

descriptive analysis and hypothesis testing is available and the output is easily interpreted. 0.05 level of significance will be used for all statistical tests throughout this study.

Tabulation, cross-tabulation and simple yet appropriate statistical methods are used in analyzing the data. Table and graphs are greatly used to present the analysis results because they simplify and clarify the research data. It also facilitates the summation and communication of the meaning of the data.

Non-parametric methods are used widely in the data analysis because it is assumed that no knowledge whatsoever about the distributions of the underlying populations. In addition, in this study, not all the data have quantitative measurements and the number of observation is small (less than thirty).

Even though factor analysis is often used for sample with more than 50 observations, however it is used in this study to give an indication of possible separate dimensions of the structure and determination of the extent to which each variable is explained by the dimension.

4. RESEARCH RESULTS AND DISCUSSIONS

4.1 Survey coverage of the ISO 14001 certified companies in Malaysia

Until the time of writing this report (September 1999), there are 83 companies who are certified to MS ISO 14001 by SIRIM Berhad. This figure has increased tremendously from 38, the figure published by SIRIM in their QAS Directory of Certified Products & Companies in 1998, which was used in the sampling procedure of this study. Out of the 38 survey questionnaire sent out, 18 companies responded within 2 weeks. The analysis that follows therefore covers only 18 companies in Malaysia. To

protect the confidentiality of information provided by these companies, they will not be identified by name; the important classifications will be by type of industry (nature of business) and firm size in terms of number of workers employed.

The type of industries mentioned throughout this study generally covers the scope described below:

- (a) Electrical/electronic - manufacturing/assembling of electrical/electronic products such as audio , telecommunication compressors, transistors, diodes, integrated circuits, memory device, motors flyback transformers, office automation equipment, lead frame, and other home electrical appliances.
- (b) Hotel/restaurant - operation of beach resort.
- (c) Metals - recycling of scrap materials mainly copper, aluminum and industrial components.
- (d) Plastic products - manufacturing of plastic injection molded parts for electrical, electronic, computer, furniture and automotive industries.
- (e) Food products - processing of fresh fruit bunches to crude palm oil and palm kernel.

Table 1 and pareto chart in figure 4 show the distribution of the companies surveyed by type of industry and years of establishment.

Table 1 Firms surveyed by type of industry and years of establishment.

	Years of establishment					Total
	1-5	6-10	11-15	16-20	> 20	
Type of industry						
electrical/electronics	3	2	2	1	5	13
hotels/restaurants					1	1
metals	1					1
plastic products		1				1
food products					2	2
Total	4	3	2	1	8	18

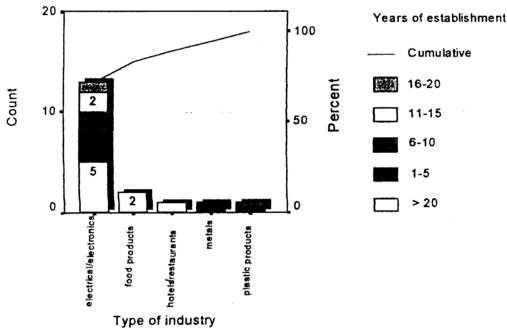


Figure 4 Firms surveyed by type of industry and year of establishment

From the pareto chart above, it is obvious that firms certified to ISO 14001 are either extremely long-established (more than 20 years) or newly established (5 years or less). Majority of them are from the electrical or electronics industry.

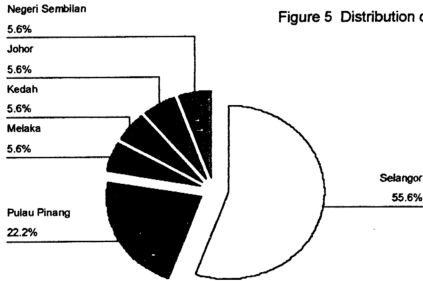


Figure 5 Distribution of location

The pie chart above shows the most of the companies certified with ISO 14001 are located in Selangor and Pulau Pinang. Most of the companies surveyed from Selangor are from Shah Alam, Bangi and Sungei Way while those from Pulau Pinang mainly located in the Bayan Lepas and Prai.

Table 2 gives the distribution of firms surveyed by number of workers and latest annual company turnover as indicators for distinguishing large and small firms.

