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GOVERNMENT FISCAL YEAR

January 1 to December 31

WEIGHTS MEASURES

Metric System

MAIN ABBREVIATIONS AND ACRONYMS

EA	Environmental Aspect
EMS	Environmental Management System
CCI	Command and Control Instrument
CEO	Chief Executive Officer
CIESAS	<i>Centro de Investigaciones y Estudios Superiores en Antropología Social Occidente</i>
COA	<i>Cédula de Operación Anual</i>
GEMP	The Guadalajara Environmental Management Pilot
IDG	Inter-Disciplinary Group
INE	<i>Instituto Nacional de Ecología</i>
ISO	International Standard Organization
ITESM	<i>Instituto Tecnológico de Estudios Superiores de Monterrey</i>
LAU	<i>Licencia Ambiental Única</i>
MBI	Market Based Instrument
NGO	Non-Governmental Organization
PEMEX	<i>Petróleos Mexicanos</i>
PFPA	<i>Procuraduría Federal de Protección al Ambiente</i>
PVG	<i>Programa Voluntario de Gestión Ambiental</i>
RETC	<i>Registro de Emisiones y Transferencia de Contaminantes</i>
SAGE	Strategic Advisory Group on the Environment
SEA	Significant Environmental Aspect
SEMARNAP	<i>Secretaría de Medio Ambiente, Recursos Naturales y Pesca</i>
SIRG	<i>Sistema Integrado de Regulación Directa y Gestión Ambiental de la Industria</i>
SME	Small and Medium-size Enterprise
TQM	Total Quality Management
UdG	<i>Universidad de Guadalajara</i>
VOC	Volatile Organic Compound

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MEXICO

THE GUADALAJARA ENVIRONMENTAL MANAGEMENT PILOT

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EXECUTIVE SUMMARY

Introduction

1. On November 19, 1996, eleven large companies in Guadalajara, Mexico signed a voluntary agreement with Mexico's *Secretaría de Medio Ambiente, Recursos Naturales y Pesca* (Ministry of Environment, Natural Resources and Fisheries, SEMARNAP) to mentor small suppliers in implementing environmental management systems (EMSs). Each large company invited one to three of its small suppliers to participate in the Guadalajara Environmental Management Pilot (GEMP), a two-year project to learn about and implement EMSs. The large companies and the World Bank provided these small and medium enterprises (SMEs) funding for EMS training and implementation support, which a team of international and local consultants delivered. The World Bank's involvement was under its Non-Lending Services program, not only as response to the Mexican authorities' request, but also to learn, from this innovative approach, how to better promote environmental performance improvements in SMEs.

2. The context of GEMP is one of enormous disparity between the environmental management capabilities of large and small companies. A 1996 survey of industrial environmental management in Mexico revealed that 70 to 80 percent of large Mexican and multinational companies in Mexico had key EMS elements in place as opposed to fewer than 20 percent of the country's small companies. Many of the small companies with these elements, moreover, belonged to larger corporate entities.¹ Econometric analysis of the survey data indicated that the factor that most strongly differentiated companies with positive environmental performance was the existence of EMS elements.²

3. The World Bank supported GEMP as a means of addressing four key policy questions:

- Is the ISO 14001 EMS model appropriate for implementation by SMEs?
- Are networks among SMEs, large companies, universities, and government agencies effective mechanisms to promote implementation of EMSs by SMEs?
- Does an EMS improve the environmental performance of SMEs?
- Can the EMSs initiated through the Pilot be sustained?

4. The remainder of this Executive Summary gives a brief description of the players and the organization of GEMP, reports on the major findings related to each of these four questions, and

¹ *Industrial Environmental Management in Mexico: Results of a Survey*. The Lexington Group, 1997. Report to the World Bank on a survey funded by a grant from the Japanese government administered by the Bank.

² Dasgupta, S., H. Hettige, and D. Wheeler. *What Improves Environmental Performance? Evidence from Mexican Industry*. World Bank Development Research Group Working Paper #1877, 1998.

concludes by considering how the experiences and lessons of GEMP can be applied to replicate the approach in other settings.

The Players and Organization of GEMP

5. The participants in GEMP included: (i) the large companies, who recruited SMEs, provided them with mentoring assistance and partially financed the pilot; (ii) the SMEs, who committed to implementing EMSs; (iii) the *Instituto Tecnológico de Estudios Superiores de Monterrey* (ITESM) and the *Universidad de Guadalajara* (UdG), two local universities that provided 17 staff members to assist the SMEs; (iv) The Lexington Group, a management consulting firm specializing in environmental issues, which provided EMS training and guidance to project participants; (v) the *Centro de Investigaciones y Estudios Superiores en Antropología Social* (CIESAS), one of Mexico's most prestigious anthropological research institutes, conducted a separate study on the role that culture change plays in the introduction of EMSs; (vi) Mexican federal, state, and local government officials who participated as observers in the pilot; and (vii) The World Bank who financed (in part) the pilot and participated as observers in the planning, training, and review sessions.

6. From February to May 1997, these groups held several sessions to make critical decisions about GEMP's development, the most significant of which was choosing to use the ISO 14001 EMS as a model without simplification. The core of the project was a series of plenary training and smaller review sessions from May 1997 to February 1998. EMS training was provided on a "just-in-time" basis with participants receiving training in the EMS elements that they could feasibly implement (with the assistance of their mentors and university consultants) in an 8-to-10-week period. At the end of each implementation period, the group reconvened, first in small workgroups to review progress, then as one large group to receive training on subsequent EMS elements.

Preliminary Results

1. Is the ISO 14001 EMS model appropriate for implementation by SMEs?

7. A widely expressed concern regarding the ISO 14001 model is that it is inappropriate for adoption by SMEs, because smaller companies find it both costly and difficult to implement formal EMSs due to their largely informal management systems and resource constraints (particularly with respect to personnel time and financing). Further, it is assumed that SMEs in developing countries have less incentive to apply the ISO 14001 model than large companies, because they are predominantly selling to domestic markets less concerned about environmental issues than the international markets of large companies. However, the industry participants in the planning sessions decided to use this model for the EMS without modification.

8. The experience to-date indicates that, compared to larger companies, SMEs both enjoy relative advantages and suffer particular drawbacks in the adoption of an EMS. A strong comparative advantage is the relative ease of generating a consensus and disseminating

information within an SME, activities that can absorb much energy in a larger company, as well as the significant benefits for SMEs from easily-achieved good-housekeeping practices. On the downside, while it is noteworthy that none of the SMEs indicated a lack of technical expertise on the details of their processes, many reported difficulties in the implementing the EMS resulting from the rapid rate of change that is a fact of life for many smaller companies.

9. It appears that given sufficient assistance with analytical tools and breaking the implementation of an EMS into manageable stages, the ISO 14001 model is appropriate for adoption by SMEs. According to the results presented by the SMEs during the review meetings held in October, 1997, and February, 1998, they have so far on average completed 85% of the policy and planning components of the ISO 14001 model, and 46% of the implementation and review components. The preliminary project findings indicate that:

- *The ISO 14001 model can be applied by SMEs with no modifications (with possibly the exception of documentation).* A survey administered in February, 1998 justified the decision to use the unaltered ISO 14001 model: only 8 percent of the SMEs suggested simplifying the EMS model. ISO 14001 provides a flexible, generic management systems model that can be applied by a wide variety of organizations. Most ISO 14001 requirements flow from the “significant environmental aspects” (SEAs) identified by the organization itself. These SEAs (and hence ISO 14001 requirements) will vary with the size and type of organization. Generally, the SMEs participating in the project identified fewer than 10 and often fewer than five SEAs, as compared to a large, complex chemical or refining operation which may identify several hundred SEAs. This means that for an SME the application of ISO 14001 is correspondingly simpler. However, one potential exception may be the requirements for documentation and document control. Many SMEs chose not to focus their energy on these elements because the required procedures would have added an unwanted layer of bureaucracy to their operations.
- *Although the ISO 14001 EMS model is appropriate for SMEs, most SMEs require substantial implementation support.* The project assigned one consultant to each SME to provide implementation assistance as well as a mentor company to monitor progress. In addition, the project involved tri-weekly meetings for the university consultant group with an expert on ISO 14001 implementation, and periodic training on ISO 14001 provided by The Lexington Group. Although in future projects this support could be streamlined, the fact remains that SMEs require substantial assistance to implement ISO 14001.
- *Particular areas where SMEs need implementation support include simplified formats, discrete milestones, management systems thinking and staff assistance.* Simplified formats and methods, developed by the project team, were critical to the success of the project in the opinion of 77 percent of the SMEs responding to the February 1998 survey. The assignment of discrete milestones for the accomplishment of specific implementation tasks proved quite important in maintaining discipline in schedules and a sense of accountability as well as in giving the participants a logical order of activities. For many of the SMEs, the ISO 14001 training was their first exposure to management systems concepts such as the plan-do-check-

act cycle or to systematic description of procedures. Thus, it was necessary to introduce generic management systems concepts as well as environmental management systems concepts (presumably, if successful, this process should result in improvements in both environmental and management performance). The local consultants, who were more experienced in systems thinking, also provided critical support in this area. Finally, the key scarce resource among the SMEs was time. Fifty-four percent of the SMEs considered lack of time a “critical” or “very important” barrier to EMS implementation. Usually, the SME representative also had very significant non-environmental responsibilities (operations or production manager, quality manager, maintenance manager, purchasing or sales manager). Significant help was provided by the assigned project consultant who often acted as a staff extension for the SMEs, providing not only expertise but “an extra set of hands” to assist the SMEs in completing the necessary tasks for EMS implementation.

