by the Deputy Administrator of NEPA, Vice-Minister Wang Yangzu, was held during 17 - 20 August 1992, in Beijing. UNDP as lead agency, and with World Bank participation, helped China's National Environment Protection Agency (NEPA) review several chapters of the country programme. Twelve Ministries/Commissions, divided into 8 subsector working groups, participated in the Workshop together with 8 international and over 20 national experts. China will present its country programme to the Ninth Meeting of the Executive Committee following conclusion of the Ministry and State Council approval processes. In the interim, NEPA has requested UNDP to include, as an annex to its Progress Report to the Eighth Meeting, a summary of the key highlights of the country programme for the information of the Executive Committee. UNDP has also started project implementation for the two solvents demonstration projects approved by the Executive Committee at its Seventh Meeting, i.e. Dalian Precision Parts Cleaning Line and Dandong Electronic Tuner Cleaning Line.

UNDP has arranged for six Chinese nationals (one from the government, four from industries and one from a university) to attend the 1992 CFC and Halon Alternatives Conference (29 September - 1 October 1992, Washington, D.C.), and have follow-up discussions with implementing agencies on their country programmes. Following the conference, the six Chinese participants would go on study tours/plant visits within the United States, from 2 - 6 October 1992. Members of the group will visit aerosol, foam and solvents facilities in Delaware, Pennsylvania, Kentucky, Ohio, Texas and California. Two of the six participants were funded by the Multilateral Fund, and the remaining four by UNDP under project CPR/89/029; Ozone Layer Protection in China.

Costa Rica

Following the completion of the ODS reconnaissance study in July 1992 by the national consulting firm, CEMSO, S.A., a regional consultant and CEMSO assisted the Government of Costa Rica prepare their country programme to phase-out ODS. The report was completed in August 1992 and is being reviewed by the Government. Following approval, it will be presented to the Ninth Meeting of the Executive Committee.

Ecuador

UNDP has started implementation of its approved work programme which comprises training of personnel for capacity strengthening, both in the public and private sector (including NGOs), and manufacturers/distributors/users, in the application of technical measures to phaseout ODS. It covers the aerosols, foams, solvents and refrigeration sectors. The project is, at the request of the Government, being nationally executed. The UNDP Office in Quito is closely coordinating with the World Bank official working on Ecuador.

Egypt

A UNDP-led investment project formulation mission was completed during 20 -31 July 1992 in which a group of international experts worked with the Egyptian Environmental Affairs Agency and local industry to prepare six investment projects, five in foams and one in refrigeration. USEPA participated in the project formulation mission. Five of these projects (four in foams, one in refrigeration) will be included in the first tranche of priority projects listed in Egypt's country programme to phaseout ODS which will be presented by Egypt at the Eighth Meeting of the Executive Committee.

Ghana

An agreement has been reached with the Canadian Government to utilize training materials developed in Canada for a refrigeration sector demonstration programme which will show correct servicing procedures for refrigeration and air-conditioning service technicians. Ghana is to determine the feasibility of establishing a regional center for replicating this type of training. The project should start in October 1992. UNDP has arranged for two government officials, both from the Environmental Protection Council, to attend the 1992 CFC and Halon Alternatives Conference (29 September -1 October 1992, Washington, D.C.) and have follow-up discussions with implementing agencies on their work programmes in Ghana.

Iran

The UNDP consultant's second country programme formulation mission took place during 16 - 21 August 1992. The Department of Environment staff, with the assistance of a national expert, had put together detailed project proposals for incorporation in the country programme. The UNDP consultant reviewed these project proposals and also reviewed other

aspects of the country programme. The draft country programme has been completed and is awaiting Government approval prior to submission to the Executive Committee. It will be presented either to the Eighth or Ninth Meeting of the Executive Committee. UNDP has arranged for two government officials, one from the Ministry of Foreign Affairs and another from the Environmental Protection Organization, to attend the 1992 International CFC and Halon Alternatives Conference (29 September - 1 October 1992, Washington, D.C.) and have follow-up discussions with implementing agencies on Iran's proposed work programme.

Jordan

Under section 9 of its 1992 work programme, UNDP is finalizing details for a technical study tour in October 1992 to visit aerosol plants in Egypt and to receive assistance in the design and application of a deodorization process for liquid petroleum gas for use as a propellant in place of CFCs. UNDP has arranged for two government officials, one from the Jordan Meteorological Department and the other from Department of Environment, Division of Air Pollution, to attend the 1992 International CFC and Halon Alternatives Conference (29 September - 1 October 1992, Washington, D.C.), and have discussions with implementing agencies on follow-up projects and activities in Jordan.

Kenya

Activities in Kenya had not yet started as of early September. UNDP has arranged for two government officials, one from the Ministry of Environment and Natural Resources and the other from the Ministry of Industry, to attend the 1992 International CFC and Halon Alternatives Conference (29 September - 1 October 1992, Washington, D.C.) and have follow-up discussions with UNDP on starting its work programme in Kenya.

Mexico

A project specification consultant, is assisting the Government of Mexico specify the detailed terms of reference for 11 projects identified in the country programme for Mexico. The assessment which started in late July is for a duration of 5 months. The report for each project will contain a description of the industry/plant including a summary of plant installation and equipment, description of processes utilized; level of production/consumption of ODS; ODS phaseout technology utilized and links; estimate of ODS to be phased-out and cost for phasing out aggregated by equipment, engineering, training requirements, land cost and proposed expenditure schedule; timing of phaseout and specification of non-financial needs.

UNDP co-sponsored with SEDUE (Secretaria de Desarrollo Urbano y Ecologia), Government of Mexico and the US Environment Protection Agency, a two-day training workshop (27-28 July 1992) in Mexico City, on centrifugal chillers. The workshop consisted of practical training on refrigerant handling and storage (demonstration and training); refrigerant conservation (compressors, installation and servicing); and refrigerant storage options and safety. Of ten Latin American countries invited to participate, four attended (Argentina, Brazil,

Uruguay and Venezuela). USEPA has indicated the desire of developing country participants, particularly representatives from the Ministry of Light Industry in China, of replicating the Refrigerant Containment and Conversion Workshop in their countries, with the possibility of conducting a leak detection training workshop.

Nigeria

A two-day National Seminar on Industry and Protection of the Ozone Layer for 40 industrialists will be held in Lagos Nigeria, during 5 - 7 October 1992. This activity is part of UNDP's work programme in Nigeria. The main objective of the seminar is to raise awareness among industries of the importance of the ODS issue and to strengthen institutional capacity. UNDP has arranged for two government officials, both from the Federal Environmental Protection Agency, to attend the 1992 International CFC and Halons Alternative Conference (29 September - 1 October 1992, Washington, D.C.) and to discuss with implementing agencies Nigeria's technical assistance and investment needs in this area.

Philippines

Ongoing training in the refrigeration sector is being handled by Likhaan Foundation (NGO). One workshop and three training courses have been conducted. The workshop involving 37 participants was held from 12 - 14 August and generated policy recommendations at various levels. It also resulted in the formulation of a multi-sectoral organization to work on Montreal Protocol issues. The workshop also identified local technology options for ODS recycling and substitution. The first training course held in Baguio City had 28 participants, the second one held in Manila had 29 participants and the third one with about 30 participants was held in Cebu City. The training courses generated strong interest among small-scale production, installation and repair service firms. The importance of taking into account consumer concerns was highlighted during the training. Inputs drawn from the training in which consumer protection groups also attended will be helpful in country programme formulation. A request for technical assistance for country programme formulation will be presented separately in an amendment to UNDP'S Work Programme.

Sri Lanka

All arrangements for the ODS reconnaissance study and country programme formulation have been finalized. The Government is using a national consulting firm, M/s Colombo Commercial Company, Ltd., with Dr. P.A. Ratnasiri as team leader and assisted by 4 national experts. We are awaiting final Government clearance from both the Ministry of Environment and the Ministry of Industry and the Government has yet to decide which of the two Ministries would be the lead agency for country programme preparation. UNDP has arranged for two participants (from industry) to attend the 1992 International CFC and Halon Alternatives Conference (29 September - 1 October 1992, Washington, D.C.) and to have discussions with implementing agencies on Sri Lanka's general technical assistance and investment needs in this area.

