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MALAYSIA PROJECT PROPOSALS

This document consists of two proposals for projects from Malaysia. Each proposal has a Project Evaluation Sheet prepared by The Fund Secretariat. The proposals are:

- (a) The Conservation, Leakage Control and Recycling of CFC-12, and Demonstration Project in Automobile Air-Conditioning Sector**
- (b) Servicing, Maintenance and Recovery Charging Kit for Portable Extinguisher (Halon 1211) and Training Project in Halon Sectors**

COUNTRY OR REGION: MALAYSIA

PROJECT TITLE: The Conservation, Leakage Control and Recycling of CFC-12, and Demonstration Project in Automotive Air-Conditioning Sector

BUDGET: US\$ 0.91 Million

INCREMENTAL COSTS: US\$ 0.91 Million

*COST EFFECTIVENESS: \$ 2.46 per Kg. ODP Saved Annually

PROJECT TIMEFRAME: START 01/92 END 12/92

TECHNICAL REVIEW COMPLETED: YES ☒ NO ☐

SECRETARIAT'S COMMENTS

The above project is comprised of two sub-projects. The first sub-project proposes to establish a National Network of Recycling (NNR) and collection of automotive air-conditioning. The second sub-project is for demonstration and training of service operators in automotive air-conditioning. The project document states that these two sub-projects are expected to result in the elimination of 370 tonnes of CFC-12 per year to the year 2000.

The first sub-project qualifies for Fund assistance. However, the Secretariat is estimating a recovery of 115 to 122 tonnes of CFC-12 per year. This would provide a financial saving of approximately US \$345,000 to US \$366,000 per year less operational costs. Moreover, if government action is initiated to increase the price of new CFC-12 then the recovery activity could become profitable and, perhaps, lead to maximum use of the equipment.

The second sub-project also qualifies for Fund assistance. As a demonstration and training project, it would result in improved public awareness with respect to the use and care of automotive air-conditioners while at the same time creating a cadre of trained technicians to service the automotive air-conditioning units and thereby reducing CFC-12 losses from leaks and operation of the units.

SECRETARIAT'S RECOMMENDATIONS

It is recommended that the project as a whole be approved for funding by the Executive Committee. It is further recommended that the financial savings derived from the recovery of CFC-12 be used to offset the operating costs of the recycling/recovery service centres for on-going training and re-training, as scheduled in the project document, as well as the service costs to customers.

* Determined as the ratio of incremental costs to the estimated annual saving of ODP (\$/ODP kg.).

PROJECT COVER SHEET

COUNTRY OR REGION	:	MALAYSIA
CALCULATED ODS CONSUMPTION (1990)	:	0.23 KG PER CAPITA
PROJECT TITLE	:	THE CONSERVATION, LEAKAGE CONTROL AND RECYLING OF CFC 12, AND DEMONSTRATION PROJECT IN AUTOMOTIVE AIR-CONDITIONING SECTOR
PROJECT DURATION	:	JAN 1992-DEC 1992
SECTORS COVERED	:	MOBILE AIR CONDITIONING
PROJECTED ODS PHASE-OUT FROM PROJECT:	:	AVERAGE YEARLY ESTIMATED 870 METRIC TONNES
PROPOSED BUDGET	:	US\$ 0.91 MILLION
IMPLEMENTING AGENCY	:	UNDP and WORLD BANK
NATIONAL COORDINATING AGENCY	:	DEPARTMENT OF ENVIRONMENT

PROJECT SUMMARY

The purpose of these projects is to establish a National Network of Recycling and to train service operators in automotive air conditioning. The main objectives are to minimise, eliminate and reduce the consumption of CFC 12 and also to create public awareness and to encourage the use of alternative CFC-friendly technology. CFC 12 accounts for the largest consumer of CFCs among the other sectors with about 1 million motor vehicles being air conditioned. DOE acts as the focal point to coordinate the implementation of 200 recycling network and at the same time propose a series of on-the-job training on the use of facilities by local experts. The retraining programme by local experts on circuit would run for 3 years. Total cost of these two projects is about US\$ 0.91 million. A yearly average recovery of 370 MT of CFC 12 is expected with 500 recycling operators and 90 core trained trainers.