- *The business culture of the firm, rather than its size, is probably a more important factor, in determining whether a firm can implement an EMS.* One of the major findings of the CIESAS study is that size alone was not a determinate factor in the implementation and effectiveness of EMSs. In fact, it may be that small and medium-sized firms can introduce EMSs more rapidly and easily than large companies exactly because of their smaller size and less formal social organization. However, there are several other factors within the “business cultures” of these firms which seem to be determinate elements in both their response to the training course, as well as their capacity to introduce functioning EMSs. In addition to size of firm, these business culture factors are the type of firm, the styles of administration, the education of the workforce, the firm’s management/production efficiency, its profitability/security, and finally its level of environmental consciousness. Another important factor in whether a firm did or did not institutionalize an EMS, according to CIESAS, was economic incentives, in particular, the perception that an EMS was needed to penetrate or increase both local and export markets, particularly in an area such as Guadalajara with a high concentration of multinational firms.

10. Finally, it is interesting to note that the International Standards Organization’s (ISO) Technical Committee (TC) 207, which developed the 14000 series of standards, itself had set up a special Task Group in 1996 to review whether a new EMS standard needed to be developed for SMEs. The recommendations of this Task Group to Sub-Committee 1 of TC 207 (as reported in a workshop during the ISO TC 207 Annual Meeting in June 1998) are that (i) no new standard for SMEs should be developed at this time; (ii) Sub-Committee 1 of TC 207 should take special account of the needs of SMEs at its next revision of ISO 14001 and ISO 14004 and should address the issues raised by members of the Task Group during their review process starting in July 1998, noting especially the concerns with the wording of ISO 14001 and its annexes and the usability of ISO 14004; (iii) ISO TC 207 should encourage its member organizations to continue to establish national groups to research and develop SME responses to its review process and to develop assistance/guidance to SMEs in their own countries, as well as to share this guidance via the Secretariat of Sub-Committee 1 with other member organizations; (iv) TC 207 should use its liaison with the ISO Committee on Conformity Assessment (CASCO) to promote understanding in certification bodies of the special needs of SMEs in implementing ISO 14001; and finally (v)

Sub-Committee 1 should continue to hold a special SME workshop at its plenary meeting and to promote interchange of information (through, for example, an electronic website) between all member countries. These recommendations, which are based on information from over 15 countries, and which required consensus-building from many more countries, are entirely consistent with the findings of this pilot.

2. Are networks among SMEs, large companies, universities, and government agencies effective mechanisms to promote implementation of EMSs by SMEs?

11. **Mentor Company Networks:** The most important role of the mentor large companies has been to invite the SMEs to participate in the pilot. Of the SMEs that completed an informal survey during the Progress Review Sessions in October 1997, about half stated that they would not have participated if they had been invited by either the government or a university. During the early stages, the motivation for participation in GEMP appeared to be largely based on the commercial interest of the SMEs in strengthening ties with their major clients, as demonstrated by the sudden loss of interest by SME management when a mentor ceased to be a customer during the course of the Pilot.³ The motivation provided by the mentor companies was particularly strong in those cases where, separate from any GEMP activities, they conducted combined quality assurance and environmental management audits of their suppliers.

12. Aside from such motivation and cooperation, the quality of the technical assistance for EMS development provided by the mentors to their SMEs has been mixed. Some multinational mentors, that have strong in-house EMS capacity and conduct supplier audits, have proven to be important sources of guidance for their SMEs. In other cases, lower levels of commitment to supplier development, and EMSs that are less developed than those of their SMEs, have limited the assistance the mentors can provide. Reflecting this variance in EMS expertise among the large companies, only 31% of the SMEs described mentor company support as “very important” or “critical” to the success of the project. Similar future initiatives could reduce such difficulties by placing greater emphasis on the EMS training provided to the mentor companies, and by building into the initial commitment of the mentors agreements to audit the EMSs of their SMEs at the end of the program, and in the longer term to provide second-party certification of any EMSs that fully meet the ISO 14001 requirements.

13. **University Consultant Networks:** The assistance provided to the SMEs by the consultants has been essential in ensuring progress in EMS implementation. Four aspects stand out:

- each SME was assigned an individual consultant from the UdG or ITESM as their main point of contact for assistance, providing the companies with an easily accessible, local source of support;
- each of the university consultants was able to draw on advice from other members of the team, whose backgrounds are diverse, and as a result, the SMEs had access to a wide range of skills. Nevertheless, none of the consultants were experts in the particular technologies of the

³ As was the case of SME #16.

SMEs, and it is noteworthy that this did not prove to be a source of complaint. Instead, the SMEs placed more value in the ability of the consultants to guide them in the development of a management system, and in the legal analysis of their compliance status, relying on in-house expertise for the more technical analysis of their processes;

- although the consultants from UdG and ITESM were entirely new to the ISO 14001 model at the start of the pilot, they have been effective in providing EMS advice to the SMEs. This was largely because The Lexington Group (which has extensive ISO 14001 experience) has provided standard formats and methodologies, and supplemented the two main training sessions with monthly review meetings. A number of SMEs have commented, however, that the consultants could have been more effective if they had learnt about EMS implementation before the SMEs, rather than at the same courses; and,
- some consultants (as in the case of the consultant for SME #9) were able to adapt specific cultural knowledge to the training process that resulted in improving and speeding up the implementation of EMSs in the SMEs. Further, the expertise of the university consultants in teaching and effectively working with groups was of considerable use as they worked with management and employees within the SME to help them better understand how to implement EMSs.

14. Finally, it is worth noting that this aspect of the project probably has the greatest developmental impact, in that by training and giving hands-on experience to 15-20 university consultants in EMS, the Pilot has helped to build long-term capacity in EMSs in Guadalajara. It is significant that even in February 1998, a number of university consultants participating in GEMP had been approached by companies outside of the Pilot (and SMEs, in particular) to help them develop and implement their EMSs in order to respond to large company client demands.

15. **Government Networks:** During the course of the Pilot, representatives of local and national environmental authorities attended many sessions of the project as invited observers, and in several sessions made presentations about how the pilot fitted into new initiatives they were planning. Generally, though, the impact of this involvement was limited. The pilot was undertaken at a time when SEMARNAP was defining the extent to which the federal government will promote EMS adoption, so the principle role of SEMARNAP representatives was to observe progress and update the participating companies on policy decisions. Although this involvement may have helped raise the profile of the initiative, perhaps stimulating management interest, there was also concern among the participating companies that such federal attention would attract additional enforcement actions, combined with a skepticism over the immediate relevance of the policy deliberations.

16. The most practical form of assistance received from the federal government was a review of the compliance checklist prepared by some of the mentor companies and used as an analytical tool by the SMEs in their initial self-evaluation. Written comments were received from the national headquarters of the *Procuraduría General de Protección al Ambiente* (PFPA), supplemented by discussions with PFPA's regional representative on the interpretation and application of the law.

17. Although state and municipal agencies have pledged their support for the initiative, such assistance was largely limited to the participation of current and recent office-holders in the consultant team. This in itself proved an ambiguous benefit: on the one hand, they provided valuable assistance in interpreting local regulations, but on the other, their uncertain status made participating companies fearful of attracting more stringent enforcement.

3. Does an EMS improve the environmental performance of SMEs?

18. Although it has only been three months since the SMEs completed the formal EMS training, and their systems are not yet fully complete, 14 of them have reported improvements in their environmental performance (see Table 4.1, Figures 4.2 - 4.3 in main report and Annex 1). Over 80 percent of the participating SMEs⁴ reduced their environmental releases, nearly 70 percent improved their work environment, and over 50 percent improved their economic performance while achieving environmental improvements. Slightly less than 50 percent of SMEs also reported improvements in waste handling, materials and energy efficiency, and compliance. It should be noted that these improvements have taken place *before* the full implementation of an EMS. The SMEs have yet to gain the full benefits of having established a systematic process to address the significant environmental aspects of their operations. However, this serves to illustrate the point that the gains from good housekeeping are potentially very large in the case of SMEs, and that an EMS provides a means to capture these gains very quickly.

19. Although these examples serve to illustrate improvements in environmental performance, the true impact of adopting an EMS is more profound. The ISO 14001 requirement for a commitment to continuous environmental improvement seems a realistic policy for the participating SMEs, largely because of two factors:

- the process of evaluating in a systematic manner their pre-existing environmental management, regulatory compliance, and environmental aspects has for many SMEs been instrumental in raising the environmental awareness of all staff, from directors down to production workers; and,
- the establishment of measurable environmental goals and the assignment of responsibilities for environmental aspects have led to organizational changes that ought to help ensure that environmental improvement is a sustained commitment.

4. Can the EMSs implemented through the pilot be sustained?

20. With the review workshop held in February, 1998, the first phase of the GEMP has been completed. The objective of the second phase (through February 1999) will be to observe progress, but no further training, assistance or direct motivation will be funded from World Bank

⁴ Only the 15 SMEs that attended the February 1998 review session are represented in these percentages quoted in this paragraph.

or grant resources, raising the question of whether the participating enterprises will continue to implement their SMEs.

21. Most of the SMEs have indicated in review sessions that they would continue the implementation of their EMSs, principally for one or more of the following reasons:

- the adoption of an EMS is a requirement of a major customer, usually the mentor company;
- the SME would like to achieve certification of their EMS for marketing purposes; and/or,
- implementation of an EMS is now company policy.

22. All the SMEs noted, however, that the most important motivating force will be to schedule future review workshops to provide discrete targets for continued improvement. The majority also indicated that the preference was that these sessions be organized either by the participating universities or the mentor companies. Since February, the companies have held a number of joint meetings to review administration arrangements of the Pilot, and in fact have set up a steering committee consisting of both large company, SME, and university representatives to guide the Pilot forward in this Second Phase. Visits during the coming year to review progress ought to provide a clearer answer to this question. Further, even though it remains to be seen whether GEMP can be sustained, there is already some evidence that it may be extending through the requirement by some of the SMEs that their own suppliers meet some environmental standards.