Thailand

One junior national coordinator recruited under UNDP assistance is continuing to assist the Government in coordination of ozone layer protection activities in Thailand. Other activities are ongoing. In addition, the Government has requested UNDP technical assistance in three areas, which will be presented separately in the amendment to UNDP's Work Programme. UNDP has arranged for two government officials, both from the Ministry of Industry, to attend the 1992 International CFC and Halon Alternatives Conference (29 September - 1 October 1992, Washington, D.C.) and have follow-up discussions with implementing agencies on their work programmes in Thailand.

Trinidad and Tobago

It has just been brought to our attention that correspondence from the Government was mistakenly sent to UNEP Regional Office in Latin America. We are accordingly following up with the Government to initiate the process of country programme formulation.

Turkey

UNDP has arranged for one government official from the Ministry of Environment to attend the 1992 International CFC and Halon Alternatives Conference (29 September - 1 October 1992, Washington, D.C.) and discuss implementing agency work programmes in Turkey.

Uruguay

A UNDP consultant mission will take place in October 1992. UNDP has also arranged for two government nominated participants, both from Universidad de la Republica, to attend the 1992 International CFC and Halon Alternatives Conference (29 September - 1 October 1992, Washington, D.C.) and discuss with implementing agencies technical assistance and other requirements.

Venezuela

UNDP has arranged for three participants, two from the government and one from industry (refrigeration) to attend the 1992 International CFC and Halon Alternatives Conference (29 September - 1 October 1992, Washington, D.C.).

B. OTHER ACTIVITIES

UNDP has identified the following sector experts and is finalizing retainer contractual arrangements with each of them: (a) Aerosols: Mr. Geno Nardini; (b) Foams : Mr. Bert Veenendaal; and (c) Halons: Mr. Erik Pedersen. For solvents, Mr. Clinton Norris is also serving as UNDP's sector expert. In the area of refrigeration and MAC, several experts are being utilized at the present time.

UNDP is processing the acquisition of the 40 portable halon recycling machines. Delivery is expected in November 1992.

In addition to overall programme monitoring and project backstopping, UNDP headquarters staff undertook the following activities during July-October 1992:

- a) During 20-31 July in Cairo, Messrs. Pinto and Norris participated in a UNDP investment project formulation mission to Egypt to assist the Government finalize preparation of six investment projects. Five of these projects are being presented to the Eighth Meeting of the Executive Committee. International refrigeration and foam experts as well as an USEPA representative participated in the mission.
- b) During 17-20 August in Beijing, Messrs. Pinto and Norris represented UNDP as lead agency and substantively participated in and contributed to China's second national workshop for the preparation of its country programme under the Montreal Protocol. Following the workshop, Messrs. Pinto and Norris spent one week assisting the Government in technical discussions and in revising the executive summary of the country programme.
- c) During 27-28 August in New Delhi, Mr. Pinto met with Government of India officials in New Delhi for discussions on potential UNDP activities in India under the Protocol. The Government of India requested UNDP assistance and funding requests for India are included in UNDP's amendment to its 1992 work programme.
- d) During 3-4 September in Washington, D.C., Messrs. Pinto and Norris represented UNDP and substantively participated at the Executive Committee's Subcommittee meeting on procedures to accelerate project implementation.
- e) On 14 September in Geneva, Mr. Pinto represented UNDP and participated at the Fourth Meeting of the Implementation Committee of the Parties to the Protocol.
- f) On 28 September in Washington, D.C., Messrs. Pinto and Norris will represent UNDP and substantively participate at the World Bank's OORG (Ozone Operations Resource Group) meeting.
- g) During 29 September - 1 October in Washington, D.C., Messrs. Pinto and Norris will represent UNDP and substantively participate at the 1992 International CFC and Halon Alternatives Conference. Mr. Pinto will speak at the two sessions (World Business Opportunities, Halons Recycling) and Mr. Norris will speak at one session (Refrigeration). Discussions will also be held with the several developing country participants on work programme implementation.
- h) During 19-21 October in Montreal, Messrs. Gomez-Echeverri, Pinto and Norris will represent UNDP and substantively participate at the Eighth Meeting of the Executive Committee.

UNDP Progress Report
on the
Preparation of the China Country Programme
for the Phaseout of Ozone-Depleting Substances
Under the Montreal Protocol

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* Included at the request of the National Environmental Protection Agency (NEPA) to the Eighth Meeting of the Executing Committee of the Interim Multilateral Fund so as to highlight key features of ongoing work on the China Country Programme.

1. INTRODUCTION

1.1 Objective of the Country Programme

China qualifies as a Party operating under Paragraph 1 of Article 5 of the Montreal Protocol, having ratified the Vienna Convention in September 1989 and the Montreal Protocol in June 1991. China is drafting its Country Programme (CP) in accordance with Protocol guidelines. This will enable China to adopt completely and effectively the control measures enumerated under the Protocol and to qualify for technical assistance and funding provided by the Interim Multilateral Fund of the Protocol.

The detailed China CP, when presented to the Ninth Meeting of the Executive Committee of the Interim Multilateral Fund, will demonstrate the process of implementation of a basic national policy for environmental protection and the Government's determination to implement provisions of the Protocol despite the difficult and complex economic and technical factors that China will face in programme implementation.

The process being followed by the Government of China in CP development is as follows:

- a) the first action comprises a detailed statistical compilation and evaluation of ODS production and consumption by sector as well as future trends and consequent ODS consumption implications nationwide;
- b) the second stage comprises sectoral appraisals of ODS substitutes and associated technologies, their effectiveness, and their applicability to China.
- c) the third stage comprises development of a comprehensive and effective action plan for ODS phaseout, with projects specified and prioritized by sector. Projects have been costed to reflect total costs as well as the incremental cost component that would be requested from the Interim Multilateral Fund.
- d) the fourth stage comprises development of a set of policies and required institutional framework that the Government of China considers are needed to support, direct and supervise the action plan so as to fully operationalize the CP.

The CP will contain a detailed statistical analysis of current ODS production and consumption by sector and end-use, a scientific appraisal of ODS trends and the status of ODS substitutes and related technologies in China, and an effective action plan for ODS phaseout in China by year 2010. The detailed CP will evaluate total and net incremental costs for each project. Investment projects will be divided

into categories based on priorities for financial assistance from the Interim Multilateral Fund.

The detailed CP will also elaborate policies and the corresponding institutional framework for ozone layer protection in China. This framework will support, direct and supervise project and programme implementation as well as evaluate action plan results.

1.2 Drafting Status of the Country Programme

The Government has established a Leading Group for Ozone Layer Protection whose responsibilities include CP development, and design and implementation of Montreal Protocol work programmes. The leading Group is headed by the National Environmental Protection Agency (NEPA) and comprises 12 Ministries and Commissions, which are further subdivided into eight technical subsector Working Groups.

The first draft CP was prepared by the Government during May-June 1992, based on the reports of the eight Working Groups and thirty national experts. Overall analytical support and coordination was provided by the Center for Environmental Sciences, Peking University.

The first national CP workshop was held in Beijing during 1-4 June 1992 at which there were approximately 50 participants including over 20 national experts and several international experts. All Leading Group members were represented and all Working Groups made presentations. UNDP (as lead agency), the World Bank and the Fund Secretariat also participated. Sectoral ODS production and consumption forecasts to 2005, and in some cases 2010, were presented.

The first draft CP relied on the following information:

- a) Study on the countermeasures for the control of ODS, internal report, Government of China, 1989.
- b) Preliminary report on the status of ODS in China, report of a UNDP mission, December 1989.
- c) Report on ODS use in China and a 3-year programme to reduce ODS production and consumption, report of a UNDP mission, May 1990.
- d) Preliminary report (February 1992) and final report (June 1992) of the 9-member UNDP mission (with financial assistance from Finland) that during November-December 1991 helped the Government of China formulate investment programme feasibility studies to phaseout ODS in the various sectors.

