OCCASION

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"Give the water planet a brake"

Contract No. 16001096
[Final Report]

Project No. MP/EGY/04/134

Development of the solvent sector strategy for ODS solvent phase-out in low consuming units in Egypt

Our Mission:
To improve the quality of life for all Egyptians through responsible management of our renewable and non-renewable natural resources and through optimizing the regulations of the environment & industry, in order to foster sustainable development of Egypt.

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SIGN Group

Conclusion

Protecting the stratospheric ozone layer by controlling the production and use of ozone-depleting compounds has been an environmental concern since the mid-1970s, when it was discovered that chlorine could potentially deplete the ozone layer. Not until significant losses of ozone were reported in 1985, however, did ozone depletion become an important international issue. The principal international policy instrument for protecting the stratospheric ozone layer is the Montreal Protocol on Substances That Deplete the Ozone Layer. Many countries, and even some cities and other sub-national authorities, have taken action to control production and use of chlorofluorocarbons and other ozone-depleting substances. Much of the ***National/Sub-national Ozone Policy Formulation*** is in response to the Montreal Protocol, although several countries had taken steps to control ODS prior to the international agreements set forth in the Protocol.

In response to these policy and regulatory developments, industrial organizations directly affected have been actively engaged in developing alternative substances to CFCs and other ozone-depleting compounds.

Several environmental and economic factors need to be considered in Chlorofluorocarbon Phase-out, such as ***safety*** characteristics, ***efficiency***, ozone-depletion ***potential***, and ***economic impacts*** on industry of phase-out schedules for existing ODS.

In contribution to all the efforts related to the OD solvents phase-out in Egypt it is recommended to ***conduct an awareness (2) two days Workshop Program***:

- Elaborating information regarding the (MP) provisions and national legislation related to OD Solvents phase-out forewarns of the phase-out deadline implications.
- Introducing the viable alternatives of ODS (Solvents & Technologies) targeting the main characteristics of ***safety***, ***efficiency***, ***ozone-depletion potential***, and ***economic impacts*** on industry to meet phase-out schedules for existing ODS:
  - Providing training activities and technical assistance on viable alternatives on OD solvents use.
  - Providing awareness campaign explaining the negative effects of OD Solvents on human health and environment.
  - Setting up an information campaign through mass-media, Internet websites, and distribution of brochures and posters along with the Ministry of Education correspondence updating the curriculum syllabus , including the negative impacts of ODS.
- Organizing of seminars, training sessions and maintaining a permanent contact between the EEAA and the Governmental affecting sectors program in compliance with the Montreal Protocol.

SEMINAR INVITEES LIST

Annex 4. P 1

#	Company Name	Contact Person / (s) (INVITEES)	Tel		Fax		Surveyed		Survey Ref# & Comments
							(Y)	(N)	From Annex 3.B.
1	Suez Canal Authority	**Eng. Yosri Abu El-Naga** / *Industrial Safety commity chief executive*		064/392241			✓		AQ/001/5/06/SIENvey
		Eng. Wael Qaddour / *Financial Controller*		064/392963					
		Mr. Khaled Hasan / *Plant Manager*		064/392295		064/321234			
		Eng. Osama El-Sahy	Res.	066/408880					
		Eng. Mohamed badran		066/386178	*Res.*	066/329581			
		Mr. Raafat / Head of Procurement Division		064/3393140	*Res.*	066/413160			
2	Egyptian Railway Authority	**Eng. Mohamed El-Hosaini** / Chief Executive		02/2353269		02/2350632	✓		AQ/013/5/06/ SIENvey
3	Egyptian Public Transportation Authority	*Procurement & Contracting division*		02/2845719		02/2840291	✓		AQ/014/5/06/ SIENvey
				02/2854858					
4	Egypt Air	**Mr. Raafat Aatia**		02/2914255			✓		AQ/022/5/06/ SIENvey
		Procurement & Contracting division		02/2656529		02/6350744			
		Technical Asst(s):		02/2908453		02/3900999			
		Mr. Walaa - Mr. Hisham - Mr. Zaki		02/6345982		02/2657519			
		Mr. Mahmoud Haridi / *General Magare*		02/2674592					
		Eng. Nargis / *General Admin*	Direct	45476					
		Mr. Abdul Aziz / *Deputy manager*							

SEMINAR INVITEES LIST (Continue)

Annex 4. P 2

#	Company Name	Contact Person / (s) (INVITEES)	Tel		Fax		Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
5	Arab Petroleum Pipelines Co., **SUMED**	**Eng. Mustafa Gomaa** / *CHAIRMAN*		03/5850761			✓		AQ/002/5/06/ SIENvey
		Eng. Mohamed El-Doryeni / *H.S.E. Managing Director*		03/5823083		02/4176731			
		Eng. Mousa Yousif / *Technical Asst.*		03/5824138-9		03/5838397			
6	Egyptian Petroleum Research & Development Institute	**Mr. Abdul Aziz** / *Procurement Manager*		02/2745902					AQ/031/5/06/ SIENvey
		DR. Mohammed El-Batanoony	Direct	02/2747917		02/2747917			
		DR. Salah Khalil		02/2736349					
		DR. Mahir El-Sokarry	Direct	02/6707521					
		DR. Ahmed El Sbbagh							
7	Middle East for Operations of Oil Refineries, **MIDOR**	**Eng. Mahmoud Najeeb** / *CHAIRMAN*		02/4140756			✓		AQ/003/5/06/ SIENvey
		Eng. Abdul Moneim Mahrous		02/4164506		02/5185630			
8	Middle East for Operation & of Oil Refineries Maintenance, **MEDOM**	**Eng. Mohamed Abdul Monaim** / *Deputy Chief Executive.*		02/4486821					AQ/003/5/06/ SIENvey
		Eng. Jamal Fahmi / *Maintenance General Manager*		02/4480655		02/4480563	✓		
		Eng. Saeed Ali / *Job Coordinator*							
9	Mardaife Petroleum & Marine Services	**Eng. Abdul Mawjuod** / *CHAIRMAN*		03/5853290			✓		AQ/004/5/06/ SIENvey
10	Cairo Oil Refining Co.	**Eng. Abdul Wahid Ajdawy** / CHAIRMAN		02/2529821		02/4037602	✓		AQ/033/5/06/ SIENvey

SEMINAR INVITEES LIST (Continue)

#	Company Name	Contact Person / (s) (INVITEES)	Tel	Fax	Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
11	Belayim Petroleum Company	**Eng. M. Ahmed Fayed** / *Chief Operational General Manager.*	02/2621738	02/3035434	✓		AQ/023/5/06/ SIENvey
		Eng. M. Atta Khalil / *Production Manager (Sainai Rigs)*	069/3440619				
		Eng. Abd Allah Abd Al Mawjood / *Nile Delta Wells General Manager.*	010/1722790				
		Eng. Abu Baker Abdul Fattah / *Port Fouad wells General Manager*	066/510649				
12	Assiut Oil Refineries.	**Eng. Raqya** / *Technical Assistnce General Director*	088/2323522	088/2323062	✓		AQ/032/5/06/ SIENvey
		Eng. Wahib Ahmed / *Assistant Vice Presedent.*	088/2322817				
13	Al-Sueiz Oil Production Company	**Eng. Mohamed Abdul Fattah** / *CHAIRMAN*	062/3360362	02/2529826	✓		AQ/017/5/06/ SIENvey
			062/3360320	062/3360345			
14	Alexandria for petroleum additives **ACPA**	**Eng. Ahmed Refaat** / *CHAIRMAN*	03/4403901	03/4402065	✓		AQ/042/5/06/ SIENvey
		Eng. Farouk El-Sawaf / *Chief Operational Manager*	02/7544662	02/7544664			
		DR. Mosaad Aatia / *Head of Petroleum Research & Development*	03/4447346-9				
		Eng. Atif Solaiman / *Chief Marketing Executive.*	03/4405105				
		Eng. Jamal Fathey / *Technical Assistance*	03/4447346				
		Mr. Jalal Sarhan / *Technical Assistance*	02/7544662-3				
15	Societe Co-op de Petrol Operations	**DR. Abdul Salam** / *Head of Petroleum R & D Department.*	02/4030975	062/334394	✓		AQ/034/5/06/ SIENvey

SEMINAR INVITEES LIST (Continue)

Annex 4. P 4

#	Company Name	Contact Person / (s) (INVITEES)	Tel	Fax	Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
16	Timsah Shipbuilding Co.	**Eng. Majdi Aamir** / *General Manager*	02/2665993	02/2665997	✓		AQ/005/5/06/ SIENvey
		Eng. Ali Khairy	064/393140	064/322801			
17	National Pipe Company **(NPC)**	**Eng. Hisham Shalaby** / *Production Manager*	410486	410485	✓		AQ/006/5/06/ SIENvey
18	East Delta Transportation Company	**Mr. Essam** / *Operation Manager*	010/2866956	02/2633373	✓		AQ/019/5/06/ SIENvey
19	West Delta Transportation Company	**Mr. Mohamed Hasan**	02/6331846	02/6336038	✓		AQ/020/5/06/ SIENvey
20	Greenland Co. & Milky Land Co.	**Mr. Fawzi Nasser** / *Chief Executive*	015/362559	015/366110	✓		AQ/036/5/06/ SIENvey
21	Dairy Land for Dairy & Food Industries - **ALZAHAR**	**Head of Administration**	02/6986846	02/6986340	✓		AQ/035/5/06/ SIENvey
		Mr. Hamdi Yassin / *Vice Presedent*	055/3220123	055/3200075			
22	Al-Dawlia for food industries	**Eng. Adil** / *Plant Manager*	02/4222969	02/4528759	✓		AQ/038/5/06/ SIENvey
23	MEMPHIS Pharmaceuticals	**Dr. Fouad Al-Badrawi** / *Technical Assistance.*	02/2833528	02/2843530	✓		AQ/037/5/06/ SIENvey
24	CARE SERVICES LTD.	**MR. Ahmed Al-Baz** / *CHAIRMAN*	066/406441		✓		AQ/008/5/06/ SIENvey
25	TIBA SERVICES LTD.	**MR. Wael Ghaffar** / *General Manager*	02/6311916		✓		AQ/009/5/06/ SIENvey
26	EGYMAC Services Ltd.	**Eng. Abdul Hakkim Hasan** / *CHAIRMAN*	02/2569163	02/2562444	✓		AQ/039/5/06/ SIENvey
		MR. Essam Al-Dien / *Financial Controller*	02/2837671				
27	AL-Wanisco Engineering	**Eng. Wanis** / *CHAIRMAN*	02/4846106	02/3428095	✓		AQ/015/5/06/ SIENvey
28	**Al Nasr** Automotive Manufacturing Co.	**Mr. Saleh Zaidan** / *CHAIRMAN*	02/3690411	02/3690532	✓		AQ/007/5/06/ SIENvey
29	The Port Said Engineering Works	**Mr. Salah Abdul Hamid** / *General manager*	02/4186148	02/4179338	✓		AQ/016/5/06/ SIENvey

#	Company Name	Contact Person / (s) (INVITEES)	Tel		Fax		Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
30	GENERAL MOTORS	**Eng. Abdul Meniem Oqba** / *CHAIRMAN*		02/8335307		02/8330818	✓		AQ/029/5/06/ SIENvey
		Eng. Abdo Abdul Hakim / Vice Presedent	Direct	02/28080463					
		Eng. Tarek fouad	Direct	02/8280318					
		Eng. Fathey El-Naggar	INT'L	406		02/8280280			
		Eng. Magdi Eskandar							
31	**QUEEN SERVICES** - Al Nasr *Service & Maintenance*	**Mr. Mohamed Madani** / *General Manager*	Direct	02/2424550		02/3426929	✓		AQ/021/5/06/ SIENvey
		Mr. Ahmed Tolba / *Deputy G. M.*		02/6849933		02/6849929			
32	**CRYSTAL ASFOUR** International	**Mr. Ameer Hasan** / *Local Procurement Manager*		02/2201670		02/2206082	✓		AQ/010/5/06/ SIENvey
		Mr. Yasser / *Financial Controller*		02/2201032					
33	**MINISTRY OF DEFENSE - Factory # (200)**	**Mr. Osama Sabir** / *Purchasing Manager*		02/2818028		02/2818041	✓		AQ/025/5/06/ SIENvey
		Mr. Sameh Abdul Karim	Direct	02/2803205					
		Commercial Sector		02/2818026					
				02/2818025		02/2818043			
34	**SHOBRA Engineering Industries - Military Factory # (27 & 81)**	**Mr. Ahmed Seraj** / *Vice Chairman*		02/4267706			✓		AQ/027/5/06/ SIENvey
		Mr. Mustafa Emam / *Commercial Manager*	Direct	02/4256862		02/4256859			
		Mr. Ahmed Abdul Salam / *Q.A. Manager*	Direct	02/4267715		012/2642407			

#	Company Name	Contact Person / (s) (INVITEES)	Tel		Fax		Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
35	AL-Nasr Oil Company	**Eng. Mahmoud Moufied** / *CHAIRMAN*		062/334386				✓	
		DR. Sayed Khalil / *Chemist Specialist Head of R&D department.*		062/329516		03/4430124			
36	ALEXANDRIA OIL COMPANY	**Eng. Ahmed Al Gayar** / *CHAIRMAN*	Direct	03/4402103				✓	
		Mr. Samih Salih / *Vice Chairman*		03/4402832					
		Mr. Ibrahim Qutob / *Off-Shore Operations Manager*		012/1673802					
37	EGYPT Petrochem Company	**Eng. Mohamed Ahmed El-Masry** / *CHAIRMAN*		03/4770017		03/4484976		✓	
38	AL-AMRIA Oil Refineries Company	**Eng. Yousuf Al-Kifafy** / *Maintenance & Devision Manager*	Direct	03/4481028		088/323062		✓	
		Eng. Bayoumi Al-Ghor /*H.S.E. General Manager*		03/4481070					
39	Petroleum Piping Company	*H.S.E. & (R & D) Departments*		02/2545726		02/7958252		✓	
40	CO-OP Oil Company	*H.S.E. & (R & D) Departments*		02/7951900		02/5745436		✓	
41	MISR Petrol Company	*H.S.E. & (R & D) Departments*		02/5755000		02/2619775		✓	
42	Petroleum Gases Company - **(PETROGAS)**	*H.S.E. & (R & D) Departments*		02/2613298		02/7021286		✓	
43	Gulf Al-Suez Petroleum Co. **(GAPCO)**	*Eng. Ahmed Gad / CHAIRMAN*		02/7021337		02/5165454		✓	
44	Oil Mountain Petroleum Company **(PETROZIT)**	*H.S.E. & (R & D) Departments*		02/7063773		02/7272155		✓	
45	SHAQIR Marine Oil Operations - **(AOSOKO)**	*H.S.E. & (R & D) Departments*		02/5272152		03/3924593		✓	