23. The culture change study also provides some indications of the sustainability of the EMSs. Per our hypothesis, a culture change in the participating firms ought to result in a potentially more rooted, permanent system. CIESAS postulate that participation in the training course and the introduction of the EMSs began a process of cultural change in these firms, and that a measurable culture change was observable in the firms that fully implemented an EMS. To understand the nature of this change process, the CIESAS researchers used the anthropological notion of “culture change agents” distinguishing among the training course itself (organized and executed by the Lexington Group), external change agents such as the mentor companies and the university consultants, and internal change agents such as the interdisciplinary groups within each company, the company management and the company workforce.

24. According to the CIESAS study, one of the outcomes of the training course was that it provided a new language and cognitive framework by which the participating company representatives could think about and discuss issues relating to industrial production and the environment. For many of the participating small and medium-sized companies, the EMS training was their first exposure to “management systems thinking” which, along with the other training course materials, provided a new way of thinking and talking about their own management and production processes. Learning a new language and logic became, in a profound cognitive sense, the first stage in the cultural change process.

25. At the level of the external change agents, CIESAS's findings were completely consistent with the earlier conclusions of the value of the mentor company supplier-chain networks and the crucial role played by the university consultants as key agents of culture change. At the level of the enterprise or factory, the CIESAS team found three factors to be important: (i) the nature of the so-called "inter-disciplinary group", who usually held multiple roles within their companies and had to balance their environmental responsibilities with other management and work responsibilities, and whose main role was to communicate the messages from the training course to the factory's personnel; (ii) upper management's "ownership" of the process, that is, how much it internalized the EMS philosophy and framework and was willing to incorporate it into the company's overall business strategy; and (iii) the participation of the plant-level workforce in the implementation of the EMS. In particular, successful EMS implementation also seemed to depend upon a "downward" dissemination process which "empowered" workers to participate in environmental management through adaptation of the system to their work habits and stations.

26. Finally, the CIESAS study provides some insights into how to sustain the cultural change process initiated through the introduction of the EMSs. Perhaps the major finding of the study in terms of sustainability is that, in order to be effective, EMSs need to be incorporated into the overall business strategies of companies as part of a general cultural change process linked to continuous learning, improvement and innovation. Size of firm is not the major factor for successful EMS implementation.

Replicating the Pilot

27. The pilot evolved during the course of the first phase, resulting in a practical model for delivering EMS support to SMEs. These successful experiences of GEMP include:

- The importance of the large company-SME network as a vehicle for recruiting and motivating SMEs. As mentioned earlier, about half of the SMEs, that fully participated in GEMP's first year of activity, stated that they would not have participated in the Pilot if they had been invited by either the government or a university.
- The critical role of the university consultants in helping the SMEs with hands-on implementation support. From providing training to workers in general environmental concepts to advising on management systems and legal requirements to just being an "extra pair of helping hands", this support was rated by 62% of the SMEs as "very important" or "critical".
- Provision of "just-in-time" training and simplified formats made the training sessions more manageable. Further clear definition of milestones gave the SMEs achievable targets at the end of each training session.
- Regular review session helped to share and compare different approaches, as well as gave the SMEs networking opportunities. It is also worth noting the importance of maintaining the same workgroups over time to build cohesiveness within the group. These review sessions

gave “teeth” to the milestones - the importance of talking about their own successful achievements in front of their peers was additional incentive for the SMEs to implement their training in time for the next review session.

- There was considerable industry “ownership” of the Pilot. One individual from a large company took on the role of “champion” of the Pilot, encouraging other large companies to participate, leading the process of setting project objectives and milestones, and advocating the project before regulatory authorities. Decision making and initiative were also in the hands of the industry participants from the start - with the large companies matching the World Bank’s funding for the international consultant; the SMEs and large companies jointly making key decisions, such as whether to use the ISO 14001 EMS model without adaptation; and the companies jointly participating in the identification of internal barriers to better environmental management, the development of formats, and the establishment of project milestones.
- The initial focus on senior management was important in giving the Pilot priority within the participating firms. The companies themselves identified senior management commitment as a key hurdle to achieving better environmental management, and as a result at the start of the Pilot, a two-hour session on EMS was scheduled purely for senior management of the large and small companies.
- The Pilot’s *convenio* and other contracts between the various parties provided the legal terms of reference. Given the large number of players involved in the Pilot, these documents were a way of clarifying the roles and responsibilities of the participants.
- Confidentiality of discussions and data was maintained, and this was essential in allowing the companies to talk freely about their environmental issues (particularly those related to compliance).

28. Clearly large scale replication of this Pilot needs to draw upon and utilize the successful experiences from this Pilot, as noted above. However, future such projects will benefit from a number of lessons learned through GEMP. The major areas that were identified for further improvements include the following:

- With hindsight, the large companies required greater support in EMS implementation than provided by GEMP. As noted earlier, many of the SMEs left their mentors behind with respect to EMS capabilities, and future projects will help to strengthen the mentor-SME link and utilize this even more effectively by providing assistance to the large companies as well, in return for the large companies’ financial contributions. The mentor-SME link would also be further strengthened if the large companies were required to implement an EMS in part or all of their installations, as well as commit to auditing their SMEs’ EMSs at periodic intervals.

- During GEMP, the university consultants, mentors and SMEs all attended training sessions together. Future pilots need to provide training to the large companies and university consultants in advance, so that they can better support their SME clients.
- GEMP involved at any one time as many as 60 to 70 participants. Despite *convenios* and contracts between the various parties, misunderstandings arose due to different expectations on the part of these parties, partly due to each contract being negotiated separately from the others, with only the priorities of those concerned individuals. Future pilots need to allocate a significant amount of time in building joint consensus of expectations of all the players and establishing an open communication process to avoid misunderstandings
- In GEMP, the role of the university consultants turned out to be more critical than originally anticipated. As a result, not much thought was given to the incidental expenses for university consultants (such as for travel to SMEs). This needs to be taken into account in future Pilots.
- The relationship of the Pilot to national, state and local regulatory programs needs to be well-defined. GEMP took place during a time of important changes in Mexico's industrial regulatory programs. Therefore, the relationship of the project to the emerging systems could not be defined. For future projects, it will be important to define at the outset the rights, responsibilities, and recognition the participating companies will receive within the regulatory system. In other words, the companies need to know what is expected of them and what they will receive in return.

29. In line with the lessons learned from the Pilot and the clear direction of the culture change study, scaling up to a national level program needs to further mainstream this initiative with other more broad initiatives, such as (i) linkage with industry associations and centers of general assistance to industry; and (ii) linkage of this Pilot with other supplier development programs in large companies, such as for quality management. In doing so, these linkages will result in mainstreaming the environment within the general business needs of the firms. In this way, the small-and-medium sized business sector can contribute to broader societal goals of environmental sustainability while increasing its chances of economic survival in a world of global markets and competitiveness.

30. Another potentially interesting linkage that could be tested in future pilots would be to use geographical proximity (for example, an industrial park, a small industrial town, or firms located around a water basin) as a basis for choosing firms. Whilst this might lose some of the advantages to be gained (as was the case in this pilot) from commercial linkages, it would have the advantage of being able to better measure changes in the location's environmental quality, as well as allow more collaboration between the local neighborhood, the authorities and the firms themselves. Further, the proximity of firms might bring significant economies of scale to their control processes for managing effluents and hazardous waste.

31. Linkages of a national program with other industrial and environmental initiatives within the country, such as clean production programs, credit lines for industry, general programs for

assistance to industry (e.g. enhanced competitiveness /export development programs) is also essential. EMSs and promotion of EMSs ought to fit within the country's broad strategy for industrial and environmental management.

32. Finally, a critical aspect of GEMP was the involvement of the universities and through their involvement, the building of local capacity in EMSs. University courses related to environmental management (whether through engineering, law, industry, environment degrees) could provide a flow of people who could potentially assist SMEs. Indeed, GEMP could equally be viewed as a model to deliver hands-on training experience in EMSs to such people. Sustainable replication at the national level needs to consciously build this in-country capacity in a systematic manner within several organizations (to prevent monopolies) and to encourage information exchange and sharing between these bodies in order to build a strong national foundation, by assembling simple tools such as tried and tested formats, case studies, compliance check lists, EMS training modules, and a basic database of sectoral level information on raw material usage per unit of output in environmental leader firms.

Conclusion

33. In conclusion, the GEMP model appears to be a practical tool to help SMEs to improve their environmental performance. The preliminary results of GEMP are consistent with the "new environmentalism" and illustrate the key role EMSs can play in improving environmental performance. The GEMP model itself demonstrates the value-added of using partnerships to target and support SMEs. One question, however, remains unanswered: what policy tools can be employed to best promote such initiatives? As these potential tools are considered, it is useful to keep two principles in mind: government can promote, but not require, the adoption of particular management methods within firms, and industrial environmental initiatives do not relieve industry of the responsibility to comply with basic regulatory requirements.

34. As described earlier, there is a general belief that SMEs, which usually supply domestic markets, lack the incentives to implement a formal EMS, such as ISO 14001 due to the fewer potential market benefits. It is interesting to note, however, that the CIESAS study indicates that an important factor in whether a firm did or did not institutionalize an EMS was, in particular, the perception that an EMS was needed to penetrate or increase both local and export markets, particularly in an area such as Guadalajara with a high concentration of multinational firms. Whilst, the pilot shows that large companies have a kind of leverage over their small suppliers which regulatory authorities lack, it is also important for wider-scale replication of the pilot to take a closer look at the potential government role.