During June-July 1992, the Working Groups refined their analysis and several follow-up workshops were organized by NEPA. At the meeting convened by NEPA during 7-8 July, the Center for Environmental Sciences of Peking

University made a presentation on a national policy framework to the Leading Group on Ozone Layer Protection. A result of this meeting was a consensus on nine major policy framework areas which will be enumerated in section 2.4 of this progress report. By early-August 1992, the Leading Group had before it a draft CP in Chinese as well as an executive summary in English.

The second CP workshop was held during 17-20 August in Beijing. Sectoral Working Groups made presentations containing more detailed analysis up to the year 2010. The executive summary was discussed. The selection of the various projects were reviewed, their justification and cost-effectiveness analyzed, and financial analysis discussed. The framework for CP presentation to the Executive Committee was also agreed upon.

Since the State Council of China decided on 19 August that each concerned Ministry/Commission would have to clear the Country Programme prior to its being approved by the State Council, final approval is expected in time for CP presentation to the Ninth Meeting of the Executive Committee. In order, however, to keep the Executive Committee informed of CP development and to serve as a necessary background to investment project approval, UNDP as lead agency was requested by NEPA to include in its Progress Report to the Eight Meeting of the Executive Committee, an Annex containing the highlights of China's CP.

1.3 Costs of Drafting the Country Programme

The Government of China has estimated the total cost of developing and drafting the country programme at US \$400,000 comprising:

- a) Working Group and drafting group expenses including the costs of national experts (\$250,000)
- b) Organizational, administrative and other costs borne by NEPA (\$80,000)
- c) Costs of international experts (\$70,000).

One-half of the total cost (i.e. \$200,000) of CP development has been funded by the Interim Multilateral Fund through UNDP (lead agency) which includes all the costs for international experts. The remaining \$200,000 equivalent has been met by the Government of China and other related national entities.

The above costs exclude the funding provided under UNDP Project CPR/89/029: Ozone Layer Protection in China, which during 1989-92 has amounted to \$727,580, of which \$419,000 was contributed by UNDP and \$308,580 by the Government of Finland.

2. ODS SITUATION IN CHINA

2.1 ODS Production and Consumption in China in 1991

There are twenty controlled substances under the Protocol of which the following seven are produced and used in China:

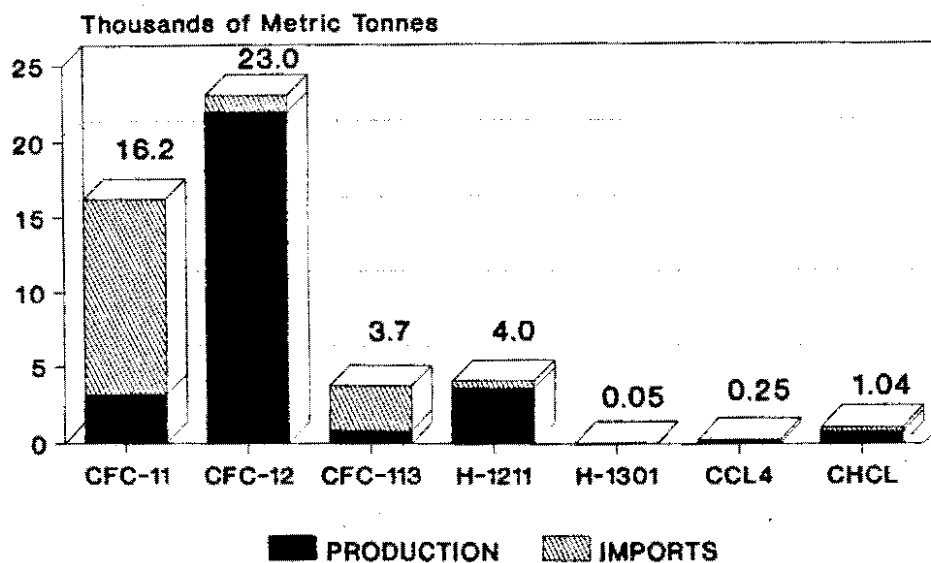
Group I : CFC-11, CFC-12, CFC-113 Group III: Carbon Tetrachloride (CCl₄)

Group II : Halon-1211, Halon-1301 Group IV: Methyl chloroform (C₂H₃Cl₃)

Table I
ODS/ODP Production, Consumption and Imports IN 1991
(Metric tonnes)

ODS	CFC-11	CFC-12	CFC-113	H-1211	H-1301	CCL4	C ₂ H ₃ Cl ₃	SubTotal
ODS Production	3,100	21,900	800	3,500	10	249	737	30,296
ODS imports	13,130	1,112	2,861	500	40	0	300	17,943
ODS Consumption	16,230	23,012	3,661	4,000	50	139	1,037	48,239
ODS %age share	33.7	47.7	7.6	8.3	0.1	0.5	2.1	
ODP Value	1.0	1.0	1.07	4	16	1.08	0.12	
ODP Production	3,100	21,900	856	14,000	160	259	88	40,373
ODP Consumption	16,230	23,012	3,917	16,000	800	269	124	60,352
ODP %age Share	26.9	38.1	6.5	26.5	1.3	0.4	0.2	100
% Local Production	19.1	95.2	21.9	87.5	20	100	71.1	66.9

FIGURE 1
1991 ODS PRODUCTION, IMPORTS,
AND CONSUMPTION IN CHINA



China's ODS consumption in 1991 was 48,239 tonnes, of which 62.8% was produced domestically and 37.2% was imported. In ODP terms, total consumption in 1991 was 60,352 tonnes of which 66.9% was produced domestically and 33.1% was imported.

Figure 1 shows 1991 ODS production, imports and consumption in China by substance. Figure 2 shows ODP consumption shares by substance used in 1991. CFC-12 was the most used substance accounting for 38.1% of the total, followed by CFC-11 in second place with 26.9%. Halon-1211 used for fire-extinguishing purposed accounted for 26.5% which is partly explained by its ODP value of 4.0 while CFC-113 which is used for cleaning purposes was in fourth place with 6.5%. The remaining three substances had very small consumption shares: Halon-1301 at 1.3%, carbon tetrachloride at 0.4% and methyl chloroform at 0.2%.

TABLE 2

ODS AND ODP CONSUMPTION BY SECTOR IN 1991
(Metric tonnes and percent)

	<u>Foams</u>	<u>Refrigeration/AC</u>	<u>Fire Extinguishing</u>	<u>Aerosols</u>	<u>Solvents</u>	<u>Total</u>
ODS	17,773	12,869	4,050	8,600	4,947	48,239
%	(36.8)	(26.7)	(8.4)	(17.8)	(10.3)	(100)
ODP	17,773	12,869	16,800	8,600	4,310	60,352
%	(29.4)	(21.3)	(27.8)	(14.3)	(7.1)	(100)

Figure 3 shows ODS and ODP consumption by sector in 1991. In ODP terms, the largest sector was foams at 29.4%, followed by halons for fire-extinguishing at 27.8%, then refrigeration/air-conditioning at 21.3%, then aerosols at 14.3%, and finally solvents at 7.1%.