MALAYSIA

COUNTRY PROGRAMME

TITLE OF PROJECT

**THE CONSERVATION, LEAKAGE CONTROL AND RECYCLING OF CFC 12, AND
DEMONSTRATION PROJECT IN AUTOMOTIVE AIR-CONDITIONING SECTOR**

Prepared by

DEPARTMENT OF ENVIRONMENT
Ministry of Science, Technology and the Environment

Kuala Lumpur
November 1991

TITLE OF PROJECT

THE CONSERVATION, LEAKAGE CONTROL AND RECYCLING OF CFC 12 AND DEMONSTRATION PROJECT IN AUTOMOBILE AIR-CONDITIONING SECTOR

PURPOSE

1. The purpose of this paper is to detail the proposal for financial assistance:

Sub-project I : to establish a National Network of Recycling (NNR) and collection of automotive air-conditioning (AAC).

Sub-project II : for the demonstration and training of service operators in automotive air-conditioning.

BACKGROUND

2. In 1989, the calculated consumption is of controlled substances in Malaysia is approximately 4779.3 MT. Refrigeration and automotive air-conditioning accounts for around 48.3% and constitutes the largest consumer of CFCs among the other sectors. There are approximately 5 million motor vehicles in Malaysia, of which about 33% or approximately 1 million are air conditioned with each unit being charged an average of 1.2 kg CFC 12. Refilling, with the same amount, is done once or twice a year. There are five AAC manufacturers which involves 200 dealers and more than 2500 air conditioning shop servicing operators throughout Malaysia.
3. There exists a positive correlation between the car population growth and the consumption of CFC 12. In establishing the total CFC 12 consumption for the AAC industry it can be divided into Original Equipment Market (OEM) and Replacement After Sale market (REM). The combined CFC 12 consumption for both is estimated to be 1951.1 MT in 1990 and it is anticipated that the consumption would increase twofold (4006.2 MT) in the year 1995.

4. AAC system leaks CFC 12 during installations, operations and servicing. There is due need to improve installations, maintenance and service technologies to reduce emission and at the same, to ensure that the CFCs, which until now is freely discharged into the atmosphere is collected, cleaned and reuse, and when substitutes are available stored for destruction using approved technologies.

OBJECTIVE

5. The objectives of these projects are as follows:-

National Network of Recycling (NNR)

- 5.1 To minimise and eliminate the wastage of the CFC 12 emission during servicing and maintenance.
- 5.2 To reduce the consumption of CFC 12 in AAC industry.
- 5.3 To develop National Network of Recycling (NNR) throughout the country.
- 5.4 To develop a continuous series of in-house training programmes in AAC.

Demonstration and Training

- 5.5. To create public awareness programmes to eliminate unnecessary emission of CFC 12 on operators in the car air-conditioning sector.
- 5.6. To train and instil correct installation and servicing procedures in handling recycling equipment.
- 5.7. To encourage the use of alternative CFC-friendly technology.
- 5.8. To encourage understanding of the ozone and CFC problems as a result of poor operating practices.

JUSTIFICATION

6. While awaiting the emergence of alternatives and suitable destruction technology, the more immediate solution is the recycling and recovery of CFC 12 and minimization stage of the said gas, while performing servicing or topping-up gas. The establishment of adequate recovery and recycling facilities in Malaysia would definitely reduce the consumption of CFC 12. The refrigeration and air-conditioning sector accounts for 50% of total CFCs consumption. Based on the study data of the Working Group, the adoption of this measures would in 1991 eliminate need for consumption of 394 tonnes/year rising to 1309 tonnes by year 2000.
7. The losses from air conditioners mainly occur as a result of leaks testing during manufacturing, material handling, loss during recharge, normal leakage due to system deterioration and venting during service and repair. When vehicle air conditioners are serviced, the remaining charge is usually vented to the atmosphere. Approximately 93% of emission occurs in operation and service. Servicing and maintenance are the major areas in which CFC 12 emission can be substantially reduced. There is also an underlying need to arrest and contain this CFC until technical facilities are available to 'destroy' and render them harmless.
8. Leaks and operating losses can be reduced if the car operators are encouraged to run vehicle air conditioners regularly to lubricate the seals. It means that public awareness can also be raised, by using the media, on the need to regularly run car for short periods.
9. Many have a limited understanding of the ozone and CFCs problem and poor operating practices, that a programme of awareness and the need for trade competence training is desirable. Training and retraining of car operators that service automotive air conditioners should be conducted by an experienced consultant together with local expertise. At the same time consultation from educationists would be required.
10. Currently there are more than 2500 air conditioning shops in the country. Out of which, 500 perform solely air conditioning servicing and maintenance functions while the remaining also deal with air conditioning servicing though smaller compared to its overall business turnover. Presently there are a few types of recovery equipment selling in the market, but the main problem, especially for small workshops, is the cost and also the purity of these recovery machines.