35. A government's decision on how actively it should promote such a model should be subject to (i) an evaluation of the significance of pollution from SMEs, and (ii) the potential benefits from bearing the costs of such an activity. Examples of the latter are the reduction of costs as a result of reduced inspection frequency in the SME sector, enhanced economic performance by SMEs addressing environmental concerns more cost-effectively, and better environmental performance from this sector. It is interesting to bear in mind that at the start of GEMP, many of the SME representatives were not aware of all their legal regulatory

requirements. The process of implementing an EMS heightened this awareness. Further, many SME representatives commented in the February 1998 progress review session that the process of implementing an EMS considerably increased their capability to comply with the law as it helped to set up a framework within which they could identify and tackle areas where they were out of compliance.

36. If a government were to decide to support EMS adoption by SMEs, a range of policy tools is available for use. Low cost options include promotional activities for the creation of private sector EMS networks, public recognition of participating companies, reduced or accelerated administrative requirements (such as faster environmental approvals and permitting procedures or fewer inspections), and efforts to harmonize environmental and other regulations with EMS implementation. More active promotion could include partial financing for EMS training, or even fiscal incentives for companies with certified EMSs. At the very least, governments could learn much from further similar pilots, particularly regarding the difficulties faced by small and large firms in complying with regulations, how to build partnerships for improved environmental management, and finally, how to develop more effective regulatory frameworks.

37. Finally, depending on a government's decision to promote such a model, a number of World Bank instruments could be used to support such initiatives in developing countries. In this particular case, due to the pilot nature of this activity, the costs of the pilot⁵ were borne by the Bank from its own budget as part of its non-lending services program, as well as through grant financing from the Norwegian Government, and by the participating large companies. In future initiatives, potential Bank instruments that could be used to finance such pilots, include stand-alone Learning and Innovation Loans (LILs) as well as regular Bank loans for environmental management or improved industrial competitiveness, where a national program based on this pilot could be one component of that loan. Additionally, the Bank could play an important role in acting as catalyst and facilitator to help build partnerships between private and public entities (for example, through its Business Partners for Development Initiative) or assist in the interchange of lessons learned as a result of such initiatives (through, for example, programs implemented by its Economic Development Institute).

⁵ The cost of this pilot was approximately US\$ 135,000, excluding Bank staff time and travel costs.

THE GUADALAJARA ENVIRONMENTAL MANAGEMENT PILOT

1. In November, 1996, an agreement was signed between Mexico's *Secretaría de Medio Ambiente, Recursos Naturales y Pesca* (Ministry of Environment, Natural Resources and Fisheries, SEMARNAP) and eleven large companies with facilities in the city of Guadalajara, to work together to improve the environmental management of selected smaller-scale enterprises. The World Bank also signed the agreement as a witness, and made a commitment to support the pilot project, principally to learn from this innovative approach how to better promote environmental performance improvements in small and medium-size enterprises (SMEs).
2. This report presents the lessons that can be drawn from the pilot, based on experience up to February, 1998. The approach adopted by the project is first placed in the context of both the "new environmentalism" identified by the World Bank in 1996, and also the process of environmental modernization currently underway in Mexico. Subsequently, the local context, design and objectives of the pilot are discussed in detail, before an examination of the preliminary results. The report ends by considering how the experiences and lessons of the pilot can be applied to replicate the approach in other settings.

1. ENVIRONMENTAL MODERNIZATION

3. The Fall, 1996, edition of the World Bank publication "Environment Matters" presented the results of an extensive review of the Bank's environmental activities.⁶ Based on this review of investments covering a wide variety of environmental problems, from industrial and municipal pollution, through rural environmental management, biodiversity conservation and institutional strengthening, the article identified the emergence of a "new environmentalism", that marks a significant departure from the traditional approach to environmental policy-making adopted by OECD nations over the last 30 years.
4. Environmental modernization can be defined as the process of institutional transformation and policy reform that allow the principles of the new environmentalism to be implemented. In this chapter, we first look at the implications of these principles for the management of industrial pollution, and in particular, how these principles highlight (i) the need to form partnerships for environmental management, (ii) the value of establishing environmental management systems (EMSs) within industrial facilities, and (iii) the importance of flexible regulatory regimes to allow such partnerships and EMSs to be fully effective in reducing the cost of environmental improvement. Subsequently, we briefly examine why SMEs present a special case for assistance in applying these principles.

⁶ *Environment Matters*, World Bank Environment Department, Fall 1996. See also Andrew Steer, "Ten Principles of the New Environmentalism", *Finance & Development*, December 1996.

A. THE NEW ENVIRONMENTALISM AND MANAGEMENT OF INDUSTRIAL POLLUTION

5. The review of the Bank's environmental activities conducted in 1996 identified ten principles that form the basis of the new environmentalism. To briefly summarize, these principles are:

- set priorities carefully, to ensure the highest economic return from scarce financial resources;
- adopt the most cost-effective solutions through a multi-disciplinary approach to problem solving;
- harness "win-win" opportunities first, through policies that achieve environmental goals as a by-product of more efficient resource use;
- use market instruments where feasible, to take advantage of the economic gains their flexibility offers compared to traditional command and control regulation;
- economize on scarce administrative and regulatory capacity, by adopting less "enforcement-intensive" policies, and leveraging the interest of non-governmental and community groups in environmental protection;
- work with the private sector, not against it, to achieve innovative least cost solutions;
- involve citizens thoroughly, to better establish priorities, identify cost-effective solutions, ensure commitment in implementation, and build constituencies for change;
- invest in partnerships that work, combining the resources and interests of civil society, the private sector and government;
- remember that management is more important than technology; and,
- incorporate the environment from the start, since the biggest gains can be made at the design stage.

6. These principles were distilled from experience in dealing with a wide range of environmental issues, encompassing both "green" challenges of natural resource management, and "brown" questions of industrial and municipal pollution control. When focused more directly on the problem of industrial pollution, we believe that these principles can be further condensed into three recommendations, each relevant at a different level of social interaction.

7. First, at the broad level of interactions between multiple users of the environment, the principles stress the value of building partnerships between and within the private sector, community groups, NGOs, and government. These partnerships allow environmental concerns to be identified more clearly, facilitate the negotiation of solutions, permit a more effective exchange of knowledge and expertise, and build multiple sources of social pressure to ensure that environmental commitments are honored.

8. Second, at the level of the industrial facility, the principles indicate the need to set cost-effective priorities through a multi-disciplinary approach within the enterprise that takes advantage of win-win opportunities. Further, the principles emphasize that management is more important than technology, and that environmental considerations should be included at the design stage. Together, these guidelines sketch out both the need for, and the fundamental

characteristics of, a system that allows the environmental impact of an industrial facility to be managed strategically as part of the business - an environmental management system.

9. Finally, at the level of regulatory interactions between government and industry, it is recommended that flexible mechanisms are applied to ensure that environmental goals are achieved at the lowest economic cost. Without such flexibility, it would not be possible to fully benefit from the EMSs established within industrial enterprises, nor the partnerships between the users and regulators of the environment.

10. We briefly discuss some of the international experience that forms the basis for each of these recommendations below, before turning to the particular circumstances of small and medium-sized enterprises.

B. PARTNERSHIPS FOR ENVIRONMENTAL MANAGEMENT

11. As countries have strengthened their environmental ministries and adopted environmental regulations, the realization has grown that the government is only one player in the complex set of interactions which define environmental management, and that effective partnerships are needed at all levels in order to tackle environmental issues successfully. The limited budgetary and administrative resources available to environmental ministries relative to their more powerful, longer-established sectoral counterparts, have compounded this awareness.

12. Three principle forms of partnership that can help lead to more effective environmental management, and specifically management of the environmental impacts of industrial activity, can be identified on a functional basis. First, in resolving local disputes over a particular impact, the chances of success are greatly enhanced if local citizens are actively involved. Such participation allows better advantage to be taken of local knowledge of priorities and potential solutions, and builds stronger commitment to the resolution eventually achieved. Second, partnerships that link sources of expertise and experience in dealing with industrial pollution issues can significantly enhance the ability of individual facilities to deal with these challenges. Finally, forums that allow regulators to consult with industry representatives in establishing environmental policy can help identify more cost-effective approaches to reaching policy goals, and can strengthen compliance with the mechanisms developed.

13. The Bank's portfolio has reflected the growing realization of the importance of partnerships, with project designs which increasingly include greater roles for civil society, from environmental education campaigns to build awareness, through the establishment of processes to allow the public to participate more directly in environmental impact assessments, to the example of the PROPER scheme in Indonesia, whereby industrial environmental indicators are published, permitting the public to play a critical role in encouraging industrial environmental compliance. The Bank's treatment of the interaction between industry and the environment also reflects this pattern. In a review of Bank industry and environment projects,⁷ Ahmed suggests

⁷ Kulsum Ahmed, *Industry and Environment: Patterns in World Bank Lending*, IEN Staff Report, February 1995.

that a trend can be observed whereby project design has evolved during a period of 20 years, from the inclusion of an environmental component in an industrial project (Type I) to environment related industrial projects (Type II) to inclusion of industrial components in general environment projects (Type III).

C. ENVIRONMENTAL MANAGEMENT SYSTEMS

14. An Environmental Management System (EMS) is a systematic approach to controlling the environmental effects of an organization's activities. Unlike a pollution control standard, an EMS standard does not set specific pollution targets, but establishes the required elements of an effective system. Consistent with the new environmentalism, an EMS provides the tools for a holistic approach to identify and tackle an organization's significant environmental aspects. In doing so, it prevents technological predeterminism, in that neither clean technologies or end-of-pipe treatment or good housekeeping are encouraged *per se*. It also places the responsibilities for operating the system squarely in the hands of the organization itself, its management and its employees.