FIGURE 2
1991 ODP CONSUMPTION
IN CHINA

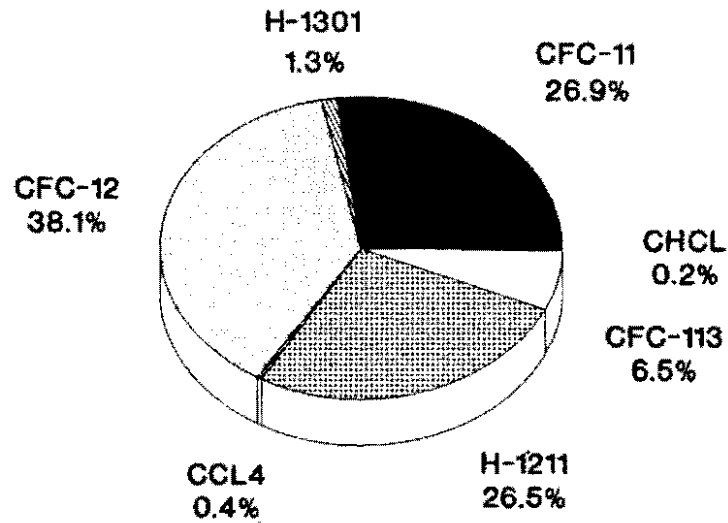
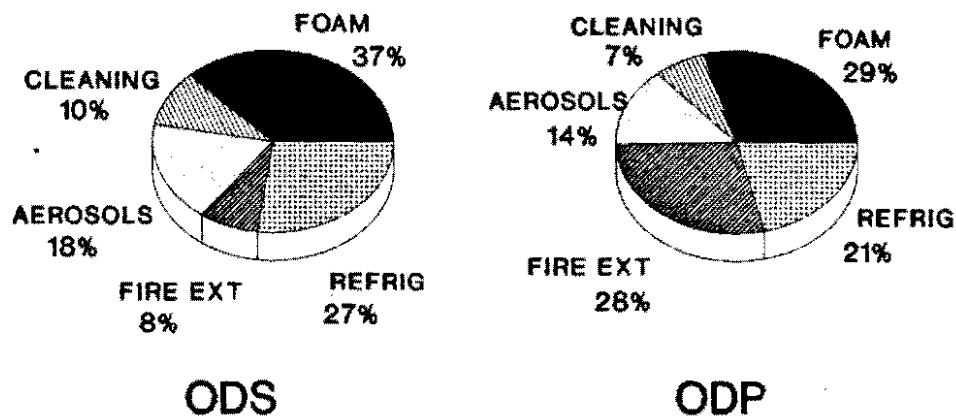


FIGURE 3
1991 ODS & ODP CONSUMPTION
BY SECTOR IN CHINA



2.2 Forecast of Unconstrained ODS and ODP Consumption to Year 2010

China is a developing country with a diversified industrial structure. Various sectors started using ODS at different times and at different stages of production processes. Table 3 presents estimates of unconstrained demand for ODS/ODP over the period 1991-2010, both by substance and by sector.

TABLE 3
ESTIMATED UNCONSTRAINED ODS/ODP DEMAND
(IN 1996, 2000, 2005 AND 2010)

(Unit: Metric tonnes)

	1991 Actual		1996		2000		2005		2010	
	ODS	ODP	ODS	ODP	ODS	ODP	ODS	ODP	ODS	ODP
CFC-11	16,230	16,230	20,420	20,420	23,897	23,897	29,278	29,278	35,495	35,495
CFC-12	23,012	23,012	46,031	46,031	65,338	65,338	96,456	96,456	139,620	139,620
CFC-113	3,661	3,917	7,420	7,939	13,794	14,759	25,864	27,674	45,500	48,685
H-1211	4,000	16,000	6,552	26,208	9,055	36,220	13,136	52,544	19,187	76,748
H-1301	50	800	124	1,984	227	3,632	456	7,296	916	14,656
CCl ₄	249	269	532	574	938	1,013	1,757	1,898	3,094	3,341
CCL ₃ CH ₃	1,337	124	2,612	313	3,900	468	7,311	877	12,882	1,545
Total	<u>48,239</u>	<u>60,352</u>	<u>83,691</u>	<u>103,469</u>	<u>117,149</u>	<u>145,327</u>	<u>174,258</u>	<u>216,023</u>	<u>256,694</u>	<u>320,090</u>
Foams	17,773	17,773	22,403	22,403	26,308	26,308	32,341	32,341	39,529	39,529
Refrigeration	12,869	12,869	20,464	20,464	29,545	29,545	44,844	44,844	68,823	68,823
Halons	4,050	16,800	6,676	28,192	9,282	39,852	13,592	59,840	20,103	91,404
Aerosols	8,600	8,600	23,584	23,584	33,381	33,381	48,549	48,549	66,763	66,763
Solvents	4,947	4,310	10,564	8,826	18,632	16,240	34,932	30,449	61,476	53,571

According to Table 3, the unconstrained demand percentage increases over the period 1991-2010 (base 1991 = 100%) for the major categories are as follows:

	<u>1991</u>	<u>1996</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>
Total ODP demand	100%	171%	241%	358%	530%
of which					
Foams	100%	126%	148%	182%	222%
Refrigeration/AC	100%	159%	230%	348%	535%
Halons	100%	168%	237%	356%	544%
Aerosols	100%	274%	388%	565%	776%
Solvents	100%	204%	377%	706%	1,243%

FIGURE 4
ESTIMATED UNCONSTRAINED ODP
DEMAND IN CHINA

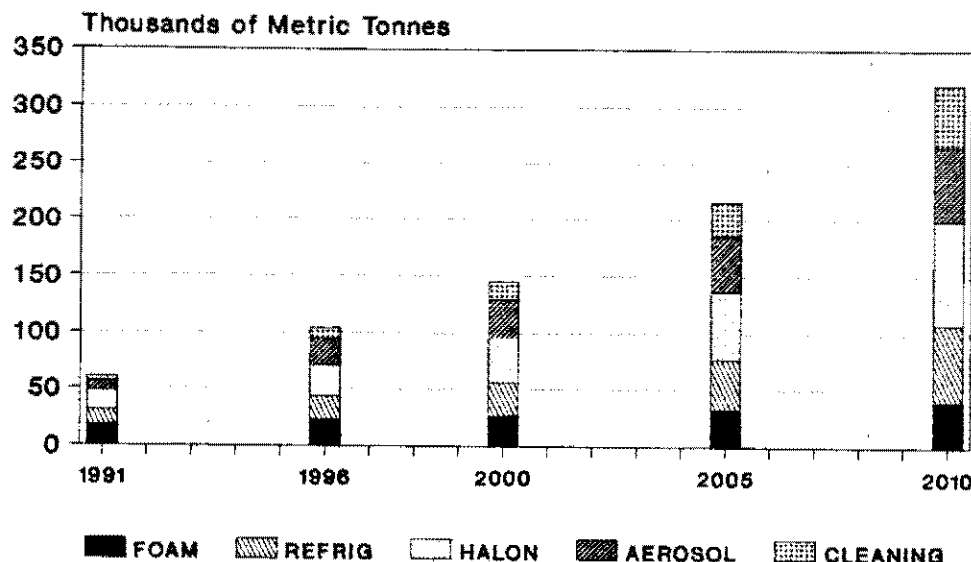


Figure 4 presents the estimated unconstrained ODP demand in China by sector. This unconstrained ODP demand scenario has the following features and underlying assumptions:

Overall Demand Total ODP unconstrained demand in year 2010 would be 530% higher than actual 1991 ODP consumption. With respect to individual substances, the 2010/1991 percentage increase is as follows: CFC-11 (219%), CFC-12 (607%), CFC-113 (1,243%), Halon-1211 (480%), Halon-1301 (1,832%), carbon tetrachloride (1,242%), and methyl chloroform (1,246%).

Foams (1991: 17,773 tonnes, 2010: 39,529 tonnes, 222% increase) Polyurethane hard foams used in domestic refrigeration will increase at the same rate as the increase in refrigerators, i.e. at 8% p.a. before 1995 and at 3% p.a. after 1995. For other foams including polyolefins, extruded foams, polyurethane soft foams, and hard tubes and boards, the overall demand growth rate is 6% p.a. over the whole period.

Refrigeration/airconditioning (1991: 12,869 tonnes, 2010: 68,823 tonnes, 535% increase) Industrial refrigeration and airconditioning (excluding MAC) will increase steadily at 6% p.a. over the period. Since most units in the automobile

industry would be equipped with airconditioners, for mobile airconditioning (MAC) a much higher growth rate of 20% p.a. before 2000 and 10-12% p.a. after 2000 is forecasted. The market demand for commercial refrigeration will grow at 18% p.a. upto year 2000 and at 15% p.a. thereafter. The present capacity for domestic refrigerators is 12,000,000 units/year and annual production of these refrigerators is expected to grow at 8% p.a. before 1995 and at 3% p.a. thereafter.