11. With the largest users of CFC 12 in AAC and the largest number of service workshops involved, the establishment of the National Network of Recycling (NNR) is immediately required. Other than to reduce and eliminate the consumption of CFC 12, NNR can also create public awareness and introduce a continuing series of in-house training.

PROPOSAL

12. It is proposed that the industry cooperate with Department of Environment (DOE) to establish a network of recycling and collection centres through acquisition of recycling and coolant saving components and at the same time propose a series of on-the-job training on the use and maintenance of these equipments by local experts.
13. To establish NNR throughout the country, recovery and recycling machines are immediately required. The number and location of NNR will be determined by the Government together with AAC industry itself using well established government and industrial mechanism to identify and install the equipment and the follow-up training.
14. Currently it has been identified and proposed that the number of NNRs required should be concentrated in the central, northern and southern region of Peninsular Malaysia and the others in Sabah and Sarawak. A minimum of 200 NNRs should be established through the trade association and professional bodies such as ASHRAE and IEM. Based on 1 million vehicles with air conditioners (approximately 10% are trucks, buses, vans and lorries) and 1400 workshops directly dealing with servicing and maintenance of air conditioners and expected number of 200 NNRs should be required and established. The specific number and location distribution will be determined depending on the number of recovery facilities approved by the Fund.
15. A series of in-house training would be developed in each recycling network. It is proposed that trained local experts should conduct the programme activities. The achievement and progress of each recovery network to reduce consumption and the training programme activities should be monitored by the Government. A Government authorization certificate would be produced at the end of each training course.

16. The Government would develop a monitoring schedule and checklist activities on a monthly basis. The purpose of this, is to ensure that all NNRs are running smoothly in their programme to reduce the consumption, at the same time their in-house training activities and public awareness campaigns are developed and properly managed.
17. The training programme for car air-conditioning technicians in the use and recycling of CFC 12 has been drawn up.
18. There is need for dealers/operators training in the maintenance of car air-conditioning unit and assistance is also required to establish a continuous demonstration programme to teach correct servicing procedures. To meet these requirements it is proposed that UN Implementing Agency send an equipment servicing training consultant to Malaysia. It has also been proposed that UN Implementing Agency consult with all parties in the final form of the training programmes.

ACQUISITION DESCRIPTION

19. Recycling is cost effective and is supported by AAC manufacturers worldwide and many automobile owners. Recycling facilities could be provided to dealers and specialized AAC repair shops.
20. At the moment, 200 units of recycling equipment are needed immediately. The detailed estimated costs and equipment specifications shown in Table III.
21. The recycling and collection equipment will be acquired and established by DOE using established government procedures in accordance with the specifications proposed by the Working Group (WG) in consultation with the industries. The centres are those selected by the WG. The operators are required to enter into an agreement with DOE or an established expert non-profit body e.g. ASHRAE to operate and maintain the centres.
22. It is proposed that the Department of Environment (DOE) or its appropriate agent acts as the focal point to coordinate and determine the specific location distribution of NNRs and to monitor the achievement of NNR throughout the country. These can be done by DOE regional offices in the country.

23. The Government will also determine detailed location distribution of NNRs and the number should be divided among AAC manufacturers. Table I shows the number of NNRs proposed and required throughout the country, according to major towns.
24. An experienced car air-conditioning consultant be engaged to consult with and advice car manufacturing industries and to draw up details for a demonstration/training programme.
25. It is therefore proposed that an UN Implementing Agency such as UNDP or World Bank and Ministry of Science, Technology and the Environment - MOSTE (DOE as Focal Point) jointly organize an intensive four-day in-country on-hand training that would cover from batches of 50 car dealers/technicians per day using CFC 12 in their operations. The agency would be responsible for training arrangements. It is proposed that training would be held in Kuala Lumpur by early 1992, immediately after the acquisition of equipments and establishment of network (Table II). It is proposed a team of local experts would be engaged to continue this on-hand retraining regularly over the next 3 years.