Table 2 Crosstabulation number of employees * average annual turnover (RM million)

number of employees	average annual turnover (RM million)							Total
	<5	5-9	10-49	50-99	100-199	200-499	>=500	
<50	1							1
50-99		1						1
100-199			1					1
300-499			1		1			2
500-799						2		2
>1000				1	1	2	7	11
Total	1	1	2	1	2	4	7	18

Results of the survey showed that most of the ISO 14001 certified companies are large firms with high annual turnover.

4.2 Impact of company size on cost and preparation duration for certification

Kruskal Wallis tests (Appendix 5) showed that there is no significant differences in cost spent as well as preparation duration for ISO 14001 certification regardless of the size of the company. This can be explained that many other factors such as availability of expertise and other resources and extent of top management’s commitment can offset the effect of company’s size on these two variables.

Similarly, that there is also no significant relationships between preparation duration and the cost spent on ISO 14001 certification. Figure 6 shows the

distribution of average cost spent for different preparation duration of the companies surveyed.

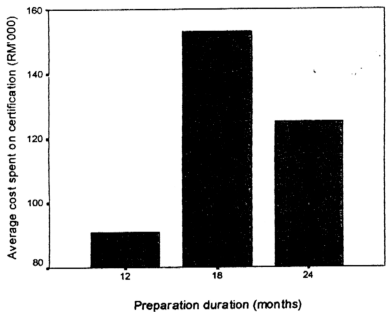


Figure 6 Cost spent for different preparation duration for ISO 14001 certification

4.3 The effect of number of establishment years on certification preparation duration

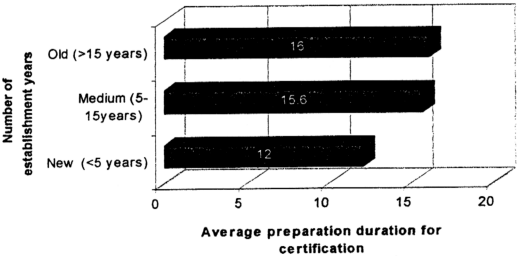
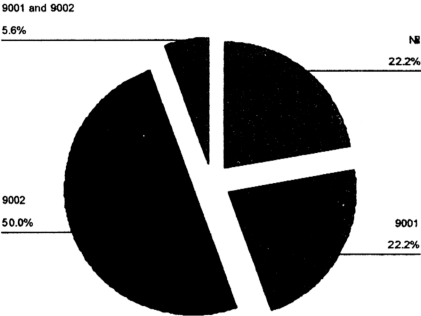


Figure 7 Average certification preparation duration for companies with different number of establishment years

On the other hand, the year of setting up the companies could be an important in that the more recently established ones would ha been able to incorporate environmental regulations into factory design but the older established factories would be more likely to face problems of adjustment, such as space constraints and greater resistance from older staffs. This was proven true in this study. From Appendix 6, it is concluded that averagely, a newly-set-up company (less than 5 years) will take about one year to prepare for ISO 14001 certification while long established ones (more than 15 years) will take about half a year longer.

4.4 Quality Management System (ISO 9000)



The survey also revealed that 77.8% of the firms surveyed (which had been certified to MS ISO 14001) has a sound Quality Management System in place. 50% of the firms surveyed have ISO 9002 system with the exception of one company, who has both the ISO 9001 and ISO 9002 system.

Table 3 Perception of the companies surveyed on the superiority of ISO14000 system over ISO 9000 system

ISO 9000 System	<i>"ISO 14001 certification is more superior than ISO 9001/2/3"</i>					Total
	strongly disagree	disagree	neutral	agree	strongly agree	
Nil			50.0%	25.0%	25.0%	100.0%
9001	25.0%		75.0%			100.0%
9002	11.1%		55.6%	22.2%	11.1%	100.0%
9001 and 9002			100.0%			100.0%
Total	11.1%		61.1%	16.7%	11.1%	100.0%

However, Table 3 shows that 61.1% of the companies surveyed are undecided whether the ISO 14001 certification is more superior than ISO 9001/2/3. But obviously, half of those companies without ISO 9000 system are of the opinion that ISO 14001 certification is more superior. The reason for not agree and disagree is that most of them think that both ISO 9000 system and ISO 14000 system are different. ISO 9000 system is for quality management whereas ISO 14000 system is for environmental management.