Fire-extinguishing (1991: 16,800 tonnes, 2010: 91,404 tonnes, 544% increase) This sector has seen exceedingly rapid growth. Halon-1211 extinguishers demand would grow by 11% p.a. before 1997 and by 7% p.a. after 1997. Halon-1211 extinguishing systems demand would grow by 14% p.a. before 1997 and by 12% p.a. after 1997. Demand for Halon-1301 systems is expected to grow the fastest, i.e. by 20% p.a. before 1997 and by 15% p.a. after 1997.

Aerosols (1991: 8,600 tonnes, 2010: 66,763 tonnes, 776% increase) The market demand for aerosol products has been increasing rapidly in recent years. Demand during 1992-1995 is estimated to increase at 30% p.a., slowing to 9% p.a. during 1996-2000 and slowing further to 6% p.a. during 2000-2010.

Solvents (1991: 4,310 tonnes, 2010: 53,571 tonnes, 1243% increase) The electronics industry is developing rapidly in China. While ODS usage in 1991 was a small percentage of total ODS demand, unconstrained demand projections show a growth rate of 11-16% p.a. over the period 1992-2010.

2.3 Institutional Framework

The Government has established a Leading Group for Ozone Layer Protection which is responsible for the implementation of Vienna Convention and Montreal Protocol provisions, the review of various implementation options, and strategic decision-making. The Leading Group comprises the following bodies:

<u>Leader:</u>	National Environmental Protection Agency (NEPA)
<u>Vice-Leaders:</u>	Ministry of Foreign Affairs (MFA)
	State Planning Commission (SPC)
	State Science and Technology Commission (SSTC)
	Ministry of Finance (MOF)
<u>Members:</u>	Ministry of Commerce (MOC)
	Ministry of Light Industry (MLI)
	Ministry of Public Security (MPS)
	Ministry of Aeronautics and Aerospace (MAA)
	Ministry of Chemical Industry (MCI)
	Ministry of Machinery and Electronics Industry (MMEI)
	Ministry of Foreign Economic Relations and Trade (MOFERT)
	General Administration of Customs.

A Coordination Group for Ozone Layer Protection has been established under the Leading Group and reports to it. The office of the Coordination Group is located at NEPA which services the Group. The Coordination Group has been entrusted with:

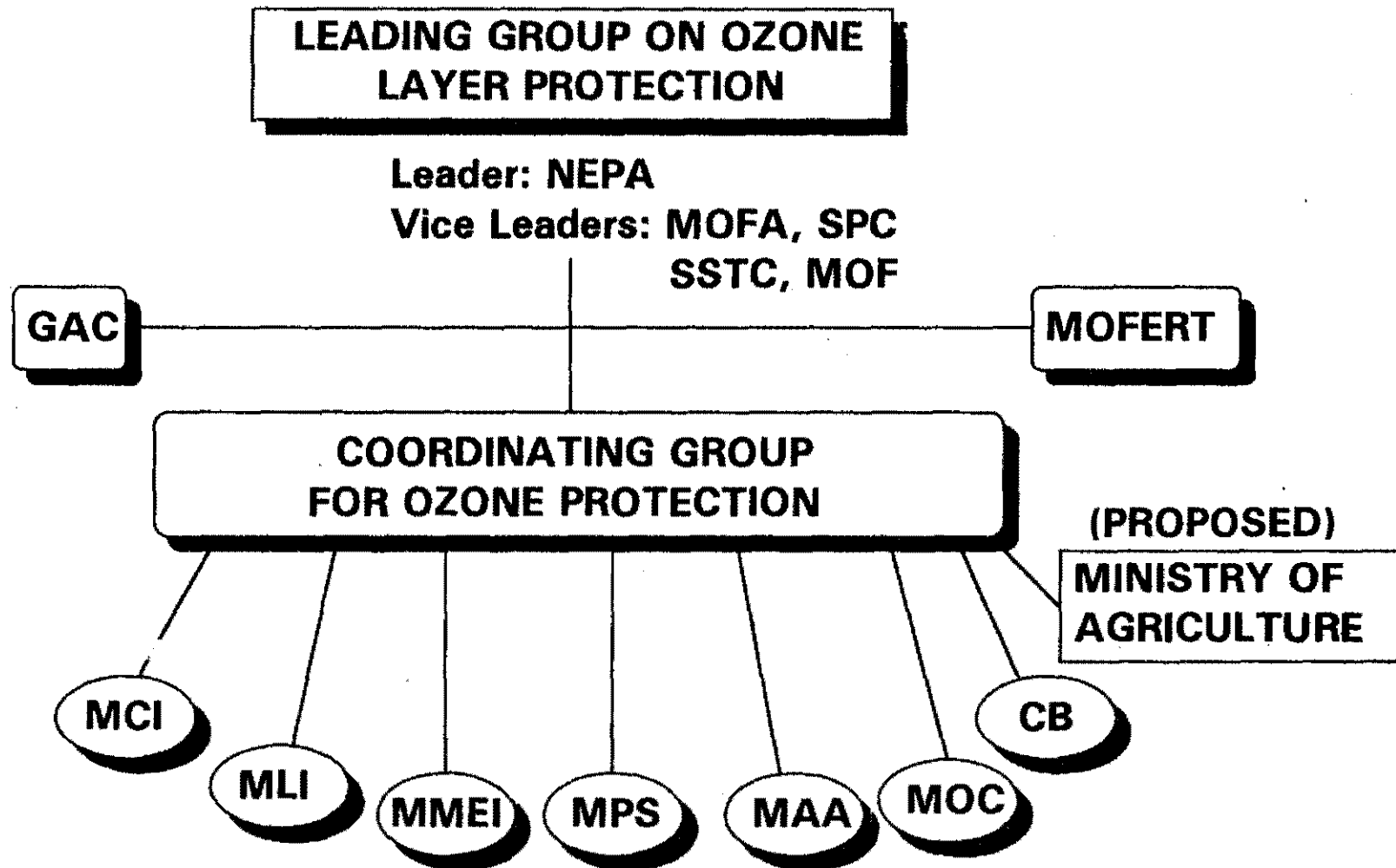
- a) concrete implementation of the Convention and the Protocol.
- b) coordination of the production, import, export and consumption of controlled substances and their products.
- c) financial analysis of the domestic and external funding needed for the implementation of the Protocol.
- d) proposing various options to the Leading Group.
- e) handling other affairs related to the Convention and the Protocol.

Eight technical subsector Working Groups have been formed for country programme formulation and they report to the Leading Group. The sectors covered include: aerosols, chemical substitutes, foams, halons, ODS recycling and recovery, refrigeration/airconditioning/MAC, refrigerator manufacture, and solvents.

A summary of the division of responsibility for ozone layer protection in China is presented in Figure 5.

FIGURE 5

INSTITUTIONAL FRAMEWORK FOR OZONE LAYER PROTECTION IN CHINA



National Environmental Protection Agency (NEPA) is responsible for the supervision of Convention/Protocol and Country Programme implementation. This includes elaborating international cooperation projects, establishment of related regulations, inspection of ODS production, import, export and consumption, and supervision of the collection and reporting of data on ODS production and consumption.

Ministry of Foreign Affairs (MFA) is responsible for international affairs related to the Convention and Protocol, as well as policies and laws that have external implications.

State Planning Commission (SPC) and the Economic and Trade Office under the State Council are responsible for macro-level programming and planning for the production, import, export and consumption of ODS and their products.

State Science and Technology Commission (SSTC) is responsible for the elaboration of the research plan for ozone layer protection, as well as the organization and management of projects with special emphasis on technology-related issues and aspects.

Ministry of Finance (MOF) is responsible for the financial management of external funds granted for ozone layer protection.

Ministry of Commerce (MOC) manages the production and utilization of small-size commercial refrigerators and cold storage machines that are manufactured using ODS. It is also responsible for coordinating the recovery and management of CFCs in these uses.

Ministry of Light Industry (MLI) manages the production and utilization of domestic refrigerators (including cold cabinets) and related compressors, aerosol products, soft and hard polyurethane foam plastics, and polystyrene and polyethylene extruded foam materials manufactured using ODS.