#	Company Name	Contact Person / (s) (INVITEES)	Tel	Fax	Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
46	West Desert Petroleum Company - **(WEPCO)**	*Eng. Osama Fakhry Al-Ebyari / CHAIRMN*	03/3928710	02/2609792		✓	
47	Suiz Oil Company - **(SOCO)**	*H.S.E. & (R & D) Departments*	02/3465909	02/3807311		✓	
48	Gysium Oil Company **(GAESO)**	*H.S.E. & (R & D) Departments*	02/7655681	02/4071296		✓	
49	AJIBA Oil & Gas operations	*H.S.E. & (R & D) Departments*	02/4028841	02/2917065		✓	
50	Badr El-Dien Petroleum Company - **(BAPETCO)**	*H.S.E. & (R & D) Departments*	02/2917055	02/6706790		✓	
51	Al-Amal Oil Company **(AMAPETCO)**	*H.S.E. & (R & D) Departments*	02/6706785	02/7682356		✓	
52	East Petroeum Oil Company **(ZETCO)**	*H.S.E. & (R & D) Departments*	02/7682200	02/5182077		✓	
53	Al-Alamien Oil Company	*H.S.E. & (R & D) Departments*	02/5182099	02/7022295		✓	
54	Khalida Petroleum Company	**DR. ISMAIL SHAABAN** / *CHAIRMAN*	02/7022874	02/5180580		✓	
55	Rashied Petroleum Company **(RASHPETCO)**	*H.S.E. & (R & D) Departments*	02/5182317	02/5202743		✓	
56	Oasis Oil Company **(OAPCO)**	*H.S.E. & (R & D) Departments*	02/5202745	02/3785774		✓	
57	Magawiesh Oil Company **(MAGAPETCO)**	*H.S.E. & (R & D) Departments*	02/3785775	02/7027828		✓	
58	Qaroun Oil Company	*H.S.E. & (R & D) Departments*	02/7063621	02/5166833		✓	
59	Borj Al-Arab Petroleum Company **(BORAPETO)**	*H.S.E. & (R & D) Departments*	02/5166988	02/5165837		✓	

#	Company Name	Contact Person / (s) (INVITEES)	Tel	Fax	Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
60	JAMSA Petroleum Company	*H.S.E. & (R & D) Departments*	02/5165835	02/2706439		✓	
61	ESH El-Milaha Petroleum Company **(ESHPETCO)**	*H.S.E. & (R & D) Departments*	02/2706224	02/7545424		✓	
62	NORTH DABGHA Petroleum Company **(DAPTCO)**	*H.S.E. & (R & D) Departments*	02/7542823	02/6705622		✓	
63	AL-Qantara Oil Company	*H.S.E. & (R & D) Departments*	02/5201136	02/2756528		✓	
64	DAR El-Perol Company	*H.S.E. & (R & D) Departments*	02/2756229	03/5838397		✓	
65	Egyptian Drilling Company	*H.S.E. & (R & D) Departments*	02/4176701	02/6230788		✓	
66	Al-Handasia for Petrochem **(ENPI)**	*H.S.E. & (R & D) Departments*	02/2748001	02/4024449		✓	
67	Engineering Company **(ENDI)**	**Eng. Mohammed Abu Galal** / *CHAIRMAN*	048/2601212			✓	
		HEADQUARTERS	02/8164055				
68	AERO PETROCHEM Services	*H.S.E. & (R & D) Departments*	02/4032186	02/5408882		✓	
69	MISR GAS Company	*H.S.E. & (R & D) Departments*	02/5406079	02/2913228		✓	
70	**GASTEC**	**Eng. Ayman Ramzi & Amro Hasan** / *Technical Assistance*	02/5203927	02/5203737		✓	
71	**CARGAS**	*H.S.E. & (R & D) Departments*	02/4152318	02/5203737		✓	
72	**GAZTIC**	*H.S.E. & (R & D) Departments*	02/5203535	02/4145936		✓	

#	Company Name	Contact Person / (s) (INVITEES)	Tel	Fax	Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
73	**PETROSAFE** oil Company	**Eng. Tarek Souailem** / *CHAIRMN*	02/7024872-825	02/2666468		✓	
74	**GASCO** Natural Gases Company	*H.S.E. & (R & D) Departments*	02/2666460	03/4440931		✓	
75	**PETROMENT** (Alexandria Petroleum Manintenance operations)	**Eng. Mustafa El-Toukhy** / *CHAIRMAN*	03/4440930	03/4770126		✓	
76	**SEDPC** Sedi Kreir Petroleum Company	**DR. Osama Fouad** / *Industrial Chemicals Specialist.*	03/4770132	02/4197592		✓	
77	**MEDTAP** Middle East Oil Rigs Piping	*H.S.E. & (R & D) Departments*	02/4140756	02/4049284		✓	
78	SUN MISR Maintenance Company	*H.S.E. & (R & D) Departments*	02/4049285	03/4443251		✓	
79	Alexandria Metal Oil Company **(AMOC)**	**Eng. Zein Saif El-Yamani.** / *Technical Assistnace General Manager*	03/4443254	03/4404347		✓	
		Mr. Ibrahim Ragab / *Chemist. Head of (R&D) department*	012/1036906	03/4404347			
		Eng. Abdul Razak Al-Kalbashawy / *Operations General Manager*	012/3962266				
80	Alexandria Specialized Petroleum Co. **(ASPC)**	**Eng. Mansour Kamil Hasanin.** / *Technical Assistnace General Manager*	03/4403973	02/4045842		✓	
		Eng. Tarek Abbas. / Assistant *Technical Assistnace General Manager*	03/4403985				
81	Egyptian Petroleum Services Co. **(EPSCO)**	*H.S.E. & (R & D) Departments*	02/4041292	03/4446783		✓	
82	Alexandrain National Refineries Petroleum Co. **(ANRPC)**	**Eng. Abdul Majid Aarif** / *CHAIRMAN*	03/4425633			✓	
		Eng. Ahmed El-Gendy / *Operations General Manager*	012/3936817	02/4029817			

#	Company Name	Contact Person / (s) (INVITEES)	Tel	Fax	Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
83	**POTAGASCO**	*H.S.E. & (R & D) Departments*	02/4029799	02/4030328		✓	
84	**SYANCO**	*H.S.E. & (R & D) Departments*	02/4030056	02/5400117		✓	
85	**(Town Gas)** for Gas destribution	*H.S.E. & (R & D) Departments*	02/5405587	02/2738523		✓	
86	Marine Petroleum Services Company	*H.S.E. & (R & D) Departments*	02/2738522	02/2684279		✓	
87	Petroleum Trade Services Company **(PETRO TRADE)**	*H.S.E. & (R & D) Departments*	02/2684281	02/7957998		✓	
88	City Gas Company	*H.S.E. & (R & D) Departments*	02/7922345	02/7037990		✓	
89	National Natural Gas Company **(NATGAS)**	*H.S.E. & (R & D) Departments*	02/7047777	02/5162358		✓	
90	Wadi El-Nile Natural Gas Company	*H.S.E. & (R & D) Departments*	02/5203906	02/2611265		✓	
91	RIPCO GAS company	*H.S.E. & (R & D) Departments*	02/4028799	02/2611265		✓	
92	National Gas Co.	*H.S.E. & (R & D) Departments*	02/4508246	02/5223848		✓	
93	United Gas Derivatives Company	*H.S.E. & (R & D) Departments*	02/5223870	02/7030019		✓	
94	Fume Gas Company	*H.S.E. & (R & D) Departments*	02/7030034	02/2611265		✓	
95	RIPCO Kafr Al-Shiekh Company	*H.S.E. & (R & D) Departments*	02/4028799	02/6446710		✓	
96	International Pipe Manufacturing Co,	*H.S.E. & (R & D) Departments*	02/6446711	02/3802487		✓	

#	Company Name	Contact Person / (s) (INVITEES)	Tel	Fax	Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
97	Egypt Liquid Gas Company	*H.S.E. & (R & D) Departments*	02/3802487	02/4486387		✓	
98	National Technolgies for Oil & Gas shipping Company	*H.S.E. & (R & D) Departments*	02/4032148			✓	
99	Al-Masriya Sports Services for Oil & Gas Secor workers	*H.S.E. & (R & D) Departments*	02/2715446	015/369792		✓	
100	Arabian Logistics for Oil & Gas Tubing **(ALTUBE)**	مصنع الانابيب - أ/ كمال	015/369791	02/7062460		✓	
101	Arabian British Engine Co. **(ABECO)**	ك/ ماجده عبد الله فرج	02/5580677	02/5548351		✓	
102	International Egyptian Oils Company	*H.S.E. & (R & D) Departments*	02/3460861			✓	
103	APEDICO	*H.S.E. & (R & D) Departments*	02/2608239	02/5166833		✓	
104	Gharib Oil Rigs Company	*H.S.E. & (R & D) Departments*	02/5166977	02/5193900		✓	
105	AUTOCOL	**Eng. Ashraf.** / *General Manager*	365221			✓	
		Eng. Kamal Al-Haggar / *T.A. Manager*	012/2183832				
106	**KANDEEL** for Fabrications & Tradings	**DR. Kamil Kandeel** / *Founder & CHAIRMAN*	010/5818262			✓	
		Eng. Adil Fathye / *Commercial Manager*	012/2458061	02/3857503			
		Mr. Hani Kandeel / *Financial Controller*	02/3841448	02/3841443			
		HEADOFFICES - Cairo	02/7429369				
		Alexandria Branch	03/5508626				

#	Company Name	Contact Person / (s) (INVITEES)	Tel	Fax	Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
107	PETROJET	**General Administration**	02/2521693				
		Eng. Ahmed Kamal / *General Manager*	02/3524131	02/3524143			
		Headquarters	02/2992347	2992347			
		Main Branch	062/225786			✓	
		Eng. Ali Al-Sayed / *Suiz Branch. General Manager*	012/7451575				
		Eng. Mohamed El-Sherbyni / *Suiz Branch. Technical Assistance*	012/7451503				
		Eng. Mamdouh Abdul Aziz / *Alexandria Branch Manager*	03/4900070	03/2020097			
108	Portsaid Containers	**Eng. Hosam Aatia** / *General Manager*	066/235864	066/339347		✓	
109	Al-Obor Metal Industries **(GALVAMETAL)**	**Mr. Moheyi El-Din Mohamed** / *CHAIRMAN*	02/6100101			✓	
		Eng. Mohamed Abbas / *Maintenance Manager*	02/6100108				
110	RATOMAJ	**Eng. Hamdi** / *CHAIRMAN*	02/4180170	02/2919608		✓	
		Mr. Habib / *H.S.E. Officer in Charge*	02/2909951				
		Eng. Refaat Hanafi / *Maintenance Manager*	010/6491411				
		Mr. Sadeq / *Financial Controller*	012/7060490				
111	RICH MIX	**Eng. Sherif** / *CHAIRMAN*	02/6101154			✓	

#	Company Name	Contact Person / (s) (INVITEES)	Tel	Fax	Surveyed (Y)	Surveyed (N)	Survey Ref# & Comments From Annex 3.B.
112	MEDSTAR	**Mr. Ahmed Abdul Aleem** / Chairman	015/ 411660	015/ 411205			
		Eng. Eissam Salah / *Managing Director*	010/1604026			✓	
		Mr. Mahmoud Shaaraui / *Financial Controller*	010/3513629				
		Mr. Ashraf Ramadan / *Technical Assistance*	010/4722754				
113	MISR for Petroleum Maintenance Operations **(SANMISR)**	**Eng. Emad Abdul Razzaq** / *CHAIRMAN*	02/4049289	02/4049284		✓	
		Mr. Amro Ashmaui / *H.S.E. Manager*	012/3160618				

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"Give the water planet a break"

Contract No. 16001096
[FIRST Report]

Project No. MP/EGY/04/134

Development of the solvent sector strategy for ODS solvent phase-out in low consuming units in Egypt

Our Mission:

To improve the quality of life for all Egyptians through the responsible management of our renewable and non-renewable natural resources and through optimizing the regulation of the environment and industry, in order to foster the sustainable development of Egypt.

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Preface

This study is directly commissioned by the United Nations Industrial Development Organization (UNIDO) to help quantify the remaining ODS used by small scale industries (SSI) in Egypt. Because the remainder of the ODS phase-out projects in Article 5 countries will probably be more complex than past projects, a linkage between investment activities, policy and regulatory activities as well as non-investment activities is identified and developed herewith.

The goal of this survey is to cater to individual needs. An in depth analysis prior to actual ODS elimination will allow a strategy to be formulated which takes into account variances in the amount and type of ODS consumption and/or production, the regulatory environment, the existing approach to phase-out and the capacity of the local institutions to carry out ODS projects. This tailored approach ensures that the country is fully engaged in the final stages of ODS elimination and that its special circumstances which impact phase-out are fully addressed.

Designed as one part of the larger research effort, this survey provides information only about ODS used in Small Scale Industries.

The results in this report are a significant contribution to the broader question because little is known about the use (or misuse) of ODS used in SSIs. Before this survey, logistics information quantifying the amount of ODS. However, that information failed to account for ODS acquired outside of the country and provided little information about how ODS are used by the average SSI.

In an effort to gather additional information, this survey was designed to solicit detailed data both on ODS used by SSI and the side effects occurring from those uses. The data consist of questionaire interviews with 42 SSI who were randomly selected to be statistically representative of the entire country of Egypt.

