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执行蒙特利尔议定书
多边基金执行委员会
第三十八次会议
2002 年 11 月 20 日至 22 日，罗马

项目提案：印度尼西亚

本文件载有基金秘书处关于下列项目提案的评论和建议：

泡沫塑料

• Delta Atlantik 公司和 Samudra Plastics 公司隔温聚氨酯硬质泡沫塑料生产改为采用 HCFC-141b 技术淘汰 CFC-11	工发组织
• Ganesha Rattesko 公司和 Sindari Nusatama.公司隔温聚氨酯硬质泡沫塑料生产改为采用 HCFC-141b 技术淘汰 CFC-11 的项目	工发组织

制冷

• 通过结合采用政策、技术援助方案以及 CFC 回收和再循环在汽车空调行业淘汰 CFC 的国家计划	世界银行
• 制冷（设备维修）行业 CFC 淘汰管理计划	工发组织

项目评价表
印度尼西亚

行业：	泡沫塑料	本行业的 ODS 消费量（2000 年）：	2,281 ODP 吨
次级行业成本效益阈值：		硬质泡沫塑料	7.83 美元/公斤

项目名称:

(a) Delta Atlantik 公司和 Samudra Plastics 公司隔温聚氨酯硬质泡沫塑料生产改为采用 HCFC-141b 技术淘汰 CFC-11

(b) Ganesha Rattesko 公司和 Sindari Nusatama.公司隔温聚氨酯硬质泡沫塑料生产改为采用 HCFC-141b 技术淘汰 CFC-11 的项目

项目数据	硬质泡沫塑料	
	Delta 和 Samudra	Ganesha 和 Sindari
企业消费量（ODP 吨）	20.75	57.00
项目影响（ODP 吨）	18.82	51.98
提议的项目期限（月）	24	30
原申请经费数额（美元）	146,388	302,740
最后项目经费（美元）：		
增支资本费用(a)	88,000	162,500
酌处资金(b)	8,800	16,250
增支经营费用(c)	60,946	104,740
项目费用总额（a＋b＋c）	157,746	283,490
地方所有权（%）	100%	100%
出口比重（%）	0%	0%
申请经费数额（美元）	146,388	283,490
成本效益值（美元/公斤）	7.80	5.45
对应出资是否已经确认？	是	是
国家协调机构	国家环境部	
执行机构	工发组织	

秘书处的建议：		
建议供资额（美元）	146,388	283,490
项目作用（ODP 吨）	18.82	51.98
成本效益值（美元/公斤）	7.78	5.45
执行机构支助费（美元）	19,030	36,854
多边基金的费用总额（美元）	165,418	320,344

项目说明

行业背景

CFC（附件 A 一类）消费和淘汰概况

印度尼西亚根据第 35/57 号决定采用备选办法 1 作为起点，其数量是：	**3,951.4**	ODP 吨
- 截至第三十八次会议符合资助条件的剩余 CFC 消费量（根据第 35/57 号决定，条件 B）	2,454.7	ODP 吨
- 向第三十八次会议提交经费申请的所有 CFC 项目产生的影响	2,057.8	ODP 吨
- 在核准提交第三十八次会议的项目后符合资助条件的剩余 CFC 消费量上限	396.9	ODP 吨

泡沫塑料行业概况

- 上报的 2000 年泡沫塑料行业 CFC 消费量*	2,281.34	ODP 吨
- 执行中的泡沫塑料项目应该淘汰的 CFC 数量	2,282.1	ODP 吨
- 向第三十八次会议提交经费申请的泡沫塑料项目对剩余的 CFC 消费量产生的影响	70.8	ODP 吨

* 截至编写本项目评价的时候，印度尼西亚政府既未向臭氧秘书处上报 2001 年消费量数据，也未向基金秘书处上报经过细分的消费量数据。

聚氨酯硬质泡沫塑料

Delta Atlantik 公司和 Samudra Plastics 公司；Ganesha Rattesko 公司和 Sindari Nusatama 公司

1. 这是两个由工发组织为 4 个印度尼西亚聚氨酯硬质泡沫塑料生产企业提交的项目。所有 4 家公司都将在生产中改为采用 HCFC-141b 技术。

2. Delta Atlantik 公司和 Samudra Plastics 公司生产用聚氨酯硬质泡沫塑料隔温的保温产品，分别在 2001 年使用了 10.75 ODP 吨和 10.0 ODP 吨 CFC-11。Delta 公司当前使用一台低压机器和一台高压机器，分别安装于 1992 年和 1995 年。Samudra 公司使用一台低压注入机，安装于 1986 年。这两家公司的增支资本费用各为 44,000 美元，其中考虑到 Samudra 公司的基准注入机已经陈旧，扣除了相应的经费。两家公司的增支经营费用则分别为 31,515 美元和 29,372 美元。

3. Ganesha Rattesko 公司和 Sindari Nusatama 公司生产用聚氨酯硬质泡沫塑料作为隔板的船只、卡车车厢和捕鱼容器，分别在 2001 年使用了 42.0 ODP 吨和 15.0 ODP 吨 CFC-11。这两个公司基本上是手工作业，准备改用高压机，技术升级后将使改造费用降低 50%。

Ganesha 公司和 Sindari 公司的增支资本费用分别为 107,250 美元和 71,500 美元，增支经营费用则分别为 76,222 美元和 28,517 美元。

使用 HCFC-141b 的理由

4. 工发组织在每份项目文件中均以对每家企业的业务进行的技术和经济分析为依据，提出了使用 HCFC-141b 的理由。工发组织指出，在各企业选择采用 HCFC-141b 作为过渡技术之前，同它们讨论了现有的各种其他技术，并讨论了执行委员会关于把 HCFC-141b 作为过渡替代发泡剂的有关决定。

5. 根据执行委员会关于使用各类 HCFC 的决定，印度尼西亚政府提交了一份支持各企业采用 HCFC-141b 的送文函，该送文函附于本文件之后。根据第 36/56(c)号决定，项目文件还附有各企业签署的保证书，其中确认收到了关于在使用 HCFC-141b 时所涉问题的说明。

秘书处的评论和建议

评论

6. 秘书处和工发组织讨论并商定了每个企业的项目费用如下：

	淘汰的 CFC ODP 吨	项目总费用 美元	申请赠款额 美元	成本效益 美元/公斤
Delta Atlantik	9.75	75,575	75,575	7.75
Samudra Plastics	9.07	73,372	70,813	7.81
小计：	**18.82**	**148,947**	**146,388**	**7.78**
Ganesha Rattesko	38.30	183,472	183,472	4.79
Sindari Nusatama	13.68	100,017	100,017	2.61
小计：	**51.98**	**283,489**	**283,489**	**5.45**

建议

7. 基金秘书处建议一揽子核准 Delta Atlantik 公司和 Samudra Plastics 公司以及 Ganesha Rattesko 公司和 Sindari Nusatama 公司的项目，供资数额和相关的支助费用如下表所示：

	项目名称	项目费用（美元）	支助费用（美元）	执行机构
(a)	Delta Atlantik 公司和 Samudra Plastics 公司通过隔温聚氨酯硬质泡沫塑料生产改为采用 HCFC-141b 技术淘汰 CFC-11	146, 388	19, 030	工发组织
(b)	Ganesha Rattesko 公司和 Sindari Nusatama. 公司通过隔温聚氨酯硬质泡沫塑料生产改为采用 HCFC-141b 技术淘汰 CFC-11 的项目	283, 490	36, 854	工发组织

项目评价表
印度尼西亚

行业： 制冷设备维修 本行业的 ODS 消费量（2001 年）： 1,987 ODP 吨
次级行业成本效益阈值： 不适用

项目名称:

(a) 通过结合采用政策、技术援助方案以及 CFC 回收和再循环在汽车空调行业淘汰 CFC 的国家计划
(b) 制冷（设备维修）行业 CFC 淘汰管理计划

项目数据	汽车空调	多次级行业
企业消费量（ODP 吨）		1,072.00
项目影响（ODP 吨）	0.00	1,072.00
提议的项目期限（月）	60	60
原申请经费数额（美元）	363,500	1,002,745
最后项目经费（美元）：		
增支资本费用(a)	4,691,375	7,314,500
酌处资金(b)	469,138	599,650
增支经营费用(c)	17,400	
项目费用总额（a＋b＋c）	5,177,913	7,914,150
地方所有权（%）	100%	100%
出口比重（%）	0%	0%
申请经费数额（美元）	363,500	1,002,745
成本效益值（美元/公斤）		
对应出资是否已经确认？		
国家协调机构	国家环境部	
执行机构	世界银行	开发计划署

秘书处的建议：		
建议供资额（美元） 项目作用（ODP 吨） 成本效益值（美元/公斤） 执行机构支助费（美元）		
多边基金的费用总额（美元）		

项目说明

行业背景

CFC（附件 A 一类）消费和淘汰概况

印度尼西亚根据第 35/57 号决定采用备选办法 1 作为起点，其数量是：	**3,951.4**	ODP 吨
- 截至第三十八次会议符合资助条件的剩余 CFC 消费量（根据第 35/57 号决定，条件 B）	2,454.7	ODP 吨
- 向第三十八次会议提交经费申请的所有 CFC 项目产生的影响	2,057.8	ODP 吨

制冷行业概况

- 上报的 2000 年制冷行业 CFC 消费量*	3,288	ODP 吨
- 执行中的制冷项目应该淘汰的 CFC 数量	1,231	ODP 吨
- 向第三十八次会议提交经费申请的泡沫塑料项目对剩余的 CFC 消费量产生的影响	1,987	ODP 吨
剩余 CFC 消费量	**70**	ODP 吨

* 根据 2002 年 10 月 14 日印度尼西亚政府向基金秘书处所提 CFC 淘汰国家战略中提供的数据。

导言

8. 印度尼西亚政府向第三十八次会议提出了两项维修行业国家淘汰计划，一项计划涉及家用、商业和工业制冷次级行业（开发计划署），另一项涉及汽车空调次级行业（世界银行）。除设备的费用外，各项计划还申请了用于培训技师、制订政策、提高公众认识、项目实施管理和监测的资金。项目提议附于本文件后。

9. 继上述两计划提交执行委员会第三十八次会议供审议后，印度尼西亚政府 2002 年 10 月 14 日正式致函秘书处提出 CFC 淘汰国家战略的资料，提供了按行业和次级行业分类的 CFC 消费量最新数据、年度 CFC 淘汰目标和各行业为实现拟订目标需要采取的行动。

整个制冷设备维修行业的结构

10. 制冷设备维修行业是 CFC 淘汰战略确定的优先领域之一。家用、商业、工业和运输制冷设备维修和空调设备的 CFC 消费量确定为 1,072 ODP 吨。另有 915 ODP 吨 CFC-12 由汽车空调设备维修次级行业消费。因此，制冷设备维修行业 CFC 消费总量为 1,987 ODP 吨。

11. 制冷设备维修和汽车空调设备维修行业计划付诸实施后，可于 2007 年底实现淘汰

1,987 吨。

制冷（生产）行业的 CFC 淘汰

12. 执行委员会第三十七次会议原则上核准了总共 6,398,000 美元的资金用于逐步减少使用并于 2007 年 12 月完全淘汰印度尼西亚制冷（生产）行业使用的 CFC。印度尼西亚政府同意将确保切实地监测淘汰情况，并根据《蒙特利尔公约》的义务提供定期报告。执行委员会的理解是，计划执行阶段内，将根据印度尼西亚认为最有利于顺利实现 CFC 淘汰的方式，依照印度尼西亚于开发计划署在行业淘汰计划中商定的业务程序，使用所提供资金。印度尼西亚在该项协定中承诺将提供实施计划和实现拟议的 ODS 阶段可能需要的必要水准的资源。

制冷设备维修次级行业概况

13. 制冷设备维修次级行业包括除汽车空调外的所有家用、商业、工业和运输制冷设备的维修。

14. 为解决制冷设备维修次级行业的 CFC 淘汰，开发计划署与一当地公司开展了一项调查。提供家用、商业、工业和运输次级行业设备维修的维修厂估计有 10,600 多家。

15. 在这 10,600 家维修厂中，135 家是组织健全的维修厂。它们附属于主要的制冷设备厂家或主要的制冷材料、部件和消耗品经销厂家。每家维修厂每年平均使用大约 5 ODP 吨 CFC，雇用 5 至 10 名技师。其消费量约占维修使用 CFC 总量的 65％。

16. 其余的设备维修公司中，大约 300 家为中型，每家每年大约使用 0.5 吨 CFC。这些公司独立存在，不附属于任何生产厂家或供应厂家，组织上相对松散。从人员技术和维修设备来说，这些维修厂能力不大，每家约雇用 1 至 5 名技师，CFC 的使用量占本行业的 15％。

17. 其余的 1 万家公司，主要的都是小型的企业，CFC 的使用量约占了本行业的 20％。这些小型企业也可以从事制冷设备维修以外的活动。在这一类别中，大约有 500 家企业被认为是有相对健全的基线。这看来主要指的是在维修中使用 CFC 相对较多的制冷行业。行业计划讨论的是这些企业，还有组织健全的中型公司。

设备数量和设备维修对 CFC 的需要量

18. 行业计划对每个次级行业中使用 CFC 的制冷设备的总数和比例作了估计。估计家用、商业、工业和运输制冷次级行业制冷设备总数为 1,817 万套，其中 1,077 万套据说是使用 CFC 的设备。在 4 个次级行业中，各行业中拥有的使用 CFC 的制冷设备比例估计分别为 60％、40％、34.7％和 50％。整体而言，印度尼西亚大约 40％的制冷设备已通过当地生产和进口被无 CFC 的设备取代。

19. 对目前各次级行业维修业务所需 CFC 的数量，均根据使用 CFC 的制冷设备的数目、

每年需要维修的设备的比例和维修平均需要的 CFC 的数量（公斤/套）进行了估算。估计总需求量，主要是 CFC-12，为 1,072 ODP 吨。 总需求量的大约 68％属于家用制冷行业，约 22％用在工业制冷行业，例如人进得去的冷藏室和制冷车、冷房和大型中央程序制冷系统。其余的 10％用于小型单体商业设备、中型系统和运输制冷设备。

为减少 CFC 的使用开展的活动

20. 行业计划设想采用最佳管理做法减少漏损以及回收/再循环和改造现有使用 CFC 的设备。这些措施的实行将需要维修和回收/再循环设备、培训、提高认识和技术支助。在采取这些措施的同时，通过加强海关和其他执法机构正确地执行进口管制，被认为是限制 CFC 的进口、让 CFC 失去经济方面的吸引力和大大减少设备维修的 CFC 的消费量的至关重要的因素。

汽车空调次级行业概览

21. 2001 年，印度尼西亚大约 128 万辆车辆和 4,800 辆小型公共汽车装配着使用 CFC-12 的汽车空调装置。每年维修这些汽车空调装置所消费的 CFC-12 估计为 915 ODP 吨。这一数字不包括另外用于维修 HFC-134a 汽车空调系统的 CFC-12 的消费量。

22. 1995 年之前，所有安装于新出产车辆而不是公共汽车上的汽车空调系统均使用 CFC-12 制冷剂。小客车生产厂家于 1996 年改用 HFC-134a 制冷剂，小型公共汽车和公共汽车生产厂家于 1997 年年改用 HFC-134a 制冷剂（有些新出产公共汽车仍装配着使用 CFC-12 的汽车空调系统）。1995 至 1997 年期间，Denso Indonesia 公司和 Thermo King 公司两大汽车空调部件生产厂家逐步改用使用 HFC-134a 的部件。

汽车空调设备维修厂

23. 据印度尼西亚国家方案称，雅加达有 200 家汽车空调设备维修厂；但较可靠的全国性调查显示，维修厂大约有 2,000 家，雇用大约 1 万名技师，其中的许多人没接受过正规的培训。

24. 通常的维修做法是将制冷剂排放到大气中。处理设备的不足、缺少区分 HFC-134a 制冷剂和 CFC-12 制冷剂的工具以及 CFC-12 and HFC-134a 价格差别很大（分别为每公斤 3.30 美元和 5.90 美元），致使汽车空调装置维修的质量很差。

25. 执行示范项目期间收集的资料显示，印度尼西亚的维修厂可分类为：占维修厂总数 32％的小厂（每天修活 0 至 4 次）、占维修厂总数 46％的中型厂（每天修活 5 至 9 次）和占维修厂总数 22％的大厂。

26. 执行委员会在 1994 年举行的第十五次会议上核准了印度尼西亚的示范项目（2002 年 4 月完成）。尽管项目的实施出现了较长的延误，但仍取得了数项积极的结果，主要是 54 家维修厂供回收了 41 吨 CFC。这些维修厂都得到了为它们提供的回收和再循环机器。

减少汽车空调设备维修次级行业 CFC 使用量的活动

27. 为将维修排放减至最低程度，同时为使汽车空调维修行业对 CFC 的需求随着老旧车辆的报废能够不断降低，印度尼西亚政府与世界银行合作制订了汽车空调设备维修行业淘汰计划。汽车空调行业计划的目标是，通过结合采取政策行动、提高认识活动、技术援助方案和在全国范围内执行回收和再循环计划，争取到 2007 年 12 月实现全国的汽车空调系统的维修都不再需要 CFC-12。

增支费用

28. 为执行上述两项计划，提出了 13,074,663 美元的增支费用的请求，其分配如下：

说明	维修(美元)*	汽车空调(美元)**	共计(美元)
投资			
-回收/再循环/示范设备	5,996,500	3,746,375	9,742,875
-酌处资金 (10%)	599,650	469,138	1,068,788
-试验性改造/替代方案	350,000		350,000
技术支助	205,000	200,000	405,000
培训	573,000	85,000	658,000
政策与管理支助	190,000	660,000	850,000
共计	7,914,150	5,160,513	13,074,663

* 增支费用申请详情可查阅制冷行业计划附件二

** 增支费用申请详情可查阅汽车空调行业计划附件一

执行方式

29. 制冷设备维修行业（不包括汽车空调）计划要付诸实施，就需让政府和工业界采取行动，通过在所需政策和管理措施的配合下在投资、技术支助和培训各内的协调努力，实现原订的制冷设备维修行业 ODS 的减少。印度尼西亚政府将负责对行业计划的执行施行全面管理，开发计划署将负责筹划具体实施和落实。执行机构费用还需通过进一步的谈判确定。