IMPLEMENTATION AND COST

26. An external consultant would be invited with each allocated for presentation of working paper and as a resource person in demonstration training. Three local resource persons would be needed as well in similar capacity.
27. This four-day training will enable operators to gain on hand coaching on equipment to use, the detection techniques, installation, care, services, maintenance of such equipments.
28. The detailed estimated costs are shown in Table IV. It is subsequently proposed that a team of local trainers would regularly visit those centres to provide on-the-job training in the local language and two further series of centralised training workshops be held to ensure the availability of a permanent core of trained personnel in recycling/recovery.

OUTPUT EXPECTED

1. A National Network of Recycling/recovery centres consisting of 200 equipments.
2. A yearly recovery/recycle of average estimated 370 tonnes of CFCs contained and prevented from escape into the atmosphere by the year 2000.
3. A trained 500 recycling/recovery experts, mechanics/operators and 90 core trained trainers.

Table I : Proposed Number of NNRs for AAC Throughout Malaysia

State	Number of Existing Service Station/ Workshop	Region	Specific Distribution of NNRs		
			Number of Location/ Major Town	Number Required	
PERLIS	30	NORTHERN	1	2	
KEDAH	155	NORTHERN	3	10	
P. PINANG	220	NORTHERN	3	20	
PERAK	185	NORTHERN	3	16	
SELANGOR	450	CENTRAL	5	45	
W. PERSEKUTUAN	550	CENTRAL	6	45	
N. SEMBILAN	100	CENTRAL	3	8	
MELAKA	75	CENTRAL	2	6	
JOHOR	220	SOUTHERN	5	16	
KELANTAN	70	EAST COAST	3	8	
TERENGGANU	80	EAST COAST	3	6	
PAHANG	155	EAST COAST	4	12	
SABAH	100	EAST M'SIA	2	5	
SARAWAK	100	EAST M'SIA	2	5	
LABUAN	10	EAST M'SIA	1	2	
TOTAL	2500		46	200	

Table II: Implementation Schedule of the Project

Project Description	Total Project Cost (million)		Date (month/year)											
			A				B				C			
			Start		Complete		Start		Complete		Start		Complete	
	M\$	US\$	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
<u>Sub-Project I</u>														
ON-JOB TRAINING	0.12	0.03	JUL/91	JUL/91	AUG/91	SEP/91	SEP/91	OCT/91	NOV/91	DEC/91	FEB/92	MAR/92	MAY/92	JUN/92
<u>Sub-Project II</u>														
RECYCLING & RECOVERY (NMR)	2.400	0.880	SEP/91	OCT/91	NOV/91	DEC/91	JAN/92	JAN/92	FEB/92	FEB/92	MAR/92	MAR/92	APR/92	MAY/92
Total	2.52	0.91												

Note:

- A : Project Identification
- B : Project Preparation
- C : Project Funding

Sub-Project I

**Table III : Estimated Cost For the Purchase
of Recycling and Recovery Machines**

Average Unit Cost		Number of Recycling & Recovery Equipment Required	Total Estimate (million)	
(M\$)	(US\$)		(M\$)	(US\$)
12,000	4444.40	200	2.4	0.9

Sub-Project II

Table IV : Estimated Expenditure for Four Days Demonstration
In-Country Training and Retraining 1991/1992

Subject	Number Required	Unit Cost (M\$)	Total Estimated Cost	
			(M\$)	(US\$)
1. Facilities rental (DOE)	4	1,500	6,000	2,222
2. Training Hall, meals, and light refreshments	4 days	7,500	30,000	11,111
3. Three local resource persons	(3ps x 4dy)	500	6,000	2,222
4. Accomodation for local resource person	(3ps x 4dy)	250	3,000	1,111
5. Teaching Materials (in different languages)	(200 ps)	50	10,000	3,704
6. Miscellaneous and contingency		4,000	4,000	1,481
7. One automobile air- conditioning consultant/ expert	(1ps x 4dy)	(aUS\$750 / day)	8,100	3,000
8. Round trip air travel of consultant (if from overseas)	(1 ps)	(aUS\$4000)	10,800	4,000
9. Accomodation of one consultants	(1ps x 4dy)	(aUS\$120 / day)	1,296	480
			79,196	29,331
10. Retraining Programme by 2 experts on circuit for 3 years		70,000	70,000	25,926