Data Collection Mood

We administered the surveys by telephone via a centralized telephone interviewing facility located in SIEN, office. It was designed for making online data collection possible. using a current computer assisted survey execution system. The system displays each interview questionnaire on the computer screen for interviewers to read, and allows direct entry of responses into the computer database at the time of the interview, while employing real-time edit and logic checks. It facilitates implementation of complex survey designs such as this one, because it can quickly determine sample eligibility, provide appropriate skipping and branching routines, and tailor question wording to respondent characteristics or previous answers. The system includes sample management as well as automatic call scheduling and case delivery.

This allowed our interviewing staff to maintain the status of each case in the sample and to work the sample efficiently according to survey priorities and scheduled appointments. Some respondent tracking was also done with the help of this system. The central monitoring system enabled both for quality control and interviewer guidance.

Description of the main survey instruments

We designed the survey instrument around two primary objectives:

- Collecting appropriate data to identify and quantify SSI use of ODS; and
- Enhancing valid recall of events while limiting biases and distortions to memory that could result from the eight- to nine-year lapse between events and the survey itself.

Our definition of "appropriate data" was driven by the determination of what information would be necessary to accurately portray use and exposure levels. We also carefully organized and presented the survey questions so that SSI's recollection of details from eight to nine years prior would be most likely to sharpen during the interview.

We conducted an extensive literature review of other retrospective studies to evaluate survey methods used to reduce recall bias. This review and its findings, in combination with the insight gained from our initial pretests, guided the survey's final organization and grouping of topics.

Appendix 3.A. provides additional details about the surveyed SSIs using ODS, and Appendix 3.B provides additional details and a complete discussion "questionnaire" of the recall bias results.

SIGN Group

Scientific Chemical Industries Group

The process of reducing chemical onslaughts on the ozone layer has been guided by well defined scientific and management interventions, the world over. The latter includes financial mechanisms to support changeover to relatively safer alternatives in developing countries.

The objective is to minimize economic dislocation and obsolescence costs through capacity building of all technical stakeholders to adapt to the changeover. Recently recorded levels of ozone in the stratosphere appear to reflect the positive impact, signaling significant success.

It is however a major challenge to sustain this success.

Significant success

At a time when debates on the causes and effects of climate change are tending to polarize participation in mitigation, the case of protection of the ozone layer appears to be growing in strength and momentum. Clear quantifications of the extent of depletion, tools and techniques to prevent release of ozone depleting substances (ODS) and capacity building for use of alternatives are responsible for this success. More than USD 1.5 billion has been approved to support 4600 projects in 134 countries to help phase out nearly 1, 73,000 ODP tones of consumption in addition to another 62,200 ODP tones of production . NASA's satellite observations have provided evidences of recovery of the ozone layer; through an observed decrease in the extent of depletion.

During the current compliance period, monitoring of progress is critical to understand causes for inability to sustain phase out and the risks associated. This is of particular interest to the funding mechanism which would choose to concentrate its resources only on countries which categorically fulfill compliance commitments. Additionally, the danger of the final stages of phase out activities being overlooked as small and insignificant looms large. This is especially true when competition for resources is expected to increase when other environmental priorities may also emerge.

Sustaining Action

Several countries have initiated joint action against illegal trade. For instance, Hungary hosted a meeting on promoting compliance with trade and licensing provisions of the Montreal Protocol in Countries with Economies in Transition (CEIT). This meeting was organized jointly with the UNEP DTIE under the Global Environmental Facility's regional project on the stated aspect. The participating countries pledged to strengthen ODS monitoring and control operations in the region. A similar initiative has also emerged as a tripartite agreement involving Afghanistan, Iran and Pakistan. The National Academy of Custom Excise and Narcotics (NACEN), India plays a very important role in building capacities of customs officers in India and several countries of the Asia Pacific region, in conjunction with the Green Customs initiative of the UNEP. Several investment projects and technical assistance initiatives are also in progress to ensure change over to alternatives. It is however important to sustain these interventions and prioritize investment of resources through a comprehensive understanding of the barriers to be overcome. A well-structured mechanism of information support for all the concerned stakeholders is crucial to guide appropriate action, especially during the present compliance phase. Information support to stimulate adaptation

During this compliance phase it is important to ask if all the erstwhile users of ODS are adequately aware of the phase out schedule and tools and techniques for using alternatives. It is equally important to see if regulations create a milieu which stimulates transition and correct reporting of compliance. Other questions which become relevant at this stage include the following:

Are civil society representatives aware of the impact of radiations and preventive measures?

Are financial institutions engaged adequately to strengthen access to alternatives?

What will be the consequences of non - compliance at the individual firm level and collectively at the country level?

Media support to periodically deliver appropriate information

The proposed medium is aimed at

- π Collecting relevant information on the stated aspects
- π Write periodically (once - a - month) in local news media and disseminate through the internet too, about the realities of phase-out. SIEN will enable the process of accessing relevant information, for you to write about by Periodically posting UNIDO with materials you can refer, and Helping to establish contact with the Head of our country's National Ozone Unit.

Survey Data

This project is organized into two main reports and two appendices. In FIRST REPORT, we discuss the population we surveyed and the survey instrument in detail. In that report we also address the methods we used to aid respondents' recall and describe the second, follow-up survey we fielded to assess recall bias. The Appendices presents our main finding in multiple tabulations of the survey data. In particular, it presents tabulations of SSI uses ODS by Quantities and volumes of usage and tabulations of SSIs use of ODS by Applications.

Then present the details of the survey instrument, the sampling methodology, our analytic methods, and the details of our recall bias analysis In the SECOND REPORT, indicating the NATIONAL STRATEGY.

Annex # 3.A

Please find attached survey sheets elaborating the SSIs surveyed along with the actual ODS used through the period (2003 – 2005).

Annex # 3.B

Please find the following SSI ODS use filled questionnaire.

Annex # 3.A

Exhibit 1: Usage	#	Company Name	City or District	ODS used	Exhibit 2: ODS Applications				ODS Consumption 2003 (KGs)	ODS Consumption 2004 (KGs)	ODS Consumption 2005 (KGs)	Comments : General Notes & Actions taken for ODS total phase out in 2010.
					1	2	3	4				
	1	Suez Canal Authority	Red sea	TCA					202	150	90	Highly reticent to TCA, CTC & CFC-113 replacement at the oxygen station due to a past accident
				CTC					51	55	11	
				CFC-113					510	290	250	
	2	Arab Petroleum Pipelines Co., SUMED	10th of Ramadan	TCA					215	115	80	Highly reticent to TCA, CTC & CFC-113 replacements
				CTC					53	50	12	
				CFC-113					470	285	290	
	3	Middle East for Operation & Maintenance of Oil Refineries, MIDOM	Alexandria	TCA					250	120	75	Highly reticent to TCA, CTC & CFC-113 replacements
				CTC					50	45	10	
				CFC-113					490	310	300	
	4	Maradaife Petroleum & Marine Services	Cairo	TCA					210	140	15	Action plans were taken into limiting the use of TCA, but still reticent to any replacements for CTC & CFC-113
				CTC					50	40	10	
				CFC-113					460	280	275	
	5	Timsah Shipbuilding Co.	Alexandria	TCA					215	135	10	Action plans were taken into limiting the use of TCA, but still reticent to any replacements for CTC & CFC-113
				CTC					52	45	13	
				CFC-113					420	330	305	
	6	National Pipe Company (NPC)	Cairo	TCA					205	140	60	Highly reticent to TCA, CTC & CFC-113 replacements
				CTC					40	35	12	
				CFC-113					480	285	270	
	7	Al Nasr Automotive Manufacturing Co.	Cairo	TCA					203	140	66	Highly reticent to TCA, CTC & CFC-113 replacements
				CTC					48	40	11	
				CFC-113					510	300	305	
	8	Care Service Ltd.	Cairo	TCA					205	135	70	Highly reticent to TCA, CTC & CFC-113 replacements
				CTC					50	40	11	
				CFC-113					495	295	270	
	9	Tiba Service Co.	Cairo	TCA					210	140	75	Highly reticent to TCA, CTC & CFC-113 replacement at the oxygen stations
				CTC					55	45	13	
				CFC-113					450	265	290	
	10	Cairo National Automotive	Cairo	TCA					210	140	75	Highly reticent to TCA, CTC & CFC-113 replacements
				CTC					40	43	10	
				CFC-113					480	270	285	

Exhibit 1: Usage	#	Company Name	City or District	ODS used	Exhibit 2: ODS Applications 1	2	3	4	ODS Consumption 2003 (KGs)	2004 (KGs)	2005 (KGs)	Comments : General Notes & Actions taken for ODS total phase out in 2010.
	11	Atwan Pipe Industry	Port Said	TCA					215	133	69	Highly reticent to TCA, CTC & CFC-113 replacement at the oxygen stations
				CTC					45	32	11	
				CFC-113					465	320	270	
	12	Engineering Automotive Co.	Alexandria	TCA					205	120	78	Highly reticent to TCA, CTC & CFC-113 replacements
				CTC					43	35	12	
				CFC-113					495	305	290	
	13	Egyptian Railway Authority	Cairo	TCA					150	95	55	Action plans were taken into limiting the use of CTC, but still reticent to any replacements for TCA & CFC-113
				CTC					30	23	8	
				CFC-113					270	140	130	
	14	Egyptian Public Transport Authority	Cairo	TCA					140	98	60	Action plans were taken into limiting the use of CTC, but still reticent to any replacements for TCA & CFC-113
				CTC					25	21	7	
				CFC-113					250	155	160	
	15	ALwanisco Enginering	Qina	TCA					130	97	55	Action plans were taken into limiting the use of CTC, but still reticent to any replacements for TCA & CFC-113
				CTC					35	21	8	
				CFC-113					270	160	140	
	16	The Port Said Engineering Works	Port Said	TCA					180	105	55	Action plans were taken into limiting the use of CTC, but still reticent to any replacements for TCA & CFC-113
				CTC					32	22	5	
				CFC-113					285	150	135	
	17	Sibalk Offshore Co.	Alexandria	TCA					222	85	66	Highly reticent to TCA, CTC & CFC-113 replacement at the oxygen stations
				CTC					31	21	6	
				CFC-113					275	190	140	
	18	The Egyptian Company for Supply & Marine Work	Alexandria	TCA					240	90	70	Highly reticent to TCA, CTC & CFC-113 replacement at the oxygen stations
				CTC					34	20	7	
				CFC-113					290	140	160	
	19	East Delta for Transport Company	Cairo	TCA					170	100	68	Highly reticent to TCA, CTC & CFC-113 replacement at the oxygen stations
				CTC					36	21	7	
				CFC-113					250	180	160	
	20	West Delta for Transport Company	Cairo	TCA					160	95	55	Action plans were taken into limiting the use of CTC, but still reticent to any replacements for TCA & CFC-113
				CTC					35	23	6	
				CFC-113					290	175	120	

Exhibit 1: Usage	#	Company Name	City or District	ODS used	Exhibit 2: ODS Applications				ODS Consumption 2003 (KGs)	ODS Consumption 2004 (KGs)	ODS Consumption 2005 (KGs)	Comments : General Notes & Actions taken for ODS total phase out in 2010.
					1	2	3	4				
	21	International Tansformers Matelec Co.	Cairo	TCA					192	95	60	Highly reticent to TCA, CTC & CFC-113 replacement at the oxygen stations
				CTC					30	25	8	
				CFC-113					205	190	135	
	22	Egyptair	Cairo	TCA					66	55	1	Action plans were taken into limiting & reducing the use of ODS
				CTC					16	11	0	
				CFC-113					90	95	90	
	23	Belayim Petroleum Company	Belayim	TCA					54	50	4	Limiting the use to General Labratorial use and slightly remote use into electrical cleaning and metal precision parts cleaning
				CTC					18	15	0	
				CFC-113					110	60	110	
	24	Egyptian Tank Factory	Cairo	TCA					55	75	0	Action plans were taken into limiting & reducing the use of ODS
				CTC					17	15	4	
				CFC-113					105	85	115	
	25	Some army departments	Cairo	TCA					60	55	0	Action plans were taken into limiting & reducing the use of ODS
				CTC					18	18	4	
				CFC-113					90	55	90	
	26	Airforce and Marine	Cairo	TCA					65	50	0	Action plans were taken into limiting & reducing the use of ODS
				CTC					12	14	0	
				CFC-113					75	65	60	
	27	Some military factories (factories 81 & 27)	Cairo	TCA					73	35	0	Action plans were taken into limiting & reducing the use of ODS
				CTC					14	17	3	
				CFC-113					60	60	75	
	28	Weapons and repertoire departments	Cairo	TCA					55	40	0	Action plans were taken into limiting & reducing the use of ODS
				CTC					11	12	0	
				CFC-113					80	85	85	
	29	National Motors	Cairo	TCA					75	65	1	Limiting the use to General Labratorial use and slightly remote use into electrical cleaning and metal precision parts cleaning
				CTC					13	13	2	
				CFC-113					80	90	95	
	30	El Gihaz El Tanfeezy electrical supplies	Cairo	TCA					65	65	2	Limiting the use to General Labratorial use and slightly remote use into electrical cleaning and metal precision parts cleaning
				CTC					19	11	6	
				CFC-113					90	95	80	

Exhibit 1: Usage	#	Company Name	City or District	ODS used	Exhibit 2: ODS Applications 1	2	3	4	ODS Consumption 2003 (KGs)	2004 (KGs)	2005 (KGs)	Comments : General Notes & Actions taken for ODS total phase out in 2010.
	31	Egyptian Petroleum Research Institute	Cairo	TCA				■	8	8	0	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		10	5.9	0	
				CFC-113		■			20	10	0	
	32	Assiut Oil Refining Co.	Assiut	TCA				■	10	8	0	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		6	5	0	
				CFC-113		■			15	10	0	
	33	Cairo Oil Refining Co.	Cairo	TCA				■	9	15	0	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		11	5	2	
				CFC-113		■			20	10	0	
	34	Societe Co-op de Petrol	Cairo	TCA				■	12	12	0	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		9	7	0	
				CFC-113		■			10	15	0	
	35	Arab Dairy Co	Cairo	TCA				■	15	10	9	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		6	5	0	
				CFC-113		■			10	10	0	
	36	Greenland Co. & Milky Land Co.	Cairo	TCA				■	10	0	0	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		6	0	0	
				CFC-113		■			20	0	0	
	37	Memphis Co. for Pharm. and Chem. Ind.	Cairo	TCA				■	8	0	0	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		3	0	0	
				CFC-113		■			30	0	0	
	38	International Foods Company	Cairo	TCA				■	12	0	0	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		8	2	0	
				CFC-113		■			15	0	0	
	39	EGY MAC CO.	Cairo	TCA				■	25	0	5	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		6	0	0	
				CFC-113		■			55	0	0	
	40	Group Engineering & Scientific Systems	Cairo	TCA				■	25	15	4	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		4	3	0	
				CFC-113		■			14	0	0	

Exhibit 1: Usage	#	Company Name	City or District	ODS used	Exhibit 2: ODS Applications 1	2	3	4	ODS Consumption 2003 (KGs)	2004 (KGs)	2005 (KGs)	Comments : General Notes & Actions taken for ODS total phase out in 2010.
	41	Erabco Building Materials & Construction	Cairo	TCA				■	10	9	9	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		7	4	0	
				CFC-113		■			10	0	3	
	42	El Shami Co. For Scales	Cairo	TCA				■	12	5	5	Limited its use of ODS to general Labratorial use only by 2005
				CTC			■		1	2	1.3	
				CFC-113		■			13	4	2	

		ODS Consumption 2003 (KGs)	2004 (KGs)	2005 (KGs)
T O T A L Reported Consumption	TCA	4853	3040	1347
	CTC	1080	866.9	220.3
	CFC-113	9122	5764	5485

EXHIBIT (1) Used Capacity:

End-users who has phased out the ODS use but still used moderately in labratorial researches
Reduced "moderate" use due to action plans taken for complete ODS phase out.
Existing ODS end-users not aware about the near deadline for ODS phase-out schemes.
Existing ODS end-users Highly Reticent to TCA, CTC & CFC-113 replacements.