30. 汽车空调行业计划的执行将由项目管理机构在臭氧机构监督下进行管理。这需要两名工作人员负责监测汽车空调行业计划的实施、审查进度报告和评价运作情况。财务管理办法，包括付款方式，将遵循世界银行的现行程序，保留现有财务管理代理人。

供资安排

31. 两项行业计划获准后，将请求执行委员会核准为2002年的活动提供1,366,245 美元（开发计划署 1,002,745 美元，世界银行 363,500 美元）。2003 年开始的淘汰活动至 2004 年才可能产生成果，使消费量到 2005 年方能开始减少。因此，印度尼西亚政府将请求在执行委员会 2003 年第一次会议期间，根据行业计划附件一所载行动计划/活动支付追加资金。

秘书处的评论和建议

评论

印度尼西亚 CFC 淘汰活动的协调

32. 两项新的次级行业计划是作为独立的项目提出，相互没有关联。秘书处注意到，秘书处有可能无法监测和区分印度尼西亚 3 个独立次级行业的 CFC 消费和 CFC 淘汰，这 3 个次级行业是：制冷生产次级行业、制冷设备维修次级行业和汽车空调设备维修次级行业。

33. 在这方面，印度尼西亚已制订、并向秘书处提供了附件 A 一类物质国家 CFC 淘汰战略。这一战略可以作为监测和报告与三项行业计划有关的 CFC 消费和协调这些行业计划执行情况的架构。执行委员会和印度尼西亚政府可草拟一综合协定，协定的内容涉及 CFC 淘汰取得的成绩和为两项新的制冷次级行业计划和已核准制冷生产行业计划拨款情况。这有助于防止在试图核实涉及使用 CFC 的各个单独的行业计划中的年度 CFC 淘汰情况时遇到困难。

34. 此外，每项计划均申请了用于培训技师（各类制冷设备和汽车空调装置的维修仍在众多的维修厂进行）、制订政策、提高公众认识、项目执行管理和监测的资金。看来有些活动内容重复，有些活动则属于重复计算。关于非低消费量国家制冷剂管理计划问题的第 37/19 号决定规定，除非生产中已完全淘汰了 CFC 的使用，否则效绩协定中不应使用临时性措施；同时还规定，应将协定视作国家 CFC 淘汰计划的一部分或一项行业计划，必须实现完全的的淘汰。在此基础上，两项新的国家计划应加以全面的协调，并使资源相应地合理化。协调工作还应考虑到制冷生产行业计划在第三十七次会议得到核准而得到的资源。目前正与有关执行机构就这一提议进行讨论中，结果将会告知项目审查小组委员会。

35. 秘书处评论的其余部分涉及的是关于综合方案问题制冷设备维修提议和汽车空调设备维修提议。

对使用 CFC 的装置数目和设备维修所需 CFC 的预测

36. 行业计划第 3.4.2 节中的一系列表格列出了预期行业计划实施期间家用、商业、工业和运输制冷设备将要减少的数量。每种用途中仍然使用 CFC 制冷设备的比例从 15％到 60％不等。以下原因导致了使用 CFC 的制冷设备数量的减少：

(a) 不使用 CFC 的制冷设备进口数量增加；印度尼西亚进口相当多的制冷设备；1998 年规定了禁止含有 ODS 的商品的进口；

(b) 在多边基金的帮助下家用和商业制冷行业的生产改为采用 HFC 和 HCFC 技术;

(c) 新建立的制冷生产设备采用了无 ODS 技术;

(d) 在没有多边基金帮助的情况下出于经济原因转向了 HFC 和 HCFC 技术。

37. 此外，有些因素可能造成 2005 年后使用 CFC 的家用电器数量急剧减少，例如：

(a) 由于根据计划第 5 条国家部分关闭 CFC 生产设施致使 CFC-12 制冷剂价格上涨，致使使用 CFC-12 的设备的维修费用上涨；

(b) 需求减少和规模经济造成的生产成本提高导致 CFC-12 压缩机价格上涨；

(c) 有可得到能效更高的无 ODS 设备；

(d) 提高认识、立法和管制措施。

38. 秘书处通过线性趋势（没有增长）对项目文件所提 1995 至 2002 年 CFC 消费量数据进行推断，预测了使用 CFC 的制冷设备的数量。结果显示，2010 年时仍存在的使用 CFC 的商业、工业和运输制冷设备将很少。根据预测，在家用制冷方面，至 2010 年将有近 200 万套使用 CFC-12 的设备。至 2012 年，使用 CFC 的家用电器的数目将微不足道。使用 CFC 的家用电器数目减少的模式，符合行业计划中所提议的 15 年的经济寿命。估计 2010 年维修仍存在的约 200 万套家用电器对 CFC-12 的需要量为大约 140 公吨。这一数字符合根据线性趋势对 CFC 需求量作出的预测，显示了印度尼西亚设备维修使用 CFC 数量的减少。

39. 秘书处指出，由于 1996 年即已开始采用 HFC-134a 汽车空调，因此，仍在运行的装配使用 CFC-12 的汽车空调的车辆数量可以说太多。虽然车辆的寿命可高达 15 年，但秘书处的技术咨询意见是，保养和维修得好的汽车空调的寿命可能只有 10 年左右。世界银行表示，印度尼西亚全年都需要汽车空调，汽车空调的设备保养得很好。曾就汽车空调系统的预期寿命问题同印度尼西亚的若干汽车空调部件供应商进行了讨论。汽车空调系统通常工作 6 年左右，随后出现部件需要更换或修理的情况。在有正常维修的情况下，汽车空调系统至少可用 15 年。由于市场有需求，CFC-12 系统的部件在印度尼西亚随时可以得到，包括进口到印度尼西亚的翻新过的 CFC-12 压缩机。

投资

40. 秘书处对投资进行了审查，在审查时考虑到了自现在起到 2010 年继续存在的使用 CFC 的设备的数量可能稳步地减少。

41. 投资强调应在印度尼西亚制订回收和再循环计划，办法是通过提供大约 400 套再循环机器和 1,200 套回收装置以及连带的零配件。估计回收/再循环设备的费用总额为 400 万美

元，因而有可能少排放 213 ODP 吨，得到的成本效益大约为每公斤 19 美元。根据判断，印度最近制订制冷设备维修行业计划过程中进行的一项研究降低了对回收和再循环家用和小型商业制冷设备的有效性的看法。回收和再循环行动的经济模型显示，回收和再循环对于每年独自消费大约 1,200 吨的维修企业来说可能有吸引力。现有维修厂 135 家，每家维修厂每年约处理 5 吨 CFC。其中有些维修厂将来要得到回收和再循环设备。项目文件显示，2010 年后，96 家企业通过回收和再循环行动即可以满足对 CFC-12 的需求的总量。在此基础上，秘书长已向开发计划署建议减少回收和再循环机器的数量。

42. 秘书处建议开发计划署使用可从已获核准类似项目得到的回收和再循环规格要求和报价单并相应对预算作出调整。

43. 秘书处支持通过提供新型注入设备减少维修所消费的 CFC。在这方面，秘书处向开发计划署表示，经执行委员会第三十七次会议核准的向 152 家中小型企业提供援助的商业制冷（生产）行业计划，会有助于改善印度尼西亚的维修操作。制冷行业的中小型企业既参与生产也参与维修的情况并不少见。项目完成报告在生产设备销毁一节中经常提到这一点。生产上不再需要的注入、清除和漏损检查设备将予以保存，供同一企业的维修经营活动使用。

44. 关于项目中提议的汽车空调回收和再循环机器问题，秘书处注意到，造成这种机器价格非常高（每套 3,650 美元）的原因是机器既可以回收 CFC-12、又可以回收 HFC-134a 的这种双重用途。只回收 CFC-12 的汽车空调回收/再循环装置的价格为由 1,800 美元到 2,600 美元不等。此外，成批购买 1,000 套，会进一步使单价降低。在这方面，合乎条件的项目增支成本应该建立在设计用途为回收 CFC-12 制冷剂的设备上。世界银行建议将单位成本降低到 3,000 美元，用于零件、技术援助和维修方面的开支。

试验性改造方案

45. 根据秘书处对使用 CFC 的制冷装置数量的分析，由于使用 CFC 的装置的报废，2010 后，除了家用制冷行业外，即便还存在使用 CFC 的制冷设备，数目也极少。拟议的一系列措施和预算足以满足家用制冷行业所需要的 CFC。秘书处已请开发计划署澄清对试验改装方案的需求程度。

技术政策和管理支助成本

46. 开发计划署申请 39.5 万美元作为对实施制冷设备维修行业计划的技术、政策和管理支助。世界银行也申请 62.15 万美元用于汽车空调项目管理（管制性和支助、提高公众认识、项目管理(国家臭氧机构)、项目实施(分包)和应急费用。这些都是第三十七次会议核准的用于制冷生产行业计划中的技术、政策和管理的 41.7 万美元之外的资金。这些费用看起来很高，在很多情况下可能出现重复计算，有些看起来并非增支性质。估计实施制冷行业全面活动的技术、政策和管理支助的全部费用不应超过所有三项行业计划经修正的增支费用总额的 10％。

47. 目前正与开发计划署、世界银行和印度尼西亚政府进行最后的讨论，密切协调拟议的

行业计划的实施，随后还将：

(a) 商定对预算作出拟议的调整和按年档落实资金的分配；

(b) 进行关于实施计划的支助费用的讨论；

(c) 编制从 2002 年 11 月到 2003 年底的实施方案；

(d) 在考虑第三十七次会议核准的关于制冷生产的协定的情况下，草拟印度尼西亚政府与执行委员会关于协调设备维修立方面两项行业计划的协定。

48. 资金分配、首项实施方案以及协定草案完成后将登在秘书处网站上提供给第三十八次会议（执行委员会和各小组委员会会议开始前，将向执行委员会成员提供）。

建议

49. 待补。

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GOVERNMENT NOTE OF TRANSMITTAL OF INVESTMENT PROJECTS TO THE EXECUTIVE COMMITTEE OF THE MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

PROJECTS OF THE GOVERNMENT OF INDONESIA

The Government of **INDONESIA** requests UNIDO to submit the project(s) listed in Table 1 below/attached Table 1 to the Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol for consideration at its 37th Meeting.

Section I: ODS Consumption Data

1. The ODS consumption figure(s) of the project(s) has/have been validated by the National Ozone Unit (NOU).

2. The consumption data have been retained in the records of the NOU for reference and/or future verification.

3. The Government has been advised by the NOU that the agreement to the project(s) indicates a commitment to ensure that the validated phase-out figure(s) was/were realized and yielded a sustained reduction from the current sector consumption of 2,282 ODP tonnes .

Table 1: Projects Submitted to the 37th Meeting of the Executive Committee

Project Title/Sector	Type of ODS	Consumption (ODP Tonnes) , (Year)	Amount to be Phased Out (ODP Tonnes), (Year)	Implementing Agency
Foam Sector				
PROJECT TO PHASE-OUT OF CFC-11 BY CONVERSION TO HCFC-141B IN THE MANUFACTURE OF RIGID POLYURETHANE FOAM FOR INSULATING PURPOSES AT ANEKA CITRA REFRIGERATAMA CO.	CFC 11	20.0	18.2	JAPAN BILATERAL
PROJECT TO PHASE-OUT OF CFC-11 BY CONVERSION TO HCFC-141B IN THE MANUFACTURE OF RIGID POLYURETHANE FOAM FOR INSULATING PURPOSES AT ***BINA TEKNIK CO.*** (FORMERLY TEMPKING JAYA CO).	CFC 11	25.0	22.8	JAPAN BILATERAL
PROJECT TO PHASE –OUT OF CFC-11 BY CONVERSION TO HCFC-141B IN THE MANUFACTURE OF RIGID POLYURETHANE FOAM FOR INSULATING PURPOSEDS AT GANESHA RATTESKO AND SINDARI NUSATAMA	CFC 11	57.0	52.0	UNIDO
PROJECT TO PHASE –OUT OF CFC-11 BY	CFC 11	20.75	18.8	UNIDO

CONVERSION TO HCFC-141B IN THE MANUFACTURE OF RIGID POLYURETHANE FOAM FOR INSULATING PURPOSEDS AT DELTA ATLANTIK AND SAMUDRA PLASTICS				
PROJECT TO PHASE-OUT OF CFC-11 BY CONVERSION TO WATER BLOWN IN THE MANUFACTURE OF INTEGRAL SKIN SHOE SOLES AT P.T. ACCURAI	CFC 11	50.0	50.0	UNIDO
Total		**172.75**	**161.80**	

Section II: Other Relevant Actions Arising from Decision 33/2

4. It is understood that, in accordance with the relevant guidelines, the funding received for a project would be partly or fully returned to the Multilateral Fund in cases where technology was changed during implementation of the project without informing the Fund Secretariat and without approval by the Executive Committee;

5. The National Ozone Unit undertakes to monitor closely, in cooperation with customs authorities and the environmental protection authorities, the importation and use of CFCs and to combine this monitoring with occasional unscheduled visits to importers and recipient manufacturing companies to check invoices and storage areas for unauthorized use of CFCs, in view of the instances of equipment purchased by the Multilateral Fund not being used or being reverted to the use of CFCs..

6. The National Ozone Unit will cooperate with the relevant implementing agencies to conduct safety inspections where applicable and keep reports on incidences of fires resulting from conversion projects.

Section III: Projects Requiring the Use of HCFCs for Conversion

7. In line with Decision 27/13 of the Executive Committee and in recognition of Article 2F of the Montreal Protocol, the Government

   (a) has reviewed the specific situations involved with the projects ANEKA CITRA REFRIGERATAMA , BINA TEKNIK (FORMERLY TEMPKING JAYA), GANESHA RATTESKO , SINDARI NUSATAMA, DELTA ATLANTIK , AND SAMUDRA PLASTICS as well as its HCFC commitments under Article 2F; and

   (b) has nonetheless determined that, at the present time, the projects needed to use HCFCs for an interim period with the understanding that no funding would be available for the future conversion from HCFCs for the company/companies involved.

Name and signature of responsible Officer:

Ms. Liana Bratasida

Designation: Deputy Minister for Environmental Conservation, Ministry of Environment

Date: 20 May 2002

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38th EXECUTIVE COMMITTEE MEETING OF THE MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL

PROJECT COVER SHEET

COUNTRY: Indonesia **IMPLEMENTING AGENCY** The World Bank

PROJECT TITLE National plan for phasing out the use of CFC in Mobile Air Conditioning sector through a combination of policies, technical assistance programs and CFC recovery and recycling.

PROJECT IN CURRENT BUSINESS PLAN: **YES**

SECTOR: Mobile Air Conditioning Servicing Sector

SUB-SECTOR COVERED:

ODS used CFC-12: Before: 915 tons After: O tons

NATIONAL ODP CONSUMPTION :

Latest reported national consumption [Y 2000]: 5,297 tons ODP

Unfunded national ODP consumption Before: 2,771.4 tons ODP After: 1,856.4 tons ODP

PROJECT IMPACT : 915 tons ODP

PROJECT DURATION: 60 month

PROJECT COSTS: (total and full costs of the project)

Incremental Capital Cost	US$ 4,691,375
Contingency (10%)	US$ 469,138
Incremental Operating Cost (Not requested)	US$ 17,400
Total Project Cost	US$ 5,160,513

LOCAL OWNERSHIP: 100 % **EXPORT COMPONENT:** 0%

REQUESTED MLF GRANT:	**US$ 4,996,513**
IA SUPPORT COSTS: [13% 0f US$ 500,000 and 11% of the rest]	**US$ 559,616**
TOTAL COST OF PROJECT TO MULTILATERAL FUND:	**US$ 5,556,129**

COST EFFECTIVENESS: **NA**

COUNTERPART FUNDING: The government is committed to implement to MAC sector plan as presented in this proposal

PROJECT MONITORING MILESTONES: **Included**

NATIONAL COORDINATING AGENCY: **Ministry for Environment of Indonesia**

EXISTING PROJECT SUMMARY

The objective of this MAC Sector Plan is to eliminate the national consumption of CFC-12 for mobile air conditioning systems by December 2007 through a combination of policy actions, awareness creating activities, technical assistance programs and a national program of MAC CFC recovering and recycling covering all of Indonesia to minimize emission during servicing and repair of MAC systems and for recovering CFC at the end of the useful life of MAC systems. The implementation of MAC sector plan would be managed by an integrated Project Management Unit (PMU) under supervision the National Ozone Unit (NOU) and to maximize effective implementation of the program, specific activities shall be subcontracted to specialized agencies and experienced institution. Practical implementation issues that have been identified in the first phase of MAC project will address the CFC-12 consumption related to more than 2000 service workshop scattered all over Indonesia. It is planned to establish a certification system for service workshops that have received training and are using recycling equipment. It is planned to install around 1,000 recycling units covering larger workshops and at least 70% of the CFC-12 used for MAC servicing. Criteria will be established for selection of workshops based on number of cars served, geographic distribution, training and certification. Trainings & certification of service shops , awareness activities , regulatory & supports shall be organized by the dedicated staff of PMU of MAC Sector Plan. Survey and monitoring activities, equipments' procurement and distributions will be handled by an independent institution. The MAC sector plan is an integrated part of the phase-out plan of servicing of refrigeration and air conditioning sector.

IMPACT OF THE PROJECT ON COUNTRY'S MONTREAL PROTOCOL OBLIGATIONS:

The proposal is part of an overall national phase-out plan and will assist Indonesia in implementing its country program as presented to ExCom and a complete phase-out of CFC-12 in the MAC service sector. The project is consistent with ExCom policies and guidelines and the consumption is within the remaining unfounded CFC consumption in Indonesia.