Note:

US\$1 (Dollar) = M\$2.7 (Malaysian Ringgit)

PROJECT EVALUATION SHEET**COUNTRY OR REGION:** MALAYSIA**PROJECT TITLE:** Servicing, Maintenance and Recovery Charging Kit for Portable Extinguisher (Halon-1211) and Training Project in Halon Sectors**BUDGET:** US\$ 0.72 Million**INCREMENTAL COSTS:** US\$ 0.72 Million***COST EFFECTIVENESS:** \$ 0.8 per Kg. ODP Saved Annually**PROJECT TIMEFRAME:** START 01/92 END 12/92**TECHNICAL REVIEW COMPLETED:** YES X NO **SECRETARIAT'S COMMENTS**

The project is comprised of three sub-projects. Sub-project I will establish servicing, maintenance, recovery and recycling centres at all major fire stations with kit charging equipment; Sub-project II will develop training and demonstration of service operations at recycling centres; and Sub-project III will set up a Central Recycling Plan (CRP) at the Central Fire Training School (CFTS). The entire project is expected to phase-out 300 tonnes of Halon-1211 annually.

The project document was well prepared and the required 50 units of charging recovery kits seem to be quite reasonable. However, it is the opinion of The Secretariat that the proposed CRP would also have the capability to handle both Halon-1211 and Halon-1301 and meet the requirements for more sophisticated needs, such as aircraft systems servicing. As a matter of fact, the equipment budget in the project document seems to take this into consideration and would therefore also result in a phase-out of Halon-1301. The Secretariat has also been informed by the Malaysian Department of Environment that a stipulated fee will be charged by The Malaysian Fire Services Department for servicing Halon-1211 extinguishers.

SECRETARIAT'S RECOMMENDATIONS

It is recommended that the project as a whole be approved for funding by The Executive Committee. It is further recommended that the fees derived, for the servicing of Halon-1211 extinguishers, be used to offset the costs of the retraining programmes, as scheduled in the project document, as well as the operating and maintenance costs of the equipment.

* Determined as the ratio of incremental costs to the estimated annual saving of ODP (\$/ODP_{Kg.}).

PROJECT COVER SHEET

COUNTRY OR REGION : MALAYSIA

CALCULATED ODS CONSUMPTION (1990) : 0.23 KG PER CAPITA

PROJECT TITLE : SERVICING, MAINTENANCE
AND RECOVERY CHARGING KIT
FOR PORTABLE EXTINGUISHER
(HALON 1211) AND TRAINING
PROJECT IN HALON SECTORS

PROJECT DURATION : JAN 1992-DEC 1992

SECTORS COVERED : HALON SECTORS

PROJECTED ODS PHASE-OUT FROM PROJECT: AVERAGE YEARLY ESTIMATED
300 METRIC TONNES OF
HALON 1211

PROPOSED BUDGET : US\$ 0.72 MILLION

IMPLEMENTATION AGENCY : UNDP and WORLD BANK

NATIONAL COORDINATING AGENCY : DEPARTMENT OF ENVIRONMENT

PROJECT SUMMARY

The purpose of these projects is to establish maintenance and recovery centres, to set up a Central Recycling Plant and to develop training for service operators. The main objectives are to eliminate and reduce the discharge of Halon 1211, to facilitate the storage point for the proposed National Halon Bank and to create a continuous series of in-house training. There is about 2000 MT of bottled capacity of portable extinguisher installed all over the country which average replacement requirement per servicing could be 100 MT. It is proposed that the users, with Department of Environment and Fire Services Department, establish a recycling network and at the same time propose a series of in-house training. Total cost of these three projects estimated at about US\$ 0.72 million. Expected yearly phase-out from projects average 300 MT of Halon 1211 with 500 trained recovery operators and 100 core trained trainers.