EXHIBIT (2) ODS

TCA	1	Electronics cleaning for actuators (electric, hydraulic, & mechanical), control panels circuit boar
	2	Solvent for oil, lacquer, paints & adhesives
	3	Metal degreaser
	4	General laboratorial use
CTC	1	Fire extinguishers
	2	Refrigerant, coolant
	3	General laboratorial use
CFC-113	1	Electric circuits cleaning
	2	General laboratorial use

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"Give the water planet a brake"

Contract No. 16001096
[SECOND Report]

Project No. MP/EGY/04/134

Development of the solvent sector strategy for ODS solvent phase-out in low consuming units in Egypt

Our Mission:
To improve the quality of life for all Egyptians through responsible management of our renewable and non-renewable natural resources and through optimizing the regulations of the environment & industry, in order to foster sustainable development of Egypt.

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Montreal Protocol preamble

The Montreal Protocol on Substances That Deplete the Ozone Layer is a landmark international agreement designed to protect the stratospheric ozone layer. The treaty was originally signed in 1987 and substantially amended in 1990 and 1992. The Montreal Protocol stipulates that the production and consumption of compounds that deplete ozone in the stratosphere--chlorofluorocarbons (CFCs), halons, carbon tetrachloride, and methyl chloroform--are to be phased out by 2000 (2005 for methyl chloroform). Scientific theory and evidence suggest that, once emitted to the atmosphere, these compounds could significantly deplete the stratospheric ozone layer that shields the planet from damaging UV-B radiation. The United Nations Environment Program (UNEP) has prepared a *Montreal Protocol Handbook* that provides additional detail and explanation of the provisions. Presenting an-in-depth look at causes, human and environmental effects, and policy responses to stratospheric ozone depletion.

The Vienna Convention for the Protection of the Ozone Layer (1985), which outlines states' responsibilities for protecting human health and the environment against the adverse effects of ozone depletion, established the framework under which the Montreal Protocol was negotiated.

The Montreal Protocol on Substances that Deplete the Ozone Layer is mainly considered to be one of the first international environmental agreements that include trade sanctions to achieve the stated goals of a treaty. It also offers major incentives for non-signatory nations to sign the agreement. The treaty negotiators justified the sanctions because depletion of the ozone layer is an environmental problem most effectively addressed on the global level. Furthermore, without the trade sanctions, there would be economic incentives for non-signatories to increase production, damaging the competitiveness of the industries in the signatory nations as well as decreasing the search for less damaging CFC alternatives.

Given the threats to life that have been averted through this landmark treaty, few would challenge their statement as hyperbole. Ozone, whose existence was unknown until 1839, has been characterized as "the single most important chemically active trace gas in the earth's atmosphere." Without it, life as it currently exists on Earth could not have evolved. The Montreal Protocol, by phasing out certain chemicals, preserved the stratospheric ozone layer that absorbs harmful ultraviolet radiation from the sun. Depletion of this thin gaseous shield which, if compressed to the planet's surface, would be no thicker than gauze would have incalculable impacts on human, animal, and plant cells, as well as on climate and ecological systems.

Recent research, for example, indicated that if anthropogenic ozone-depleting substances had continued their rapid accumulation in the upper atmosphere, there would have been a "runaway increase" in skin cancer over the next several decades.

And yet, while the treaty was under negotiation, the science was still speculative, based on projections from evolving computer models of imperfectly understood atmospheric processes models that yielded varying, sometimes contradictory predictions each time they were refined. Moreover, measurements revealed neither the theorized mid-latitude depletion of ozone nor any of the predicted impacts. The scientific, economic, technological and political issues involved in the negotiations were staggeringly complex. Chlorofluorocarbons (CFCs) and related substances seemed virtually synonymous with modern standards of living. They were ideal chemicals nonflammable, nontoxic, noncorrosive. In the 1980's, they were finding new applications in thousands of products and processes across dozens of industries, from electronics, refrigeration, insulation, and plastics, to telecommunications, aerospace, pharmaceuticals, and agriculture. Powerful political and economic interests were aligned against meaningful controls.

Nevertheless, within less than six years after negotiations began in late 1986, the Montreal Protocol had been ratified by more than 100 (later over 160) nations and had undergone two major revisions that expanded the list of controlled substances from 8 to over 90 and that considerably strengthened timetables for reduction and phaseout of the dangerous chemicals. A veritable technological revolution was unleashed that in only a few years transformed entire industries. The protocol created the first-ever global environmental fund to assist developing nations, and promoted an unprecedented North-South collaboration in researching and diffusing new technologies that have now made ozone-depleting substances obsolete.
Even so, it was a near thing. For decades after their discovery in the 1930's, no one suspected that these "wonder-chemicals" could cause any harm, much less to the critical ozone layer. And, because the CFCs and their cousins have such long atmospheric lifetimes, their deleterious impacts will still be felt for decades, even after new emissions cease.
Unquestionably the indispensable element in the success of the Montreal Protocol was the role of science and scientists. Without the curiosity and courage of a handful of researchers in the mid-1970's, the world might have learned too late of the deadly, hidden dangers linked with rapidly expanding use of these substances. The initial, now legendary, hypotheses of Sherwood Rowland and Mario Molina at the University of California-Irvine unleashed a storm of criticism and controversy. They were vindicated by the 1995 Nobel Prize in Chemistry (together with Paul Crutzen of the Netherlands), but it is worth noting that the first popular book on this subject, published in 1978, was entitled The Ozone War.
The complexity of the research effort was enormous. Ozone amounts to considerably less than one part per million of the total atmosphere, with 90 percent of it concentrated above six miles in altitude. The intrinsically unstable ozone molecules are continually being created and destroyed by complex natural forces involving solar radiation and interactions with even more minute quantities of other gases. Moreover, stratospheric ozone concentrations fluctuate wildly on a daily, seasonal, and solar-cyclical basis, and there are great geographical as well as altitudinal variations.
Amidst all these fluxes, scientists faced a formidable challenge in predicting, and then detecting, the minuscule "signal" of a downturn in stratospheric ozone concentrations. This necessitated the development of ever more sophisticated computer models to simulate the stratospheric interplay among radiative, chemical, and dynamic processes such as wind and temperature for decades or centuries into the future. Intricate

measuring devices had to be created and fitted onto aircraft, satellites, and rockets to monitor remote gases in quantities as minute as parts per trillion.

To understand the implications of a fading ozone layer, scientists had to venture far beyond atmospheric chemistry: they had to examine our planet as a system of interrelated physical, chemical and biological processes on land, in water, and in the atmosphere — processes that are themselves influenced by economic, political, and social forces. The Montreal Protocol became a truly multi- and interdisciplinary effort. Over the years, researching the dangers and solutions involved not only chemists and physicists, but also meteorologists, oceanographers, biologists, oncologists, economists, soil scientists, toxicologists, agronomists, pharmacologists, electrical, chemical, automotive, and materials engineers, botanists, entomologists, and more. It was not sufficient, moreover, for scientists merely to publish their findings. In order for the theories to be taken seriously and lead to concrete countermeasures, scientists had to interact with diplomatic negotiators and government policy makers. This meant that they occasionally had to leave the familiar atmosphere of their laboratories and assume an unaccustomed shared responsibility for the policy implications of their research. The history of the Montreal Protocol is filled with instances of scientists called upon to analyze the implications of alternative remedial strategies and policy measures.

International scientific consensus was also essential. The development of an accepted common body of data and analysis was prerequisite for a political solution among negotiating governments whose positions were initially very far apart. In 1984, a remarkable collaborative international research effort was launched, spearheaded by the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA), in cooperation with the WMO, UNEP, the Federal Aviation Administration, the German Ministry for Research and Technology, and the Commission of the European Communities. The Montreal Protocol later institutionalized this idea by establishing international expert panels to periodically assess scientific, technological, economic, and environmental knowledge and thereby guide the negotiators in the further evolution of the treaty. Over the years hundreds of scientific experts from dozens of countries participated in the effort to learn more about both the dangers and the possible technological solutions. This proved to be a central element in the protocol's success, facilitating agreement by negotiators on additional measures to protect the ozone layer. In effect, the Montreal Protocol was deliberately designed to be a dynamic process of narrowing the ranges of uncertainties, rather than a static solution based on the status quo. The role of scientists in the ozone history provided useful lessons for the climate change issue. In the 1980's, scientific assessments on climate change appeared regularly, under the aegis of WMO and UNEP, from a small group of largely self-selected scientists called the Advisory Group on Greenhouse Gases. During the summer of 1987, while preparing for the conclusive final negotiation in Montreal, I recommended that the US take an initiative to establish a formalized international assessment body on climate change, similar to what we were doing on the ozone issue. My Intergovernmental Panel on Climate Change, founded in 1988, has confirmed this hope.

Another lesson from the protocol's success was the importance of public education: interpreting the continually evolving and sometimes confusing data, and communicating it intelligibly to the public and the media. This information flow mobilized public opinion on the potential dangers of a diminishing ozone layer, and thereby promoted political consensus for both policy measures and for funding

research. The proponents of actions to protect the ozone layer generally avoided exaggerating their case as a means of capturing media and public attention. In this way, they maintained credibility and did not provide gratuitous ammunition to those interests that sought to minimize the problem. In 1976-78, US media interest, promoted and nurtured by some scientists, legislators, and environmental organizations, stimulated decisions by millions of individual consumers that led to the collapse of the domestic market for CFC aerosol sprays even before there was any government regulation. Later, UNEP and WMO played prominent roles, through workshops, publications, and electronic media, in disseminating relevant information, including the availability of new technologies, to officials, business, and public around the world.
The history of the Montreal Protocol also underscored the importance of having sufficient funding for all levels of science, from curiosity-driven basic research to applied engineering solutions. Initially, most funding came from government sources, in particular NASA and NOAA in connection with their space-related research. But this was not always the case.

Concluding Ozone Depleting Substances Phase-out

The National Phase-out Strategy has been developed to continue ozone depleting substances (ODS) phase-out in Article 5 countries in view of a changed environment. The strategy would comprise of several approaches, such as surveys, umbrella projects, policy development and/or recycling/recovery plans which would be assembled in accordance to the particular needs of Egypt.

Past projects focused on phasing out ODS from enterprises which were large and easy to identify. As these types of projects are complete or entering their final phases, there is a need to take on projects which will phase out the remaining ODS which is consumed primarily by small sector industries (SSIs) and/or residual users in the solvent, foam and aerosol sectors. While each enterprise in these sectors may use small amounts of ODS compared to larger enterprises, these small enterprises are large in number. Therefore the total ODS consumed is substantial. Ignoring these enterprises and residual users could result in increased consumption and risks which would undermine the progress made in larger enterprises.

Because the remainder of the ODS phase-out projects in Article 5 countries will probably be more complex than past projects, a linkage between investment activities, policy and regulatory activities as well as non–investment activities will have to be identified and developed. As we are dealing with SSIs.

Different incentives may be required to promote effective conversion in this sector.

Protocol Amendments

London Amendment

The London Amendment was adopted in 1990 at the Second Meeting of the Parties to the Montreal Protocol held in London. The amendment introduced control measures for both production and consumption for three new groups of substances, namely other halogenated CFCs (Annex B, Group I substances), Carbon Tetrachloride (Annex B, Group II) and Methyl Chloroform or 1,1,1-trichloroethane (Annex B, Group III). Control measures also included restrictions on trade with non-Parties.
The financial mechanism was also established (Article 10 of the Protocol) for providing financial and technical assistance to developing countries to enable their compliance with their obligations under the protocol. The financial mechanism meets the agreed incremental costs of developing countries in order to enable their compliance with the control measures of the Protocol.
The amendment further introduced HCFCs (Annex C, Group I substances), but only required reporting of production and consumption data for the Annex and did not introduce control measures for the Annex Group.

The London Amendment entered into force on 10 August 1992.

Copenhagen Amendment

The Copenhagen Amendment was adopted in 1992 at the Fourth Meeting of the Parties to the Montreal Protocol held in Copenhagen. The amendment introduced control measures for consumption only for HCFCs (Annex C, Group I substances). The amendment further introduced control measures for both production and consumption for two new groups of substances, namely HBFCs (Annex C, Group II substances) and Methyl Bromide (Annex E, Group I).