Prepared by : Dasa Windu Agung Date: September 2002

Reviewed by : James Baker, OORG Date: September 2002

NATIONAL PLAN FOR PHASING OUT THE USE OF CFC-12 IN THE MOBILE AIRCONDINING SECTOR THORUGH A COMBINATION OF POLICIES; TECHNICAL ASSISTANCE PROGRAMS AND CFC-12 RECYLING AND RECOVERY

PREPARED BY

LH
THE GOVERNMENT OF INDONESIA

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PROJECT OF THE GOVERNMENT OF INDONESIA
Mobile Air conditioning Sector Plan Project

A. PROJECT OBJECTIVES

The objectives of this project are:

a) To achieve complete phase-out of CFC-12 in the mobile air conditioning servicing sector in Indonesia by December 2007. The sector plan form an integral part of complete phase out of CFC in the servicing of refrigeration equipment and supplement programs proposed for refrigeration equipment and chillers.
b) To enable Indonesia to meet its obligations of phased ODS reductions in accordance with the control schedule as proposed by Indonesia and a complete phase-out of CFC consumption by 2007.
c) To ensure timely, sustainable and cost-effective CFC phase-out in the mobile air conditioning servicing sector, through development and implementation of national MAC recycling a through a combination of investment activities and technical support components and policies.

B. SECTOR BACKGROUND

1. Number of Cars With CFC Based MAC Systems.

The updated Country Program reported that in 1998, approximately 50% or 1.3 million of the vehicles have MAC units installed, all of which use CFC-12 as the refrigerant. The charge used for both services of repairing and new installation is about 1,436 MT CFC-12 yearly. Of this amount 84.3% is used for servicing or repairing and 15.7% for new installation.

Indonesia has a national production of vehicles. Global manufactures for MPVs, SUVs and sedan like Toyota, Honda, Mitsubishi, Suzuki, Daihatsu, General Motor, Mercedes Benz are all operating in Indonesia and has set up car assembly lines in the Jakarta area. While minibus and light trucks are mostly CBU described in order based on percentage of market shares as Toyota, Mitsubishi, Isuzu and Suzuki. Regular buses mainly imported as "real Bus Chassis" described in order as above; Mercedes Benz, Hino, Nissan and Mitsubishi.

Car industry in Indonesia grouped vehicles into six categories. The following table informs detail market population according to category:

Table 1 - VEHICLE MARKET SHARE AS PER CATEGORY 1995 – 2001 *)

CATEGORY	1995	1996	1997	1998	1999	2000	2001
I	1,879,497	2,097,172	2,347,111	2,385,546	2,453,264	2,667,093	2,880,919
II	681,409	733,427	779,150	785,117	795,540	825,152	865,792
III	846,373	858,703	871,516	872,561	875,352	881,473	888,163
IV	68,870	74,321	78,711	79,516	81,157	84,795	87,365
V	221,823	222,470	223,081	223,191	223,420	224,293	224,901
Sedan	384,210	428,124	501,339	513,280	524,292	571,183	606,409
Total	4,082,182	4,414,217	4,800,908	4,859,211	4,953,025	5,253,989	5,553,549

Note : Category I : Gross Vehicle Weight 5 Ton (MPVs)
Category II : Gross Vehicle Weight 5 - 10 Ton (Minibus & light truck)
Category III : Gross Vehicle Weight 10 - 24Ton (Regular Bus)
Category IV : General Purpose (SUVs)
Category V : Gross Vehicle Weight > 24Ton (Heavy Trucks)
Sedan : Passenger Car

*) Data: Source from GAIKINDO (Association of Indonesian Automotive Industries) and GIAMM (Indonesia Automotive Parts & Components Industries Indonesia)

According to information provided by Denso, Sanden and Thermo King as leading MAC producers in Indonesia, the change over of MAC systems from CFC-12 to HFC-134a in categories I, IV and Passenger Cars (hereafter called "car") had started since 1996 and for categories II, III and V started in 1998. Multi Purpose Vehicles (MPV), Special Utility Vehicles (SUV) and passenger car are dominant fleets to have had CFC MACs fitted to 55 percent and 15 percent of all buses to have CFC MACs. Most of trucks are non-air-conditioned. The following table provide information as of year 2001 about vehicles population and CFC-consumption in the sector:

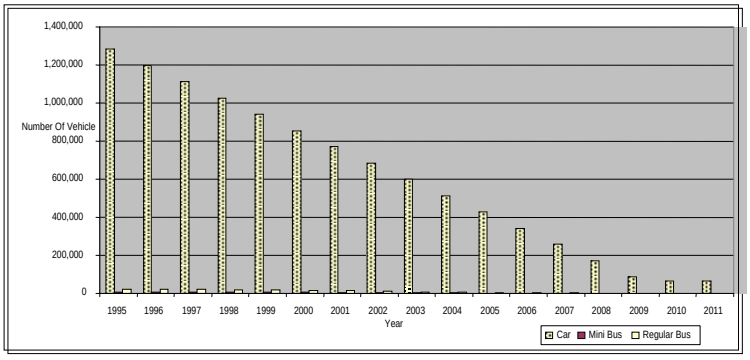
Table 2 CFC-12 Consumption in Automative Air-Conditioning in 2001

Category	Type	# of Vehicles per respective change over	# of Fleets still using CFC	# Fleets using CFC-System	Average Consumption / Vehicle (Kg)	CFC-12 Consumption (Kg. / Year)
I, IV & Passenger car	MPV, SUV & Sedan	2,332,577	55%	1,282,917	0.6	**769,750**
II	Minibus	79,878	6%	4,789	3	**14,367**
III	Regular bus	436,794	3%	13,098	10	**130,980**
V	Trucks	0				**0**
	TOTAL					**915,097**

It is estimated that without taking into account any reverse use of CFC-12 in HFC-134a MAC systems, the current consumption of CFC-12 in the MAC sector for servicing of 1.3 million vehicles with CFC-12 MAC system is 915 MT in 2001. However, the "hidden" CFC consumption by HFC-134a MAC systems using CFC-12 is not included in the 915 MT. To ensure that the emission during servicing is reduced to a minimum and the CFC demand in the MAC servicing sector continues to decrease over time as old vehicles are put out of service every year, a MAC sector plan targeting vehicle owners, service shops and supply of CFC-12, has been developed by the Indonesian Government in corporation with the WB. The plan is based on the experiences gained from the Indonesian MAC recycling project completed in 2001 and International experiences on CFC phase-out in the MAC sector.

The following Graph shows evolution of CFC filled MAC system from 1995 to 2011:

Graph-I Number of Vehicles with CFC filled MAC system 1995 – 2011



2. CFC-12 Forecast for Automotive Air-conditioning

Estimate needs of CFC-12 in automotive may still be continue over the year 2010 considering in hot climate like Indonesia and incapacitated economic status of people which tend to keep the MAC system operating until the car is very old. In a tight economic condition where savings for buying new vehicles is not preferred, people tend to recondition existing vehicles. The life-time for the MAC system in the vehicles is around 15 years based on manufacturer information and 10 years for buses. The following table pictures CFC-12 demand projection from 2001 to 2010:

Table 3 CFC Demand Projection

Year	Category I, IV & Passanger Cars (MPV, SUV, Sedan)	Category II (Minibus, light truck)	Category III (Regular Bus)	Total Demand for CFC (MT)
2001	769.75	14.37	130.98	915.10
2002	684.22	11.97	109.15	805.34
2003	598.69	9.58	87.32	695.59
2004	513.17	7.18	65.49	585.84
2005	427.64	4.79	43.66	476.09
2006	342.11	2.39	21.83	366.33
2007	256.58	2.39	21.83	280.80
2008	171.06	1.20	10.92	183.18
2009	85.53	1.20	10.92	97.65
2010	64.15	1.20	10.92	76.27

The above table shows that there will be a gradual decline in CFC demand for MAC servicing due to retirement of older cars and MAC systems. However, the number of CFC-12 based MAC system in existing cars and CFC consumption will still be significant in 2007 (280 MT) and the Government will have to take additional actions from 2005 and onwards to ensure that the CFC demand in the sector will be insignificant in 2007. Awareness creating activities, strengthening of import control and limitation on supply of CFC-12 are expected to increase CFC prices and promote the use of HFC-134a when existing MAC system break down and eliminate the hidden CFC consumption in HFC-134a MAC systems. Without premature retirement of MAC systems or conversion to HFC-134a, the demand in 2010 will be 76 MT CFC-12.

3. MAC Industry

There are three main manufacturers of MACs in Indonesia, they are Denso, Sanden Jaya Indonesia, and Thermo Asri Makmur. Other manufacturers like Coach Air (Australia), Convecta (Jerman), Mark IV and Term Air contribute to more stiff competition in the automotive industry.

Denso Indonesia has 46 authorized servicing outlets that also sell MACs spare parts to other service shops. Sanden Jaya Indonesia has about 17 authorized service outlets operating similarly under independent distributors. Thermo Asri Makmur is specialized for buses and trucks, this company is a sole agent of Thermo King USA.

Denso Indonesia has a service network with strong coordination between parts supplier and distributors due to technology information system such as technical information, repair manual, and technical training course. In 1997, it had introduced retrofit scheme of MAC using CFC-12

system to HFC-134a. After Indonesia became the party of ozone convention, Denso in 1994 had started to distribute a leaflet "Save the Ozone Layer" to car assemblers, dealers and car owners. Trainings and seminars were conducted since 1994 to socialize the conversion of HFC-134a system to the public. Since early 1996 onward, Denso has put labeling of HFC-134a for new MAC installation in vehicles.

Denso had also stated to do promotional schemes such give away t-shirts "Save the ozone layer" to mac technicians. In addition, Denso provided price incentives to its authorized service shops for any purchase of special service tools for HFC-134a system.

Another MAC distributor, Thermo Asri Makmur that holds Thermo King USA license currently has two official dealers, but does not have an organized service network, but it maintains establishment of service shops in south and north lines of Java where most of bus liners transport between cities of Java. Aside from that Thermo king also maintains customer list of 151 bus companies, 193 refrigerated truck, and 5 transport logistic companies. There are a number of bus companies with range of bus fleets from 50 to 1600 fleets that do own MAC system maintenance for cost effective reason. They would only come to Thermo service shops for any major repair.

While Sanden Jaya Indonesia has a distributor system but it does not have an organized service network.

Until 1995, all MAC system installed in new vehicles except buses was CFC. The passenger car manufacturers changed to HFC-134a as refrigerant in 1996. Manufacturers of minibuses and buses changed their MAC system to HFC-134a in new buses by 1997. As production of buses are normally based on specific requirements from the customer, some new busses are still equipped with CFC based MAC system due to request by the buyer. The two manufacturers of MAC components; Denso Indonesia and Thermo King, had gradually switched to HFC-134a based components between 1995 to 1997. Denso Indonesia stated that they have begun to replace the new MACs installation with non-ODS by the end of 1995 and beginning of 1996 the consumption of ODS in this sector was mainly for the purpose of services activities.

Denso controls 90% of sales of automotive compressor, evaporators and driers for passenger cars, MPV and SUV. Remaining 10% is for Sanden. While for mac system in buses, Denso owns 60% market share, Thermo King 30% and remaining is for other producers like Mitsubishi, Fuji, Carrier, Coach air, Therm air, and Convecta. The latter currently established local production for evaporator and condenser in East Java.

Denso has its local manufacturers of compressors and evaporators of which 75% of its supply manufactured locally and 25% is imported. Sanden assembles its compressors and evaporator locally. On the other hand 100% of MAC parts of Thermo King imported from USA. Convecta, recently established manufacturing of evaporator in Surabaya, East Java to compete with other existing brands.

The following table shows sales performance of MAC parts:

Table-4 Data of sale of compressor, Evaporator and Drier of from 1995 to 2001

	Original Equipment			After Market		
Year	Compressor	Evaporator	Drier	Compressor	Evaporator	Drier
1995	106,818	106,818	106,818	61,650	57,682	57,682
1996	100,767	100,767	100,767	28,900	27,040	27,040
1997	160,177	160,177	160,177	19,285	18,044	18,044
1998	26,272	26,272	26,272	1,650	1,544	1,544
1999	57,656	57,656	57,656	3,667	3,431	3,431
2000	195,005	195,005	195,005	8,202	7,674	7,674

*) Data from Denso Indonesia, excludes system for bus fleets

4. CFC consumption in the MAC sector

The estimated consumption is based on a) number of CFC based MAC systems on the roads and estimated consumption per car, b) records from a representative sample of MAC service workshops and c) information obtained and experiences gained from the MAC project implemented in Indonesia and d) other national MAC phase-out programs in the region.

Gathered data from Ministry of Industry and Trade that CFC-12 import from 1999 to 2001 recorded to be 117 MT, 84 and 34 MT respectively. The project perceived that the records does not reflect the actual consumption in Indonesia and the consumption in the MAC sector. Informal information from only one CFC-12 supplier shows importation for 56 MT per month of which over 30% are supplied to MAC service shops.

a) CFC based MAC systems and estimated consumption per car.

The large number of locally assembled cars without air-conditioning results in an unusually high proportion of larger, more exclusive vehicles among those with air-conditioning. Regular buses (real bus chassis) and minibus have the refrigerant charge of 10 Kg. and 3 Kg. respectively, compare to average of 0.6 Kg. in cars. Though smaller in volume, buses have significant influence on total consumption in this sector. The demand calculated for refrigerant charge for vehicles in Asian would be different compare to USA or Europe which is around 1.3 Kg. per car.

Cars (including MPVs, SUVs and sedan):	0.6 kg / car
Minibuses / light trucks	3 kg / minibus
Buses	10 kg / bus

b) MAC Service Shop Survey

A total about 118 mobile air-conditioning service shops comprises 109 service shops for cars, 5 service shops for buses, 3 bus companies own bus fleets range from 53 to 160 units and a taxi service company were field surveyed covering cities of big islands in Indonesia (Java, Sumatra, Kalimantan, Sulawesi and Bali). The findings show that 14 shops (12%) use recovery equipment which either own or locally made with note that they posses substantial rate of emission during operation due to inaccurate design of the equipment. Rare application of

recovery/recycling equipment occurs since there has been no customer demand for it and also the CFC-12 price has been low. Customers are often only interested in quick and a cheap repair that makes service shops to invest in equipment is low. They claim that it would be difficult to compete in service business where quick service and cheap material are prime factor. Most of service shops are only equipped service tools like with vacuum pump, leak detector and pressure gauge.

The survey also recognized that these service shops use, on average, 915 Kg CFC-12 per year or 2.54 Kg./day with average cars served in a day of 7 cars, but around 2-4 cars come to service with empty refrigerant. The data would lead to a net savings of 1 Kg. per day or 30 Kg./month (average of 39% net saving using recovery equipment). Taking the average price of CF-12 of $ 3.3/Kg then net saving will account to $ 100/month.

The number of technician working in surveyed service shops range from 1 to 28 technicians. The latter number happens to be the service shops of Thermo king in Jakarta. Significant findings of survey disclosed that most of technicians have no formal training. The normal practice when service of MAC is to vent the refrigerant to atmosphere. Inadequate handling equipment and knowledge of identifying HFC-134a and CFC-12 have caused improper service to cars. It is also found that widespread HFC-134a counterfeit available in the market, a tank if unidentified may contain CFC-12 or hydrocarbon could harm the MAC system. One may identify counterfeit HFC-134a using identifier and often by lower purchase cost. Surveyed shops rarely own identifier and they do not put much care on price difference as long as they could sell and charge to the system.

Significant price differential between CFC-12 and HFC-134a has also proven to be a major reason for service technicians to charge the repaired units with CFC-12 without any consideration as to whether the units were originally designed for, and suitable for use with CFC-12. Average purchase price of service shops noted in the survey is around $ 3.3/Kg. for CFC-12 and $ 5.90 for HFC-134a. However, the price of these two substances varies depending on the supply availability and dollar currency exchange.

c) Experiences from the implemented MAC recycling project.

As continuation of completed pilot MAC project, this sector plan project will convene total reduction of emission of CFC-12 during service with estimated cars and buses in all categories in 2001 around 1.3 million vehicles and estimated average usage of CFC-12 of 915 tons.

MAC project phase I approved in 15th Ex.Com Meeting of March 1995 was completed in April 2002. Despite of backlogs experienced in the implementation of the project due to the difficulty in finding an organization to manage the project and economic and political turmoil in the Country, the caretaker was able to develop multi-faceted implementation plan that resulted directly in the very positive results achieved by the project. The 1st phase of the project achieved reduction of CFC-12 emission of 40.95 MT during service in 54 service shops. The major components of this implementation plan were:

1. Majority of the service shops commented upon the dual benefits of the project, that eliminating an environmental hazard while at the same time increasing the benefits (financial incentive) to the shop or to the clients.
2. The MAC recycle equipment itself is simple to use for anyone with rudimentary knowledge of mobile air conditioning.

3. All service shops reported careful training in the usage of the equipment. Due to the simplicity of the equipment, apparently this training was accomplished in less than two hours, but it was done well.
4. Not only the machine was supplied, all needed fittings to assure the proper connections on the equipment were supplied like filter drier, vacuum oil and spare part kit.
5. A manual on the equipment and its functioning in the Bahasa language was included as key factor to assure usability. Videocassette how to run the unit was provided to each service shop.
6. Reports were required monthly basis and needed spare parts were initially withheld to assure that the reporting would take place.
7. A quarter monitoring was conducted to the extend possible to assure equipment applied during service.

The completed pilot project categorized service shops as follows: smaller service shops (0-4 vehicles per day), medium size service shops (5-9 vehicles per day) and bigger size service shops (above 9 vehicles per day). There were 54 shops participated the program with CFC-12 service categories; 32% or 17 shops as small, 46% or 25 as medium, and 22% or 12 as big. The distribution of recycle equipments were made in five big cities of Java as follows; 24 shops in greater Jakarta, 9 shops in West Java, 15 shops in Central Java and 6 shops in East Java. Total saving of emission reduction of CFC-12 in 54 workshops was 41.2 MT/year which was above the expectation of 40.95 MT the project pertained.

The application of recycle equipment in service shops was monitored by monthly progress report which recorded that they have a net saved emission of 19.5 tons or 47% effectiveness of recycle machines from December 2000 to November 2001. Lower saved emission compare to preliminary survey might be due inconsistent usage of equipment in servicing, redundant recording by MAC technician. Therefore it is important for the MAC sector plan to conduct training for reporting to avoid unrecorded usage of equipment.