MALAYSIA

COUNTRY PROGRAMME

PROJECT

SERVICING, MAINTENANCE AND RECOVERY CHARGING KIT
FOR PORTABLE EXTINGUISHER (HALON 1211)
AND TRAINING PROJECT IN HALON SECTORS

Prepared by

DEPARTMENT OF ENVIRONMENT
Ministry of Science, Technology and the Environment

Kuala Lumpur
November 1991

PROJECT

SERVICING, MAINTENANCE AND RECOVERY CHARGING KIT FOR PORTABLE EXTINGUISHER (HALON 1211) AND TRAINING PROJECT IN HALON SECTORS

PURPOSE

1. The purpose of this paper is to detail the proposal financial assistance:

Sub Project I : To establish servicing, maintenance, recovery and recycling centre at all major Fire Stations with kit charging equipment.

Sub Project II : To develop training and demonstration of service operations at recycling centre.

Sub Project III : To set up a Central Recycling Plant (CRP) at Central Fire Training School (CFTS).

BACKGROUND

2. Halon have been used widely in Malaysia. The installations of fire fighting portable extinguishers (Halon 1211) and fixed installations (Halon 1301) have normally been required by the Fire Services Department (FSD). These major uses of halons which are used to

protect enclosures that house highly sensitive electronic, computing and telecommunications equipment such as aircraft engines, computer suites, sub-stations.

3. In 1989, Malaysia's calculated consumption of controlled substances is 4779.3 MT of which halon constitute 7.6 percent or 1338 MT. Although the quantity of halons used especially for new installations are relatively small, they have a high percentage of Ozone Depleting Potential (ODP).
4. Therefore, as a proportion of the total ODP, they contribute a significant proportion and there are no immediate substitute.

OBJECTIVE

5. The objective of these projects are as follows:

Establish Servicing - Recovery Centre (SRC)

- 5.1 To minimise and eliminate the discharge of Halon 1211 contained in the existing portable extinguishers during servicing and maintenance.
- 5.2 To reduce the consumption of Halon 1211.
- 5.3 To develop Halon Services Centre Network (HSCN) at the major fire stations.
- 5.4 To develop a continuous series of in-house training.

Demonstration and Training Scheme

- 5.5 To create awareness programmes to eliminate unnecessary emission of Halons on operators.
- 5.6 To advise and educate correct servicing and maintenance procedures in handling recycling facilities.
- 5.7 To encourage the use of alternative friendly technology.
- 5.8 To encourage understanding of the Ozone Depleting Substances (ODS) problems as a result of poor operating practices.

Central Recycling Plant (CRP)

- 5.9 To recover and recycle all extinguishers not serviceable and be replaced by CO₂ fire extinguishers or withdraw from use.
- 5.10 To facilitate the storage point for the proposed National Halon Bank (NHB) for reusable stock and contaminated stock awaiting destruction.
- 5.11 To establish the Central Fire Training School (CFTS) at CRP.

JUSTIFICATION

6. There are 600,000 to 800,000 of portable extinguishers (Halon 1211) installed all over the country, equivalent to about 2000 tonnes of bottle capacity of portable halon 1211 extinguishers. Average replacement requirement per servicing and maintenance could be 100 tonnes or 80 percent to dissipation of contents held under pressure into the atmosphere, accidental discharge during training and fire extinguishment. The total installed capacity of Halon 1301 is estimated to be between 12,000-20,000 tonnes whose effect to the ozone layer is very high and will have to be closely monitored.
7. Halons are emitted during training, testing, servicing, maintenance, accidental discharge and leakage, as well as during fire fighting.
8. The more immediate solutions appear to be the recycling, especially of Halon 1211 and minimization stage of the gas, while performing servicing and maintenance. These recycling facilities would definitely reduce the consumption of Halon 1211 and it is believed that this portion of consumption constitutes more than 60 percent of the total Halon 1211 consumption.