The Copenhagen Amendment entered into force on 14 June1994.

Montreal Amendment

The Montreal Amendment was adopted in 1997 at the Ninth Meeting of the Parties to the Montreal Protocol held in Montreal. This is the only amendment that did not introduce new substances to the protocol. Instead, the amendment introduced the requirement for licensing systems to allow control and monitoring of trade in substances controlled under the protocol.

The Montreal Amendment entered into force on 10 November 1999.

Beijing Amendment

The Beijing Amendment was adopted in 1999 at the eleventh Meeting of the Parties to the Montreal Protocol held in Beijing. The amendment introduced control measures for production for HCFCs (Annex C, Group I substances) and imposed restrictions on trade with non-Parties for these HCFCs. The amendment further introduced control measures for both production and consumption for one new group of substances, namely Bromochloromethane or BCM (Annex C, Group III substance).

The Beijing Amendment entered into force on 25 February 2002.

Egypt has been among the most active Article 5 countries in ratifying and enforcing the Vienna Convention, the Montreal Protocol and its amendments. Exhibit 3 illustrates the ratification and acceptance dates as of 2 April 2004 (UNEP).

Ratification and Acceptance Dates

Convention/Protocol/Amendment	Ratification	Entry into force
Vienna Convention	9 May 1988	7 August 1988
Montreal Protocol	2 August 1988	31 October 1988
London Amendment	13 January 1993	13 April 1993
Copenhagen Amendment	28 June 1994	26 September 1994
Montreal Amendment	20 July 2000	18 October 2000
Beijing Amendment		

Regulations

Ministerial Decree No. 977 (8 Nov. 1989) bans the use of CFCs in new aerosol industries as of January 1991.

Ministerial Decree No. 633 (31 Dec. 1994) bans the import and use of ODSs in the manufacture of air-conditioning, refrigeration and aerosol equipment (except for medial uses). Ministerial Decree No. 977 (8 Nov. 1989) bans the use of CFCs in new aerosol industries as of January 1991.

Action publication 18 (7 Oct. 1999) concerns the control of all imported ODS entering the country through the Customs House.

Monitoring

The Ozone Unit monitors the consumption data for all ODS.

The Government has offered and intends continuing to offer continuity of activities and endorsement for the projects through the institutional support (Ozone Unit) over the next years. This will guarantee the success of any activity approved for Egypt.

Egypt (ODS) Phase-out National Strategy

The Egyptian Government has taken several initiatives and measures to phase out ODS. Some major actions and achievements of the Government, during 1993-1997, are given below:

Regulatory measures

Trade in ODS with Non-Parties was banned. Disposal of old equipment in an ozone-friendly way was mandated in legal agreements that were to be signed for the implementation of approved projects. Annex A and B substances were brought under the ambit of licensing for purposes of imports and exports. Exports of these substances to non-Article 5 countries was banned. All exports of CFCs to Article 5 countries were to have the label "New produced CFCs". Comprehensive regulations on ODS phase-out are under development. The first round of discussions has taken place with EEAA, Ministry of Law, industry, etc. The first round of consultations with other government departments are ongoing.

Institutional Framework

Egypt ratified the Montreal Protocol in August 1998. In 1992, Egypt prepared a Country Programme incorporating the national strategy and action Project to phase out ODS in line with the Montreal Protocol control schedule. The action plan proposed to address each of the ODS consuming industry sectors, through six elements, namely, institutional measures, regulatory measures, incentive and disincentive measures, awareness and information dissemination, investment and technical assistance and monitoring. The 1992 CP was approved at the 8th Meeting of ExCom in October 1992.

The Government prepared a Country Programme Update in 2000 (2000 CPU) with the assistance of the World Bank, UNDP and the industry, under which the ODS consuming sectors were re-surveyed. The updated country programme renewed and reinforced Egypt's commitment, strategy and action plans to eliminate ODS and is intended to serve as a guideline for future activities related to meeting Egypt's obligations under the Montreal Protocol.

The activities related to ozone layer protection and implementation of the Montreal Protocol are co-ordinated by the Ozone Unit, within Egyptian Environmental Affairs Agency (EEAA).

To provide regulatory and policy support for enabling the industry to eliminate ODS, the Government of Egypt has taken the following initiatives and actions:

Establishing a licensing and quota system for import of ODS from 2003.

Active monitoring of the progress of implementation of projects funded by MLF.

Formulating guidelines and regulations as necessary for policy implementation.

Supporting public awareness initiatives and campaigns for promoting ozone layer protection at the consumer level.

Regular interaction with other ministries and departments, industry representatives and implementing agencies for information dissemination related to impact of policy measures.

Promoting research and use of ozone-friendly technologies.

Providing incentives and rewards for development and use of ozone-friendly technologies.

Fiscal measures

The government decided in January 1995 to fully exempt from payment of customs and excise duties all capital goods required to implement ODS phase-out projects funded by the Multilateral Fund (MLF). This benefit was later extended for all MLF-eligible projects and items of recurring use, whether or not MLF assistance was requested/available at the time of implementation of the ODS phase-out project. Egypt financial institutions decided in April 1995 to stop financing/refinancing new ODS producing and/or consuming enterprises. The Government of Egypt has exempted companies making new investments in non-ODS technologies from paying customs and excise duties with effect from March 01, 1997.

Overall Consumption of ODS in Egypt

Egypt ratified the Montreal Protocol on 2 August 1988 and qualifies under paragraph 1 Article 5 of the Protocol for a 10-year delay in the phase-out of ODSs and for assistance from the Multilateral Fund for the Implementation of the Montreal Protocol in accomplishing the phase-out. Egypt does not produce ODSs. In 1991 the total consumption was 1,730 tons or 0.03 kg per capita. The major demand has been concentrated in the industries which manufacture and service domestic refrigerators, large air conditioning systems and in the foam industry, which produces cushioning, furniture and packaging materials.

In 2003 Egypt consumed 3,765 actual MT of ODSs, distributed by Sector as shown in Exhibit 1. There is no production of ODS in Egypt.

Exhibit 1 *2003 ODS consumption by Sector, actual MT*

Sector	MT ODS	% of total	comments
Aerosol	**0**	**0**	
Foam	**152**	**4.04**	
Fire fighting	**25**	**0.66**	
Refrigeration, manufacture	**253.33**	**6.73**	
Refrigeration, servicing	**2,625.4**	**69.73**	
Solvent	**206.75**	**5.49**	
Process agent	**51**	**1.35**	
Methyl bromide	**451.48**	**11.99**	
Tobacco fluffing	**0**	**0**	
Total	3,764.96	99.99	

The industries involved with ODS use in Egypt are mainly engineering industries which manufacture household refrigerators, freezers, room and auto air conditioners, commercial air conditioning units, systems for industrial refrigeration, aerosol sprays and foams. Halons are used for fire extinguishers and central fire protection systems. Methyl bromide is used in agriculture.

The 2003 ODS overall consumption is summarised in Exhibit 2.

Exhibit 2. 2003 ODS consumption (as reported to UNEP)

Type of ODS	2003 Consumption (tons)			
		ODP-weighted		
	Actual, MT	ODP	MT	%
CFC-11	149	1.0	149	8.78
CFC-12	918	1.0	918	54.12
CFC-113	33.75	0.8	27	1.59
CFC-114	0	1.0	0	0
CFC-115	73	0.6	43.8	2.58
Halon 1211	10	3	30	1.77
Halon 1301	15	10	150	8.84
TCA	180	0.1	18	1.06
CTC	10.73	1.1	12.98	0.67
HCFC-22	1,932	0.055	106.26	6.26
HCFC-141b	39	0.11	4.29	0.25
HCFC-142b	15	0.065	0.975	0.06
HCFC-123	0	0.02	0	0
Methyl Bromide	396.65	0.6	237.99	14.03
Total	3,772.13		1,698.30	100.01

ODS consumption in the Solvent Sector has been split between electronics, optics, metal cleaning and formulation of cleaners. In 2003 EEAA reported that the Solvent Sector consumed 45.98 ODP MT of ODS, comprising 15 ODP MT of CFC-113, 18 ODP MT of TCA and 12.98 ODP MT of CTC. This constitutes 2.6% of the 2003 ODP-weighted ODS consumption.

N.B. - It should be noted that the 2002 and 2004 UNIDO Surveys found that one user of CFC-113, ADCO (6.25 ODS MT or 5 ODP MT CFC-113) was in fact using CFC-113 in a medical application, namely as an ingredient in topical aerosols. ADCO is also using CFC-12 as propellant in MDI formulations. Therefore the ADCO project will be submitted separately and not as part of this Terminal Umbrella Project, in order to avoid having two projects for the same enterprise.

The Solvent Sector

Exhibit 3 gives the quantities (ODP MT, all Sectors) as reported by Egypt to the Ozone Secretariat and published in UNEP/Ozl.Pro/ExCom/38/58, Annex II. These are used to establish the baselines for the Solvent Sector (average of 1998-2000).

Exhibit 3: Quantities (ODP MT, all Sectors) as Reported by Egypt to the Ozone Secretariat.

ODS	1998, ODP MT	1999, ODP MT	2000, ODP MT	Baseline (Solvent Sector), ODP MT
CTC	55.0	33.0	27.5	38.5
TCA	25	33	20	26.0
CFC-113	Included with CFCs, no separate figure for CFC-113			

Recent reported consumption

Exhibit 4 gives the quantities (ODP MT) as reported by Egypt to the MLF for consumption in the Solvent Sector in 2001, 2002 and 2003.

Exhibit 4. Quantities (ODP MT) as reported by Egypt for consumption in the Solvent Sector.

ODS	2001, ODP MT	2002, ODP MT	2003, ODP MT	Baseline, Solvent Sector, ODP MT
CTC	11	10	*12.98	38.5
TCA	15	19	18.0	26.0
CFC-113	**17	16	***15.0	CFC-113 included with CFCs
Total	43	45	45.98	

*Original 8.8 ODP MT corrected to 12.98 ODP MT (letter of 23/09/2004 from EEAA to UNEP)
**By back-extrapolation since no separate figure reported for CFC-113 (included with CFCs)
***Includes 5 ODP MT from a medical project (ADCO) which will be submitted separately

UNIDO submitted the Terminal Solvent Sector Umbrella Project to the December 2004 ExCom meeting. The Project was implemented through two annual implementation programmes and upon completion resulted in the complete phase-out TCA, CTC and CFC-113 in the Solvent Sector in Egypt by the end of 2006. The Project covered the technology conversions in the identified eligible enterprises in the Solvent Sector and ensure timely, sustainable and cost-effective phase-out through a combination of investment, technical support and policy/management support components. The total eligible incremental costs and the requested grant for the Terminal Solvent Sector Umbrella Project in Egypt amounted to US$ 778,464. A total consumption of 40.98 MT ODP (12.98 of CTC, 18 of TCA, 10 of CFC-113), based on reported 2003 consumption (less 5 MT CFC-113 from a separate medical Project at ADCO), was phased-out with the funding provided by the Terminal Solvent Sector Umbrella Project.

The Solvent Sector projects earlier implemented contributed to the total phase-out of 40.8 ODP MT.

The remaining use of OD solvents in the small scale industries still has to be addressed and it is the subject of the present contract with SIEN Group which is to conduct a survey of small scale users and develop a National Strategy for complete phase out of OD solvents in Egypt.

Features of the National Phase-out Strategy:

This new strategy can be differentiated from other Ozone Depleting Substances (ODS) phase-out strategies in several ways. First, as the title implies, the National Phase-out Strategy is country specific. Because each country which will qualify for this type of assistance will have a unique framework in face of ODS phase-out, the strategy will have to cater to individual needs. An in depth analysis prior to actual ODS elimination will allow a strategy to be formulated which takes into account variances in the amount and type of ODS consumption, the regulatory environment, the existing approach to phase-out and the capacity of the local institutions to carry out ODS projects. This tailored approach ensures that the country is fully engaged in the final stages of ODS elimination and that its special circumstances which impact phase-out are fully addressed.

Second, the National Phase-out Strategy would provide flexibility in how Egyptian government phase out ODS, thereby allowing the country to decide how funding should be allocated while developing and strengthening their institutional capacities. In addition, this flexibility opens up possibilities for introducing innovative projects and conversion technologies.

Third, the National Phase-out Strategy would be comprehensive and absolute and would aim to address all remaining ODS consumption in Egypt. The preliminary stage of such an approach is thus crucial because success will only stem from an accurate assessment of remaining Ozone Depleting Substances (ODS) SSI users. This task could prove to be daunting, however, and will require the cooperation of several actors (ODS end-users, suppliers of chemicals and equipment, local government, implementing agencies, etc). Once users are identified, the government can work towards final phase-out.

Finally, the National Phase-out Strategy will combine multiple approaches; including hiring third party (Event Managements "Seminar", Press, & Media), to ensure that total phase-out is achievable. Because the strategy is broad based and country directed, it can incorporate approaches which are crosscutting in their goals. For instance, elimination of ODS could be combined with other environmental objectives. In addition, new approaches might have to be developed and included as part of the strategy as special circumstances of client usage or, innovations in the field are disclosed.

In order to ensure that funds (whether they are in the form of grants or loans) are used effectively and efficiently, the National Phase-out Strategy would link performance based

implementation to disbursement. Thus, concrete measures of performance as delineated by the Multilateral Fund Executive Committee and adopted and expanded by the MLF would be used by Egyptian government, along with its own measures of performance, to examine the eligibility of beneficiaries for funding. The level of funding by the MLF would depend on the Egypt's performance in Ozone Depleting Substances (ODS) phase-out as evaluated by an ongoing, comprehensive auditing system which would be part of the National Phase-out Strategy

In addition, impediments to phase-out, such as duties on imports, continued Chlorofluorocarbon (CFC) accessibility, economic difficulties and enforcement breaches would require special attention by the Egyptian government.

Survey synopsis

Identifying the potential size of the OD Solvents remaining applications in the SSI's sector in Egypt is considered to be the overall objective of this field survey.