4.5 Reasons for an EMS implementation or ISO 14001 certification

Figure 9 Reasons for an EMS implementation/ISO 14001 certification

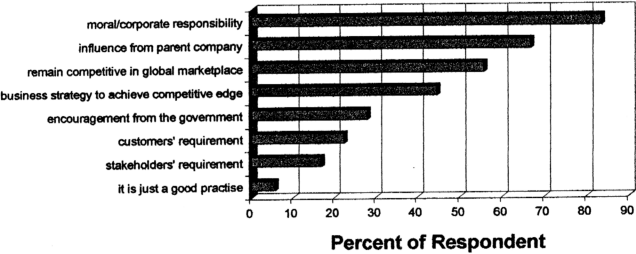


Figure 9 above shows the main reasons for Malaysian companies to have an EMS in place are moral/corporate responsibility and influence from parent company, especially if it was from a more advanced country with more stringent environmental standards.

Appendix 7 shows detailed factor analysis carried out on these reason. In general, these set of reason can be broken down into three major reasons, namely to achieve competitive advantages, expected incentives from government and influence from authoritative parties such as customers, parent company and stakeholders.

From the survey, it was also found that the electrical and electronics industry is influenced mostly by competitive advantage achievement and influence from their parent company in the foreign countries. The hotel industry is encouraged by the desire to achieve competitive advantage and also customers' requirement of a 'green' environment. Plastic and metal industries want to gain competitive advantage as well as satisfying customers' requirements. Surprisingly, the local food product industry is motivated by the government to implement EMS in their companies.

4.6 Does ISO 14001 benefit the company?

Majority of the companies surveyed agree that ISO 14001 certification benefits their company in one way or another. However it cannot be concluded that ISO 14001 certification means good performance of a company. The statistical test is discussed in Appendix 8.

4.7 Is third party registration necessary for a successful EMS implementation?

There is a mixed opinion on the necessity of third party registration for a successful EMS implementation (refer to Appendix 9 for detailed statistical test). Those who agree expressed desire for independent decision and judgement and demonstrate compliance compared to self-declaration.

Others said that third party can observe the weaknesses/short-coming or potential weaknesses/short-coming in the system independent body . For those who think otherwise are of the opinion that third party registration is just a short-term success contributor to an effective EMS because the main factor is the sincere commitment from the company itself especially from the top management.

4.8 Benefits of ISO 14001 Certification or EMS

Table 4 below shows the benefits gained from ISO 14001 certification by each industry under study.

	Type of industry					Total
	E/E	H/R	Metals	Plastic	Food	
<i>better business control</i>						
yes	76.9%	100.0%		100.0%		66.7%
no	7.7%					5.6%
n/a	15.4%		100.0%		100.0%	27.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<i>transparency/openness</i>						
yes	92.3%	100.0%	100.0%	100.0%	100.0%	94.4%
no						
n/a	7.7%					5.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<i>marketing advantages</i>						
yes	69.2%	100.0%		100.0%		61.1%
no	7.7%		100.0%			11.1%
n/a	23.1%				100.0%	27.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<i>cost reduction</i>						
yes	84.6%	100.0%	100.0%	100.0%	50.0%	83.3%
no	7.7%					5.6%
n/a	7.7%				50.0%	11.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

	Type of industry					Total
	E/E	H/R	Metals	Plastic	Food	
<i>less injuries/environmental accidents</i>						
yes	84.6%	100.0%	100.0%	100.0%	100.0%	88.9%
no						
n/a	15.4%					11.1%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<i>more research and development</i>						
yes	46.2%	100.0%		100.0%		44.4%
no	23.1%					16.7%
n/a	30.8%		100.0%		100.0%	38.9%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<i>improvement in operations efficiency</i>						
yes	46.2%	100.0%	100.0%	100.0%	50.0%	55.6%
no	15.4%				50.0%	16.7%
n/a	38.5%					27.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<i>company's image improved</i>						
yes	92.3%	100.0%	100.0%	100.0%	100.0%	94.4%
no						
n/a	7.7%					5.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
<i>improved work culture</i>						
yes	92.3%	100.0%	100.0%	100.0%	100.0%	94.4%
no	7.7%					5.6%
n/a						
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 4 Benefits gained after ISO 14001 certification by different industry type

Basically, all the benefits above can be condensed into three dimensions namely, competitive advantage, effective operation and improvement in company's image. Appendix 10 illustrates the analysis details. It is also

found that for each of the benefit listed above, there is no significant difference in the industry type.