The Country program indicates only 200 shops in Jakarta but more accurate survey over a national range, it was estimated about 2,000 service shops spread across the country. All the service shops employ in order about 10,000 people, many of them have not received formal training. Most of the service shops are independently owned and operated, and some of them are organized into groups.

5. MAC System Technology

Alternative refrigerants in MAC industry have been introduced since 1995 aside from conversion to HFC-134a is ammonia or hydrocarbon. The preferred strategy is to first reduce the emissions from the existing mac system by having central reclamation unit. However, it would prove very much more expensive and probably ineffective operation due to the wide dispersion of the service shops. Replacement or retrofit is primarily recommended in connection with major repairs. Replacement to hydrocarbons often poses an unacceptable hazard in old systems not designed with consideration for use with a flammable refrigerant. Retrofit to HFC-134a in general will require replacement of all oil in the system. The proposed system by providing recycle equipment is ultimately compatible with the change over of MACs from CFC-12 to HFC-134a. The accompanying financial assessment and in particular the unit cost effectiveness indicates that this project proposal is very cost effective. The three manufacturers of MACs in Indonesia currently have converted their units to HFC-134a and they have no longer produced MAC parts like compressors, evaporators for servicing.

6. Size of MAC recycling equipment

Under the 1st MAC project, 54 recycle equipments were distributed. Each service shop received a recovery, recycling and recharging (3R) Robin Air USA model 17451 tank capacity of 5.5. Kg, spare part kits, 4 units of filter, and 4 units of vacuum oil. The price of 3R unit is $ 3,194 each.

The project foresees to allocate different tank capacities of recovery equipment to allow different vehicle categories in different target service shops can be accommodated. Service shops that cater services to passenger cars, MPVs and SUV will only need recovery equipment with tank capacity of 5.44 Kg. while service shops caters services to buses including bus companies who maintain own MAC service, should be provided recovery equipment larger tank capacity of around 12.3 kg.

Aside from achieving objective to reduce emission, it is also important to consider providing recycle equipment for dual function of which it can be applied for R-12 or HFC-134a. It implies when mac with R-12 system has completely phased, service shops can still apply the same for reduce emission of HFC-134a which has impact for Global Warming Potential (GWP). Offered price of recycle equipment from dual functions of R-12 or HFC-134a brand for the project amounting $ 3,650 the price for double tank capacity would be higher.

7. Experiences on operational costs and savings.

The project document of previous MAC project foresaw service shops joining the program to get incentive in average net amount of $125 per month per shop after deducting rental, labor costs and electricity charges. In additional to the rental, labor and energy costs, it was found that operational costs and maintenance also had to be taken into account when calculating costs and benefits. Summary of monthly reports of completed project shows that each shop on average was able serve five cars with CFC-12 system, and it received net incentive of $ 100 per month with recycling equipment rental set at US $ 9.16 per month or $ 220 in two years to allow a reasonable incentive for smaller service shops. This incentive was considered sufficient in the first phase in making the scheme viable. Taking into account net saving for refrigerant recovery of the survey is similar with actual implementation of pilot project, it proposes to have service shops charged rental fee of $ 100 / year for two year implementation and $150 / year for bus.

C. POLICIES AND AWARENESS CREATING ACTIVITIES (REQUIRED REGULATION ACTIONS)

Necessary measures / regulations should be in place and they will be formulated as parts of the sector plan. These measures will include a ban on new MAC installations with CFC, and, a venting ban and compulsory use of recovery equipment when a MAC system is serviced or decommissioned, mandatory recovery before junking vehicles with CFC-12 system, prohibition for mislabelling containers as well as requirements for training and the use of proper work methods in the MAC servicing sector. These legal measures are important to send a clear message to the market of the Government's intention to carry out the phase-out but also to clarify the requirements of the Montreal Protocol and strengthen the pro-active service providers that are promoting state-of-the-art service methods.

To further find the sector plan in effective ways the import control system in the country that is currently being designed should immediately be functioning to expect gradual declining or stoppage of CFCs unmeasured import is achievable. The on-going implementation in

production sector plans in China and India is expected to achieve gradual reduction of CFCs production as scheduled.
Considering the present weaknesses in law enforcement and judiciary that affect all aspects of governance in Indonesia, and difficulty in doing more than spot-checking shops scattered all over the Country, the non-investment part of the will rely more on:

- Awareness to get the public to understand the issues and problems and the need to go to qualified shops that do proper work. Public should be made aware on presence MAC system in their vehicles to get proper filling and handling during service. Dissemination information through pamphlet, medias would also be effective measures. Car manufacturers will also be involved in providing literature specifying HFC-134a and warning about CFC-12 for new vehicles;
- Certification of shops and listing of certified shops as to encourage shops to offer an improved service, allowing them to use an ozone-friendly logo and a sticker on the MAC after service;
- Code of Good practice – would need to be established and defined. It requires a range of measures such as capacity building in the vocational training sector, training of the existing workforce, introduction of recovery and recycling and the use of it instead of release of refrigerant. Good practice would include the use of proper leak detection methods and corrective measures before recharging.

Awareness: The information given to car owners in connection with renewals of their registrations will include information on the importance of proper maintenance for long-term reliability as well as the obligation of the service technicians to recover refrigerant and repair leaks before recharging refrigerants.

To increase the technical capacity of the technical inspection team to service shops, it is proposed that a manual describing procedures for determining the type of refrigerant in MAC systems to be developed. It is proposed that five training sessions be organized: in the Jakarta Area and other major cities of the country as part of awareness creating workshops. At the conclusion of the training, each regional focal point will be given a refrigerant identifier which can identify CFC-12, HFC-134a and hydrocarbons. The focal points will include random spot checks at workshops in their periodical reporting to the MAC coordination team. NOU Office will monitor the frequency of inadequate practice by service workshops and decided on future actions as needed.

It is expected that the cost of development and production of the manual for inspecting MAC systems will be US $10,000. An additional amount of US $15,000 is required for organizing 10 regional training sessions for technicians of the MAC regional focal points. For refrigerant identifiers, a budget of US $40,000 (approx. $2,000 per unit) is required will be provided to equip regional MAC regional focal point. A total of 20 are needed for the purpose.

All new vehicles produced after 1996 will have a sticker identifying the HFC-134a as type of refrigerant in the MAC system. It would be useful if the service shops servicing HFC-134a MAC system have the ability to verify the refrigerant used. During the implementation of the first annual program, it will be evaluated to which extent and how servicing of HFC-134a MAC could be covered under the program in order to prevent the use of CFC instead of HFC.

The ozone unit will address the issue through voluntary agreements with the MAC system and component suppliers supported by awareness creating activities. The workshop maintaining and servicing cars will play a major role in implement such a voluntary agreement. The more

workshops directly engaged in the program, the higher likelihood for implementing a voluntary agreement.

C.1. Control of supply of CFC-12

The present import/export control system will be strengthened through the study undertaken by the NOU. As its strengthening import control system is developing, the annual import quotas to be monitored will reflect the estimated actual annual demand for CFC-12 in the market. As so, the quotas will not reflect possible consumption by cars using CFC-12 instead of HFC-134a. If there is significant demand in that area, it would either result in higher market prices of CFC-12 or illegal import. The Ozone Unit will need continued capacity monitor CFC use in the market and ability to address issues as they may come up. The Ozone Unit will draw on the new UNEP MP Compliance Program.

C.2. Regulation on Installation of New CFC MAC system in new vehicles

While the manufacturers all have converted to HFC-134a MAC system in new cars and no new CFC are installed in cars, there would still be a significant CFC-12 MAC system and component in the MAC after market in Indonesia. In addition, CFC-12 systems are still installed in some new buses due to buyer requirements. It might be useful to include the type of MAC in the standard specifications of cars and part of the car inspection scheme.

As it would be unrealistic to assume it possible to control the after market through regulation, the Ozone Unit will address the issue through voluntary agreements with the MAC system and component suppliers supported by awareness creating activities. The workshop maintaining and servicing cars will play a major role in implement such a voluntary agreement. The more workshops directly engaged in the program, the higher the likelihood for implementing a voluntary agreement. The number of workshops engage directly in the program is therefore one of the design parameters for the MAC recycling program.

Table 5

Policy actions program	**US $**
Development of a standard inspection manual	10,000
Development and printing of pamphlet explaining new on MAC systems awareness	30,000
Training of regional MAC focal points	15,000
Refrigerant identifiers for 20 MAC focal points	40,000
Sub-total	95,000
Contingency 10%	9,500
Total	**104,500**

Funding for the increase management capacity required is addressed under the TA part.

C.3. Voluntary Certification of MAC Service Shops and Technicians

C.3.a MAC Service Shops and Technicians

According to the surveys performed for the preparation of this project, there are at least 2,000 MAC service shops throughout the country. The three MAC component suppliers each have their own network of workshops and maintenance shops. Larger taxi companies and bus companies also have their own maintenance shops. Car manufacturer also have there own network of service shops. In addition, there are a significant number of independent workshops who maintain, repair and install MAC systems. The target for the voluntary system would be to cover service workshops which cover at least 70% of the CFC-12 service demand. This can be achieved if at least 1,000 of the larger workshops participate in the certification program. To reach such a number, it would be necessary to conduct a public outreach program including distribution of information through the refrigerant supply chain and local governments, and, articles in newsletters and trade magazines. The objectives of the public outreach program are as follows:

- To inform service shops of the national phase out schedule for CFCs;
- To inform service shops of the implementation of the voluntary certification program and the need and benefits of using recycling equipment when servicing MAC system;
- To inform service shops of possibility to obtain basic equipment required for proper maintenance of CFC and HFC MAC systems.
- To inform service shops on how and where to obtain the training; and,
- To inform service shops of the future import quotas of CFC-12;

Service shops will need to have certified staff in order to be working with MAC systems. While it seems impossible to establish a formal accreditation system, a certification system combined with awareness creating activities might direct the customers towards certified workshops. To become certified, a technician needs to pass an examination at an accredited training centre. The objectives of the training program will be to educate service technicians on how to properly handle CFC-12 and how to properly repair non-ODS equipment. The training course should also provide service technicians with the knowledge to retrofit CFC systems to non-CFC alternatives. Service technicians will be trained not to top up refrigerants without detecting and fixing leaks, as well as on the need for proper labelling of all repaired units. They will also be informed of the potential commercial viability of the use of recovery and recycling machines. The duration of training can be adapted to the prior knowledge of the technician. The specified competencies will be verified through a test before the technicians get the certificate proving their competencies. The competencies specified as a minimum level to get refrigeration service accreditation will also be integrated in the regular courses that are continuously operated.

In addition, it will be required of each certified service shop, that it has access to certain specified equipment. Assistance in a form of a financial subsidy for the procurement of basic equipment will be given to the service shops where at least one of their technicians has already received training from one of the authorized training centres.

Creation of a well-developed structure for certification of vocational training to different levels as well as existing programs for shorter and longer courses in refrigeration and air-conditioning has to be done. To evaluate and adjust or expand the existing curriculum to accommodate both short-term needs to educate the existing work force as well as long-term requirements for new staff, a working group.

There are currently product standards that are compulsory for many products but the specific legal requirement of labelling products with CFC should be clarified and the requirement with specifics on the label should be included in the code of good practice clarifying that service shops should attach a label to each of the MAC systems they repair. The label should contain information pertaining to refrigerant type and names of service technicians and service shops.

It is proposed that the train-the-trainer program described below begin in mid-2003, and training for service technicians begin at the beginning of 2004. The cost for training 2,000 technicians is calculated to be US $93,500 and will be covered by the collected rental fee of service shops. Service shops associated with major auto manufacturers will be urged by MOE to have their technicians trained and to start employing the code of good practice in their service work by mid-2004.

The certified service enterprises will raise public awareness through promotion of their certification. Along with public awareness, there will be further benefits and incentives for the enterprises to join the system. Thus, promotional material should be made available to them.

C.3.b. National MAC Recycling Program

The use of appropriate equipment in the servicing sector will be essential to achieve the necessary reductions in CFC emissions. The size of the MAC sector makes this sector particularly important to reach compliance with phase-out target dates. As the CFC consumption in the MAC servicing sector is approximately 915 ODP MT, (2001) the phase-out of CFC consumption in this sector will have a direct impact on the Indonesia's ability to meet its 50% reduction targets in 2005 and 100% reduction in 2007.

Access to the necessary equipment will be a requirement. It is important that financial assistance be provided to enable service shops to purchase the necessary equipment. Indonesia is requesting MLF funding for implementing the MAC recycling program in order to be able to achieve phase out as required under the MP. The additional hidden costs of accelerated phase out will be covered by Indonesia.

To fulfill the project objectives as outlined above of having a permanent reduction of emissions, a cost effective scheme for maximizing recycling of it at the service station level needs to be developed based on the experiences gained through the MAC recycling pilot project where economic incentive at the service station level was workable. The service of recovering and recycling is charged to the mobile air condition user in addition to the cost of any fresh CFC uses. This represents a saving or reduction in the use of new CFC-12. The service station would have to pay a fixed rental for the recycling machine plus the cost of electricity and labour to operate them. It is estimated a rental fee of $ 100/year for 2 years would be charged for service shops cater for passenger cars and $ 150/year for 2 years would be charged for service shops, bus station that require larger capacity of recovery equipment. It is expected that by having economic incentive of $100/month is more than enough to compensate each shop to pay $ 100/year rental fee. Rental fee would also become a strong drive for service shops to maximize the use of recycle equipment. In addition, profit generated from the difference between these costs and the revenue generated can be appreciable for the service outlets particularly with the rising cost of CFC-12 in the future.

To successfully implement the national MAC recycling program, continued implementation by previous proponent is necessary as they have substantial experience in coordinating, monitoring and controlling the distribution and usage of the MAC recycling equipment.

While the number of service centers involved in the first phase, the national MAC servicing program is aiming of covering 70% of the CFC-12 usage for servicing. Hence the number of workshop to be included is estimated to be at least 1,000 CFC recycling units. In accordance with the Decision of the Parties, it is required that due consideration is given to the usage and emission of global warming gases like HFC's. It would be evaluated if it possible to achieve the objectives of the program and cover HFC without requesting additional MLF funding.

The completed phase I MAC project purchased of 55 recycling machines with distribution of the 54 of this machines by them to suitable 54 mobile air conditionings service stations. They covered selected workshops in 5 cities in Java (Jakarta, Bandung , Surabaya , Semarang and Yogyakarta). Record of operation of recycle machines, which was received on monthly basis from the service shops. The reporting required forms to be developed and distributed and significant follow up work was required by the MAC recycling team in order to ensure proper reporting by the workshops. The approach has been very effective and has allowed analyzing operational costs, number of cars services, the CFC-12 recovered and recycled, economic savings as assessment to the viability of the project. (See attachment 2 - Monitoring Report).

This national MAC recycling program is aimed to achieve a significant reduction of CFC-12 emission and support the complete phase-out of the use of CFC-12 in the MAC sector. In order to cover at least 70% of the national CFC consumption in the MAC sector, participations of at least 1,000 workshops is required and at least 1,000 recycling units will have to be provided throughout the major urban areas all over Indonesia.

This selection of the service shops to receive machines under this program will be based on an initial national awareness creating activity through which service workshops can register their interest in participating. The condition for participating will be part of the information provided to service workshops. The starting point will be listed service outlets provided by three MAC component and system companies, car dealers, taxi companies and bus companies. There are 2,000 potential MAC service shops, 1300 directly affiliated with the three MAC companies, 700 service independent service shops, 157 bus companies listed by the project located all over provinces in Indonesia of which over 20 bus companies do its own MAC service maintenance and 30 taxi companies of 60 in Indonesia who have their own maintenance workshops . With estimated 1,000 service shops for funding of which 950 service shops for cars including taxi service companies and 50 for bus companies, initial work has been started and 118 service shops has been surveyed / interviewed. One design parameter to be used would be number of cars served in average per day. Service shops are categorized by a) Small service shops (1-4 vehicles per day), b) medium service shops (5-8 vehicles per day) and c) big service shops (above 9 vehicles per day) shall be applied as design criteria. In the fist year, only larger workshops will receive equipment, while smaller and medium workshops will receive recycling equipment in the follow years as the program expand. The lease income will be used to support the program. If service shops do not operate correctly as given by the contract, removal of recycling unit would be an option and it could then be given to other service shops wanting to participate.

C.3.c Recovery of CFC from retired MAC System

For Indonesia to meet the 2007 phase-out target, improving practice in the service of systems will not be enough. It will also be necessary to ensure that the existing stock of CFC is reused. Based on the table below, the total amount "retired each year would be around 110 MT/year. Taking into account the logistic and the incentives for recovery, it should not be assumed that more than 50% could be recovered. Any recovered CFC from retired equipment would need to be reclaimed to meet specifications given by the car suppliers. A legal requirement for mandatory recovery, training of service technicians in how to perform this operation and common access to reclamation facilities will help in this process. In addition, support will be given under the NOU to encourage the use of recovery and recycling machines in the MAC sector.

The calculations are based on the cost for procurement of 20 recovery and recycling machines for the removal/recovering from system when not used any more an additional MT CFC from the MAC sector. See table below of CFC phase out due to retirement of cars and MAC systems.

The estimated impact is calculated year by year, assuming a fully effective program. As seen from the table below, the annual impact differ from year to year depending on the overall consumption and number of servicing workshop operating in accordance with standards. The program will have to continue on an ongoing basis. It is not limited to the procurement and distribution of recycling machines. Lease income based on an annul lease contract of US$ 100/unit for service shops and $150 for bus companies will provide US$ 102,500 on an annual basis. Assuming only 80% will pay their dues, an annual income of US$ 82,000 is used for cost calculation purpose.

The annual support and monitoring will have to be financed through a combination of MLF funds up to 2007. The issues would be continued maintenance of machines as they grow older and the change of the decreasing population of CFC based MAC system and increase population of HFC MAC system. The expected percentage of CFC MAC out of the overall MAC population will change from 50% in 2003 to [25%] in 2007.

Calculation based on a 5 car per day workshop. Now and in 2007 with fewer CFC cars.