9. The losses from Halon 1211 portable extinguishers mainly occur as a result of leaks testing during manufacturing, material handling, loss during recharge, normal leakage due to system deterioration and venting during service and refill. There is need to ensure that the 2000 tons of Halon 1211 now contained in their system is not discharged into the atmosphere and stringent control will have to be introduced.
10. Many have a limited understanding of the ozone depleting issues and problems currently faced due to ineffective control that a programme of awareness and the need for trade competence training is desirable. Training and retraining of operators that service should be conducted by an experienced consultant together with local expertise. At the same time consultation from educationists would be required.
11. Currently most portable extinguishers are serviced by private companies, individuals using various forms of equipment. Almost invariably they are discharged or the contents are lost in the process. Practically, all halon 1211 portable extinguishers can and will be regulated at the fire stations over the next 10-20 years provided 'kits' are made available.

12. With a large number of portable extinguishers and the number of installations involved, the establishment of the HSCN is immediately required. Other than to reduce and eliminate the consumption of Halon 1211, HSCN can also create public awareness and introduce a continuing series of in-house training.

PROPOSAL

13. It is proposed that the users cooperate with FSD and DOE to establish a network of recycling and collection centres through acquisition of recycling and at the same time propose a series of on-the-job training on the use and maintenance of these equipments by local experts.
14. Currently it has been identified and proposed that the number of servicing centres required should be concentrated at the major fire stations will facilitate this operation. Approximately 50 HSCNs should be established. The specific number and location distribution will be determined depending on the number of recovery facilities approved by the Fund.
15. A series of in-house training would be developed in each recycling network. It is proposed that trained local experts should conduct the programme activities. The achievement and progress of each recovery network

to reduce consumption and the training programme activities should be monitored by FSD and DOE. A Government authorization certificate would be produced at the end of each training course.

16. The Authority concerned would develop a monitoring schedule and checklist activities on a monthly basis. The purpose of this is to ensure that all are running smoothly in their programme to reduce the consumption, at the same time their in-house training activities and public awareness campaigns are developed and properly managed.
17. It is proposed that a Central Recycling Plant (CRP) can be set up at the Central Fire Training School (CFTS). The cost of such a plant is expected to be M\$1.5 million or US\$0.6 million. All extinguishers not serviceable would be replaced by CO₂ or withdrawn from use and sent to the CRP for recovery and recycling. The process will include purification and removal of contaminants. It is proposed that Halon Bank for storage of Halon 1211 be set up for refilling of Halon 1211 still in use or are required to be used in certain critical sectors.
18. There is need for training of technician operators in the maintenance of portable extinguishers unit and

assistance is also required to establish a demonstration programme to teach correct servicing procedures. To meet these requirements it is proposed that UN Implementing Agency (World Bank) send an equipment servicing training consultant. It has also been proposed that UN Implementing Agency (UNDP) consult with all parties in the final form of the training programmes.

ACQUISITION DESCRIPTION

19. The recycling and collection equipment will be acquired and established by FSD using established government procedures in accordance with the specifications proposed by the Working Group (WG) in consultation with the users. The centres are those selected by the FSD. The operators are required to enter into an agreement with FSD or an established expert non-profit body e.g. Malaysian Fire Protection Authority (MFPA) to operate and maintain the centres.
20. It is, therefore, proposed that the FSD acts as the focal point to coordinate and determine the specific location distribution of HSCNs throughout the country can be done by FSD and DOE regional offices in the country.

21. A local experienced Halon services person be engaged to consult with and advice manufacturing industries or users and to draw up details for a demonstration/ training programme.
22. It is therefore proposed that an UN Implementing Agency and Ministry of Science, Technology and the Environment - MOSTE and FSD as focal point jointly organize an intensive four-day in-country training that would cover 100 technicians. The UN Implementing Agency (UNDP) would be responsible for training arrangements. It is proposed that training would be held in Kuala Lumpur by the middle of 1992, immediately after the acquisition of equipments and establishment of network (Table I).

IMPLEMENTATION AND COST

23. Two external consultants would be invited with each allocated for presentation of working paper and resource persons would be needed as speakers in local context.
24. This four-day training will enable operators representatives to discuss alternative technologies with experts. The experts will be available to discuss with individual industry, how each of these technologies and information might be applied in their operations.
25. The detailed estimated costs are shown in Table II. It is subsequently proposed that a team of local trainers would regularly visit those centres to provide on-the-job training in the local language and further series of centralised training workshops be held to ensure the availability of a permanent core of trained personnel in recycling/recovery.
26. At the moment, 50 units of recycling equipment are needed immediately. The detailed estimated costs are shown in Table III. The submission of these figures are based on information gathered and these cost estimates may vary from time to time depending on economic factors and also taking into consideration the possible facility changes.