Therefore, strategy promotes sustainable development, defined as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". In relation to atmosphere protection and ambient air quality, sustainable development principles must be taken into account because if air pollution is not controlled, it has an increasing impact on quality of life, and ultimately on the life expectancy of the population of the country. But at the same time, a balance has to be struck between achieving the aims of sustainable development and on imposing unacceptable economic and social costs on industry and society. Sustainable development must make due consideration of the economic impacts associated with all plans and strategies.

Strategic Goals:

Identifying the remaining companies (Parties) Supplying / Consuming ODS (CFC-113, 1,1,1-Trichloroethane, CTC-Carbon Tetrachloride) in their operations as a solvent for industrial cleaning, or formulation solvent.

Providing the technical assistance required to generate an awareness program tackling the magnitude significance of the ODS phase-out program following the Montreal Protocol.

Conducting a final survey targeting the identified sectors procuring the ODS to confirm their phase-out compliance.

Key Objectives:

Two major objectives were distinguished:

I. Survey Analysis objectives (*First Report*).

II. Awareness objectives (*Second Report*).

Measures specified steps necessary for the achievement of the major key objectives. There are technical, economical, institutional, procedural and informative measures.

Actions undertaken for the implementation of an individual measure or of a package of measures in order to achieve the objectives. An action is undertaken within a certain frame by an appointed and responsible party.

No single objective or measure is sufficient to achieve the final OD solvent – related to human health and environment protection goals, unless there were a package of objectives, measures and action were finally proposed. There are three ways which the measures and actions are directed:

- encouraging the use of viable alternatives to OD solvents
- improving monitoring activities
- raising awareness between users and consumers about the benefits for human health and for the environment.

Strategic Key Objectives

Annex # 1.A

Survey Analysis objectives		
Objectives	***Measures***	***Actions***
Objective 1: Updating the list of OD Solvents user	**1.1.** Identifying the remaining SSI (ODS) end-users	*1.1.1*: Studying the last updated list of OD Solvents users and traders, existing at the National Ozone Unit (EEAA). *1.1.2*: Studying the list periodically elaborated by the local EEAA on the current OD solvent users identified based on inspections and environmental permits issued *1.1.3*: Gathering the relevant data related to OD solvents import and export, from the customs authority & chamber of commerce.
	1.2. Establish a contact (Questionnaire)	*1.2.1*: Sending the investigative questionnaire to all identified SSI end-users. *1.2.2*: Maintaining of contact with the identified OD solvents users through the local EEAA and other sub departments affiliated with EEAA. *1.2.3*: Performing of inspections to OD solvents users facilities
Objective 2: Monitoring ODS consumption	**2.1.** EEAA Periodic update of the national database on OD solvent consumption, & imports.	*2.1.1*: Collecting and processing of data related to OD solvent production, consumption, import and export in order to continuously update the national database *2.1.2*: Dissemination of questionnaires concerning the evolution of OD solvents consumption
	2.2. Preparation of periodical reports on OD solvent consumption, and import through the EEAA	*2.2.1*: Assessment of periodical reports on OD solvent production, consumption, import and export
Objective 3: Assessment of the contributed activities related to OD solvents use.	**3.1.** Establishing of a methodology nationally approved for OD Solvents atmospheric emission assessment	*3.1.1*: Training programs for preparing OD solvents atmospheric emissions inventories *3.1.2*: Elaboration of annual OD Solvents atmospheric emission inventories *3.1.3*: National validation by the stakeholders, of the national emission inventories

Strategic Key Objectives (continue)

Annex # 1.B

Awareness program objectives		
Objectives	***Measures***	***Actions***
Objective 4: ODS User awareness program forewarns of the phase-out deadline implications	**4.1.** Elaborating information regarding the (MP) provisions and national legislation related to OD Solvents phase-out	*4.1.1*: Conducting awareness seminars. *4.1.2*: Setting up of information campaigns through mass-media, Internet sites and distribution of brochures and posters.
	4.2. Training of local EEAA regarding the enforcement of the national legislation related to OD solvent phase-out	4.2.1: Organizing of seminars, training sessions and maintaining a permanent contact with EEAA
Objective 5: Information, dissemination and Technical support for complete ODS phase-out throug viable alternatives	**5.1** Training activities and technical assistance on viable alternatives on OD solvents use	*5.1.1*: Organizing of seminars, training sessions on viable alternatives on OD solvents use
	5.2. Awareness campaigns on viable alternatives on OD solvents use	*5.2.1*: Setting up of information campaign through mass-media, Internet sites and distribution of brochures and posters *5.2.2*: Maintaining of permanent contact between OD solvents users and technical advisers through the local EPAs and NOU
	5.3. Implementation of the projects identified in the updated Country Program for the solvent sector	*5.3.1*: Designing of projects to implement viable alternatives on OD solvents use *5.3.2*: Survey and reporting on projects implementation and outcomes
Objective 6: Public awareness related issues and the atmospherically negative effects caused by ODS	**6.1.** Awareness campaigns on the negative effects of OD Solvents on human health and environment	*6.1.1*: Setting up of information campaign through mass-media, Internet sites and distribution of brochures and posters along with the Ministry of Education correspondence updating the curriculum, including the negative impacts of ODS.

Awareness Program & Action plan

The focus of this program related is to increasing awareness on:

- The urgency & necessity of the ODS phase-out.
- Solvent sector phase out plan and related regulations,
- Non-ODS technology options, availability of alternatives and technology transfer for the use of alternatives,
- Participation in phase out activities including training, information exchange etc.

Survey reports indicated that most enterprises using OD solvents were not aware of phase out deadlines or assistance available under the Multilateral Fund for phasing out OD solvents and shifting to non-OD alternatives. Therefore, awareness programs are to be designed to access the end users, mostly of SSIs, through stakeholders offering information and technical assistance related to the available alternatives in the Egyptian market. It was also important to inform the stakeholders on the status of the phase out activities and initiatives of the private sector in other countries having similar economic situation.

In addition, enterprises also needed information on the acceptable alternatives to OD solvents, relating to technical and commercial aspects. There was also the need to educate end-users to employ good practices for servicing the requirements in the sector.

The needs of the solvent sector, suitable to be addressed through the awareness program, Exhibit 2.A tabulated here below:

Annex # 2.A

Immediate Actions	On-going Studies	Total Phase-out Stage
Elaborating the concepts & terms of the Montreal Protocol	Regulatory & Legal aspects	Creating awareness of the non-ODS solvents, their availability and adoptions.
Regulatory & Legal aspects	Encourage participants in phase-out activities & workshops adopting the non-ODS applications	Provision of information on impact of phase-out activities in solvent sector through involving the Educational system to provide sustainability to the awareness program
Attracting participants into involving more into phase-out activities and adoption of non-ODS	Negative ODS effects on human and environmental health.	Negative ODS effects on human and environmental health.
Negative ODS effects on human and environmental health.		

The National OD Solvents Phase-out Strategy included a survey component on the OD solvents end uses. This survey revealed the need of addressing the awareness program objectives to different target groups, depending on the size of the companies and their field of activity.

The National Awareness Program is targeting the public on broader parameters including the harmful effects of ODS and depletion of Ozone Layer and subsequently build awareness and public opinion to purchase non ODS products. But given the short time frame to address the solvent sector phase out, concentrated awareness was required targeting the industry on aspects pertaining to the industry. Moreover, focus was also required on provision of alternative technology options, assistance in shifting to non-OD solvent, good practices.

The National OD Solvents Phase-out Strategy revealed the existence of four target groups:

- Large Industrial Plants
- Small Size Industries SSIs
- New founded companies which are developing activities using solvents
- Public involved in connected activities

Each of the identified target groups needs specific information in terms of technical aspects and also regarding the institutions and organizations to which they have to exchange information on a permanent basis.

It was planned the target groups to be addressed through local environmental authorities, direct contacts with EEAA and distribution of awareness materials, relevant information posted on the site of the Ministry of Environment and Water Management, articles published in specific environmental publications.

The Action Plan comprises of activities to be carried out under the National Phase-out Program in order to enable Egypt to completely phase-out the use of ODS in the country in line with the MP obligations applicable to developed countries. The proposed plan entails non-investment activities and technical assistance to completely phase out the CTC use by the end of the OD Solvents phase-out project.

The enterprises involved in the solvent industry generally agree that there are alternatives to replace all OD solvents. Methyl chloroform and CFC 113 has been drastically reduced by 2002, while TCA & CTC are still used in some applications in small size industries, most of them consisting in cleaning activities at oxygen plants and filling stations.

NON-INVESTMENT ACTIVITIES FOR PHASEOUT OF OD SOLVENTS IN EGYPT

Awareness activities

There is a significant need for raising awareness regarding Montreal Protocol and phase out of ODS in the solvent sector as this sector has a significant component of informal sector and the quantum of phase-out by 2007 is very high. In a country of the size of Egypt, stakeholders relating to this sector have varying degrees of awareness on Montreal Protocol and its implication. Low awareness regarding OD solvent phase out could impede successful phase out of OD solvents used in Egypt and also result in risk of illegal use of OD solvents. Moreover, the phase out needs to be aligned in a manner that does not unduly harm industrial and economic growth or consumer interests. The above necessitates effective awareness and information exchange programs for this sector.

Objectives of awareness activities

The focus of the program relates to increasing awareness on:

Solvent sector phase out plan and related regulations.

Non ODS technology options, availability of alternatives and technology transfer for usage of alternatives.

Participation in phase out activities including training, information exchange etc.

Survey report indicate that most enterprises using OD solvents are not aware of phase out deadlines or assistance available under the Multilateral Fund for phasing out OD solvents and shifting to non-OD alternatives. Further, the consumption of informal enterprises is concentrated in clusters/pockets primarily close to the production centres of CTC. Therefore, awareness mechanisms have to be designed to access these consumption pockets through stakeholders offering services in these pockets.

In addition, enterprises also need to be educated on various alternative technology options to OD solvents along with the technical and commercial aspects. There is also a need to educate users to employ good practices for servicing the requirement in the sector.

The needs of the solvent sector, which may be addressed through the awareness program supported by training activities are tabulated below:

Key needs of solvent sector

Needs		
Immediate needs (less than a year)	**Short term needs (1-3 years)**	**Long term needs(3-7 years)**
Awareness regarding Montreal Protocol	Regulatory and legal aspects	Awareness on non-OD solvents, their availability and adoption.
Regulatory and legal aspects	Encourage participation in phase out activities and adoption of non-OD solvents	Information on impact of phaseout activities in solvent sector.
Attract participation in phase out activities and adoption of non-OD solvents	Effect of CTC on human and environmental health	Effect of CTC on human and environmental health
Effect of CTC on human and environmental health		

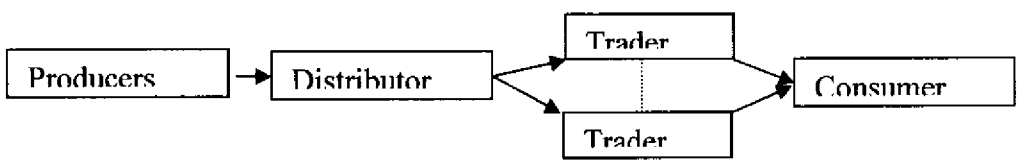
Use of direct communication channels

Besides media such as print, television, radio, publications, pamphlets etc., access to the consumers in solvent sector can also be developed through mechanisms of direct communication to users in this sector. Knowledge updates pertaining to phaseout requirements, Government interventions, rules and regulation, new technologies etc. should happen through networking with industry representatives and associations.

Use of distribution network to support phaseout

A schematic representation of the distribution network for solvents is given below.

Engaging Cleaner Production Centre inEgypt



Use of dealer network presently supplying OD solvent may result in resistance to propagation of non-OD solvent related information. During the survey, high resistance was encountered from present dealers to share information regarding end

users of OD solvent. It is likely that the dealers may look for options of selling non-OD alternatives. Therefore, use of dealer network for facilitating to ODS phaseout should primarily relate to help them develop business opportunites for cleaning applications using non-ODS solvents.

Dealers can also serve as an important coordinating point in identification of user enterprises in phasing out ODS. Distributors and traders are agents of change for non-ODS technologies and practices. They know the users and understand their needs. They can thus facilitate in transfer of knowledge and information for facilitating conversion to non-ODS technologies. Therefore, it is important to maximise their participation in information exchange and training activities for OD phaseout in solvent sector. This will serve an incentive to them for becoming "early birds" in supplying non-ODS chemicals and give them an environment friendly image. Further, inclusion of dealers in alternative technology information dissemination process will serve as an incentive to them in achieving visibility and their active participation in technology transfer process.

The assistance and help of dealers of non-OD alternative chemicals to these industries may be solicited to disseminate information and increase reach. The dealers of non-ODS could play a dual role of not only increasing awareness but also ensuring logistics of supply of alternatives and usage of alternative technology.

National Awareness Strategy

The Ozone Unit, Government of Egypt has already initiated a nation wide Awareness Strategy. The objectives of the Awareness Strategy will include increasing awareness on the Montreal Protocol, increasing awareness regarding ODS and its harmful side effects, ODS rules and regulations, provide inputs to stakeholders so that they can cost effectively manage phase out and educate stakeholders on their role in phasing out ODS.

The campaign would provide general awareness regarding usage of OD solvents as well as address the needs of State and regional level bodies. The overall solvent sector awareness program will dovetail into the National Awareness Strategy and the coordination would be through the SPO.

The National Awareness Strategy is targeting the public on broader parameters including the harmful effects of ODS and depletion of Ozone Layer and subsequently build awareness and public opinion to purchase non ODS products. But given the short time frame to address the solvent sector phase out concentrated awareness is required targeting the industry on aspects pertaining to the industry. Moreover, focus is also required on provision of alternative technology options, assistance in shifting to non-OD solvent, good practices which is not directly being addressed by the National Awareness Strategy.

UNEP's information cleaning house assists National Ozone Units and other stakeholders with regard to compliance with the 2005 limits (primarily for CFCs and CTC) and earlier phase out targets. Further, assistance to NOUs in developing

countries on preventing growth in consumption of ODSs is also offered through clearing house activities. Given their experience in countries across the globe and rich experience in assisting NOUs in phaseout, UNEP's Clearing House activities can be gainfully used for phaseout related measures especially information exchange and technology transfer, which are critical for ODS phaseout in solvent sector in Egypt.