15. Evidence for the value of an EMS in ensuring superior environmental performance is provided by a survey of environmental management in Mexican industry, conducted in 1995. An analysis of the results of this survey by the World Bank showed that the more EMS elements a plant has in place, the better the facility's environmental performance.⁸ The analysis also underlined the importance of fully incorporating the EMS into mainstream business procedures, since the provision of environmental training and the assignment of environmental tasks to specialized environmental personnel was found to be less effective than involving personnel with general production duties.

16. It is important to note that promotion of EMSs does not obviate the need for a strong framework of environmental regulation, nor does the adoption of an EMS substitute for compliance with environmental regulations. Rather, an EMS should be viewed as a tool to help ensure cost-effective compliance, and to encourage the continuous improvement of environmental performance beyond the regulatory minimum.

(1) The ISO Standard for Environmental Management Systems

17. In the recent past a number of voluntary EMS standards have been developed, including the British Standard Institute's BS7750, published in 1992, and the European Union's Eco-Management and Audit Scheme (1994). In the same year that BS7750 was published, the International Standard Organization (ISO), an international non-governmental organization, made a commitment to identify ways it might help promote "sustainable business development" in support of the U.N. Conference on Environment and Development, held in Brazil in June 1992. To this end, ISO formed the Strategic Advisory Group on the Environment (SAGE).

⁸ See footnote 2.

Recognizing the desire to improve environmental performance in the business community, and conscious of the potential trade barriers that might be raised by competing standards, SAGE recommended the formation of a Technical Committee to develop voluntary international standards for environmental management systems and tools. Through an iterative process of consultation, building partnerships between governmental and private sector representatives from its 112 member countries, ISO published the ISO 14001 standard on Environmental Management Systems in 1996. While each EMS model presents its own strengths and weaknesses, the ISO standard has attracted particular attention, largely because of the importance of ISO in the global market place.

18. The ISO 14001 standard identifies a series of elements as requirements of an effective EMS, including:

- **an environmental policy**, defined by top management and communicated throughout the organization, specifying commitment to compliance with environmental legislation, pollution prevention, and continual improvement in environmental performance;
- **planning**, starting with the identification of environmental aspects and legal requirements, from which objectives and targets are set and incorporated into an environmental management program that defines responsibilities, means and time-frame;
- **mechanisms for implementation and operation** of the environmental program, covering the structure of responsibilities, training, communication, documentation, and emergency preparedness;
- **procedures for checking and corrective action**, especially for monitoring and measurement, correcting nonconformance, maintaining records, and conducting periodic audits; and,
- **management review** of the EMS, to ensure its continuing effectiveness.

19. This model was developed through a protracted process of international negotiation, and as a result reflects a number of compromises for which it has subsequently been criticized. Among these, two weaknesses have attracted particular attention. First, the ISO 14001 standard does not require that a certified organization be in compliance with environmental legislation, only that the environmental policy include a commitment to compliance, and that the EMS include a mechanism for identifying regulatory requirements and establish a plan for achieving them. Second, an ISO 14001 certified organization is only required to publicly communicate its environmental policy, not its environmental aspects and program.

(2) Environmental Management Systems and Environmental Cultural Change

20. A growing body of evidence indicates that without fundamental changes in corporate outlooks, values, and behavior it will be difficult to resolve the serious problems of pollution in industrial societies. This holds true whether industrial enterprises are large multinational companies, or medium or smaller-sized, national firms. Environmental change is part of a broader process of culture change which must take place within industrial enterprises as well as in other segments of society if economic development is to be environmentally sustainable.

21. EMSs appear to be an excellent instrument for both understanding and promoting cultural change within industrial enterprises. This is because EMSs focus attention upon a number of critical aspects of business organization, including productive processes and technologies, management styles and systems, worker education and participation, internal communications, and relations of industrial enterprises to regulatory agencies, local governments, and neighboring communities. In doing so, they mainstream environmental aspects into the organization's business management system. Further, the process of establishing an EMS requires "buy-in" from different levels of management and from the employees of the company in order to successfully operate such a system. This suggests that as a result of the successful implementation of an EMS, a change in environmental culture occurs within the organization, where culture change can be defined as a change in environmental behavior as a result of increased environmental awareness and empowerment.

D. FLEXIBLE MECHANISMS FOR ENVIRONMENTAL REGULATION

22. The economic gains that can be achieved through the greater flexibility of Market-Based Instruments (MBIs) rather than Command and Control Instruments (CCIs) are well understood in theory, and are increasingly being realized in practice, for example through the application of wastewater charges in the Netherlands, China, the Philippines and Colombia. In addition, programs that support and recognize voluntary initiatives, including eco-labelling schemes, environment audits, and EMSs, such as ISO 14000 and Responsible Care, provide a flexible mechanism through which industry can respond to wider environmental concerns. By broadening the possible scope of responses, voluntary programs also help empower non-regulatory stakeholders with an interest in industry's management of the environment.

23. Such flexibility is essential if the potential benefits of the partnerships and EMSs discussed above are to be fully realized. Illustrating this point, the corporate headquarters of Du Pont analyzed about four thousand proposals for environmental investments submitted by the corporation's individual businesses between 1994-1997. The amount of waste that could be reduced through "efficient" voluntary initiatives was more than five times the reduction achievable through projects required for regulatory purposes, and the cost of the regulated projects, per pound of waste avoided, was more than 10 times higher than that of the non-regulated initiatives.⁹

E. THE SPECIAL CASE OF SMALL AND MEDIUM-SIZED ENTERPRISES

24. The SME sector in many countries is a significant portion of the total industrial sector. In the case of Mexico, 89% of manufacturing industrial establishments are so-called "micro" facilities, with less than 15 employees, and a further 10% are SMEs (less than 250 employees). Together, micro and SME facilities account for about 50% of employees in the manufacturing

⁹ Personal communication with Darwin Wika, Director Safety, Health and Environment, Du Pont, April 1998.

sector.¹⁰ Many governments view promotion of SME business sectors as a high priority because of their reputed ability to absorb excess labor, grow rapidly, eradicate poverty, and nurture an indigenous business class. There is increasingly evidence that SMEs do create jobs and that a significant number of SMEs do grow larger. Further, SMEs' abilities to respond quickly and flexibly to changing market opportunities remain unchallenged.

25. The World Bank has been supporting small business development for about 25 years.¹¹ Bank lending for SME development first began in 1973 with the dual objectives of fueling economic growth and of employment creation. The economic argument was that small firms do not have access to the financial and technical services that are available to large firms due to market imperfections that, in fact, discriminate against small firms. The practical argument was that building strong SME sectors would create jobs at low cost, promote decentralized industrial growth, and develop an entrepreneurial base.

26. It is estimated that between FY73 and FY97, the Bank approved 81 loans that directly support SMEs in 39 countries with a total loan amount of US\$3.4 billion. Over this period, however, the design of the projects has evolved considerably. The initial projects were stand-alone SME operations consisting of a credit line channeled through the banking sector to eligible SMEs and a technical assistance program delivered by government enterprise promotion agencies. Current projects integrate SME issues within a broader framework, such as having SME set-asides within more general industrial credit lines; or infrastructure projects that focus on building/repairing infrastructure through contracts with the private sector, particularly SMEs; or social funds where the main objectives have been improvements in infrastructure and community development, but a significant extra benefit has been employment creation for SMEs. There has also been a continuance in the building of capacity within SME support institutions; however the focus has shifted from supporting government promotion/extension agencies to improving SMEs' competitiveness mainly by upgrading national capacity in technology-related areas, including standards, technology consulting, and twinning with foreign companies.

27. Despite this extensive history in general developmental lending for SMEs, the environment sector has lagged behind. A preliminary review indicates that there are only a handful of loans with an SME-focused component in Bank Industry/Environment lending.¹² These examples are mainly to be found in China and India, and date from 1992. The SME components usually consist of one or more of the following: (i) environmental fund with a partial/complete focus on SMEs; (ii) technology development/cleaner production centers, again with a partial/complete focus on SMEs, and (iii) common treatment facilities, usually of industries of small size in a concentrated area.

¹⁰ *Ciudades y Giros Prioritarios en Relacion con la Contaminación Industrial en México*, AMBIO, September 1995.

¹¹ This section draws in large part from an internal Bank report: *World Bank Support for Micro, Small and Medium Business*, Leila Webster, Private Sector Development Department, July 10, 1997.

¹² Internal Bank memoranda on Review of Bank Experience on Industrial Pollution Control Assistance to SMEs, Ede Ijjasz, January-February, 1998.

28. It is interesting to note that these components imply a certain environmental sophistication on the part of the SME in that they assume that the SME has a degree of awareness of the environmental aspects of its operation. A survey of environmental management in Mexican industry, conducted in 1995, clearly indicated that size of facility is one of the most important determinants of EMS implementation, with SMEs less than half as likely as large companies to have EMS elements in place.¹³ This clearly raises the issue of how to enhance the environmental awareness of SMEs, and more particularly, how to improve their EMSs.

2. ENVIRONMENTAL MODERNIZATION IN MEXICO: BUILDING MOMENTUM

29. Environmental modernization has been underway in Mexico for a number of years. Major institutional milestones in this process include the creation of the office of the Federal Attorney General for Environmental Protection (*Procuraduría Federal de Protección al Ambiente*, PFFPA) and the National Institute of Ecology (*Instituto Nacional de Ecología*, INE) in 1992, followed by the regrouping of environmental responsibilities under a new Ministry of Environment, Natural Resources and Fisheries (*Secretaría de Medio Ambiente, Recursos Naturales y Pesca*, SEMARNAP) in 1994.