4.8.1 Better Business Control

66.7% of the respondents claimed that they have better business control. In-depth study showed that out of this figure, 61% said that they have better management control, 66.7% said that they are in a better position of controlling overall cost and 61% claimed that there is a significant improvement in their process. However, both the metal and food industry claims that better business control is not applicable to them.

4.8.2 Transparency

94.4% of the respondents said ISO 14001 certification provides transparencies and openness in their business. Table 5 shows the aspect of transparencies claimed by the respondents. All, with the exception of one company claim that with the implementation of an EMS, environmental damaging practices were not hidden but solved.

However, more than half of the respondents said an EMS will not reduce the accusation by others on environmental damaging practice. According to them, in terms of easy accessibility of information and proving environmental claims, it remains a problem. 50% of the respondent agree that an EMS will enable society to "see into" the company and assess what it is doing with its resources that determine future options and react accordingly.

Table 5 Transparency aspects

Transparency aspects	yes	no	n/a
1. environmental damaging practices were not hidden but solved	94.4%		5.6%
2. less accusation by others on environmental damaging practices	33.3%	61.1%	5.6%
3. easier access to information	33.3%	61.1%	5.6%
4. easier in proving environmental claims	33.3%	61.1%	5.6%
5. transparency to society	50.0%	44.4%	5.6%

4.8.3 Marketing Advantages

61.1% of the respondents found that an EMS implementation followed by certification by a third party provide marketing advantages such as easier entry to global market and increased market share whilst 27.8% claims that this is not applicable to them. The survey results reported that the average increment in market share after implementation of an EMS or certification of ISO 14001 system is 2%.

4.8.4 Cost Reduction

Table 4 also shows that 83.3% of the respondents observed overall cost reduction at the average of 16.3%. However this figure is obtained from computation with a standard deviation of 14.9. In fact, 66% of the respondent who declare this information only claim a cost reduction between 5% to 12%.

On the other hand, a few respondents highlighted that overall cost reduction is very difficult to estimate. One the other hand, one company said that they do not regard this as cost reduction but rather cost improvement. The authoritative that was interviewed through telephone claims a direct influencing level of USD150K per year and highlighted that effects of EMS on indirect costs are not tracked.

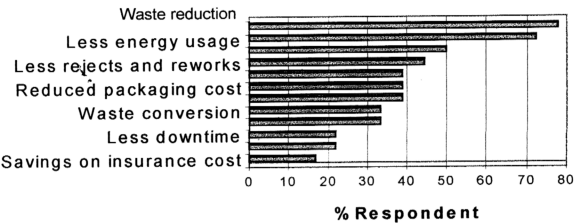


Figure 10 Percent of respondent with different aspect of cost reduction

77.8% of the respondents recognized cost saving through waste reduction after implementation of an EMS. According to some of the respondents, they have successfully applied cleaner production technologies, which encompasses the development of new and more efficient low-waste processes, changing production processes to optimize performance and reduce waste generation and the use of less toxic chemicals in production processes.

In summary, it was observed that all industry except food product industry profited from waste reduction. Respondents from plastic products, hotel/ restaurant and electrical/electronics claim that after implementation of EMS, they experienced cost reduction from the following aspects

- (i) increase in overall operating efficiency
- (ii) less energy usage
- (iii) cost saving through recycling of products inputs
- (iv) improved quality
- (v) less rejects and reworks
- (vi) reduced packaging cost

Only respondents from plastic products and a substantial few from electrical/electronic said that they could cut cost through material saving from complete processing/substitution.

Cost reduction through less downtime is only experienced by respondents from the metal and plastic product industries. However, a small percentage of respondents from electrical/electronic industry also cut cost from this aspect. Less downtime in here refers to more careful monitoring and maintenance.

Respondents from the plastic product industry and a small percentage of respondents from electrical/electronic industry found that they save by doing conversion of waste into commercially valuable forms.

Opposing to expectation of insurance cost reduction after an EMS is established, all the respondents except a small percentage of respondents from electrical/electronic industry , are not experiencing any insurance premium reduction. However, all of them except respondent from the metal industry, agree that they save cost through fewer penalties as consequences of complying with the law.

4.8.5 Less Environmental Accidents

88.9% of the respondents benefited from the EMS by having less environmental injuries/accidents. Out of this figure, 61.1% experienced reduction in internal environmental accidents i.e. among internal staffs or contract workers in the company while 27.8% said it involves accident to the public as well.