Ministry of Public Security (MPS) manages the research, production, use and recovery of halon extinguishants, all fire extinguishers, and stationary extinguishing systems as well as halon substitutes and substitute technologies.

Ministry of Chemical Industry (MCI) manages the production of ODS (excluding halons) and their substitutes.

Ministry of Machinery and Electronics Industry (MMEI) manages the production and use of cold storage and combined cold storage, 3-phase airconditioning equipment, refrigerant compressors (excluding those used in domestic refrigerators and cabinets), refrigerant and cold storage equipment

(excluding domestic and small-size commercial refrigerators), and mobile airconditioners which are manufactured using ODS. MMEI is also responsible for managing the production and operation of ODS recovery facilities and leakage monitoring instruments, as well as the development and use of cleaning reagents manufactured using ODS.

Ministry of Foreign Economic Relations and Trade (MOFERT), with the concurrence of the Ministry of Commerce, is responsible for the management of the import and export of controlled substances and their products.

General Administration of Customs is responsible for the control and statistics on the import and export of controlled substances and their products.

Local environmental protection agencies are, at the local level, responsible for the implementation of regulations and ordinances for environmental protection, and the supervision of local production and consumption of ODS. They ensure that ODS reduction regulations are followed and that new and technically innovative projects are supported.

2.4 Policy Framework

China has already taken several actions to phaseout ODS use. These include the following:

- a) In the halons sector, China has already phased out Halon-2401, established a license policy for the use of halons, and banned the use of halons in new installations.
- b) In April 1991, MLI and NEPA announced controls on the use of CFCs in the aerosols sector. As of that date, no new CFC-based manufacturing installations were allowed, and all new installations must use CFC alternatives as propellants.
- c) Chinese technical institutes have completed developmental work on the use of reduced CFC foams in refrigerators. Use of 50% reduced CFC foam has begun in 11 locations on a test basis for scale-up as soon as practical.
- d) China, in its Country Programme, highlights the critical importance of HCFCs especially their use in blends to extend the life of the existing equipment base. China has already worked with outside suppliers who have blends to test, and has also independently developed some proprietary binary blends. Test installations are now in small-scale operation and resulting data are being gathered.

Nine specific policies have or are being developed to phaseout ODS use and to encourage the introduction and use of substitute technologies. While they will be fully elaborated in the country programme, a summary of their key features follows:

2.4.1 Policy for Production Management The permit and quota system would be used for ODS production with enterprises requiring Government permission for ODS manufacture. Environmental impact assessments would be used to strictly control new requests for projects that would produce or use ODS. Those enterprises producing products using ODS will have to follow the phaseout schedule in the country programme, failing which those enterprises would either be penalized or shut down.

2.4.2 Import Policy The import of controlled substances and their products would be restricted when needed by appropriate measures so as to promote local development and production of ODS substitutes.

2.4.3 Sales Policy The Government will become the exclusive supplier for sales of ODS and will manage this sales programme based on the national ODS phaseout plan in the country programme taking due account of essential ODS uses.

2.4.4 Taxation Policy Tax reductions/exemptions on controlled substances and their products will be strictly controlled and applicable tax rates will be increased when appropriate. Preferential tax rates will apply to products manufactured using ODS substitutes. Tax reduction and/or exemption would apply for ODS recovery since the Government will establish recovery networks and filling centres to encourage the re-use of ODS.

2.4.5 Investment Policy The Government will encourage investment policies that help ozone layer protection so as to positively influence domestic and external funding of projects away from ODS use and towards use of ODS substitutes. Industrial sectors would be responsible for the elaboration of industrial sector investment policies that promote ozone layer protection.

2.4.6 Incentive Policy The Government supports and encourages universities, scientific research laboratories, industries and institutions to develop technologies for ozone layer protection applicable to China. A special fund would be established to encourage organizations and individuals who have made or could make outstanding contributions to the phaseout of controlled substances.

2.4.7 Public Awareness Policy Public awareness on the importance of ozone layer protection will be raised through extensive use of the public media (television, radio, newspapers, magazines). Technical training courses will be designed to increase the skills of technicians and managers involved in the production, use and management of controlled substances and their substitutes.

2.4.8 Green Label Policy The Government will design a system to issue "green labels" for products manufactured using either ODS substitutes or that are completely free of ODS.

2.4.9 Legal Policy Laws and regulations for the management of controlled substances and their substitutes will be enhanced and finalized.

3. ODS PHASEOUT IMPLEMENTATION STRATEGY

3.1 Government Strategy

The Government will strictly adhere to the provisions under the revised Protocol and is fully aware of the importance and urgency for ozone layer protection. However, China needs both funding and access to technologies essential for ODS phaseout. Therefore, on the basis of and subject to the limitations of technical and economic feasibility, the complete phaseout of ODS will be carried out as early as possible. Despite these limitations, the complete phaseout of ODS in aerosols (excluding medical applications) will be attained in 1997, and in the foams sector complete phaseout (excluding foam use in refrigerators and hard polyurethane boards) is planned for year 2000.

Table 4 presents estimated ODS/ODP consumption under the year 2010 phaseout alternative. It provides estimates by both controlled substance and by sector. Total ODP consumption in 1996 would be 12% less than in 1991, while total ODP consumption in year 2000 would be 61% less than in 1991.

Table 4 also shows that the fastest phaseout would be in aerosols with year 2000 consumption amounting to only 8% of year 1991 consumption. Halons consumption in year 2000 would be only 24% of year 1991 consumption. Solvents consumption would increase in 1996 but by year 2000 would come down to 1991 levels and will then rapidly decrease.

TABLE 4

ESTIMATED ODS/ODP CONSUMPTION UNDER YEAR 2010 PHASEOUT
(IN 1996, 2000, 2005 AND 2010)

(Unit: Metric tonnes)

	1991 Actual		1996		2000		2005		2010	
	ODS	ODP	ODS	ODP	ODS	ODP	ODS	ODP	ODS	ODP
CFC 11	16,230	16,230	13,832	13,832	4,633	4,633	2,800	2,800	0	0
CFC 12	23,012	23,012	22,865	22,865	10,545	10,545	6,535	6,535	0	0
CFC 113	3,661	3,917	5,320	5,692	3,700	3,959	1,087	1,163	0	0
H-1211	4,000	16,000	2,380	9,520	900	3,600	500	2,000	0	0
H-1301	50	800	50	800	30	480	20	320	0	0
CCL ₄	249	269	353	381	190	205	60	65	0	0
CCL ₂ CH ₂	1,037	124	1,373	165	1,005	121	500	60	0	0
Total	<u>48,239</u>	<u>60,352</u>	<u>46,173</u>	<u>53,255</u>	<u>21,003</u>	<u>23,543</u>	<u>11,502</u>	<u>12,943</u>	<u>0</u>	<u>0</u>
Foams	17,773	17,773	30,940	30,940	14,498	14,498	9,335	9,335	0	0
Refrigeration	12,869	12,869	30,940	30,940	14,498	14,498	9,335	9,335	0	0
Halons	4,050	16,800	2,430	10,320	930	4,080	520	2,320	0	0
Aerosols	8,600	8,600	5,757	5,757	680	680	0	0	0	0
Solvents	4,947	4,310	7,046	6,238	4,895	4,285	1,647	1,288	0	0

According to Table 4, estimated consumption percentage decreases over the period 1991-2010 (base 1991 = 100%) for the major categories are as follows:

	<u>1991</u>	<u>1996</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>
Total ODP demand	100%	88%	35%	21%	0%
of which					
Foams)	100%	101%	47%	30%	0%
Refrigeration/AC }					
Fire-extinguishing	100%	61%	24%	14%	0%
Aerosols	100%	67%	8%	0%	0%
Solvents	100%	145%	99%	30%	0%

Table 5 presents the same data in another way by showing the estimated reduction in ODS/ODP potential demand under the year 2010 phaseout scenario. Figure 6 presents this data in graphical form.