30. Associated with these institutional developments are a series of programs that implicitly recognize the value of the principle elements of the new environmentalism for improving the management of industry's impact on the environment. Below, we briefly describe how these programs promote the adoption of EMSs, support the development of partnerships for environmental management, and provide flexible mechanisms for recognizing voluntary environmental initiatives. We conclude this chapter with a look at the results of a survey of environmental management in Mexican industry, which highlights the importance of strengthening EMS capacity, especially among SMEs.

A. EMS PROMOTION: VOLUNTARY ENVIRONMENTAL AUDITS

31. Stimulated by a major industrial environmental catastrophe in Guadalajara, the Federal Government created PFFPA in 1992, including the office of the Deputy Attorney General for Environmental Audits. From the outset, such audits were seen as a voluntary mechanism to assist industry in the resolution of their environmental challenges, and in many respects they anticipated the EMS standards that were subsequently published by the British Standards Institute, the European Union, and the International Standards Organizations. The scope of such audits covers:

- the identification of potential risks;

¹³ See footnote 1.

- the definition of systems to minimize such risks;
- the design of emergency response plans; and,
- a review of compliance with regulations governing industrial safety, occupational health and environmental protection.

32. Once the necessary corrective and preventive actions have been determined, an action plan is formulated, providing the basis for an agreement between PFPA and the audited facility. Under this agreement the facility assumes the obligation to resolve any irregularities encountered through the audit. Since the formation of the institution, PFPA has undertaken environmental audits at more than 900 facilities, focusing on the highest risk sectors of production.

33. In 1997 a new step was taken in the Voluntary Environmental Audit program, with the award of Clean Industry (*Industria Limpia*) certificates to the first 115 companies to complete the action plans developed as a result of the initial audits. Such public recognition firmly underscores SEMARNAP's support for EMSs as an invaluable tool for improving industrial environmental performance.

B. A FRAMEWORK FOR NEW ENVIRONMENTALISM: REFORM OF THE ECOLOGY LAW

34. In December 1996, after a year of consultations with representatives from a wide range of society, the Mexican Congress approved a major reform of the framework environmental legislation, the General Law of Ecological Balance and Environmental Protection (*Ley General del Equilibrio Ecológico y Protección al Ambiente*, the Ecology Law). Some of the principle objectives of this reform were to:

- establish a gradual process of decentralization of environmental management;
- broaden the participation of civil society in environmental decision-making;
- incorporate economic instruments into environmental policies; and,
- promote voluntary environmental programs and standards.

35. The implementation of these new legal mandates provides significant additional impetus for environmental modernization in Mexico. Programs based on these principles will accelerate the formation of partnerships between all interested elements of society for the identification, negotiation and resolution of environmental challenges. Additional efforts to promote voluntary environmental initiatives will foster the adoption of EMSs by industry. And the further incorporation of economic instruments will grant environmental policies the flexibility necessary to fully realize the benefits of such partnerships and voluntary undertakings.

C. REGULATORY MODERNIZATION: INTEGRATED ENVIRONMENTAL REGULATION

36. On April 1, 1997, the President of Mexico announced a new policy for the environmental regulation of industry, based on the 1996 reform to the Ecology Law, and the national

Environment Program, 1995-2000. A principle element of the new policy is the Integrated System of Direct Regulation and Environmental Management of Industry (*Sistema Integrado de Regulación Directa y Gestión Ambiental de la Industria*, SIRG), which is currently undergoing testing prior to full implementation. The three basic elements of the SIRG are:

- the Single Environmental Licence (*Licencia Ambiental Única*, LAU);
- the Annual Certificate of Operation (*Cédula de Operación Anual*, COA); and,
- the Voluntary Program of Environmental Management (*Programa Voluntario de Gestión Ambiental*, PVG).

37. Together, these elements will help SEMARNAP better integrate the control of pollution across media, stimulate public participation in environmental decision-making through fuller information provision, and promote wider involvement of industry in voluntary environmental management initiatives.

38. The LAU is intended to enable SEMARNAP to achieve a more integrated approach to environmental licensing by building regulatory partnerships between the agencies responsible for different aspects of environmental management. It will incorporate in a single process the regulatory requirements regarding environmental impact and risk, atmospheric emissions, use of national waters, waste-water discharges and the management of hazardous waste. Pilots are also being undertaken to test mechanisms for coordinating environmental licensing requirements between federal, state and municipal levels of government.

39. Through the COA, regulated industry will submit annual data on the generation, transfer and disposal of waste. In addition to using this information to update licenses, the COA will enable SEMARNAP to publish an annual Register of Emissions and Transfer of Pollutants (*Registro de Emisiones y Transferencia de Contaminantes*, RETC), strengthening the role of civil society in partnerships for improved industrial environmental performance. It is also intended that the annual process of measuring waste generation will encourage industry to adopt voluntary waste minimization and control measures.

40. Participation in the PVG is a voluntary option, intended to promote environmental management as an integral part of business administration. While seeking to encourage continuous improvement in environmental performance based on pollution prevention and the sustainable use of natural resources throughout the production chain, the PVG is designed to be sufficiently flexible to allow companies to adopt an EMS appropriate to their needs.

D. THE STATUS OF ENVIRONMENTAL MANAGEMENT IN MEXICAN INDUSTRY

41. During 1995, INE and the World Bank sponsored a survey of the status of environmental management in Mexican industry, based on in-person interviews with representatives of 236

industrial facilities chosen to represent a variety of potentially polluting sectors, geographic locations, and plant sizes.¹⁴

42. Of the facilities visited, 30% stated that they consistently complied with regulatory requirements. An additional 6% responded that they exceeded regulatory requirements, and rated their environmental performance as being world class. The characteristics of this elite group provide an indication of the factors likely to lead to improved environmental management in Mexican industry, starting with the observation that the senior management of these companies were five times more likely to place a very high priority on environmental issues than the management of the rest of the sample. Associated with this management commitment, 80% of the leading companies possessed written environmental policies and plans, compared to only 30% of the full sample, and 90% of the leaders maintained programs to prevent pollution. These companies were also more likely to give environmental training to non-environmental staff, to measure environmental performance, and to integrate environmental considerations into business decisions. The importance of a system for environmental management is highlighted by the observation that the more elements of an EMS a company had implemented, the more likely it complied with or exceeded environmental regulations.

43. The survey also helped determine the factors that increase the likelihood of a company implementing an EMS.¹⁵ Those companies that considered regulatory requirements to be influential were also more likely to adopt elements of an EMS, underlining the importance of maintaining a strong regulatory system. In this regard, SMEs pose a particular challenge, however: two-thirds of those in the sample reported that they had little knowledge of regulatory requirements regarding the environment, and one third claimed they had no sources of environmental information. Partly because of this, only one third of the surveyed companies with less than 100 employees responded that they met or exceeded regulatory requirements, compared to two-thirds of the large companies. Independently of concern for regulatory requirements, size of company was also found to be a strong determinant of the extent to which an industrial facility had implemented an EMS.

44. These observations suggest that as part of Mexico's environmental modernization, SMEs require special assistance in the adoption of an EMS, which can provide a platform for not only meeting, but exceeding regulatory requirements.

3. THE GUADALAJARA ENVIRONMENTAL MANAGEMENT PILOT

45. The Guadalajara Environmental Management Pilot (GEMP) was initiated in Guadalajara, Mexico in the Fall of 1996. It's primary objective was to assist about 20 SMEs to implement EMSs, using large company-SME linkages as a mentor support system. The World Bank's

¹⁴ See footnote 1.

¹⁵ See footnote 2.

involvement in this Pilot was under its Non-Lending Services Program, following a request from SEMARNAP. As described in the previous Chapter, the basis for implementing such a Pilot arose from the findings of a survey administered by the Government and the Bank of industrial environmental management practice in Mexico, which found that the potential for assisting SMEs in environmental management was substantial, and that EMS expertise was already present in many larger companies. The objective of the Pilot was to answer a number of policy questions related to EMSs and SMEs. In this chapter, we present the context and the background of the Pilot. The first section gives some basic information on industry in Guadalajara. Section B gives some details of the GEMP model, describing the legal basis for the Pilot, the players involved, and the phases of the Pilot. Finally Section C presents the policy questions that the Pilot is designed to answer, and describes the test methodologies by which the answers are determined.

A. THE GUADALAJARA CONTEXT

46. Guadalajara, in the state of Jalisco, is Mexico's third largest city, with a population of almost 3 million. It is a metropolitan area, made up of 9 municipalities. Guadalajara is also one of Mexico's major industrial centers, and is rapidly acquiring a reputation as Mexico's "Silicon Valley" due to the large influx of multinational electronic companies. Its pleasant weather and relatively smaller size make it one of Mexico's more popular locations for multinational industry siting. As a result, the city has seen some very rapid growth in recent years.

47. Guadalajara is home to a wide range of industrial sectors, with the more important ones, apart from electronics, being the food and drink, shoe, oil, metal working, textiles, leather, plastics, chemicals and cement industries. Jalisco State's recent State Development Plan 1995-2000 notes that 7,300 potentially contaminating firms are located within the metropolitan area of Guadalajara, and it postulates that the air, water and solid waste contamination in the State is only due to two factors: pollution due to rapid population growth and industry. These factors are compounded by the lack of basic infrastructure for disposing and handling of solid wastes and the lack of municipal water treatment plants in the metropolitan area.