Training for capacity building in solvents sector

Brief overview of training program

Training program is key to facilitate switchover of a large proportion of informal enterprises using OD solvents in their manufacturing/production process. The target group for training program is primarily technical institutions and dealers in non-ODS so that they can help in information dissemination and technology knowledge to end user industry.

Given the short time frame required for switchover, the technology transfer road map that is proposed includes mobile arms for technology dissemination. The training program is expected to facilitate access to information for the consumption pockets especially the small-scale user industries.

For SMEs, low cost lending for those who are willing to convert on their own, venture capital for those who have innovative solutions like no-clean technologies, zero interest financing scheme for the early transition (to show early success to other enterprises) can be used. Enterprise to enterprise cooperation should be actively encouraged and pursued as this can yield convincing results for other enterprises using OD solvents – "learning by seeing" principle. This will help in hastening the process of conversion and facilitating such conversion process. Other incentive schemes such as incentives for early conversion may be considered for facilitating phase-out.

Development of a non OD Solvent management plan

The phase out of OD solvent consumption and conversion requirement to non OD solvent will increase the demand for the latter. There would be a need to identify the requirement for non OD solvents for its application in different end use sectors and ensuring availability of these alternatives. While some alternatives will be already produced by the domestic industry in the country, the other alternatives may need to be imported. Awareness activities should focus on making additional information available on technology and availability of non-OD solvents and their applications.

Development and investment in local production of non-OD solvents to meet some of the domestic demand as well as export demand can also be considered. Industry must be encouraged through bilateral dialogues and specific incentive mechanisms for development capacities and ensuring easy availability of non-OD solvents.

Formulation of standards and technical norms is important whenever a new technology is introduced. Technical Committees under the Ozone Secretariat do prescribe standards and technical norms for usage of alternative chemicals and technologies in the solvent sector. This will be used as a base line information for non-OD solvent. Local standards need to be developed and approved for usage, wherever necessary.

Impact on ODS tonnes phased out

Awareness and training activities alone would not lead to phase out of OD solvents, unless accompanied by conversion to no clean or alternative non-OD technologies. Therefore, better awareness and training should ensure evaluation of non OD solvents as well as gradual acceptance at good and clean practices. The impact and magnitude of conversion would be difficult to estimate at this stage.

Supply situation assessment and management for adoption of non-ODS technologies is important. This will ensure transition at minimum cost to the industry and consumer. Past experience in similar transitions in Egypt indicate that good amount of persuasive effort with periodic and systematic awareness building and supply management of alternatives are necessary to ensure smooth phaseout.

ODS phase-out plan

In order to implement the OD Solvent Phase-out Action Plan in Egypt, we developed a series of awareness and training activities.

The following target groups for awareness and training have been identified:

- ODS end-users – SSIs users,
- Representatives of authorities responsible for environmental protection, and
- Public.

COMMUNICATION CHANNELS

The following methods were considered in approaching the target groups:

CTC end-users: Established direct contact with all identified ODS end-users in order to provide knowledge pertaining to phase-out requirements, Government interventions, rules and regulation, new technologies etc. This was the channel of communication preferentially used as the pressure of OD solvent phase-out is directed to the CFC-113, CTC & TCA users.

ODS end-users were also approached through the local EEAAs, which have responsibilities in permitting procedures for the activities with impact on environment (including activities which involve OD solvents use).

Besides, this target group could also access relevant information on this issue from the Internet sites.

Representatives of environmental protection authorities: Approach this target group using direct contact with the designated persons in the local EEAAs responsible for the activities related to the Montreal Protocol. The regional and territorial authorities for environmental protection play a key role in the implementation of clean alternatives, national awareness program objectives and also survey activities.

Public: The relevant information on OD Solvents health and environment effects could reach the public through the information distributed by the local EPAs, that have direct contact with local public and NGOs, or through the Internet site of MMGA.

Special attention was paid to long-term measures regarding public education. The Ministry of Environment and Water Management set an agreement with the Ministry of Education and Research that contains provisions regarding the introduction of issues related to the Montreal Protocol, ODS use and phase-out in the scholar curricula.

ELABORATION OF AWARENESS MATERIALS

- National Strategy for OD Solvents Phase-out which was edited as a brochure to be distributed at the coming awareness seminars.
- The content of the brochure "Ozone Depleting Solvents Phase-out in Small Size Enterprises in Egypt" and established the message of the poster regarding CTC & TCA phase-out, both in Arabic and English languages. The brochure contains information on the Montreal Protocol provisions and the Legislative Framework concerning OD Solvents use and phase-out in Egypt, the characteristics of Carbon Tetrachloride - a good solvent with harmful effect on ozone layer, Viable alternatives for CFC-113, CTC phase-out and Internet Sites.
- A presentation in Arabic language to be submitted by the Ministry of Environment to the Ministry of Education and Research, in the framework of the Protocol agreed between the two authorities. This material offers relevant information on the ozone layer, the Vienna Convention and Montreal Protocol and on OD Solvents, to support the development of an adequate scholar curriculum.
- Contributing to the elaboration of a video clip illustrating the harmful effects of ozone layer depletion due to OD Solvents use and promoting actions for ozone layer protection. The video clip is part of the campaign initiated by the EEAA authrities.

TRAINING AND TECHNICAL ASSISTANCE ACTIVITIES

The objectives of the Awareness Program included increasing awareness on the Montreal Protocol, on OD Solvents and their harmful side effects, and also on ODS rules and regulations, in order to provide inputs for CTC phase-out. The campaign is to provide general awareness regarding usage of OD solvents. The National Awareness Program was targeting the public - on broader parameters including the harmful effects of ODS, and Ozone Layer depletion and none ODS use, and also the local EEAAs - for institutional and legislative strengthening. But given the short time to address the solvent sector phase out, concentrated awareness addressed the industry, as it was thought as a key to facilitate switchover CTC & TCA use to non-OD alternatives.

In order to identify the training and technical assistance needs, a national survey on the status of CFC-113, CTC & TCA use and phase-out is to be initiated in cooperation with EEAA. The data is to be collected through the local EEAA.

In the process of data validation and completion certain aspects to be examined:

Existence of few ODS end-users not aware about the near deadline for ODS phase-out schemes.

Existence of few ODS end-users highly reticent to CFC-113, CTC & TCA replacement at oxygen or hydrogen station, due to security reasons or previous accidents.

the need for information on the alternative chlorinated solvents, including removal of exhausted solvents;

The need for information concerning the obligation for reporting and destroying the remnant ODS.

We managed to contact each of the identified companies, informing them about the mandatory and fast requirement for CTC replacement, about the most applied alternative in the field and sent informative materials (brochure, presentations from the National Training Workshop on "Viable Alternatives to Ozone Depleting Solvents". Upon the request of interested companies, we'll provide information on viable alternatives for CFC-113, TCA & CTC replacement, highlighting the advantages but also the specific issues to be taken into account. Facilitating the contact with companies with the same profile successfully phased-out CFC-113, CTC & TCA, and make recommendations for known suppliers of equipment and non-OD chemicals. Also will provide information on health aspects related to the use of non-OD chlorinated solvents and informed the interested companies about the legal requirement for controlled removal of (exhausted) chlorinated solvents and about the possibility of their destruction by incineration or co-incineration. Maintain a solid communication channel with the assisted companies until CFC-113, CTC & TCA phase-out is completed.

DISTRIBUTION OF AWARENESS MATERIALS

Distribution of awareness materials was performed using the following channels:

brochures and posters elaborated by us and CD's containing the information provided during the seminars "Viable Alternatives for to Ozone Depleting Solvents" were sent to the local EEAAs, both as direct receptors of information and as distributors to the CFC-113, CTC & TCA end-users under their jurisdiction. Local EEAAs.

brochures and posters elaborated and CD's containing the information provided during the seminars are to be sent to environment protection compartment in the Ministry of Industry and Commerce, accompanied by a letter showing the importance of the legal requirements, environmental and health aspects involved in OD Solvents phase out and highlighting the status of OD Solvents phase-out in Egypt.

Brochures, posters and presentation containing information on the ozone layer, the Vienna Convention and Montreal Protocol and on OD Solvents, will be sent to the Ministry of Education and Research to support the development of an adequate scholar curriculum.

Direct distribution to the CFC-113, CTC & TCA end-users information provided during the seminars and links to websites of interest.

The brochure elaborated and the video clip promoting the campaign will be posted on the Ministry web-site.

Chlorofluorocarbons and Ozone Depletion

Chlorofluorocarbons (CFCs), along with other chlorine- and bromine-containing compounds, have been implicated in the accelerated depletion of ozone in the Earth's stratosphere. CFCs were developed in the early 1930s and are used in a variety of industrial, commercial, and household applications. These substances are non-toxic, non-flammable, and non-reactive with other chemical compounds. These desirable safety characteristics, along with their stable thermodynamic properties, make them ideal for many applications--as coolants for commercial and home refrigeration units, aerosol propellants, electronic cleaning solvents, and blowing agents. Production and Use of Chlorofluorocarbons experienced nearly uninterrupted growth as demand for products requiring their use continued to rise.

Not until 1973 was chlorine found to be a catalytic agent in ozone destruction. Catalytic destruction of ozone removes the odd oxygen species [atomic oxygen (O) and ozone (O3)] while leaving chlorine unaffected. This process was known to be potentially damaging to the ozone layer, but conclusive evidence of stratospheric ozone loss was not discovered until 1984. Announcement of polar ozone depletion over Antarctica in March 1985 prompted scientific initiatives to discover the Ozone Depletion Processes, along with calls to freeze or diminish production of chlorinated fluorocarbons. A complex scenario of atmospheric dynamics, solar radiation, and chemical reactions was found to explain the anomalously low levels of ozone during the polar springtime. Recent expeditions to the Arctic regions show that similar processes can occur in the northern hemisphere, but to a somewhat lesser degree due to warmer temperatures and erratic dynamic patterns.

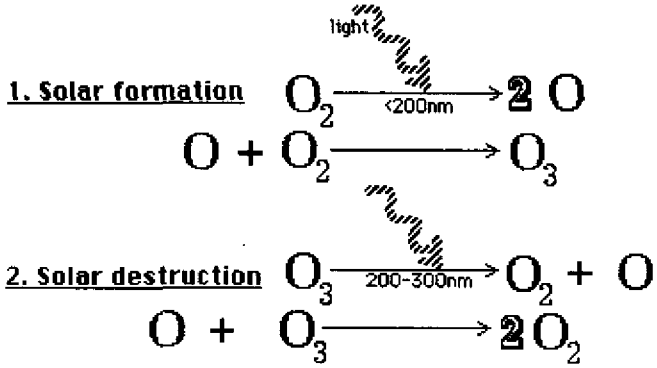
A primary objective for researchers in addressing this issue has been analysis of Measurements and Trends in Ozone and Chlorofluorocarbon Levels. Global monitoring of ozone levels from space by the Total Ozone Mapping Spectrometer (TOMS) instrument has shown statistically significant downward trends in ozone at all latitudes outside the tropics. Measurements at several ground-based stations have shown corresponding upward trends in CFCs in both the northern and southern hemisphere. Despite rapid phaseout of CFCs, ozone levels are expected to be lower than pre-depletion levels for several decades due to the long tropospheric lifetimes of CFCs. These compounds are carried into the stratosphere, where they can undergo hundreds of catalytic cycles involving ozone before being scavenged by other chemical species.

Replacement compounds for CFCs have also been evaluated for their Ozone Depletion Potential (ODP). Hydrochlorofluorocarbons (HCFCs) still contain chlorine atoms, but the presence of hydrogen makes them reactive with chemical species in the troposphere. This greatly reduces the prospects of the chlorine reaching the stratosphere, as chlorine will be removed by chemical processes in the lower atmosphere. Hydrofluorocarbons (HFCs), potential replacements for CFCs that contain no chlorine, have been evaluated for potential effects of fluorine compounds on ozone destruction.

Basic chemistry of ozone depletion

Formation and destruction of ozone

Sunlight is the major energy source for both making and destroying stratospheric ozone:



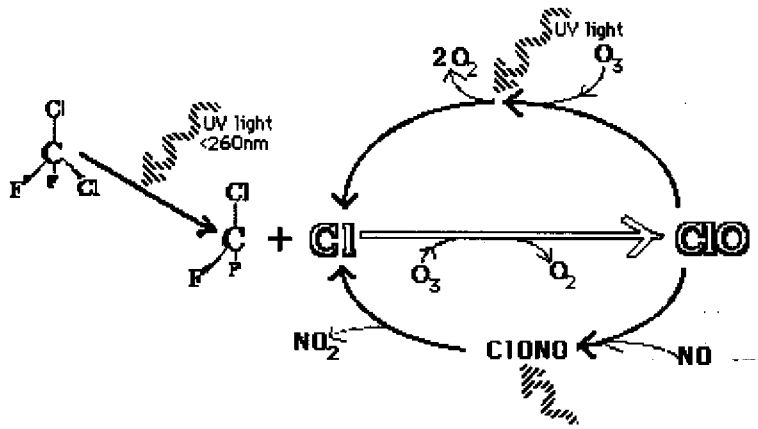
When an Oxygen molecule absorbs a photon of light with a wavelength shorter than 200 nanometers (1 billionth of a meter) the energy splits the molecule into two Oxygen atoms. One of these atoms can react with another Oxygen molecule to form an Ozone molecule.

Up to 98% of the sun's high-energy ultraviolet light (UV-B and UV-C) are absorbed by the destruction and formation of atmospheric ozone. The global exchange between ozone and oxygen is on the order of 300 million tons per day.

Halogen catalysis of ozone degradation

Halogens are a chemical family containing fluorine, chlorine, bromine and iodine; any carbon compound containing them is known as a halocarbon. While all halogens have the ability to catalyze ozone breakdown, they have an unequal impact on the ozone layer.

A catalyst is a compound which can alter the rate of a reaction without permently being altered by that reaction, and so can react over and over again.



In this fashion it is estimated that one molecule of chlorine can degrade over 100,000 molecules of ozone before it is removed from the stratosphere or becomes part of an inactive compound. These inactive compounds, for example ClONO2, are collectively called 'resevoirs'. They hold chlorine in an inactive form but can release an active chlorine when stuck by sunlight.