TABLE 5
ESTIMATED REDUCTION IN ODS/ODP POTENTIAL UNDER
YEAR 2010 PHASEOUT
(IN 1996, 2000, 2005 AND 2010)

(Unit: Metric tonnes)

	1996		2000		2005		2010	
	ODS	ODP	ODS	ODP	ODS	ODP	ODS	ODP
CFC 11	6,588	6,588	19,264	19,264	26,478	26,478	35,495	35,495
CFC 12	23,166	23,166	54,793	54,793	89,921	89,921	139,620	139,620
CFC 113	2,100	2,247	10,094	10,800	24,777	26,511	45,500	48,685
H-1211	4,172	16,688	8,155	32,620	12,636	50,544	19,187	76,748
H-1301	74	1,184	197	3,152	436	6,976	916	14,656
CCL ₄	179	193	748	808	1,697	1,833	3,094	3,341
CCL ₃ CH ₃	1,239	148	2,895	347	6,811	817	12,882	1,545
Total	<u>37,518</u>	<u>50,214</u>	<u>96,146</u>	<u>121,784</u>	<u>162,756</u>	<u>203,080</u>	<u>256,694</u>	<u>320,090</u>
Foams } Refrigeration)	11,927	11,927	41,355	41,355	67,850	67,850	108,352	108,352
Halons	4,246	17,872	8,352	35,772	13,072	57,520	20,103	91,404
Aerosols	17,827	17,827	32,701	32,701	48,549	48,549	66,763	66,763
Solvents	3,518	2,588	13,737	11,955	33,285	29,161	61,476	53,571

1991 ODP CONSUMPTION ODP REDUCTION AS COMPARED TO 1991 ODP CONSUMPTION

		<u>1996</u>	<u>2000</u>	<u>2005</u>	<u>2010</u>
Total ODP demand	100%	83%	202%	336%	530%
of which					
Foams }	100%	39%	135%	221%	354%
Refrigeration/AC }					
Fire-extinguishing	100%	106%	213%	342%	544%
Aerosols	100%	207%	380%	565%	776%
Solvents	100%	60%	277%	677%	1,243%

FIGURE 6
ESTIMATED ODP REDUCTION IN
CHINA UNDER YEAR 2010 PHASEOUT

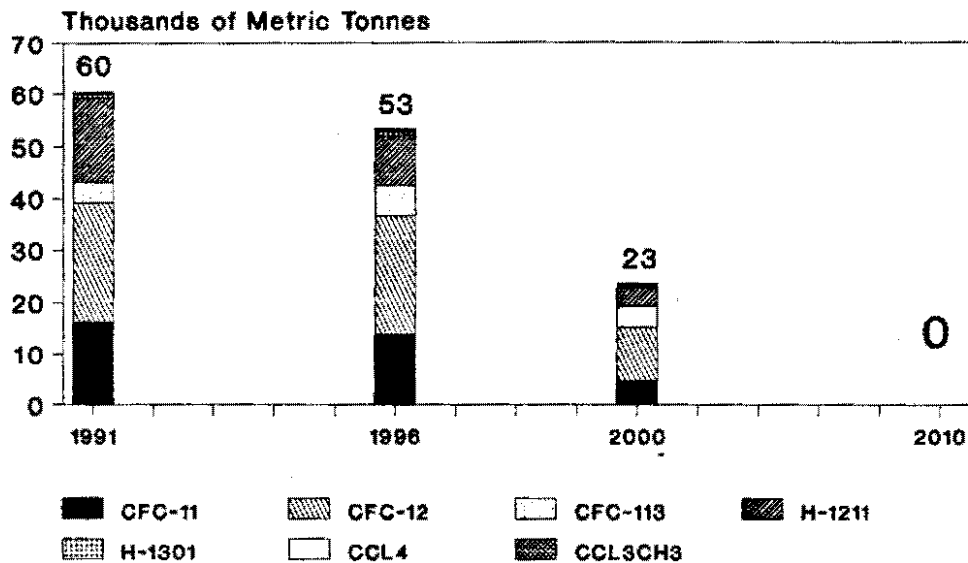
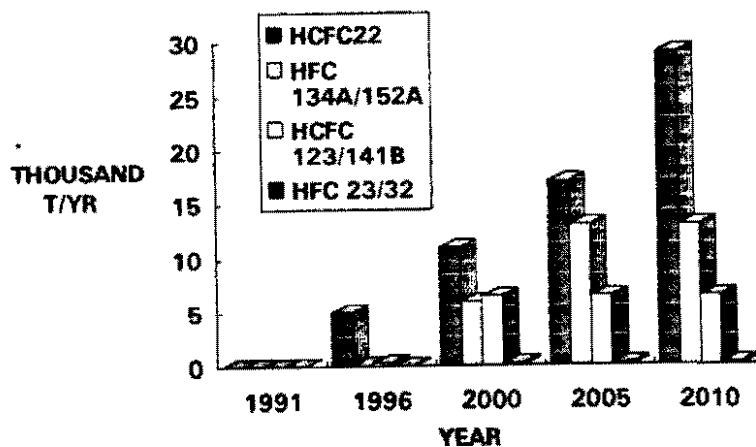


FIGURE 7
Projected Capacity of ODS Alternatives
in China

1991 - 2010



The conversion to substitutes is planned as a smooth transition from high ODP to lower ODP and then to zero ODP based on availability. For example, if the needed technology is available, then a direct step to zero ODP would be logical. The objective is to smoothly meet the demand that is dictated by the market, using the lowest ODP substances up to the limit of their availability, and then moving up the ODP chain as required. The market demand for substitutes, substitute technologies, and related equipment will be based mainly on the development of local production. Figure 7 shows the projected capacity of ODS alternatives in China to the year 2010.

The Government plans to organize technical and economic appraisals on alternatives in a way that allows the phaseout to be carried out at the least economic cost. Additionally, the phaseout will be closely linked with economic reforms and the adjustments being made in the industrial structure. Relevant laws and regulations, incentives, and technical policies will be established, and the management of phaseout activities will be enhanced.

3.2 Principles Followed for the Overall ODS Phaseout Process

Early obsolescence of equipment containing or using ODS will be a major cost of the CFC phaseout process in China, and extraordinary measures will be needed to minimize this early equipment retirement cost. China will reduce this cost significantly by following the principle of using HCFCs to phase out CFCs, thereby extending the life of installed equipment across the country while simultaneously reducing ODP. This principle will include the conversion of manufacturing facilities away from CFC production to HCFCs in order to satisfy the demand created by the loss of CFC availability.

With respect to phaseout costs, the Government will simply use definable costs ("Indicative List of Categories of Incremental Costs" from the Second Meeting of the Parties are the guideline) as the basis for estimating the cost effectiveness and priorities associated with the phaseout plan. Incremental costs are estimated at the enterprise level following procedures and related definitions used by the Interim Multilateral Fund. The incremental costs at the state level (e.g. costs incurred due to the implementation of permit systems for imports, consumption and production) have not been included in the net incremental phaseout costs.

3.3 Aerosols

Aerosol products in China mainly use CFC-12 as a propellant. The majority of aerosol enterprises in China are state-owned (approximately 70%), with capacities generally less than 500,000 cans per year. There are more than 100

small collectively-owned or private enterprises. These generally each produce less than 100,000 cans per year. Retrofitting costs would be very high.

The Ministry of Light Industry plans to consolidate these operations using regional centers. The centers would receive the product-filled cans from the various small enterprises and top them up with refined LPG. At this point, three main filling centers are planned. The concurrent use of regulatory and incentive programmes is also planned to ensure that the many small enterprises use the new centers. Additionally, the new centers will be capable of supplying deodorized propellant to those enterprises which have the capability to safely fill using flammable non-ODS. ODS phaseout in the aerosol sector is planned for completion by 1997.

According to Table 4, CFC use in aerosols should decline from 8,600 tonnes in 1991, to 5,757 tonnes by 1996, and to 680 tonnes in year 2000 comprising only essential uses.