Table 6 - Annual saving achieved in MAC sector plan

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of MAC R&R In operation	50	50	350	700	1000	1000	1000	1000	1000	1000
Sector Phase-out Plan	915	805	695	585	476	366	280	0	0	0
Consumption with no additional MAC R&R	915	805	695	585	476	366	280	183	97	76
Consumption with A Sector R&R Program	915	805	695	520	369	241	185	121	65	51
Annual saving achieved Through the recycling Program	0	0	0	65	107	125	95	62	32	25
Possible 50% recovery From retired MAC system	0	0	0	33	33	33	29	31	29	7

Implementation of a national recycling program and day-to day operation will require significant support and monitoring system. The following approach is proposed as modality for implementing and monitoring the MAC program.

Table 7 – Investment Cost

Cost items	Number of units	Unit costs	Total incr. Costs
Recycling equipment Tank capacity 5.44 Kg., including spare parts, filters & oil	950	$ 3,650	$ 3,467,500
Recycling equipment Tank capacity 12.3 Kg. including spare parts, filters & oil	50	$ 3,750	$ 187,500
Delivery & insurance during transport 2.5%			91,375
Sub-total			$3,746,375
Contingency 10%			374,638
Training centers costs	5	10,000	50,000
Annual Training / workshops (3 years)	40	2,250	90,000
Monitoring and technical support			25,000
NOU consultant costs			35,000
Sub-total			200,000
Contingency 10%			20,000
Less rental fee for recovery equipment: - Service shops for cars : 80% 0f 950 x $100 x 2 - Service shops for bus & bus companies: 80% of 50 x $150 x 2 years			(152,000) (12,000)
Total			4,177,013

D. TECHNICAL ASSISTANCE PROGRAM

Training programs shall be developed and organized for service technicians that are expected to help minimize the current practice of topping up refrigerant without fixing leaks, education for proper service methods. Technicians who have attended training and passed technical tests shall receive certification. Notice of failure to implement good practice during service by PMU could result delisting as certified service shops.

A train-the-trainer program for the MAC sector will be jointly developed by international and local trade experts in close cooperation with the trade representatives appointed by the NOU. The existing training requirements and materials used for MAC training, if available, will be upgraded.

Once training regulations are available, NOU will invite potential training centres and technical institutes, including the regional and provincial training centres, to apply for accreditation for the respective courses as is the established practice in Indonesia.

Proposals submitted by training centres will provide information related to their staff (those in charge of the training courses), descriptions of their existing facilities, and proposed duration for their service technician training courses. The intention is to have special training for skilled workers that only need specified new competencies. This could, with the existing system and with twelve technicians per session, require 2-5 days depending on the technicians' backgrounds. Based on this information, MOE will accredit training centres across the country in this project component.

The local experts will carry out five-day workshops to train trainers – a minimum of two from each of the accredited training centres. Training will include hands-on sessions. At the end of training, participants will be required to take an examination. Those who pass the examination will receive certificates from PMU. Those who fail will be required to take make-up classes before

certificates are given to them. The training centres will not receive basic equipment free of charge until all of their trainers have received certificates from PMU.

After completion of each training course and exams, the accredited training centres will be obliged to provide a list of all technicians who have passed their exams along with names and addresses of service shops that they are working with. A database containing names of certified technicians will be developed and maintained by NOU.

It is proposed that two sets of basic equipment for training, such as pressure gauges, vacuum pumps, refrigerant charging cylinder, leak detectors, and recovery and recycling machines, be given to each of the participating training centres.

Table 8 - Train-the-Trainer Program in the MAC Servicing Sector

Description	US$
Development and Production of Training Materials	15,000
Technical assistance to facility this process	5,000
Training of trainers (2-5 days courses, 15 persons of each course) of by local expert	20,000
Basic Equipment for on hands training at Regional Training Centres, Automotive Industry (2 sets each)*	45,000
Sub-total	85,000
Contingecy 10%	8,500
	93,500

*Based on a standard cost of $4,500.

The preparation of the training curriculum as well as the identification of the additional needs for training manuals are to be developed. Competencies that will be required for the certification are being established in the work group with participants from trade and the relevant authorities. The training capacities will be gradually increased during the first 6-12 months of the project depending on the current situation of each training centre.

E. IMPLEMENTATION MODALITY

Taking into account a comprehensive review of policy framework to strengthen and develop; enhancement of the compliance monitoring capacity; training and workshops of a large number of service shops; creating public and service shops awareness, overseeing the project implementation of 1000 service shops, selection and hiring consultants, the project will require establishment of one integrated Project Management Unit (PMU) that will be headed by the National Ozone Unit (NOU) to manage implementation of all the sector plans. PMU will require 2 dedicated individuals to do monitoring of the implementation. The assigned persons shall be responsible to monitor the overall implementation of the MAC sector plan, review progress report, and evaluate the overall performance assigned contractor on annual basis.

PMU shall be submitting quarterly progress report on the implementation of the sector plan to the Implementing Agency in the required report format that in subsequent will provide reporting to the Executive Committee for evaluation and audit.

Financial administration mechanism including disbursement modality of the project shall continue to apply the existing procedures by retaining the existing Financial Administration agent.

It is foreseen that the PMU will contract activities such as public awareness programs to more specialized agencies, selections training centers for train the trainers program, implementation of training programs and hiring local experts for monitoring and technical supports for trainings shall be done through subcontracting to specialized institutions in the field. Discussion and decision on regulatory and supports for the program shall be dealt by the NOU to related ministries to assure the program is framed with more concrete legal frameworks. The NOU also foresees to contract to carry out survey and monitoring of recipients, equipments' procurement and distributions to Dasa Windu Agung (DWA), the previous proponent of MAC pilot project.

5.1. Project Management

With supervision from the NOU, staff dedicated in the PMU for MAC sector plan shall undertake the following activities:

a. Project Implementation:

- prepares standard implementation procedures for eligible enterprises that would like to seek project funding;
- reviews and approves proposals & data gathering submitted by eligible enterprises from DWA;
- coordinates the establishment of the networks of authorized training centers for MAC servicing sector;
- employs technical experts for training and supervision;
- develops awareness strategy to enable end users understand about the on-going program;
- develop and maintain, in cooperation with selected training center, a database and MAC certified technicians including names and addresses of service shops that have their technicians trained;
- Assist PMU's vocal points, if required, to enable identifying various refrigerant types in the MAC system;
- Prepare an annual progress report of MAC sector plan implementation in accordance with ExCom procedures and requirements pertaining to this task.

b. Public Awareness

- Disseminate information related to the Government Policy to completely ban on new MAC installations with CFC-12;
- Organize workshops to achieve a voluntary agreements with the MAC system and component suppliers on the need for discontinued usage of CFC in new installation;
- Issue certification to MAC service shops that have passed technical examination of technicians
- Raise public awareness of the environmental and economic impact of ozone layer depletion via newspapers, new articles, seminars, electronic media etc.
- Organize a promotional program to encourage the public to have its MAC systems repaired by certified technicians, and;

Undertake public outreach programs for MAC servicing sectors as described in the previous sections.

With supervision from the NOU, DWA shall undertake the following activities:

- Surveys of potential service shops for inclusion to the program;
- Monitoring of service shops during implementation;
- Facilitates procurement of investment items including recycle equipments to MAC service shops;
- Timely distribution of investment items to eligible service shops.
- Supervision on the use of recycle equipment;
- Provide spare parts for proper maintenance of equipment;
- trouble shooting/repair for design/system defects, whenever necessary of recycle equipment;
- provides quarterly progress report to NOU on the implementation in the recipients' level;

Table 9 Project Management (Implementation and Monitoring) 2003 – 2007

Description	US$
Regulatory & supports	65,000
Public awareness	100,000
Project management (NOU)	150,000
Project implementation (subcontracted)	250,000
Sub-total	565,000
Contingecy 10%	56,500
Total:	621,500

F. PROJECT COST

The project costs is given in the tables below and in annex 1, 2 and 3.

Table-11 CASH FLOW FOR INVESTMENT & NON INVESTMENT COMPONENTS MAC SECTOR PLAN

ACTIVITIES DESCRIPTION	Cash Out Budget	YEAR / QUARTER																			
		2003				2004				2005				2006				2007			
	(US$)	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Train The trainer Program :																					
- Set-up Train The Trainer Program	5,500	5,500																			
- Implementation of program	88,000			88,000																	
Policy Actions	104,500			44,000				60,500													
Regulatory and Supports	71,500			40,000				31,500													
Project implementation	275,000		63,000				71,500				71,500				34,500				34,500		
Public awareness	110,000		40,000			40,000				30,000											
Financial for purchasing equipment	4,121,013							1,236,304				1,442,355				1,442,355					
Project Implementation & management	165,000			33,000				33,000				33,000				33,000			33,000		
Certification of MAC service shops	0								0				0								0
Rental fee	(164,000)							(50,000)				(58,000)				(56,000)					
Training, Monitoring & consultant cost	220,000		50,000				50,000				50,000				50,000				20,000		
Quarterly Net Cash Out Flow	**4,996,513**	5,500	153,000	205,000	0	40,000	121,500	1,311,304	0	30,000	121,500	1,417,355	0	0	84,500	1,419,355					0
Annual Net Cash Out Flow	**4,996,513**	**363,500**				**1,472,804**				**1,568,855**				**1,503,855**				**87,500**			

G. MILESTONED FOR THE SECTOR PLAN

The following milestones for the implementation of the project is given in the table below. It should be noted that the work would have to continue after January 2008 and until the global production of new CFC stops by December 2009 in order to ensure sustainability of the national MAC program.

MAC SECTOR PLAN MILESTONES

Milestone	(ODP MT)	Performance Target	Amount
1st Tranche (Nov. 2002)	915	MAC sector Plan approved by ExCom	
2nd Tranche (2003)		- Dedicated individuals in PMU & consultants have been contracted. - Standard for implementation procedures established. - Train the trainer program finalized. - Set up Policy action programs. - Regulatory & supports set up.	363,500
2nd Tranche (2004)		- Policy action programs implemented. - Regulatory & supports completed. - Entering into force of certification for 300 service shops announced. - Trainings & workshops implemented. - Procurement and distribution of 300 recycle equipments - All conversion set out in compliance schedules and scheduled completion for 2004 - Distribution of 300 recycle equipments	1,472,804
3rd Tranche (2005)		- Entering into force of certification for 350 service shops - Equipment testing and trial underway - MAC inspection requirement - Distribution of 350 recycle equipment	1,568,855
4th Tranche (2006)		- Entering into force of certification for 350 service shops. - Equipment testing and trial underway - MAC inspection requirement - Distribution of 350 recycle equipment	1,503,855
5th Tranche (2007)		- Equipment testing and trial underway - MAC inspection requirement	87,500
6th Tranche (2008)			
7th Tranche (2009)			
8th Tranche (2010)			

ANNEX 1

INCREMENTAL CAPITAL COSTS

Item	Unit Cost	Quantity	Requested Cost
Equipment costs			
Recycling equipment Tank capacity 5.44 Kg., including spareparts, filters & oil	950	$ 3,650	$ 3,467,500
Recycling equipment Tank capacity 12.3 Kg. including spareparts, filters & oil	50	$ 3,750	$ 187,500
Delivery & insurance during transport 2.5%			$ 91,375
A: Sub-total			$3,746,375
Technical assistance Program Costs, National Recycling network			
Train the Trainer Program (2 persons each in 5 regional centers)	5	$10,000	$ 50,000
Annual training / workshops (3 years)	40	$2,250	$ 90,000
Monitoring and technical support			$ 25,000
NOU Consultant costs			$ 35,000
B: Sub-total			$ 200,000
Train the trainer program:			$ 85,000
C: Sub-total			$ 85,000
Policies and overall project implementation management			
Policy action program			$ 95,000
Regulatory & supports			$ 65,000
Public awareness			$100,000
Project management (NOU)			$150,000
Project implementation (sub-contracted)			$250,000
D: Sub-total			$660,000
Total project capital costs (A+B+C+D)			**4,691,375**
Contingency (10%)			**469,138**
Total incremental capital costs			**5,160,513**

ANNEX 2
Incremental operating costs
Not requested

IOC cost components	Without recycling equipment(USD/kg)	With recycling equipment (USD/kg)
Maintenance cost 3% of US$ 3,000	0	US$ 90
Filters and dryers	0	US$ 20
Energy costs 4 cars/day * 0.5h*US$ 0.1/kWh	0	US$ 40
CFC-12 consumption 800*0.6/0.3*2	US$ 960	US$ 480
Extra manpower US$0.5/hr *800cars *0.5/hour	0	US$ 200
Total	US$ 960	US$ 890
Average saving/costs per recycling machine		**US$ 10/year**
Total costs per year, 1,000 units:		US$10,000/year

ANNEX 3

COST EFFECTIVENESS

Base line consumption - ODP Impact of the project				
ODS Substances and substitutes	Actual year	ODP	Consumption (kg)	ODP (kg)
Total ODP before conversion				
CFC-12	2001	1.0	915	915
Total ODP:				915
Total ODP after conversion				
HCFC, HFC, Hydrocarbon, etc			NA	
Total ODP:				915
ODP Impact of project (taking into account HCFC)			NA	
Remaining ODP consumption:				0

Calculation of Cost Effectiveness			
Project costs			**Requested**
A. Incremental Capital Costs			**4,691,375**
B. Contingency			**469,138**
C. Incremental Operating Costs, 2 years (not requested)			-
D. Total Incremental Project Costs (A + B + C)			**5,160,513**
Adjustments			
	%		0
E. Adjustment for export to non Article 5 countries	%		0
F. Adjustment for technical upgrade			0
G. Total adjustment (E+F)			0
H Total incremental costs (D-G)			5,160,513
I. Adjustment for Non-Article 5 ownership (% non Art. 5 ownership)			0
J. Eligible costs funding (H-I)			5,160,513
K. **Requested MLF** (Adjusted for lease income)			**4,996,513**
L: ODP impact of the project			915
Cost Effectiveness			
L. Actual costs effectiveness of the project (I/J)		US$/kg/y	NA
M. Threshold for Sector		US$/kg/y	NA

OORG TECHNICAL REVIEW

COUNTRY OF ORIGIN: Indonesia

IMPLEMENTING AGENCY: The World Bank

PROJECT TITLE: National ODS Phase-out Plan

PROJECT DATE: September 2002

SECTOR / SUB-SECTOR: Mobile Air Conditioning Servicing Sector

PROGRAM SUMMARY: This is a continuation of a completed MAC refrigerant recycling pilot project to assist Indonesia in completely phasing out its CFC consumption in accord with the Montreal Protocol. The request is for support funding for refrigerant recovery/recycling/reuse (3R) equipment, training to facilitate the use of the equipment, public awareness and program monitoring.

PROGRAM GOALS: **Preventing unnecessary refrigerant venting via the use of 3R equipment and providing technician training are appropriate and compatible with the OORG MACS Guidelines.**

PROJECT COSTS: **Requested funding is reasonable for this level of support.**

REFRIGERANT RECOVERY & RECYCLING: 1000 3R machines will be purchased with MLF funds. A train-the-trainer program will facilitate widespread technician training in the country.

Analysis of benefit:

Per the Indonesian MAC shop survey (4.b), 2-4 out of 7 cars come in with no recoverable refrigerant, which means only about 43% have refrigerant that can be recovered with 3R. This is nearly the same as a similar study of 595 vehicles in year 2000 in the US (Mobile Air Conditioning Society) showed that some 40% came in without any charge.

For estimating the amount of recoverable refrigerant, this same U.S. MACS survey showed that the overall net recovery effectiveness, accounting for all vehicles serviced – with and without recoverable charge - was 33%. I recommend using this as the weighted average recoverable for the industry.

Assuming 70% of vehicles are covered by 3R equipment, the net effectiveness of the Indonesian program would be 70% of 33%, or 23%. This would yield an average of 1.0 kg x 23% = 0.23 kg/vehicle serviced (including those with and without recoverable charge). Based on a cost of $3.30/kg, the *weighted average* job would return about $0.76 in reusable refrigerant. This is still likely enough return to offset costs and return a profit to the shop owner as an incentive.

Given that the overall effectiveness of the Indonesian 3R program would be ~23%, and considering the fact that 3R machines would be purchased and installed over a 3 year period, the annual savings achieved in the MAC sector plan shown in Table 6 appear to be overstated by about a factor of 2. See attached chart.

In 2008, there will still be about 160,000 vehicles operating that will need some kind of refrigerant. Recycling can reduce the overall need for new refrigerant, but cannot provide enough to keep the fleet going without NEW refrigerant, especially since the recovery rate will be only about 23%. Within a year or two, all vehicles will have insufficient refrigerant to operate. Accordingly, the remaining vehicles in 2008 will have to either be retrofitted to another refrigerant (R-134a), continue to use CFC-12 (illegal by then?), or simply go without A/C. This situation is not unique to Indonesia as all nations seeking to end the use of CFC-12 will have vehicles whose owners will have to make such choices when and if CFC-12 is no longer available. The issue of retrofitting should be discussed and addressed, especially if CFC-12 is to be banned after a certain date.

IMPLEMENTATION TIMEFRAME: Timeframe appears workable, although the short time between full implementation and the end of legal CFC use will limit the ODS savings.

RECOMMENDATION: This program falls within the OORG MACS guidelines and my recommendation is to proceed with the request for funding with the following caveat: consider the above analyses and modify the predictions of environmental and cost benefit derived from this level of support to assure the validity and viability of the economics of the program. In addition, some thought should be given to preparing the country for the eventual need to retrofit CFC-12 vehicles to HFC-134a.

In addition, the legal structure should be such that it does not push vehicle owners away from shops that recycle (due to perceived higher cost) and over to shops that only provide lower cost "top-off" service. This is important since only about ½ of the service shops in Indonesia will have 3R equipment. The other half would only legally be able to provide top-off service or illegal service (due to venting refrigerant).