4.8.6 More Research and Development

Only 44.4% of the respondents said they benefit in terms of more research and development after implementing the EMS. Many are embarking on more ecological research , for example uncovering ways

to reduce the impact of packaging waste. Some are gearing towards scientific research with respect to ecological issues especially on renewal resources. Others are applying pressure on suppliers to use environmentally friendlier manufacturing processes and also to change their packaging. One of them claimed that, his company emphasize on having liaison with retailers to reduce impact on the environment.

4.8.7 Improvement in Operations Efficiency

Only 55.6% of the respondents benefit from operation efficiency in terms of increases in process yields, less downtime through careful monitoring and maintenance, higher quality and more consistent products and also more efficient resource use. They claimed an average of 7% improvement in operation efficiency. The 16.7% said that implementation of EMS does not improve their operations efficiency while 27.8% said this not applicable.

4.8.8 Improvement in Company's Image

One respondent claimed that the company's image does not depend on the implementation of an EMS. Other (94.4%) strongly agree that their company's image has improved after the ISO 14001 certification. They are proud of achieving it and customers as well as stakeholders are even more confident on the operations' management of the company.

4.8.9 Changes In Work Culture Among Staffs

94.4% of the respondents strongly agree that their EMS has brought positive changes in the work culture among their staffs.

From the radar chart in Appendix 11, 78% of the respondent experience better communication among staffs. This is due to proper documented procedures and records, required by the EMS. Employees also gain in better knowledge about preservation, protection and

improvement of the environment's quality. In addition they are now more aware about protection of human health too. However, it was a discouraging result that the EMS implemented neither motivates the employees nor encourage them to work in teams willingly. Only one-third of the respondents said otherwise.

4.9 Company's Commitment/Approach Towards EMS

Table 6 below shows the distribution of expertise used in establishing an EMS among the respondents

Expertise	Frequency	Percent	Cumulative Percent
internal staff	14	77.8	77.8
external expertise/consultant	2	11.1	88.9
internal staff and consultant	2	11.1	
Total	18	100.0	
Total	18	100.0	

Table 6 Expertise used in establishing EMS

It was found that 77.8% of the respondent uses internal staffs to develop their EMS. Two of the respondents depend solely on external consultants and two other respondents used combination of internal staff and external consultant.

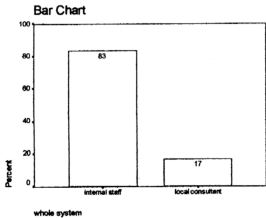


Figure 11

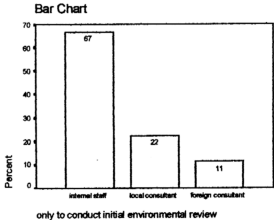


Figure 12

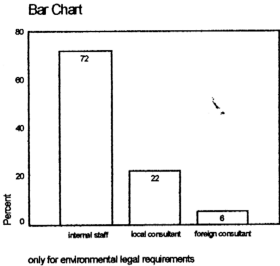


Figure 13

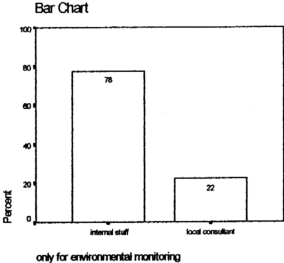


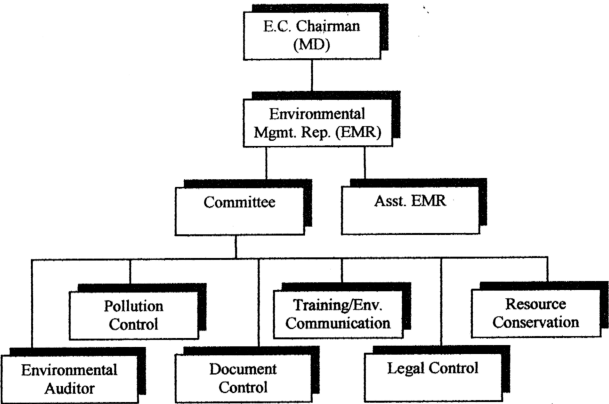
Figure 14

The four bar charts above show the expertise used in different stages of the EMS. It can be concluded from the sample, most companies in Malaysia utilize internal staff in developing their EMS except at some specific stage where external expertise are needed, for example on initial environmental review and also on legal requirements. Internal staff may not have the sufficient knowledge in these specialized areas.