48. The importance of pollution management was sadly brought to the general public's attention by a massive explosion in the sewer system in Guadalajara on April 22, 1992 as a result of the dumping of several thousands of gallons of gasoline by the local PEMEX facility. More than five miles of sewerage line exploded resulting in an official death toll of 200, permanently disabling an additional 53 people, and badly damaging over 500 houses. In 1995, once again, the spillage of 12,000 to 15,000 gallons of a toxic solvent into the sewage system by a local SME resulted in more than 12,000 people in surrounding areas being evacuated from their homes. These two incidents in their own backyard sharply altered the Guadalajaran public's perception of environmental risks.

B. THE GUADALAJARA ENVIRONMENTAL MANAGEMENT PILOT MODEL

(1) The Voluntary Agreement of November 1996

49. On November 19, 1996, eleven large Mexican and multinational companies with production facilities in Guadalajara signed a voluntary agreement with SEMARNAP to work with selected SMEs to improve their EMSs over a two year period. This agreement forms part of SEMARNAP's *Programa de Competitividad Industrial y Protección Ambiental*. It was agreed that each large company would choose up to 3 SMEs each, these SMEs would be either suppliers or clients of the large companies, and that the large companies would designate mentors to work with them. The Lexington Group, a US-based consulting company, signed the agreement as one of the parties committed to providing consultancy support to the Pilot and the World Bank signed the agreement as witness, with the understanding that the Bank would pay the costs of the SME training program.

(2) The Players

50. Thus this pilot brought together the large multinational and Mexican firms and their small and medium-scale supplier and client companies in Guadalajara, Mexican federal and local government officials from INE and PFFA, and the World Bank. In addition, the consultant team contracted by the World Bank, which was lead by the Lexington Group, included subcontracts with two of Guadalajara's major universities, the *Instituto Tecnológico de Estudios Superiores de Monterrey* (ITESM) - Guadalajara campus and the University of Guadalajara (UdG). Under these subcontracts, researchers and postgraduate students from these two universities were to act as local consultants to the SMEs providing day-to-day advice and assistance in helping to set up the EMS. In addition, the Bank also contracted one of Mexico's most prestigious anthropological research institutes, the *Centro de Investigaciones y Estudios Superiores en Antropología Social* (CIESAS) to conduct a separate study on the role that culture change plays in the introduction of EMSs. The study was based on the hypothesis that several other factors besides the size of firms and the nature of the training course explain the capacity of industrial firms to introduce and sustain EMSs.

51. For SEMARNAP, this was an important pilot as part of their work on voluntary regulations. Under the November agreement, both INE and PFFA committed to participate as observers in periodic evaluations of the Pilot, and to use these review sessions for discussion of pertinent aspects of national environmental policy. Under the voluntary agreement, PFFA committed to remove any duplication of effort between the actions taken during the pilot of incorporating EMSs and the appropriate parts of its Environmental Audit program.

52. The large multinational and Mexican companies that signed the voluntary agreement of November 1996 included Lucent Technologies, *Cementos Guadalajara*, *Acietera la Junta*, *Aralmex*, *Casa Cuervo*, *Celulosa y Derivados* (CyDSA), *Compañía Siderúrgica de Guadalajara*,

Honda de Mexico, Quimikao, SCI Systems, and *IBM de México*. These companies each contributed US\$ 5,000 to share part of the consultant costs with the World Bank. Their role in GEMP was to recruit, motivate, and encourage their SME suppliers or customers to develop EMSs and to act as mentors during the process, when appropriate. The large company representatives also attended all the training sessions with the SMEs. In addition, the project was a chance for these companies to publicly support a positive environmental initiative, sanctioned by the environmental authorities.

53. A total of 22 SMEs participated in this Pilot at one stage or another. Each of these SMEs were invited by a large company, and were also required to meet the following two criteria: (i) each SME had to be an independent company, not a subsidiary of a larger company; and (ii) no SME could have more than 250 employees (the upper limit of the official Mexican definition of a medium-sized business). The participating SMEs ranged in size from 3 to 230 employees and represented a variety of industries, including construction, metalworking, chemical manufacturing, automobile parts, environmental services, and printing. Annex 1 contains a brief description of each SME and its progress in the project.

54. As noted above, the Lexington Group was contracted by the World Bank and the 11 large companies to provide training to the companies on how to implement an EMS, based on the ISO 14001 model and to lead the progress review sessions. A Mexico-based member of the Lexington Group provided regular support to the SMEs and university consultants on a regular basis, meeting with them approximately every 3 weeks during the implementation phases of the project. The following section summarizes the training and review sessions of the Pilot.

55. Fifteen affiliates of two universities, ITESM and the UdG, participated in GEMP as consultants to the SMEs. The consultants had backgrounds in environmental sciences, law and regulation, and/or management. The consultants attended The Lexington Group's training sessions and were charged with providing assistance in EMS development to the SMEs on an as-requested basis. Each SME had one lead consultant assigned to it but could draw on others for specialized expertise. ITESM's initial involvement was through a contract with the Lexington Group, and UdG joined the project subsequent to its start-up at the request of some of the large companies. The participation of UdG staff was underwritten by the university.

(3) The Phases of GEMP

56. The following section describes the phases in GEMP in chronological order through February, 1998.

57. **Preparation and Decision-Making.** During this period, the legal basis of the Pilot was established, the large companies and a select group of SMEs received some preliminary training in EMSs, a decision was taken on the appropriateness of ISO 14001 as the EMS model, obstacles to implementing an EMS were determined, the idea was sold internally to senior management by the industry representatives, and reporting formats were developed. These are described in greater detail below.

- *November 1996—Voluntary Agreement signed between large companies, SEMARNAP and the Lexington Group.*
- *February 1997—Three-day Training Course for Large Companies.* This presentation was oriented toward the large companies, with some SMEs participating as observers. The purpose of the course was to describe the ISO 14001 model in broad terms so that large companies could gauge their environmental management systems against this model and so that all participants could decide whether the model is suitable for SMEs. Large companies also received training in the use of a self-assessment tool, which asks a series of questions related to the ISO 14001 model.
- *February to April, 1997—Work Groups and Large Company Self-Evaluation.* Between the February course and the April meeting, representatives of all participating companies were divided into 5 work groups. Each work group discussed the appropriateness of ISO 14001 as a model for implementing EMSs in SMEs and reported on the potential obstacles they identified. During this time the large companies also implemented the self-assessment tool to evaluate their EMSs.
- *April, 1997—Planning Meeting.* Two key decisions were made at this meeting: (i) the ISO 14001 model is appropriate for SMEs as well as for large companies; no elements of the model need be dropped to make it suitable for the SMEs. The basis for this decision was participants' understanding that an ISO 14001-based EMS allows for different levels of detail, depending on the nature and objectives of the implementing company. A company with relatively few or simple operations, or without the resources to develop a complicated EMS, can develop a basic but effective EMS that meets ISO 14001 guidelines; and (ii) convincing SME senior management of the importance of developing an EMS should be an explicit phase of the project.
- *April to May, 1997—Work Groups: Selling ISO 14001 Internally and Developing Reporting Formats.* Representatives of all participating companies were divided into 4 work groups. Each group was asked to develop formats for recording environmental aspects, significant environmental aspects, and objectives and targets, based on their understanding of these elements of ISO 14001 from the February course. Each work group also discussed strategies for convincing key company managers of the value of an ISO 14001-based EMS. The groups presented their results during the May session of the course.

58. Training and Progress Review. During this period, periodic 3 monthly training sessions, together with progress review sessions were held. The training was preceded by a senior management briefing to build awareness of GEMP, at the suggestion of the companies themselves.

- *May 1997—Senior Management Briefing and ISO 14001 Course (Part 1) for SMEs.* In May 1997, The Lexington Group gave a two-hour briefing to the CEOs of the participating large companies and SMEs. This briefing, which was videotaped as a dissemination tool within

the companies, included a succinct overview of the components of ISO 14001 and focused on how their companies could benefit from implementing an EMS based on ISO 14001. Following this briefing, The Lexington Group gave a two-and-one-half day training course on ISO 14001. The original project plan was that the Lexington Group would cover all components of ISO 14001 in this course session. This plan was scaled back. Instead, a two-tier training model was adopted. The first part was to include the policy and planning clauses of ISO 14001, the second part the implementation, checking and corrective action, and management review clauses. During the first part of the course, participants were given a broad overview of ISO 14001 and then trained on identifying environmental aspects (EAs); determining which EAs were significant; checking their operations for regulatory compliance; developing an environmental policy; setting objectives and targets; and developing an implementation plan to reach those objectives and targets. The course included a case study of a metal plating facility, designed to give participants practice in identifying EAs. Several other key decisions were made at this time as well, including more precisely defining the role of the university consultants, singling out an industry champion for the Pilot, and assigning administrative responsibility to a representative from ITESM.

- *May to August, 1997—SME Implementation of ISO 14001 (as presented in Part 1 of the course).* From May to August, the SMEs were asked to apply the EMS methodology presented in Part 1 of the ISO 14001 course to their own operations.
- *August 1997—Progress Review Meetings and ISO 14001 Course (Part 2).* On August 5 and 6, 1997, four half-day sessions were conducted to review SME progress. On August 6 and 7, 1997, The Lexington Group delivered the second part of the ISO 14001 Course to the SMEs. This included laying out responsibilities and authority for employees in the context of the EMS; setting up operational control procedures based on root cause analyses; defining training requirements and establishing a training program; developing a strategy for internal communication; monitoring and measuring environmental and economic performance indicators; documenting the EMS; establishing emergency procedures; conducting an internal audit; and review by senior management.
- *August to October, 1997—SME Implementation of ISO 14001 (continued).* From August to October 1997, the SMEs were expected to complete the initial policy and planning clauses of ISO 14001 taught in May, as well as the implementation, checking and corrective action, and management review clauses taught in August 1997.
- *October 1997—Progress Review Meetings.* A second series of progress review meetings, similar in format to those held in August, was conducted on October 28-29, 1997. A plenary session was also held with the SMEs, large companies, and university consultants to review the group's overall progress and to lay out additional tasks for the October, 1997 to February, 1998 period. In addition, some company visits were undertaken.
- *October 1997 to February 1998—SME Implementation of ISO 14001 (continued).* During this time, the SMEs were expected to complete their EMSs.