The relative potency of the different halogens depends a great deal on the stability of the resevior compounds. Hydrogen fluoride, HF, is so very stable that fluorocarbons have relatively no known impact on ozone. Bromine resevoirs, such as HBr and BrONO2, are much more easily broken up by sunlight ; causing bromine to be from 10 to 100 times more effective than chlorine at destroying ozone. From 30-60% of bromocarbons released to the atmosphere are man-made (methyl bromide fumigants and halon fire extinguishers) and both compounds will soon be restricted by international agreement.

Chlorine Removal

In the stratosphere the major mechanisms for chlorine removal involve the formation of HCl:

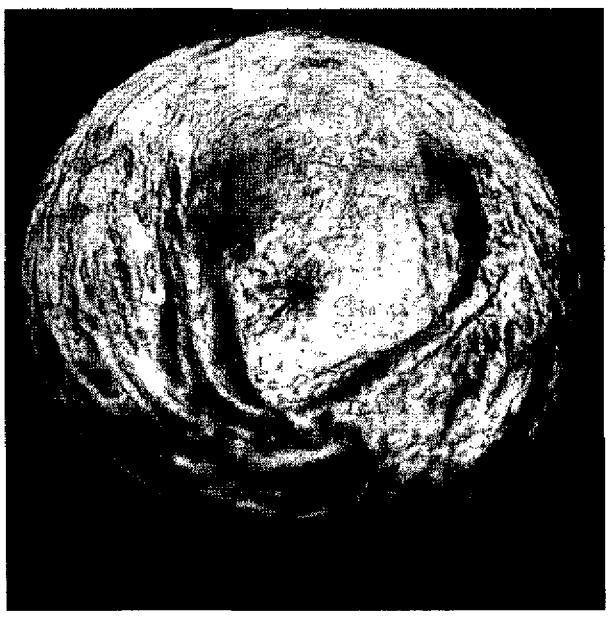
OH + ClO ---->HCl + O2
O2H + Cl ------> HCl + O2

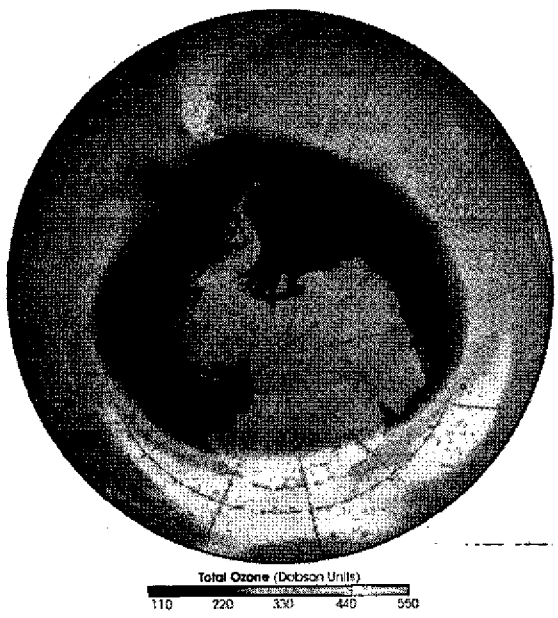
HCl is water soluble and is eventually precipitated out of the stratosphere by water droplets or crystals. The estimated lifetime of HCl in the stratosphere is about 2 years. CH4 and other Hyrogen-containing organics compounds, including HCFC's, can also convert active chlorine to HCl.

In the troposphere and lower stratosphere NO, NO2 and OH radicles are catalysts in ozone degredation. But they are equally able to tie up tropospheric chlorine into resevoir compounds, which adhere to water particles and get rained out of the troposphere.

Ozone Hole over Antarctica

These models here below shows the ozone hole during the summer over Antarctica. Within the model, height represents ozone concentration.





Environmental Effects of Ozone Depletion

Effects of increased ultraviolet radiation on biological systems had been investigated even before the ozone-depletion issue came to prominence. Effects such as alterations in troposphere chemistry and potential global warming due to chlorofluorocarbons (CFCs) did not present themselves, however, until depletion and the rise in CFC levels was thought to be possible.

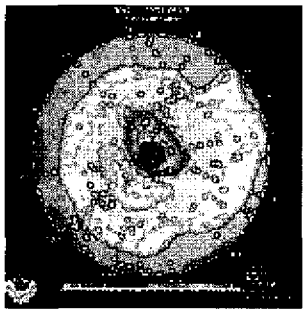
Several possible Ultraviolet-B Effects on Terrestrial Plants have been investigated, including reduction in yield, alteration in species competition, decrease in photosynthetic activity, susceptibility to disease, and changes in plant structure and pigmentation. Studies carried out on loblolly pine indicate retardation of growth and photosynthesis resulting from enhanced levels of ultraviolet-B (UV-B). Similar effects, including yield reduction, were found in certain rice cultivars. In field study experiments, soybean harvests showed decreases under a simulated 25 percent ozone reduction. Existing microclimatic conditions, such as drought and mineral deficiency, can reduce sensitivity to UV-B, however.

Most field studies of Ultraviolet-B Effects on Aquatic Ecosystems have taken place in the Antarctic region, due to the presence of the ozone hole during the polar springtime, and have focused on the effects on phytoplankton, the primary producers at the base of the Antarctic food web. Phytoplankton are sensitive to increased UV-B doses, resulting in decreased mobility and orientation, and changes in photosynthetic and enzymatic reactions. These effects may lead to reduction in primary productivity, which indirectly affects higher trophic levels. Because humans and other consumers are dependent on higher species such as fish and shrimp, populations outside the local ecosystem are potentially at risk. Prokaryotic microorganisms responsible for nitrogen fixation are also susceptible to UV-B, which could result in changes in the biogeochemical cycling of nitrogen, potentially leading to detrimental effects on plant growth. Other possible indirect effects of higher UV-B stress are decreased planktonic production of dimethylsulfide (DMS), an important source of sulfur and cloud condensation nuclei to the atmosphere, and reduced uptake of CO2 by the oceans.

Global climate may also be influenced by Changes in Tropospheric Chemistry. Studies have suggested that the recent slowdown in the rate of increase of methane levels in the atmosphere may be due, in part, to increased UV-B irradiance in the lower atmosphere. Photochemical smog production in urban areas would also increase under enhanced UV-B levels, reducing air quality and leading to possible effects on human health and agriculture.

Chlorofluorocarbons and potential replacement substances also enter into the global climate picture because of their radiative characteristics. Some of these compounds absorb longwave infrared radiation from the Earth's surface that no other substances absorb, thus adding to the greenhouse effect. The Global Warming Potential of Chlorofluorocarbons and Their Replacements has been evaluated relative to carbon dioxide warming potential. This factor is significant when evaluating whether alternatives to CFCs are suitable for distribution in widespread applications on a worldwide basis.

Southern Hemisphere Total Ozone Analysis



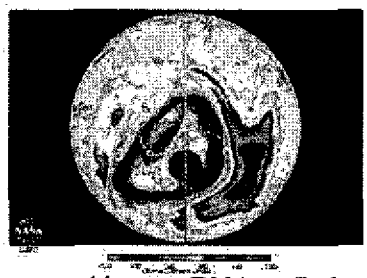
This map shows the most recent analayis of the Southern Hemsisphere total ozone from the Solar Backscattering Ultraviolet (**SBUV/2**) instrument on board the NOAA polar orbiting satellite. In austral spring the analysis shows the "ozone hole" (values below 220 Dobson Units)over Antarctica and the Antarctic Ocean.

This area of low ozone is confined by the polar vortex. Usually circular in August and September, the vortex tends to elongate in October, stretching towards inhabited areas of South America. By November, the polar vortex begins to weaken and ozone rich air begins to mix with the air in the "ozone hole" region. The "ozone hole" is usually gone by late November/early December.

The SBUV/2 instrument can not make observations in the polar night region because it relies upon bascscattered sun light. The blackened area centered over the pole represents the latitudes in which no observations can be made.

Health effects of UV-B light

Genetic damage



DNA absorbs UV-B light and the absorbed energy can break bonds in the DNA. Most of the DNA breakages are repaired by proteins present in the cells nucleus but unrepaired genetic damage of the DNA can lead to skin cancers. In fact one method that scientists use to analyze amounts of 'genetically-damaging UV-B is to expose samples of DNA to the light and then count the number of breaks in the DNA.
For example J.Regan's work at the Florida Institute of Technology used human DNA to find that genetically significant doses of solar radiation could penetrate as far as 9 feet into non-turbulent ocean water.

The Cancer link

The principle danger of skin cancer is to light-skinned peoples. A 1%decrease in the ozone layer will cause a estimated 2%increase in UV-B irradiation; it is estimated that this will lead to a 4%increase in basal carcinomas and 6%increase in squamous-cell carcinomas.[Graedel&Crutzen]. 90% of the skin carcinomas are attributed to UV-B exposure [Wayne] and the chemical mechanism by which it causes skin cancer has been identified [Tevini]. The above named carcinomas are relatively easy to treat, if detected in time, and are rarely fatal. But the much more dangerous malignant melanoma is not as well understood. There appears to be a correlation between brief, high intensity exposures to UV and eventual appearance (as long as 10-20yrs!) of melanoma. Twice as many deaths due to melanomas are seen in the southern states of Texas and Florida, as in the northern states of Wisconsin and Montana, but there could be many other factors involved. One undisputed effect of long-term sun exposure is the premature aging of the skin due to both UV-A, UV-B and UV-C. Even careful tanning kills skin cells, damages DNA and causes permanent changes in skin connective tissue which leads to wrinkle formation in later life. There is no such thing as a safe tan.

Possible eye damage

Can result from high doses of UV light, particularly to the cornea which is a good absorber of UV light. High doses of UV light can causes a temporary clouding of the cornea, called 'snow-blindness', and chronic doses has been tentatively linked to the formation of cataracts. Higher incidences of cataracts are found at high elevations,Tibet and Bolivia; and higher incidences are seen at lower latitudes(approaching the equator).

Damage to marine life

The penetration of increased amounts of UV-B light has caused great concern over the health of marine plankton that densely populate the top 2 meters of ocean water. The natural protective-response of most chlorophyll containing cells to increased light-radiation is to produce more light-absorbing pigments but this protective response is not triggered by UV-B light. Another possible response of plankton is to sink deeper into the water but this reduces the amount of visible light they need for photosynthesis, and thereby reduces their growth and reproduction rate. In other words, the amount of food and oxygen produced by plankton could be reduced by UV exposure without killing individual organisms. There are several other considerations:

- Ultraviolet levels are over 1,000 times higher at the equator than at the polar regions so it is presumed that marine life at the equator is much better adapted to the higher environmental UV light than organisms in the polar regions. The current concern of marine biologists is mostly over the more sensitive Antarctic phytoplankton which normally would receive very low doses of UV. Only one large-scale field survey of Antarctic phytoplankton has been carried out so far [Smith et.al _Science_1992] ; they found a 6-12% drop in phytoplankton productivity once their ship entered the area of the spring-time ozone hole. Since the hole only lasts from 10-12 weeks this translates into a 2-4%loss overall, a measurable but not yet catastrophic loss.
- Both plants and phytoplankton vary widely in their sensitivity to UV-B. When over 200 agricultural plants were tested, more than half showed sensitivity to UV-B light. Other plants showed negligible effects or even a small increase in vigor. Even within a species there were marked differences; for example one variety of soybean showed a 16% decrease in growth while another variety of the same soybean showed no effect [R.Parson]. An increase in UV-B could cause a shift in population rather than a large die-off of plants
- An increase in UV-B will cause increased amounts of Ozone to be produced at lower levels in the atmosphere. While some have hailed the protection offered by this 'pollution-shield' many plants have shown themselves to be very sensitive to photochemical smog.

Conclusion

Stratospheric ozone depletion is a concern because the ozone layer in the stratosphere keeps 95-99% of the suns ultraviolet radiation from striking the earth. A number of consequences can result from increased levels of UV (*ultraviolet radiation*) striking the earth, including: genetic damage, eye damage and damage to marine life. Increased UV radiation in the lower atmosphere, called the troposphere, can result in increased amounts of photochemical smog. Photochemical smog is already a health hazard in many of the world's largest cities.

The decrease of stratospheric ozone was first reported in 1974 and the decrease was quickly linked to the increasing presence of a class of manmade compounds called CFC's or Chlorofluorocarbons. Many countries of the world have moved to reduce the use of CFC's but because of the slow rate of air mixing between the lower and upper atmosphere it is theorized that stratospheric CFC's will stay at a significant level well into the next century.

Stratospheric ozone depletion has become very much a controversial political and economic issue as well as a complex scientific issue. Major and minor sources of chlorine, and factors which affect ozone levels are still being sorted out among a great deal of media-generated excitement and misinformation; but the link between CFC's and Ozone depletion, and the major factors creating the Antarctic ozone hole, are considered by most researchers to be well established facts. Scientific models of the atmosphere are being constructed in order to assist scientists in looking for other factors in Ozone depletion, evaluate their importance and predict what may happen to our atmosphere in the future.

Protecting the stratospheric ozone layer by controlling the production and use of ozone-depleting compounds has been an environmental concern since the mid-1970s, when it was discovered that chlorine could potentially deplete the ozone layer. Not until significant losses of ozone were reported in 1985, however, did ozone depletion become an important international issue. The principal international policy instrument for protecting the stratospheric ozone layer is the Montreal Protocol on Substances That Deplete the Ozone Layer. Many countries, and even some cities and other sub-national authorities, have taken action to control production and use of chlorofluorocarbons (CFCs) and other ozone-depleting substances. Much of the ***National/Sub-national Ozone Policy Formulation*** is in response to the Montreal Protocol, although several countries had taken steps to control CFCs prior to the international agreements set forth in the Protocol.
In response to these policy and regulatory developments, industrial organizations directly affected have been actively engaged in developing alternative substances to CFCs and other ozone-depleting compounds. Several environmental and economic factors need to be considered in Chlorofluorocarbon Phase-out, such as safety characteristics, efficiency, ozone-

depletion potential, and economic impacts on industry of phase-out schedules for existing CFCs.