Most of the companies have a committee over-seeing the EMS activities. From the respondents' feedback, an environmental committee, in general, is shown in Figure 15. Only about half of them (55.6%) have someone specially assigned solely to be responsible for the EMS. They are mainly managers and senior executives/officers of the firm and their title would carry the word 'environmental'!. For others, EMS is under the responsibility of a functional manager of a particular department, for example Facility and Industrial Engineering department.

The environmental manual is usually prepared by the Environmental Management Representative (or the committee members) or the person who is assigned solely to EMS. The company's operating procedures and work instructions are mostly written by the individual departmental managers/executives concerned.

Figure 15 Environmental Committee (E.C.)



4.10 Costs

A substantial amount of money, about 30% of total cost incurred, was spent on upgrading of equipment and facilities while 21% of the budget went to new installation and purchase of equipment and facilities. The other area where cost has incurred are external expertise (10%, if any), measurements (10%) for example, air monitoring and laboratory tests. ON the average, certification cost would take only 8-10%, while training requires 13%. Others include cost spent on awareness programmes.

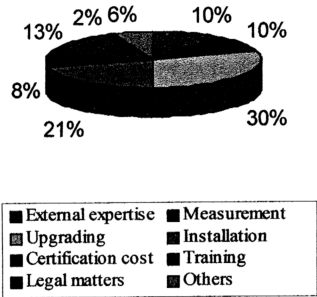


Figure 16 Breakdown of cost incurred for ISO 14001 certification

4.11 Environmental measures

All the respondents claimed that adequate measures had been taken in the following environmental aspect:

- Pollution to the atmosphere i.e. smoke and gas emission
- Water pollution
- Discharge of waste, sewage and industrial effluents
- Toxic and hazardous wastes

- Soil and ground water protection
- Noise emission

4.12 Problems encountered

From the factor analysis in Appendix 11, it gives us an indication that the problems faced by the companies surveyed can be divided into 4 dimensions namely, lack of training, lack of commitment, too much documentation and lack of knowledge on local legislation.

The survey results also show that there is no significant difference among the industries on each of the respective problems faced.

About 67% of the respondents admitted that all levels of employees in their organization lack of know-how on EMS. Resistance from staffs from all levels were highlighted by the responses but majority mentioned they faced resistance from operational and technical staffs. Companies do faced difficulty in interpreting the ISO 14001 standard especially the operational and technical staffs. Middle/junior management and the administration staffs often complained about too much documentation. This has resulted in increase pressure to their work and will definitely lead to negative impact on the quality of work.

Most of the respondents said they are having much difficulties in understanding the local legislation and they do not know how to set objectives and targets. These two task were found to be problematic not only to the operational and technical staffs but all level of employees in the organization, including the top management. However, difficulty in training is faced only at the lower level namely the operational, technical and administration staffs.

On the other hand, 77.8% of the respondents said that they do not face problems in fund allocation and communication among the staffs. Those

who admitted that there exist communication problem among the staffs claimed that it is between the management and staffs.

4.13 Other issues

The companies surveyed have varying degrees of centralization of environmental management. Underscoring the tradeoff between the need for standardization of environmental performance to avoid inconsistency or duplication of effort, and the need for responsibility of the operating or business units, most of the companies had a combined centralized and decentralized approach to environmental management. Policy is often centrally set at the corporate level and operating companies are then responsible to implement and adapt it to their local circumstances, with the central, corporate environmental department monitoring the implementation and providing the operating units with requested expertise and assistance and, in some cases, auditing their performance. environmental management.

Providing information on environmental performance is seen as a first step improving communication with the public. There should be a clear distinction between the type of information, which is useful to technical people and that which is useful to the general public. Communications with the public is absolutely necessary. Generally the public is concerned with the protection of the environment and that industry has a responsibility to inform the public of its activities that affect the environment. This is considered not only a responsibility but also a matter of good management. A multi-dimensional effort can be carried out through public meetings, door-to-door mailings and open house events and plant tours. Openness , receptiveness to the press and those who make enquiries, and a general willingness to discuss company plans and to admit past mistakes are essential to developing trust and creditability. Posted signs outside factories can offer a quick and regular indication of chemical emissions and other environmental data.