OORG REVIEWER: James A. Baker **DATE OF REVIEW:** September 25, 2002

Estimated Consumption With and With Out 3R
[Revised for 33% Average MAC System Recovery Effectiveness And a Total of 23% ODS Reuse Based on 70% 3R Coverage]

	2004-2005 Q4 - Q4	2005-2006 Q4 - Q4	2006-2007 Q4 - Q4	2008	2009	2010
Consumption without 3R	476	366	280	183	97	76
# 3R in use	300	650	1000	1000	1000	1000
% 3R in use	30	65	100	100	100	100
% 3R Coverage Max=70%	21	46	70	70	70	70
% of charge recoverable From U.S.MACS Study	33	33	33	33	33	33
Net % total recoverable	7	15	23			
Total Recoverable Service + Scrap	586	476	366			
Net MT Reused	**41** 586 (7%)	**71** 476 (15%)	**84** 366 (23%)			
Consumption with 3R With 3R at Service & Scrap	**435**	**295**	**196**			

MULTILATERAL FUND FOR THE IMPLEMENTATION OF THE MONTREAL PROTOCOL ON SUBSTANCES THAT DEPLETE THE OZONE LAYER

PROJECT COVER SHEET

COUNTRY	INDONESIA		**IMPLEMENTING AGENCY**	UNDP
PROJECT TITLE	Phase-out Management Plan for CFCs in the Refrigeration (Servicing) Sector in Indonesia			
PROJECT IN CURRENT BUSINESS PLAN			Yes	
SECTOR			Refrigeration (Servicing)	
SUBSECTOR			All sub-sectors (except MAC & Chillers)	
ODS USE IN SECTOR	Baseline (Average of 1995-97)		2,818	MT ODP (Refrigeration Sector)
	Current (2000)		2,252	MT ODP (Excl. MAC/Chillers)
	Covered by Refrig. (Mfg) Sector Plan		1,180	MT ODP (in Refrig. Mfg)
	Net covered by this Plan		1,072	MT ODP
PROJECT IMPACT			1,072	MT ODP
PROJECT DURATION			5 years	
PROJECT COSTS	Incremental Capital Costs	US$	7,314,500	
	Contingencies (10%)	US$	599,650	
	Incremental Operating Costs	US$	0	
	Total Project Costs	US$	7,914,150	
LOCAL OWNERSHIP			100%	
EXPORT COMPONENT			0%	
REQUESTED GRANT		US$	**7,914,150**	
COST EFFECTIVENESS		US$/kg/y	7.38	
IMPLEMENTING AGENCY SUPPORT COSTS		US$	TBD	
TOTAL COST OF PROJECT TO MULTILATERAL FUND		US$	TBD	
STATUS OF COUNTERPART FUNDING			N/A	
PROJECT MONITORING MILESTONES			Included	
NATIONAL COORDINATING BODY			Ministry of Environment	

PROJECT SUMMARY

This project will facilitate elimination of all the remaining eligible CFC consumption in the Refrigeration (Servicing) Sector in Indonesia, except in the MAC and Chiller sub-sectors, upon completion. The Phase-out Management Plan will be implemented through five annual implementation programmes and together with the implementation of the approved ongoing projects in the Refrigeration Sector, is expected to result in the complete phase-out of CFCs in the Refrigeration Sector in Indonesia in five years. The Phase-out Management Plan will address the conversion requirements in the Refrigeration (Servicing) Sector for ensuring a timely, sustainable and cost-effective phase-out, through a combination of investment, technical support and policy/management support components. The plans for phase-out of CFCs in the MAC and Chillers Sectors are being submitted separately by the World Bank. The total eligible incremental costs and the requested grant for the Phase-out Management Plan for the Refrigeration (Servicing) Sector excluding the MAC and Chiller sub-sectors are US$ 7,914,150.

IMPACT OF THE PROJECT ON THE COUNTRY'S MONTREAL PROTOCOL OBLIGATIONS

The approval of this project will help Indonesia in meeting its Montreal Protocol obligations, such as the phased reductions in ODS consumption as per the agreed schedules.

PREPARED BY UNDP (in consultation with LH and World Bank) **DATE** 27 August 2002

PROJECT OF THE GOVERNMENT OF INDONESIA
Phase-out Management Plan for CFCs in the Refrigeration (Servicing) Sector in Indonesia

1. PROJECT OBJECTIVES

The objectives of this project are:

a) Together with the Refrigeration (Manufacturing) Sector Phase-out Plan approved at the 37th ExCom Meeting, to achieve complete phase-out of CFCs in the Refrigeration Sector in Indonesia within five years by implementing the phase-out management plan for CFCs in the Refrigeration (Servicing) Sector.
b) To enable Indonesia to meet its obligations of phased ODS reductions in accordance with the control schedule of the Montreal Protocol.
c) To ensure timely, sustainable and cost-effective CFC phase-out in the Refrigeration (Servicing) Sector, through development and implementation of a combination of investment, technical support and policy/management support components.

2. BACKGROUND

2.1 Introduction

Indonesia is the world's largest archipelago, comprising about 16,000 islands and located between the Indian and Pacific oceans. The total area is about 1.9 million sq. km. with a land area of about 1,8 million sq. km and a coastline of about 54,000 km. With about 23 million, it has the fifth largest population in the world. The country is administratively organized into 32 provinces, 2 special regions and one special capital district. The 357 subdivisions of the provinces, called regencies, have become key administrative units following the implementation of the decentralization legislation from January 2001.

The key economic sectors in Indonesia are petroleum and natural gas, mining, textiles and footwear, cement, chemicals and fertilizers, plywood, rubber and tourism. Manufacturing and services contribute about 55% of the size of the economy. The main concentration of population and industrial/commercial centers is in Java (Greater Jakarta, Surabaya, Semarang, etc), Sumatera (Medan, Padang, etc) and to a lesser extent in Sulawesi, Kalimantan and Irian Jaya regions.

2.2 Montreal Protocol Activities

Indonesia ratified the Vienna Convention and the Montreal Protocol in June 1992. The per capita consumption of ODS in Indonesia being less than 0.3 kg, Indonesia is classified under Article-5 of the Montreal Protocol. In 1994, Indonesia prepared a Country Programme incorporating the national strategy and action plan 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. With the assistance of the Multilateral Fund, several investment and non-investment activities were implemented by Indonesia, from 1993 to 2000. Complete ODS phase-out was initially targeted ambitiously for 1998.

The Government initiated preparation of the Country Programme Update in 1998 with the assistance of the World Bank, UNDP and the industry, under which, the ODS consuming sectors were resurveyed. The updated country programme renewed and reinforced Indonesia's commitment, strategy and action plans to eliminate ODS and is intended to serve as a guideline for future activities related to meeting Indonesia's obligations under the Montreal Protocol. Realizing the needs of the industry and the economy, the updated Country Programme revised the target date for complete ODS phase-out to the end of 2007.

2.3 Institutional Framework

The activities related to ozone layer protection and implementation of the Montreal Protocol, are coordinated through the Ozone Unit, within the Climate Change and Atmosphere Department of the Ministry of Environment.

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

a) Establishing a licensing system for import of ODS from 1998.
b) Ban on imports of goods containing ODS from 1998.
c) Monitoring the use and import of ODS to minimize illegal trade and capacity-building of customs officials in line with ASEAN agreements
d) Active monitoring of the progress of implementation of projects funded by MLF
e) Formulating guidelines and regulations as necessary for policy implementation
f) Supporting public awareness initiatives and campaigns for promoting ozone layer protection at the consumer level.
g) Regular interaction with other ministries and departments, industry representatives and implementing agencies for information dissemination related to impact of policy measures
h) Promoting research and use of ozone-friendly technologies
i) Providing incentives and rewards for development and use of ozone-friendly technologies

3. SECTOR BACKGROUND

3.1. Industry Structure

The Refrigeration Sector in Indonesia has experienced significant growth in the past decade due to the consistent growth in the per capita incomes, the predominance of the tourism and service industry and the relatively low market penetration of refrigeration appliances and equipment in the past. CFCs are consumed as blowing agents (CFC-11) and refrigerants (CFC-12, R-502, etc) in the manufacture of refrigeration and air-conditioning products.

In the Refrigeration Sector, CFCs are presently consumed in Indonesia, in manufacturing of new products and for servicing of existing appliances, equipment and systems.

The range of products manufactured, imported and serviced in the sector includes household refrigerating appliances such as domestic refrigerators and freezers, commercial refrigeration equipment such as display cabinets, bottle coolers, chest freezers, hot and cold water dispensers, visi-coolers, reach-in refrigerators, walk-in coolers and freezers, supermarket systems, etc.; industrial refrigeration equipment such as process chilling/freezing systems, cold storages, hospital refrigeration systems (mortuary cabinets, blood-bank refrigerators, etc) and transport refrigeration equipment (refrigerated trucks and trailers) and commercial appliances such as mobile air conditioning units for cars, vans and buses.

3.1.1 Supply Industry

Production

There is no production of CFCs in Indonesia. The entire domestic demand is met through imports from mainly from India, China and Europe. There is also no production of refrigeration compressors and the same are imported from North America, Europe, Japan and Southeast Asia. Other refrigeration system components, such as evaporators, condensers, etc. are partly imported and partly manufactured indigenously.

Imports

The Government of Indonesia has designated certain importers for CFCs, who are licensed to import CFCs, mandated through the licensing regulation.

Distribution

The CFCs imported are sold to the users directly by the importers or indirectly through secondary distributors or retailers. Since the CFC consumption in Indonesia in the Refrigeration and Air Conditioning Sector is significantly high, CFCs are also supplied through service establishments and contractors.

Considering the geography and size of the country, the availability of upstream supplies in general is satisfactory, however the quality and level of customer service and technical support is quite limited, mainly due to inadequate infrastructure and due to insufficient availability of trained and qualified staff.

3.1.2 User Industry

Manufacturing

There are several manufacturers in the Refrigeration Sector, in the domestic, commercial, industrial and transport refrigeration sub-sectors. The manufacturers of domestic refrigeration equipment are only a few, are large and are organized. The enterprises engaged in the manufacture of commercial, industrial and transport refrigeration equipment, are predominantly small and unorganized, with modest or low investments in plants and machinery. They also lack adequately trained and knowledgeable manpower.

Servicing

There is a significant existing population of domestic, commercial, industrial and transport refrigeration appliances, equipment and systems, and also of automobile air conditioning units, requiring servicing. Also, due to rapid economic growth in the past two decades, there are a significant number of office buildings and complexes served by central air conditioning centrifugal chillers, which require servicing. As a result, there is a large and fast growing servicing sector comprising of a large number of servicing establishments.

Most of the large-sized service establishments are predominantly a part of the network of servicing centers owned or managed by the major domestic and commercial refrigeration equipment manufacturers or a part of the network of local offices of the main dealers/distributors of refrigeration raw materials, components, consumable, etc. The medium-sized servicing establishments are predominantly independent and cater to small and medium-sized end users in the respective local markets. There are in addition, a large number of small servicing shops and freelancing service technicians.

End-users

The end-users of products containing CFCs are in the domestic (household refrigerators/freezers and hot/cold water dispensers), commercial (small shops and other small commercial establishments, mini markets, departmental stores and supermarkets), industrial (process refrigeration systems, cold stores, etc) and transport refrigeration sub-sectors (refrigerated trucks and trailers) and in the mobile air conditioning (passenger cars and buses) and chiller (centrifugal chiller plants) sub-sectors.

3.2 CFC Phase-out Scenario

The overall baseline ODS consumption for all sectors in Indonesia, as reported by the Government of Indonesia is as tabulated below:

Table-1
Indonesia: Baseline ODS Consumption (1995-97)

SECTOR	1995 (MT)	1996 (MT)	1997 (MT)	Average (MT)
Aerosols	1,800	1,500	800	1,367
Foams	3,609	4,627	3,936	4,057
Refrigeration	2,780	2,786	2,889	2,818
Solvents	474	473	255	401
Tobacco	90	35	35	53
Halons	134	51	15	67
Methyl Bromide	254	182	242	226

The breakdown of CFC consumption in Indonesia as reported by them for the various CFC-consuming sectors for CY 2000 is tabulated below:

Table-2
Indonesia: CFC Consumption Data for CY 2000

Sector	Baseline Consumption (1995-97 Avg.) (ODP MT)	Consumption covered by approved projects (ODP MT)	Consumption from approved unimplemented projects (ODP MT)	Consumption for CY 2000 (ODP MT)
Aerosols	**1,367**	460	460	**700**
Foams	**4,057**	3,751	1,950	**2,282**
Refrigeration	**2,818**	819	49	**2,603**
TOTAL	**8,242**	**5,030**	**2,459**	**5,585**

The Refrigeration and Air Conditioning Sector in Indonesia accounts for about 34% of Indonesia's baseline CFC consumption, which comprises of CFCs consumed in both manufacturing and servicing of refrigeration and air conditioning equipment. The following table depicts the CFC consumption scenario within the Refrigeration and Air Conditioning Sector:

Table-3
Indonesia: CFC Consumption breakdown for the Refrigeration Sector for CY 2000

Substance	Refrigeration Manufacturing (ODP MT)	Refrigeration Servicing (ODP MT)	MAC Servicing (ODP MT)	Chillers Servicing (ODP MT)	TOTAL (ODP MT)
CFC-11	674	0	0	35	709
CFC-12	591	905	262	35	1,793
Other CFCs	10	23	0	5	38
TOTAL	**1,275**	**928**	**262**	**75**	**2,540**

The current CFC phase-out status in the Refrigeration and Air Conditioning Sector is as below:

Sector	Sub-sector	Status
Manufacturing	Domestic, commercial, industrial and transport refrigeration	All the seven existing manufacturers of domestic refrigerators effected CFC phase-out with assistance from the Multilateral Fund. There is no known further remaining unfunded manufacturing capacity in this sub-sector. There are six enterprises with ongoing individual projects (approved in December 2001). A Phase-out Management Plan covering this sector was approved in July 2002, which targets eliminating all the remaining ODS consumption in this sector by end-2007.
	Residential and commercial air conditioning	This sub-sector does not consume CFCs, but predominantly uses HCFCs and HCFC blends, mainly HCFC-22.
	MAC	The two indigenous manufacturers of MAC equipment converted to HFC-134a between 1993 and 1997. There is no further CFC consumption in this sub-sector
	Chillers	There is no manufacturing capacity for central air conditioning centrifugal chillers in Indonesia.
Servicing	Domestic, commercial, industrial and transport refrigeration	Comprises of service establishments serving the existing population of domestic and commercial refrigeration appliances and equipment. The estimated number of such establishments is about 10,000.
	Residential and commercial air conditioning	As noted above, this sub-sector does not have CFC consumption.
	MAC	One technical assistance project has been completed covering about 50 MAC repair shops eliminating 41 MT/y CFC consumption. There are an estimated 1.3 million vehicles with CFC-based air conditioning systems.
	Chillers	There is a substantial population of CFC-based central air conditioning centrifugal chillers. Due to the constraints imposed by the economic crisis in 1997, most owners of chillers have postponed their retrofitting/replacement decisions.

3.4 Survey of the Refrigeration (Servicing) Sector

With a view to address the CFC phase-out in the Refrigeration Sector through a sector-wide approach, the Government of Indonesia, through the Ozone Unit, requested UNDP to assist them in conducting surveys of the Refrigeration (Manufacturing and Servicing) sectors to enable the preparation of sector-wide Phase-out Management Plans for these sectors.

The survey of the Refrigeration (Manufacturing) Sector was carried out in early 2002, leading to the preparation of the Refrigeration (manufacturing) Sector Phase-out Management Plan, which was submitted to and approved at the 37th Executive Committee Meeting in July 2002

Considering the magnitude of the task of surveying the Refrigeration (Servicing) Sector, and with the agreement of the Government, Institut Teknologi Bandung (ITB), a reputed technical university with a strong background in the Refrigeration and Air Conditioning field and with prior experience in designing refrigerant management plans (such as for Bandung) and a local consultancy firm familiar with the Refrigeration Sector in Indonesia, were retained to carry out the survey. The survey was jointly conducted by these entities in conjunction with the Ozone Unit. The survey and identification work covered the servicing establishments, training establishments, technicians and end-users in the Refrigeration (Servicing) Sector and also upstream suppliers of raw materials, components and consumables in the refrigeration sector, as well as manufacturers of refrigeration equipment related to the servicing of domestic, commercial, industrial and transport refrigeration sub-sectors. The servicing in the MAC and Chiller sub-sectors was excluded from this survey.

3.4.1 Survey Methodology

The survey methodology comprised of the following steps:

- Interaction with upstream suppliers of refrigerants, components and accessories
- Interaction with manufacturers of refrigeration equipment
- Interaction with major servicing establishments
- Interaction with training establishments
- Interaction with selected representative samples of technicians
- Interaction with customs units/offices
- Interaction with major end users
- Interaction with statistics bureaus and other government departments

The interaction was carried out through meetings and visits. Through these interactions, lists of entities involved in servicing of refrigeration equipment, were obtained. For the purpose of obtaining baseline information on the establishments, a questionnaire developed by UNDP and the Ozone Unit was used. Based on the lists obtained, interaction with establishments in the Refrigeration (Servicing) Sector was carried out. About 25% of the major establishments surveyed were physically visited through field trips by the surveyor teams. The remaining were surveyed through either meetings or by phone and fax. The CFC consumption figures obtained through the survey were verified at the establishment-level through procurement records and were then correlated with the records of sales from distributors and traders and checked for overall consistency with the information available from the statistical bureaus (Biro Pusat Statistiks Indonesia) and other government departments, to the extent available.

The survey of the Refrigeration (Servicing) Sector covering the domestic, commercial, industrial and transport refrigeration sub-sectors, was conducted and organized so as establish the structure of the sector and CFC consumption patterns as below:

A. End use and equipment population

- Estimation/identification and classification (by size, by end-use, by location) of the existing population of CFC-based equipment in the domestic, commercial, industrial and transport refrigeration equipment, and assessment of their servicing requirements and CFC usage in servicing
- Estimation of the remaining economic life of the CFC-based equipment

B. Service Providers

- Identification of Refrigeration service stations and their classification (by size and by location) and assessment of their baseline capabilities and capacities in terms of equipment, training and manpower availability and also assessment of CFC usage in servicing
- Estimation of the existing population of refrigeration service technicians and their existing level of competences
- Identification of existing training and educational establishments providing vocational training and education for refrigeration technicians and their existing level of competence and capacity.