OUTPUT EXPECTED

1. A Halon Service Centre Network of Recycling/recovery census consisting of 50 equipment.
2. A yearly recovery/recycle of average estimated 300 tonnes of Halon contained and prevented from being emitted into the atmosphere by the year 2000.
3. A trained 500 recycling/recovery experts, mechanics/operators and 100 core trained trainers.

TABLE I: IMPLEMENTATION SCHEDULE OF THE PROJECT

Project Description	Total Project Cost (million) (US\$)	Date (month/year)											
		A				B				C			
		Start		Complete		Start		Complete		Start		Complete	
		(a) (b)		(a) (b)		(a) (b)		(a) (b)		(a) (b)		(a) (b)	
		(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
<u>Sub Project I</u>													
Recovery and charging kit for BCF (Halon 1211)	0.31	10/91	11/91	12/91	01/92	02/92	03/92	04/92	05/92	06/92	07/92	08/92	09/92
<u>Sub Project III</u>													
Central Recycling Plant	0.36	12/91	01/92	02/92	03/92	04/92	05/92	06/92	07/92	08/92	09/92	10/92	11/92
<u>Sub Project II</u>													
Demonstration & Training	0.05	11/91	12/91	01/92	02/92	03/92	04/92	05/92	06/92	07/92	08/92	09/92	10/92
Total	0.72												

NOTE:

- A : Project Identification
 B : Project Preparation
 C : Project Funding

Sub-Project II

**TABLE II : ESTIMATED EXPENDITURE FOR FOUR DAYS
IN COUNTRY TRAINING IN HALON SECTOR**

Subject	Number Required	Unit Cost (M\$)	Total Estimated Cost	
			(M\$)	(US\$)
1. Equipment Rental	4	1,500	6,000	2,222
2. Conference Hall, Lunch Tea Break	4 days	15,000	60,000	22,222
3. Three Local Resource Person	(3ps x 4dy)	500	6,000	2,222
4. Two Session Chairman	(2ps x 4dy)	500	4,000	1,480
5. Organizing Committee	(2 times)	1,500	3,000	1,111
6. Accomodation for Local Resource Person	(3ps x 4dy)	500	6,000	2,222
7. Proceeding	(100 ps)	30	3,000	1,111
8. Miscellaneous and Contingency		4,000	4,000	1,480
9. Two Halon Consultant/ Experts	(2ps x 4dy)	(@US\$500/day)	10,000	4,000
10. Round Trip Air Travel of Two Consultants	(2ps)	(@US\$4000)	10,000	3,000
11. Accomodation of Two Consultant	(2ps x 4dy)	(@US\$100/day)	1,080	400
			119,680	46,470
12. Retraining Programme by 2 Experts on Circuit for 3 Years	-	108,000	108,000	40,000

Sub-Project I and III

TABLE III : ESTIMATED COST FOR THE PURCHASE OF
RECYCLING MACHINES AND TO SET UP
CENTRAL RECYCLING PLANT

Project	Number of Required	Average Unit Cost		Total Estimated Cost	
		(M\$)	(US\$)	(M\$)	(US\$)
Sub-Project I					
<u>Recovery Equipment</u>	50	13,500	5,000	675,000	250,000
- Spares (10%)	-	-	-	-	25,000
Sub-total					275,000
- Contingency (10%)	-	-	-	-	27,500
Total I					302,500
Sub-Project III					
<u>Central Recycling Plant</u>	1				
- Transfer pump dryer, vapour recovery pump, 5000 tonne storage capacity					100,000
- Spares (10%)					10,000
Sub-total					110,000
- Sophisticated recycling system capable of separating nitrogen and Halon					150,000
- Spares (10%)					15,000
Sub-total					165,000
- Facility modification and accessories (scales, cylinder rack and cylinder dollies)					50,000
- Spares (10%)					5,000
Sub-total					55,000
Total					330,000
Contingency (10%)					33,000
Total II					363,000