3.4 Foams

In the Foams sector, the majority of the plants are state or collectively owned. The estimated number of 86 plants excludes smaller township and individually owned enterprises. The Ministry of Light Industry is the coordinating organization for phaseout of ODS in this sector. MLI believes that in flexible foams, a 100% phaseout is feasible with proven mature technology, but more knowledge is needed about this technology. In rigid polyurethane pipe foam, a 100% phaseout is feasible with existing technology (100% water blown). More knowledge is needed on the economic implications. In extruded PE/PS, 100% phaseout is feasible with existing technologies. Butane is currently the preferred technology. HCFC- 22 alone or with blends is acceptable where fire risks are not too high. Pure CO₂ and HFC-152a need to be evaluated. It is believed that the foam industries can phaseout CFCs for many uses by year 2000.

MLI's plan is as follows:

- acquire information concerning phaseout technologies through technical missions and seminars.
- select technologies based on economics, phaseout potentials, investment required, and availability of raw materials.
- introduce technologies using a phased approach, i.e start with demonstration projects and then scale-up the replication nationwide.
- refrigerator and insulating foams will phaseout in a step-wise approach with the first step being to adopt 50% CFC-11 technology, followed by a 100% CFC-free foam technology. This technology should be available shortly and will be adopted when proven.

3.5 Halons

MPS is responsible for coordinating the phaseout in this sector. As it is unlikely that a timely, acceptable substitute will be available for all fields of application presently covered by halons, the phaseout plan is based on a transition to traditional extinguishants and alternatives wherever possible, the establishment of a recycling programme and halons bank (for recycled product to be used in critical systems), and the coordinated phaseout of halon production.

China imports very little and produces most of its halons. The import of halons will be banned and the production of 16,000 tonnes/year of halon-1211 ODP equivalent will be phased down, with 76% eliminated by 2000, and 100% phased out in 2010. The smaller production (800 tonnes/year) of halon-1301 ODP equivalent will be banned in the year 2000. Production of associated portable extinguishers will be similarly reduced, then eliminated.

Of the 30,000 fixed halon systems, non-essential systems will be converted and the halons recovered. The remaining essential systems will be filled with recovered halon from the recycling/recovery programme mentioned above.

3.6 Refrigeration and Mobile Air-conditioning (MAC)

Several Ministries are responsible for phasing out ODS in these sectors (MLI, MMEI, MAA, MOC and MCI). MMEI has been assigned by NEPA to oversee the phaseout of CFC's in most refrigeration and air-conditioning sectors. The phaseout plan includes the use of incentives, taxes and licensing relating to the sale and import of CFC containing products. The establishment of enterprises that produce equipment using CFCs will be curtailed. Because early retirement of existing equipment would be a major cost to China, extensive use of HCFC blends is planned. These blends will be essentially "drop in" materials which will substantially extend the life of existing equipment. Since HCFC-22 will be used primarily as a transitional substance to phaseout CFCs, its consumption is expected to grow as CFC-12 is eliminated.

New systems will be introduced such as HFC-152a and HFC-132a in mobile air-conditioning. The use of HCFC-123 will extend the life of CFC-11 based chillers. New commercial and industrial refrigeration systems will generally utilize HCFC-22. In small to medium sized systems (10 to 25 kw refrigeration capacity), the use of ammonia is planned. To monitor progress, the Ministry of Chemical Industry will collect production figures, while import figures will be collected by customs authorities.

3.7 Solvents

There are 3,200 enterprises using ODS for cleaning purposes in China. Most are under the control of MMEI, which has responsibility for the coordination of the cleaning sector phaseout of ODS. Of the 1991 consumption of nearly 5,000 tonnes, 80% is associated with computers, circuit boards, precision cleaning, while the rest is associated with electronics industries.

The strategy is to use demonstration projects followed by replicating the tested technology at other enterprises across China, wherever applicable. Cleaning technologies will employ "no-clean", aqueous, semi-aqueous, and non-ODS solvent cleaning techniques, essentially in the order stated.

3.8 Chemical Substitutes

The Ministry of Chemical Industry is responsible of all ODS production except halons (which is under the Ministry of Public Security). With over 40 plants manufacturing CFCs, domestic production meets approximately 60% of demand. Two-thirds of this production comes from national enterprises. The remainder comes from local or collectively-owned manufacturing units.

Under MCI coordination, the plan is to reduce CFC imports and production in conjunction with CFC consumption, while increasing production of fluorinated substitutes to meet the constantly growing total demand (see figure 7). The industry structure will be gradually adjusted as CFC manufacturing is phased out or converted to production of alternatives. Since the demand for HCFC-22 will be greater than current supply, the plan calls for conversion of CFC-12 plants to HCFC-22 manufacture. As the plan is executed, 70% of CFC-11/12 manufacturing will be eliminated by 2005, with a 100% phaseout by the year 2010.

3.9 ODS Recycling and Recovery

ODS (refrigerants) will be recovered using local recycling in service depots to process most of the used refrigerants. Heavily contaminated refrigerants will be stored and transported to central reclamation plants which will upgrade the material to specifications that meet refrigerant standards. Refrigerant recovery and recycling machines will initially be imported, but after 1995, this equipment will be produced locally.

Establishing a recovery and recycling network in a country as vast and complex as China is a difficult task. It is anticipated that this sector will require monitoring on a continuing basis to assure that recovery and recycling is being accomplished as planned, and to determine when modifications to the original plans are required.

4. PRELIMINARY FINANCIAL IMPLICATIONS OF THE COUNTRY PROGRAMME

4.1 Net Incremental Costs of ODS Phaseout to Year 2010

Preliminary estimates of net incremental project costs for ODS phaseout in China by the year 2010 as follows:

(1992 US \$ million)

Aerosols	\$ 8.4
Chemical Industry	295.3
Foams	341.0
Halons	88.1
Recycling & Recovery	28.9
Solvents	66.0
Refrigeration comprising:	
(a) domestic refrigeration	228.5
(b) industrial/commercial refrigeration	<u>146.7</u>
Total	1,202.9

The following are the assumptions underlying the above figures:

- a) The above figures are based on the results of the Second National Country Programme Workshop (17-20 August 1992) and include direct investment costs and project operational costs for the first four years only. The Country Programme will revised those figures to include operational costs over the full economic lifetime of each project.
- b) Estimates for the increased cost of substitute chemicals have been included for foams (\$34.5 million) and domestic refrigeration (\$135.8 million) only. Material cost increases for other sectors are being calculated.
- c) No incremental costs or benefits are included for aerosol industry plants constructed after 1996 and which use non-ODS propellants.
- d) No incremental costs are included for solvent cleaning lines built after 1996 and using non-ODS cleaning agents.
- e) No incremental costs are included for new production plants for foam plastics that use non-ODS foaming techniques.
- f) For recycle/recovery networks, while incremental capital costs are included, operational costs and any net benefits are excluded.

- g) No incremental costs are included for MAC plants built after 1996 and using HFC-134a as refrigerant.
- h) The Country Programme will detail the costs for premature retirement and/or obsolescence of ODS-using equipment, especially in the refrigeration and halons sectors. It is estimated that these costs would amount to several billion US dollars.

The Government has estimated that the net incremental costs for ODS phaseout would comprise only half the total funds needed. The remaining funds would be raised domestically.

4.2 SUMMARY OF PROVISIONAL SECTORAL ODS PHASEOUT PROJECTS

Sector Name	Number of Projects	Annual ODS Reduction (tonnes)	Estimated Cost (\$'000)
CHEMICAL SUBSTITUTES			
A. Investment Projects	11	21055	440400
B. Technical Support	4	-	820
AEROSOLS			
A. Investment Projects	1	1300	6800
B. Technical Support	2	-	175
FOAMS			
A. Investment Projects	8	4638	78798
B. Technical Support	4	-	1285
INDUSTRIAL/COMMERCIAL REFRIGERATION			
A. Investment Projects	21	12851	163405
B. Technical Support	9		7131
DOMESTIC REFRIGERATION			
A. Investment Projects	15	28537	353855
B. Technical Support	8		8300
HALONS			
A. Investment Projects	16	11367	130640
B. Technical Support	5		2220
CLEANING SOLVENTS			
A. Investment Projects	8	12278	61325
B. Technical Support	4		2040
RECOVERY/RECYCLE			
A. Investment Projects	6	2349	86300
B. Technical Support	7		25766
NEPA			
A. Institutional Support	8	-	1990