C. General

- Assessment of the prevailing average prices of CFCs and substitutes
- Assessment of the current levels of recovery and recycling and other practices in servicing
- Assessment of capabilities and capacities for monitoring CFC imports at the customs entry points and at major distributors

3.4.2 Survey Findings

The survey findings are summarized as below:

A. End use and equipment population

Domestic Refrigeration

The estimated population of domestic refrigeration appliances (household refrigerators and freezers and hot and cold water dispensers) in Indonesia is 17,576,541. The servicing requirement is tabulated below:

Type of equipment	Estimated total population (Units)	Proportion of CFC-based population (%)	Estimated CFC-based population (Units)	Proportion of CFC-based units serviced annually (%)	CFC-based population serviced annually (Units)	Average CFCs used in servicing (Kg/Unit)	Total CFCs used in Servicing (MT/y)
Household refrigerators/freezers	16,041,667	60	9,625,000	20	1,925,000	0.35	673.75
Hot and cold water dispensers	1,534,874	60	920,924	20	184,185	0.30	55.26
Total	**17,576,541**	**60**	**10,545,924**	**20**	**2,109,185**	**0.39**	**729.01**

Commercial Refrigeration

The estimated population of commercial refrigeration appliances, systems and installations in Indonesia is 495,648. This comprises of about 450,000 small-sized unitary systems, such as chest freezers, bottle coolers, water coolers, visicoolers, vending machines, etc. and 45,468 medium sized systems such as large display cabinets and counters, reach-in refrigerators and freezers, super market refrigeration systems with single or multiple compressors, etc.

Type of equipment	Estimated total population (Units)	Proportion of CFC-based population (%)	Estimated CFC-based population (Units)	Proportion of CFC-based units serviced annually (%)	CFC-based population serviced annually (Units)	Average CFCs used in servicing (Kg/Unit)	Total CFCs used in Servicing (MT/y)
Small-sized unitary systems	450,000	40	180,000	30	54,000	0.60	32.40
Medium-sized systems	45,648	40	18,259	30	5,478	10.00	54.78
Total	**495,648**	**40**	**198,259**	**30**	**59,478**	**1.47**	**87.18**

Industrial Refrigeration

The estimated population of industrial refrigeration equipment, systems and installations in Indonesia is 69,470. This comprises of:

Small-sized systems	Walk-in coolers and freezers, small cold rooms and chilling and freezing plants, etc (average charge of about 25 kg)
Medium-sized systems	Medium-sized cold rooms, small/medium chilling and freezing systems, etc. (average charge range about 50 kg – 75 kg)
Large-sized systems	Large central refrigeration systems, large cold stores, process refrigeration systems, etc. (average charge range of 100 kg or higher)

Type of equipment	Estimated total population (Units)	Proportion of CFC-based population (%)	Estimated CFC-based population (Units)	Proportion of CFC-based units serviced annually (%)	CFC-based population serviced annually (Units)	Average CFCs used in servicing (Kg/Unit)	Total CFCs used in Servicing (MT/y)
Small-sized systems	45,800	40	18,320	30	5,496	25	137.40
Medium-sized systems	21,700	25	5,425	30	1,628	60	97.65
Large-sized systems	1,970	15	296	30	89	100	8.90
Total	**69,470**	**34.60**	**24,041**	**30**	**7,213**	**33.82**	**243.95**

Transport Refrigeration

The estimated population of transport refrigeration equipment and systems in Indonesia is 5,510. This comprises of about 5,060 refrigerated trucks and trailers and about 450 marine and other mobile refrigeration systems.

Type of equipment	Estimated total population (Units)	Proportion of CFC-based population (%)	Estimated CFC-based population (Units)	Proportion of CFC-based units serviced annually (%)	CFC-based population serviced annually (Units)	Average CFCs used in servicing (Kg/Unit)	Total CFCs used in Servicing (MT/y)
Refrigerated trucks and trailers	5,060	60	3,036	30	911	10.00	9.11
Marine and other mobile refrigeration	450	40	180	30	54	50.00	2.70
Total	**5,510**	**58**	**3,216**	**30**	**965**	**12.23**	**11.81**

Summary

The summary of the CFCs used in servicing for the various sub-sectors is tabulated below:

Table-4
Indonesia – Summary of CFC consumption in servicing of Refrigeration Equipment

Sub-sector	CFC Consumption (MT)			Total (MT)
	CFC-11	CFC-12	Other	
Domestic refrigeration equipment	0.00	729.01	0.00	729.01
Commercial refrigeration equipment	0.00	86.18	1.00	87.18
Industrial refrigeration equipment	0.00	236.15	7.80	243.95
Transport refrigeration equipment	0.00	10.56	1.25	11.81
Total	**0.00**	**1,061.90**	**10.05**	**1,071.95**

There expected to be additional quantities of CFCs held as stocks. The stocks likely are a result of unsold imports made up to the import quotas.

B. Service Providers

The findings related to the assessment of the baseline conditions of service providers are summarized as below:

Service Establishments

The estimated population of establishments providing servicing for the Refrigeration (Servicing) Sector in Indonesia, covering the domestic, commercial, industrial and transport refrigeration sub-sectors, distributed by provinces (the newly added 5 provinces and 3 special regions are listed as a part of the 27 provinces listed below) is tabulated as below:

No	Province	Number of Service Establishments
1	Aceh	376
2	North Sumatera	1,263
3	West Sumatera	54
4	Riau	145
5	Jambi	10
6	South Sumatera	81
7	Bengkulu	19
8	Lampung	45
9	DKI Jakarta	1,021
10	West Java	1,964
11	Central Java	1,328
12	Yogyakarta	294
13	East Java	1,964
14	Bali	289
15	West Nusa Tenggara	96
16	East Nusa Tenggara	61
17	West Kalimantan	182
18	Central Kalimantan	130
19	South Kalimantan	157
20	East Kalimantan	334
21	North Sulawesi	174
22	Central Sulawesi	66
23	South Sulawesi	319
24	Southeast Sulawesi	75
25	Maluku	51
26	North Maluku	33
27	Papua	97
Total		**10,627**

Of the above, 135 service establishments are organized, with affiliations either to major manufacturers of refrigeration equipment for product sales, service and support, or to major distributors of refrigeration raw materials, components and consumables. They are dedicated to and specialized in providing service to the Refrigeration Sector and have relatively large-sized operations, handling about 65% of the total CFC usage in servicing. These establishments handle about 5 MT/y of CFCs at an average and typically employ 5-10 technicians each and have some baseline equipment available for meeting the servicing requirements of existing CFC-based systems. Of the remaining establishments, about 300 are classified as medium-sized (average CFCs handled about 0.5 MT/y). These establishments are independent, without major affiliations to any suppliers; relatively less organized, have modest capability in terms of personnel or equipment, but predominantly engaged in refrigeration service. The medium-sized establishments employ about 1-5 technicians each, and account for about 15% of the CFCs used this sector.

The remaining 10,192 establishments are predominantly small-sized and account for the balance CFC usage. These small-sized establishments may or may not be catering exclusively to the refrigeration sector. In these establishments, the individual level of CFCs handled is relatively small. With not much equipment and training, the baseline capacity and capability in these small establishments is quite modest. About 30% of these establishments claim to be formally registered. Of this group, those establishments, which have a relatively sound baseline and which do cater to the Refrigeration Sector and have considerable CFC usage in servicing, number about 500, and will be addressed in this Plan. The details of each of the large-sized and medium sized service establishments, such as names, locations, individual CFC consumption data, etc. are available with the National Ozone Unit and can be provided upon request.

Training Establishments

There are about 20 government-operated vocational training institutes (Balai Latihan Kerja) in Indonesia, which deliver refrigeration and air conditioning training courses and curricula on a regular basis, for prospective technicians. In addition, there are about 10 government-recognized or operated universities and polytechnic institutions engaged in providing similar regular training courses. In addition, there are about 100 private institutions engaged in these activities. Most establishments are not adequately equipped with demonstration equipment for hands-on training or field-experienced staff. Details of these training establishments are available with the Ozone Unit and can be provided upon request.

Technicians

The estimated population of technicians engaged in servicing of domestic, commercial, industrial and transport refrigeration equipment, distributed by provinces, is tabulated as below:

No	Province	Number of Technicians
1	Aceh	1,171
2	North Sumatera	3,898
3	West Sumatera	290
4	Riau	788
5	Jambi	57
6	South Sumatera	434
7	Bengkulu	102
8	Lampung	238
9	DKI Jakarta	9,635
10	West Java	9,358
11	Central Java	6,336
12	Yogyakarta	1,399
13	East Java	13,767
14	Bali	3,088
15	West Nusa Tenggara	584
16	East Nusa Tenggara	370
17	West Kalimantan	1,112
18	Central Kalimantan	793
19	South Kalimantan	959
20	East Kalimantan	2,040
21	North Sulawesi	1,062
22	Central Sulawesi	404
23	South Sulawesi	1,953
24	Southeast Sulawesi	460
25	Maluku	310
26	North Maluku	198
27	Papua	590
Total		**61,396**

About 20% of the above have undergone some formal training. About 60% are skilled and/or field experienced. The remaining 20% are semi-skilled and/or relatively inexperienced. Most technicians lack knowledge and experience on CFC-free technologies and practices.

C. General

Prevailing prices of CFCs and substitutes

There is a variation in the availability and prices of CFCs and substitutes in the various provinces and markets in Indonesia. The average prevailing retail prices of CFCs and substitutes employed in servicing of refrigeration equipment are tabulated as below:

Refrigerant	Average retail price (US$/kg)
CFC-11	2.91
CFC-12	3.05
HCFC-22	2.28
R-502	13.07
HFC-134a	4.50
R-404a	14.30

Servicing Practices

Predominantly due to the lack of awareness, equipment, training and economic incentive, due to the relatively convenient and economic availability of CFCs and absence of specific regulations on venting and other practices, there is virtually no recovery or recycling of CFCs in servicing of refrigeration equipment. CFCs are routinely used in flushing of equipment. CFCs may also be used for servicing of non-CFC-based equipment, due to the prevailing price differentials.

3.5 Analysis of Survey Data

The projection of future CFC consumption trends in Indonesia will need to be made based on the impacts of the market forces, regulation, progress in retrofitting, good practices and economic life of existing equipment. A realistic assessment of the future CFC consumption trends would facilitate assessment of the constraints likely to be faced by the government and the industry in Indonesia for effecting CFC phase-out and the level and scope of assistance needed to accomplish the same.

3.5.1 Market forces

The lower prices of CFCs with respect to substitutes by about US$ 1.00 to US$ 2.50/kg, is one of the major barriers in retrofitting or replacement of existing CFC-based equipment. The prevailing prices of various refrigerants indicate that market forces alone are not sufficient to drive down CFC consumption and that the market forces have not yet reconciled fully to the CFC phase-out objectives an important reason for which, is the continued availability of CFCs at lower prices than the substitutes, from both Article-2 and Article-5 countries.

3.5.2 Economic life of equipment

The useful economic life for all equipment is considered at 15 years, although most well maintained equipment can be used for more than 20 years.

Unless dictated by the age of existing CFC-equipment, market forces alone will not be effective in curtailing CFC consumption in servicing. However, replacement of the equipment due to the end of its economic life, by non-CFC-based equipment provides an opportunity for sustainable reductions in the CFC consumption in servicing.

It appears unlikely that domestic refrigeration equipment would be retrofitted to a level that would significantly affect the CFC consumption in servicing in this sub-sector. Typical consumer preferences are to replace the appliances upon retirement.

In the commercial refrigeration sub-sector, retrofitting existing equipment is economically not feasible, as in domestic refrigeration equipment. The equipment will more likely tend to be replaced at the end of its economic life.

In the industrial refrigeration sub-sector, the relatively high price of R-502 has precipitated retrofitting or replacement decisions by end-users of R-502 based equipment, typically cold stores, freezers and other low temperature equipment, which have tended to convert to R-22, ammonia or R-404a based systems. In case of the remaining users in this sub-sector, retrofitting or replacement decisions are constrained by the relatively high investments required.

In the transport refrigeration sub-sector, since most equipment is imported from Article-2 countries, CFC-free equipment has been introduced more quickly and the proportion of CFC-based equipment with a significant balance economic life is quite small (about 25%). The overall contribution of this sub-sector in presenting a constraint for reduction of CFC use in servicing is quite small.

The following table summarizes the estimated remaining economic life of existing CFC-based equipment in various sub-sectors:

Table-5
Indonesia: Economic life and projected CFC usage in servicing refrigeration equipment

Sub-sector	Existing population of CFC-based equipment	Estimated proportion of population more than 15 years of age (%)	Estimated proportion of population less than 15 years of age (%)	Projected annual CFC usage in servicing of population less than 15 years of age (MT/y)
Domestic refrigeration	10,545,924	50	50	364.51
Commercial refrigeration	198,259	60	40	34.87
Industrial refrigeration	24,041	70	30	73.19
Transport refrigeration	3,216	75	25	2.95
Total				**475.52**

* Independent of market forces and regulations and at the current handling practices

In view of the foregoing, it is clear that in the short/medium term, retrofitting with technically suitable drop-in substitutes may be a relatively more feasible and cost-effective solution. However, it is also clear that independent of regulatory constraints and conducive market forces, the CFC consumption in servicing would continue at the level of at least around 475 MT/y excluding growth, if replacement or retrofitting of existing CFC-based equipment is not implemented in the short term. This indicates a major constraint in compliance by the industry to the prevailing and future regulations.

3.5.3 Good practices

The introduction of containment, good housekeeping practices and recovery/recycling/reuse will result in significant reduction of CFC consumption for servicing. In order to obtain significant reductions in CFC consumption through good practices, it will be necessary to introduce equipment, training, awareness and technical support.

3.5.4 Regulation

The introduction of appropriate regulations on handling of CFCs in servicing and proper enforcement of the import controls through strengthening of the customs and other enforcement agencies, in conjunction with the implementation of retrofitting/replacements and introduction of good practices, would be a critical factor in limiting CFC imports and indirectly making CFCs economically unattractive, thereby reducing CFC consumption in servicing in the Refrigeration Sector sustainably. Since the Government of Indonesia aims to eliminate CFC use in the country (including the Refrigeration Sector) from 2008, the government and the industry will need to take expeditious actions now, to minimize the economic impact to the country in the future.

4. PROJECT DESCRIPTION

The Phase-out Management Plan for CFCs in the Refrigeration (Servicing) Sector in Indonesia will be implemented through a combination of Investment, Technical support and Policy/Management support components.

4.1 Investment Component

The investment component of the plan will focus on providing inputs to the service establishments, training establishments and major end users, enabling the industry to physically eliminate the use CFCs in their activities and would comprise of the following elements:

4.1.1 Recovery and recycling equipment

This sub-component will provide recovery & recycling equipment to service establishments, commensurate with their size and baseline conditions (see Annex-1) to ensure the following:

- CFC use is reduced to the extent feasible in servicing operations, by discontinuing venting and flushing and facilitating of reuse of CFCs through recycling
- Reducing the import demand for virgin CFCs
- Enhancing the capacity in the servicing establishments to facilitate early retrofitting of CFC-based equipment at their end-user clients.
- Facilitate creation of an inventory of recovered CFCs to meet to the extent possible, the servicing requirement of existing CFC-based equipment during the remaining economic life

The projected direct impact of introduction of recovery and/or recycling in the CFC usage for servicing in the various sub-sectors is as below:

Sub-sector	Present CFC consumption in Servicing (MT/y)	Present level of recovery & recycling (%)	Projected level of recovery/recycling after equipment inputs (%)	Net savings in usage of CFCs (MT/y)
Domestic refrigeration	729.01	0	20	145.80
Commercial refrigeration	87.18	0	20	17.44
Industrial refrigeration	243.95	5	25	48.79
Transport refrigeration	11.81	5	15	1.18
Total				**213.21**

4.1.2 Demonstration equipment for Training Establishments

This sub-component will provide demonstration equipment to the existing qualified and recognized training establishments, for strengthening their capacity and effectiveness in imparting hands-on training to prospective technicians on actual field-used equipment. This will result in reducing the technician's learning curve in these operations prior to their entering the field and would supplement the content of the vocational training curriculum.

As identified in the survey, there are 30 government -operated/authorized and about 100 privately operated institutions offering regular curricula in Refrigeration and Air Conditioning. Each of these institutions will be provided with one set of demonstration equipment comprising of recovery equipment, recycling equipment, charging unit, vacuum pump, refrigerant identification kit and accessories, enabling these institutions to provide early and direct hands-on exposure to the technician trainees, as a curriculum supplement.

4.1.3 Pilot Retrofitting and Replacement Program for End Users

It is proposed to select two representative users from each of the typical refrigeration end use applications (cold storages, hospitals, supermarkets, restaurants, etc., but excluding chillers and MAC equipment) for carrying out a retrofitting and replacement demonstration (retrofitting at one end user and replacement at the other end user). The end users would be selected in such a way that one demonstration pair (one retrofitting and one replacement) is available in each province, covering a total of 32 provinces and 3 special regions (total 70 end users: 35 for retrofitting and 35 for replacement). The end users will need to meet the following criteria:

- Should own and be a continuous operator of CFC-based refrigeration equipment installed prior to July 1995 but not earlier than 1990, with a contained CFC charge of at least 10 kg.
- Should be in a stationary business at the particular location since establishment
- Should be financially viable
- Should undertake if selected, to complete permanent retrofitting or replacement (as applicable) of the baseline CFC-based refrigeration equipment within six months, in accordance with the technical guidelines provided and destroy replaced CFC-based equipment (in case of replacement)
- Should undertake to provide to Ozone Unit and/or their authorized visitors, free access to the retrofitted/replaced equipment for demonstration purposes, including advertisement/promotions or similar information dissemination activities, for a period of at least 3 years

The Ozone Unit will carry out the qualification and selection of end users for participating in this pilot program, with technical assistance from the implementing agency. The upper limit of the number of participating end users would be 70 (as described above). The selected end users would then enter into a binding agreement with the Ozone Unit, incorporating appropriate legal, technical and operational provisions. Each end user would be provided financial assistance covering the actual retrofitting/replacement costs (excluding taxes) of up to a maximum of US$ 5,000 against satisfactory completion of conversion and satisfactory documentation justifying the costs. Any balance funds would be applied towards creating additional such demonstration end users, until exhausted.

The expected outcomes of this pilot program would be:

- Availability of demonstration cases of successful retrofitting and replacement of CFC-based refrigeration systems for information dissemination and awareness
- Confidence building in other end users
- Precipitating early retrofitting and/or replacement decisions at other end users
- Reducing CFC demand for servicing of refrigeration equipment at end users

4.2 Technical Support Component

The sector as a whole will need to be supported through provision of a technical support component for ensuring that their phase-out actions and initiatives are not only technically sound but also sustainable, and consistent with the important priorities of the Government, which are to prevent industrial dislocation, obsolescence and adverse impact to the economy. The Technical Support component will assist the sector as a whole, for the following:

- Technical assistance for retrofitting/replacement of existing CFC-based equipment in all sub-sectors.
- Establishment quality and performance standards for servicing of refrigeration and air conditioning equipment.
- Periodic interaction with the user industry through technical workshops for providing technical assistance to ensure sustainability of retrofitting/replacement actions and refrigerant handling practices

4.3 Training Component

The sustainability of the outcomes of the Phase-out Management Plan would be significantly influenced by the capability and willingness of the large number of refrigeration technicians in this sector (estimated total about 61,000 of which, only about 20% possess formal training) to implement practices that would lead to optimal and economical use of CFCs in servicing. To ensure that this important manpower base is positioned to contribute tangibly to the plan objectives, it is considered essential to deliver to these technicians, the requisite level of classroom and hands-on training pertaining to operation and maintenance of equipment, process and applications involved in CFC-based and substitute refrigerants, technologies and systems, with a specific emphasis on conservation, containment, recovery and recycling of refrigerants during servicing. The Training Component would comprise of the following:

4.3.1 Capacity-building

This sub-component will aim to create a pool of Master Trainers leading to a sustainable local capacity. The candidates for Master Trainers would be drawn from the faculty available in the existing training establishments and also from major service establishments, with the aim of preparing about 150 Master Trainers.

The training of Master Trainer candidates would be delivered through training workshops to be conducted by international experts designated by the implementing agency in consultation with the Ozone Unit. It is proposed to organize a minimum of 10 training workshops, each of five days duration, in a way as to effectively target the geographical distribution of training and servicing establishments. The training curriculum would comprise of classroom presentations, practical demonstrations and field exposure visits. The training courses would include training materials and demonstration equipment and also cover development of curriculum for subsequent technician training (see 4.3.2 below)

4.3.2 Technician training

This sub-component will target the training of refrigeration technicians operating at the field level for their livelihoods, in good practices in refrigeration. Since these technicians are the first-level interface with the users of refrigeration equipment for servicing, it is considered crucial that maximum numbers of technicians are brought under the umbrella of training. While it would not be realistic to cover all existing technicians from the census established in the survey, it is considered feasible to impart training to about 40% of the technician population. This amounts to coverage of about 24,000 technicians.

Technician training for good practices in refrigeration would be carried out by Master Trainers (see 4.3.1). The Ozone Unit will organize information dissemination and awareness on the training program, through the major service establishments and training establishments, who would conduct the training course according to the curriculum developed in the capacity-building sub-component, be equipped with demonstration equipment (see 4.1.2) and would also enroll the technicians for the course. The technicians would be provided with classroom and hands-on training, a guide in good practices, documentation and other technical reference materials. Upon completion of the prescribed course they would be provided with a certificate.

4.4 Policy & Management Support Component

The implementation of the Phase-out Management Plan for the Refrigeration (Servicing) Sector will need to be closely aligned and coordinated with the various policy, regulatory, fiscal, awareness and capacity-building actions, which the Government of Indonesia is taking and will need to take in future, in order to ensure that the implementation of the Plan is consistent with the Government priorities and its compliance obligations. Further, in view of the annual CFC reductions needed to be achieved under the terms of the Phase-out Management Plan, the implementation of the Plan will need to be closely and efficiently managed and will introduce additional coordinating, reporting and monitoring activities.

The Phase-out Management Plan will need to be managed by a dedicated unit, comprising of a coordinator to be designated by the Government and supported by representatives and experts from the implementing/executing agencies and the necessary support infrastructure. The Policy & Management Support component of the Plan will include the following activities, for the duration of the Plan:

a) Establishment and operation of the Plan management and coordination unit for coordinating the Plan implementation with the various Government policy actions pertaining to the Refrigeration Sector
b) Establishment of a time-bound policy development and enforcement program, covering various legislative, regulatory, incentive, disincentive and punitive actions to enable the Government to acquire and exercise the required mandates in order to ensure compliance by the industry with the phase-out obligations.
c) Development and implementation of training, awareness and capacity-building activities for key government decision-makers and other institutional stakeholders, to ensure a high-level commitment to the Plan objectives and obligations.
d) Awareness creation for the Plan and for the Government initiatives in the Sector among consumers and public, through workshops, media publicity and other information dissemination measures.
e) Preparation of and reporting on annual implementation plans
f) Verification and confirmation of CFC reductions through site visit and audits.
g) Establishment and operation of a reporting system of usage of CFCs/substitutes by users
h) Establishment of a formal regime for licensing of refrigeration technicians, in order to prevent free-lancing technicians without proper training or skills, from offering cheaper CFC-based solutions to prospective customers.
i) Establishment and operation of a decentralized mechanism for monitoring of Plan outputs, in association with provincial regulatory environmental bodies.

4.4 Action Plan

The implementation of the Phase-out Management Plan will involve actions on part of the Government and industry to achieve the targeted ODS reductions in the Refrigeration (Servicing) Sector, through a coordinated approach combining the inputs to the sector through the investment, technical support and training components, in close alignment with the required policy and regulatory measures. Annex-1 provides details of the actions in relation to the annual ODS reduction milestones and the corresponding funding disbursements.

5. INCREMENTAL COSTS AND FINANCING

The total eligible incremental costs and the requested grant funding is US$ 7,914,150. Details are provided in Annex-2.

6. IMPLEMENTATION

6.1 Management

The overall management of the Plan will be carried out as described in Section 4.4, by Government of Indonesia and the actual implementation and execution will be arranged by UNDP.

The Ozone Unit within the purview of the Assistant Deputy for Climate and Atmosphere, Deputy Ministry for Environmental Conservation, Ministry of Environment, will be responsible for monitoring of the implementation of the Phase-out Plan. The Ozone Unit will be responsible for tracking the promulgation and enforcement of policy/legislations, the preparation of annual implementation plans and assist UNDP in the preparation of the progress report to the Executive Committee of MLF. UNDP would conduct an annual independent audit for verifying CFC consumption levels including spot checks and random visits; provide assistance for policy, management and technical support and supervise implementation activities.

6.2 Disbursement Schedule

Year	ODS phase-out target (MT)			Remaining ODS Consumption as of 31 December (MT)	Disbursement (US$)
	From approved ongoing projects	From Sector Phase-out Management Plan	Total		
2002	0	0	0	2,303	1,002,745
2003	90	0	90	2,213	1,600,000
2004	300	200	500	1,713	3,000,000
2005	300	300	600	1,113	1,000,000
2006	300	322	622	491	1,000,000
2007	241	250	491	0	311,405
TOTAL	**1,231**	**1,072**	**2,303**	**0**	**7,914,150**

6.3 Funding Arrangements

Upon approval by MLF of the Phase-out Management Plan, the Government of Indonesia, through UNDP, requests the Executive Committee to authorize disbursement of US$ 1,002,745 representing the business plan allocation for this activity for 2002. The phase-out activities initiated in 2003 may not produce results until 2004, contributing to the reduction of consumption starting only in 2005. Therefore, the Government of Indonesia through UNDP, will request the disbursement of the 2003 funding of US$ 1,600,000 at the first Meeting of the Executive Committee in 2003, based on the action plan/activities, in the proposal approved at the 38th EC Meeting. The details of the planned activities under this Plan for 2003 and subsequent years are provided in Annex-1 (Action Plan and Monitoring Milestones).

The funds for each subsequent year will be provided in accordance with the disbursement schedule in the above table for the exact amount listed for that year and on the basis of the implementation programme for the year. The funding installments will be released subject to:

(a) Confirmation that the agreed consumption limits for the previous year have been achieved;
(b) The verification that the activities planned for the previous year were undertaken in accordance with the annual implementation programme.

In the unlikely event of Indonesia failing to achieve phase-out targets for a given year (i.e. CFC consumption limit in the Refrigeration Sector exceeds the target for the year), UNDP and Indonesia would agree on remedial actions. New funding requests to the MLF would go forward only after phase-out targets have been met. The approach to remedial action would be to bring the program back on track by the end of the second year so that the combined phase-out targets for the two years could be met. This approach to remedial action would allow the program to maintain momentum and to keep the phase-out schedule on track even if difficulties arise in a particular year. If the program is still not back on track within two years, continued funding of the program could be based on reduced level of compensation. However, if it were established that delays are persistent and the phase-out targets may not be achieved within the schedule set in the approved Phase-out Plan, the Multilateral Fund would reduce funds proportional to the phase-out shortfall.

7. RESULTS

This project will facilitate elimination of CFCs in the Refrigeration (Servicing) Sector in Indonesia by end-2007.

ANNEXES

Annex-1: Action Plan and Monitoring Milestones
Annex-2: Incremental Cost Calculations

ANNEX-1
ACTION PLAN AND MONITORING MILESTONES

Year/ Action	Investment Component	Technical Support Component	Training Component	Policy/Management	Disbursement (US$)	ODS reduction (MT)
2002	None	None	None	Annual implementation programs prepared and approved.	1,002,745	0
2003	• 135 large, 300 medium-sized and 500 small service establishments and 130 training establishments identified and verified • Purchase orders for recovery & recycling equipment issued for 135 large-sized service establishments • 70 end-users selected for demonstrating pilot retrofitting and replacement program	2 Technical assistance workshops for selected service establishments, end users and other industry stakeholders	• Delivery of training inputs to about 150 Master Trainers • Information dissemination and publicity for enrolling refrigeration technicians • Finalization of arrangements for commencing Technician Training courses	• Recruitment/allocation of coordinating personnel within ozone unit for plan management • Preparation of Annual Implementation Program • 2 Training/capacity building workshops for institutional and government stakeholders • 1 public awareness workshop • Licensing regime for technicians • Reporting system for CFCs • Enforcement of import controls	1,600,000	0
2004	• Recovery/recycling equipment operational at 135 large-sized service establishments • Purchase orders for recovery & recycling equipment issued for 300 medium-sized establishments and 500 small-sized establishments • Completion of pilot end-user demonstration conversions	2 Technical assistance workshops for selected service establishments, end users and other industry stakeholders	Commencement of Technician Training courses and completion of training delivery to 6,000 technicians	• Reporting on 2003 implementation • Preparation of Annual Implementation Program • Agreements with and commitments from CFC importers for reduced quota • 2 Training/capacity building workshops for institutional and government stakeholders • 1 public awareness workshop • Verification of CFC reductions	3,000,000	200
2005	• Recovery/recycling equipment operational at 300 medium-sized and 500 small-sized service establishments	2 Technical assistance workshops for selected service establishments, end users and other industry stakeholders	Training delivery to 6,000 technicians	• Reporting on 2004 implementation • Preparation of Annual Implementation Program • 2 Training/capacity building workshops for institutional and government stakeholders • 1 public awareness workshop • Verification of CFC reductions	1,000,000	300

Annex-1: Action Plan and Monitoring Milestones (Cont'd)

Year/ Action	Investment Component	Technical Support Component	Training Component	Policy/Management	Disbursement (US$)	ODS reduction (MT)
2006	• Recovery/recycling equipment operational at 300 medium-sized and 500 small-sized service establishments	2 Technical assistance workshops for selected service establishments, end users and other industry stakeholders	Training delivery to 6,000 technicians	• Reporting on 2005 implementation • Preparation of Annual Implementation Program • 2 Training/capacity building workshops for institutional and government stakeholders • 1 public awareness workshop • Verification of CFC reductions	1,000,000	322
2007		2 Technical assistance workshops for selected service establishments, end users and other industry stakeholders	Training delivery to 6,000 technicians	• Reporting on 2006 implementation • Preparation of Annual Implementation Program • 2 Training/capacity building workshops for institutional and government stakeholders • 1 public awareness workshop • Verification of CFC reductions	311,405	250
2008				• Reporting on 2007 implementation • Verification of CFC reductions • Final reporting on Plan implementation and conclusion	0	0

ANNEX-2
INCREMENTAL COSTS

A. Investment Component

1. Recovery & Recycling Equipment/Demonstration Equipment

Cost Head and Enterprise Type	Large-sized Service Establishments			Medium-sized Service Establishments			Small-sized Service Establishments			Training Establishments		
	Qty each	Cost each (US$)	Total (US$)	Qty each	Cost each (US$)	Total (US$)	Qty each	Cost each (US$)	Total (US$)	Qty each	Cost each (US$)	Total (US$)
Recovery equipment	2	1,200	2,400	1	1,200	1,200	1	1,200	1,200	1	1,200	1,200
Recovery cylinder	2	125	250	1	125	125	1	125	125	1	125	125
Recycling equipment	2	3,000	6,000	0	3,000	0	0	3,000	0	1	3,000	3,000
Recycling cylinder	2	250	500	0	250	0	0	250	0	1	250	250
Charging-cum-evacuation equipment	2	1,500	3,000	1	1,500	1,500	0	1,500	0	1	1,500	1,500
Refrigerant Identification Kit	2	1,000	2,000	1	1,000	1,000	0	1,000	0	1	1,000	1,000
Misc. Accessories	1	100	100	1	100	100	1	100	100	1	100	100
Consumables and spares	2	250	500	1	250	250	1	250	250	1	250	250
Delivery/transportation	1	1,000	1,000	1	500	500	1	250	250	1	500	500
Trials and startup	1	1,000	1,000	1	500	500	1	250	250	1	500	500
Total (per establishment)			**16,750**			**5,175**			**2,175**			**8,425**
Number of establishments			**135**			**300**			**500**			**130**
TOTAL (all establishments)			**2,261,250**			**1,552,500**			**1,087,500**			**1,095,250**
GRAND TOTAL (US$)												**5,996,500**

2. Pilot Retrofitting/Replacement End-user Incentive Program

Activity	Maximum cost per End-user (US$)	Number of End-users	Total Cost (US$)
Total 70 selected end-users (2 each in total 32 provinces and 3 special regions)	5,000	70	350,000

3. Summary

Recovery & Recycling Equipment/Demonstration Equipment	5,996,500
Pilot retrofitting/replacement incentive program for end-users	350,000
Sub-total	6,346,500
Contingencies (10% on equipment)	599,650
TOTAL (A - Investment Component)	**6,946,150**

B. Technical Support Component

Activity	Inputs	Cost (US$)
Technical assistance for retrofitting and replacement for selected end-users for the pilot program	Technical expert costs including all expenses	75,000
Establishment of standards and code of practices for refrigeration servicing	Technical expert costs including all expenses	30,000
Technical assistance workshops for service establishments and end-users	Two 2-day workshops/year for 5 years (total 10 workshops) @ US$ 5,000/workshop	50,000
	Workshop materials/kits	5,000
	Technical expert costs for content delivery including all expenses	45,000
TOTAL (B – Technical Support Component)		**205,000**

C. Training Component

1. Capacity Building (training for 200 Master Trainers)

Activity	Inputs	Cost (US$)
Workshop content delivery and conduction	Technical expert costs for 10 workshops including all expenses.	75,000
Workshop arrangements	Ten 5-day workshops @ US$ 5,000 per workshop	50,000
Training materials	200 sets @US$ 25/participant	5,000
Participant attendance expenses	200 persons @ US$ 450/person all inclusive	90,000
Development and delivery of training curriculum for technicians	Technical expert costs including all expenses	3,000
Total (for capacity building – Master Trainers)		**223,000**

2. Technician Training (training for 24,000 Technicians)

Activity	Inputs	Cost (US$)
Information dissemination and enrollment expenses	Estimated US$ 10,000/year for 5 years	50,000
Training course arrangements	800 training courses @ US$ 500 per course	40,000
Training materials & documentation	24,000 sets @US$ 5/set	120,000
One-time logistics preparation costs for participants	Lumpsum	90,000
Certification expenses	Local expert costs for 5 years, including all expenses	50,000
Total (for capacity building – Master Trainers)		**350,000**

TOTAL (C – Training Component)	**573,000**

D. Policy and Management Support Component

Activity	Inputs	Cost (US$)
Management, coordination and monitoring of Plan	200 man days/year for 5 years, total 1,000 man days @ US$ 50/man day	50,000
Policy development and enforcement program	40 man days/year for 5 years, total 200 man days @ US$ 50/man day	10,000
Training and capacity-building for institutional and government stakeholders	Total 10 workshops including all expenses @ US$ 5,000/workshop	50,000
Awareness creation and information dissemination programmes	Total 5 public awareness workshops including all expenses @ US$ 5,000/workshop	25,000
Preparation of and reporting on annual implementation programs	20 man days/year for 5 years, total 100 man days @ US$ 50/man day	5,000
Verification and confirmation of CFC reductions	40 man days/year for 5 years, total 200 man days @ US$ 50/man day	10,000
Establishment of a CFC reporting system for service establishments and end users	Technical/legal expert costs (local) for 100 man days @ US$ 200/man day	20,000
Institution of a Licensing regime for refrigeration technicians	Technical/legal expert costs (local) for 100 man days @ US$ 200/man day	20,000
TOTAL (D – Policy & Management Support Component)		**190,000**

Summary

Activity	Cost (US$)
Investment Component	6,946,150
Technical Support Component	205,000
Training Component	573,000
Policy & Management Support Component	190,000
GRAND TOTAL	**7,914,150**

Notes:

- It is understood that the Government of Indonesia will have maximum flexibility for allocating the approved funding in a way that is determined to be the best for achieving the project objectives and compliance obligations.
- Incremental operating costs, if any, which may be incurred will be borne by the respective stakeholders.