- *February 1998—Progress Review Meetings.* A third series of progress review meetings, similar in format to the previous two series, was conducted on February 9-11, 1998. In addition to some more site visits, a final plenary session was also held to discuss overall progress and to administer a survey. The session also provided a forum for the SMEs, large companies, and consultants to begin preliminary discussions about sustaining the project without the oversight and support of the World Bank and The Lexington Group.

59. **Potential Future Phases.** The World Bank and consultants hope to return to Guadalajara at six month intervals in their new role as observers to record the progress of the SMEs under GEMP in the coming year.

C. POLICY QUESTIONS AND TEST METHODOLOGIES

60. The principal interest of SEMARNAP and the World Bank in the pilot was to address a series of policy issues relating to the adoption of an EMS by SMEs. These issues can be summarized in four questions, which the pilot was designed to help test. This section describes these questions, as well as the test methodologies that were used to answer the questions.

(1) Is the ISO 14001 EMS model appropriate for implementation by SMEs?

61. The view expressed by many observers is that the ISO 14001 standard is too complex for voluntary adoption by SMEs, particularly in developing countries. The assumptions underlying this argument are twofold. It is broadly felt that smaller companies find the adoption of formal EMSs both costly and difficult due to their largely informal management systems and resource constraints (particularly with respect to personnel time and financing). Further, it is assumed that SMEs in developing countries have less incentive to apply the ISO 14001 model than large companies, because they are predominantly selling to domestic markets less concerned about environmental issues than the international markets of large companies. Indicating the depth of these concerns, ISO itself set up a special Task Group in 1996 to further study these issues.

62. **Test methodology.** In this pilot, it is primarily the ability of SMEs to implement an EMS that is being tested. However, the CIESAS study also provides some indication of the incentive structure present to promote EMS implementation. As mentioned above, representatives from the large companies, some SMEs and university consultants were provided with initial training in the ISO 14001 standard to determine whether *a priori* they felt that the model should be simplified in order for it to be successfully applied by SMEs. The group's conclusion was not to simplify or adapt the standard, but to use ISO 14001, as is, as a model for the EMS. In order to answer, at a preliminary level, the question posed above, during each progress review session, the EMS of each SME was reviewed to determine the degree to which it met the ISO 14001 standard. Furthermore, a self-assessment tool was developed in order for each SME to determine the extent they had implemented an EMS. This tool was applied at the start of the training, and then again in February, 1998. It was expected that the variety of

experiences of the participating SMEs would help to indicate the conditions under which an EMS based on ISO 14001 could be successfully applied by an SME. Finally, CIESAS's culture change study also helped to provide a better understanding of the type of factors that affected EMS implementation in a firm.

(2) Are networks between SMEs, large companies, universities and government effective mechanisms to promote implementation of EMSs by SMEs?

63. The pilot is designed to utilize a number of networks to assist and provide support to the SMEs in implementing EMSs. At the company level each SME is either a supplier or a client of a large company, thus giving a "mentor" role to the large company. In addition, affiliates from the two major local universities, the UdG and the Guadalajara campus of ITESM have been trained in EMSs and teamed-up as consultants to the SMEs. The involvement in the GEMP of federal, state and municipal government representatives provides a direct link with the authorities which may assist the SMEs in interpreting regulatory issues.

64. **Test methodology.** The effectiveness of the networks in delivering support to the SMEs is analyzed based on discussions with the SME representatives and other parties, with this analysis being directly related back to the changes in the quality of environmental management.

(3) Does an EMS improve the environmental performance of SMEs?

65. One of the most commonly voiced concerns regarding EMSs is the fear that, even if they lead to better systems of environmental management, they may not actually improve environmental performance.

66. **Test methodology.** The Pilot covers a two-year time period, but the World Bank's direct involvement has only been for the first year. Given the time frame, this question can only be partially answered. The methodologies available to test this hypothesis include: (i) comparison of the SMEs' self-reported environmental data before and after implementing an EMS; (ii) comparison of the achievements of the SMEs with their own initial assessment of the potential for improvement; and (iii) comparison of the results of periodic applications of an environmental compliance checklist.

(4) Can the EMSs initiated through the Pilot be sustained?

67. A crucial question is how sustainable the SMEs' EMSs will be, especially as the high visibility for the initial stages of the Pilot is reduced in subsequent phases.

68. **Test methodology.** The answer to this question can only be answered in a very limited manner given that this report is being prepared soon after the end of the final training phase. Discussions with the SMEs and subsequent occurrences after the final February progress review

session provide some preliminary conclusions. In addition, a more qualitative measure is provided by the study, conducted by CIESAS, of the change in environmental culture caused by GEMP within a sample group (both large and SME) of the participating companies.

69. The CIESAS team used a variety of sociological methods to study the nature of environmental awareness and culture among the participating firms. These included formal questionnaires administered to a sample of firms prior to and following the training course; focus group discussions of environmental problems, policies and procedures; observation of production processes and administrative systems; and, case studies of different types of firms. This study provides an indication of the sustainability of the improvement in environmental performance, and draws heavily upon knowledge of changing patterns of industrial organization in Guadalajara. It also seeks greater understanding of how the history, social organization and management cultures of industrial firms influence differing approaches to problems of pollution management.

Box 3.1 Defining “Environmental Culture”

The CIESAS research team defined “Environmental Culture” as “the integrated functioning of knowledge, social communication and values in terms of the priority of the environment in relation to lifestyles and behavior.” It includes, according to the CIESAS researchers, both “attitudes and perceptions in terms of the environment (usage of natural resources and other materials, perception and management of risks), as well as behaviors, social organization and the relations of economic activities to the environment.”

In terms of commercial enterprises, the CIESAS team writes: “the *environmental culture* can be defined as the complex interaction between the individual perception of workers and the public policy of the business organization in relation to the environment. This culture takes a particular form according to the scale of production and the type of product generated under a determined system of industrial administration.”

4. PRELIMINARY RESULTS OF GEMP

70. In this chapter, we look in greater detail at the preliminary answers, obtained through GEMP, to the four main policy questions, namely (i) whether the ISO 14001 EMS model is appropriate for implementation by SMEs; (ii) whether networks between SMEs, large companies, universities and government are effective mechanisms for promoting implementation of EMSs by SMEs; (iii) whether an EMS can improve the environmental performance of SMEs; and (iv) whether the EMSs initiated through the Pilot can be sustained. Despite being only six months after the last major training session, the February 1998 Progress Review Session was a source of some very interesting results, with potentially widespread implications, for both the Bank Group and the Mexican Government, with regard to assistance for SMEs on environmental matters. The basis for this chapter are two reports, financed by the World Bank, completed in May-June 1998: (i) *The Guadalajara Environmental Management Pilot: Improving the*

Environmental Management Capabilities of Small and Medium Companies in Guadalajara, Mexico, prepared by The Lexington Group; and (ii) *Cultura Ambiental y la Industria en Guadalajara*, prepared by CIESAS.

A. QUESTION 1. IS THE ISO 14001 EMS MODEL APPROPRIATE FOR IMPLEMENTATION BY SMEs?

71. The experience to-date indicates that, compared to larger companies, SMEs both enjoy relative advantages and suffer particular drawbacks in the adoption of an EMS. A strong comparative advantage is the relative ease of generating a consensus and disseminating information within an SME, activities that can absorb much energy in a larger company, as well as the significant benefits for SMEs from easily-achieved good-housekeeping practices.¹⁶ On the downside, while it is noteworthy that none of the SMEs indicated a lack of technical expertise on the details of their processes, many reported difficulties resulting from the rapid rate of change that is a fact of life for many smaller companies, including:

- the difficulty of identifying significant environmental aspects of processes that have not yet been brought on-line;¹⁷
- providing appropriate training and assignment of responsibilities when personnel are shifting positions;
- finding time to focus on environmental issues when the top priority is expanding production; and,
- the unwillingness of management to share production information for fear that employees would leave the company with commercially confidential data.¹⁸

72. The pilot has supported a variety of activities to help the SMEs meet the challenges of EMS implementation, as described in Chapter 3. As a result of these efforts, according to the results presented by the SMEs during the review meetings held in October, 1997, and February, 1998, they have so far on average completed 85% of the policy and planning components of the ISO 14001 model, and 46% of the implementation and review components.

73. It is also worth noting, that in a survey conducted in February 1998, only 15% of the SMEs defined the complexity of the ISO 14001 EMS model as a “very important” or “critical” barrier. Furthermore, the 7 SMEs, out of the original 22 SME, that did not participate fully in GEMP, dropped out for reasons that were not related to the complexity of the model. Three were absorbed by or turned out to be subsidiaries of their mentor companies (and therefore did not

¹⁶ Examples of this are present throughout this Chapter, e.g. in Table 4.1, the US\$ 500 saving for SME #2 is far more significant than a US\$ 500 saving in a large company.

¹⁷ For example, SME #6 reported that they did not yet know the useful life of an abrasive that would be used in a new process.

¹⁸ Both SMEs #4 and #5 reported that the fear of employees being poached by competitors led management to withhold proprietary production information important for the establishment of an EMS.

fulfill the original criteria for choosing SMEs), one dropped out for logistical reasons due to the distance between the installation and the choice of meeting/training places, one dropped out due to lack of senior management commitment, one dropped out due to a conflicting commitment (implementation of ISO 9000) and one's progress was delayed due to a change in senior management.

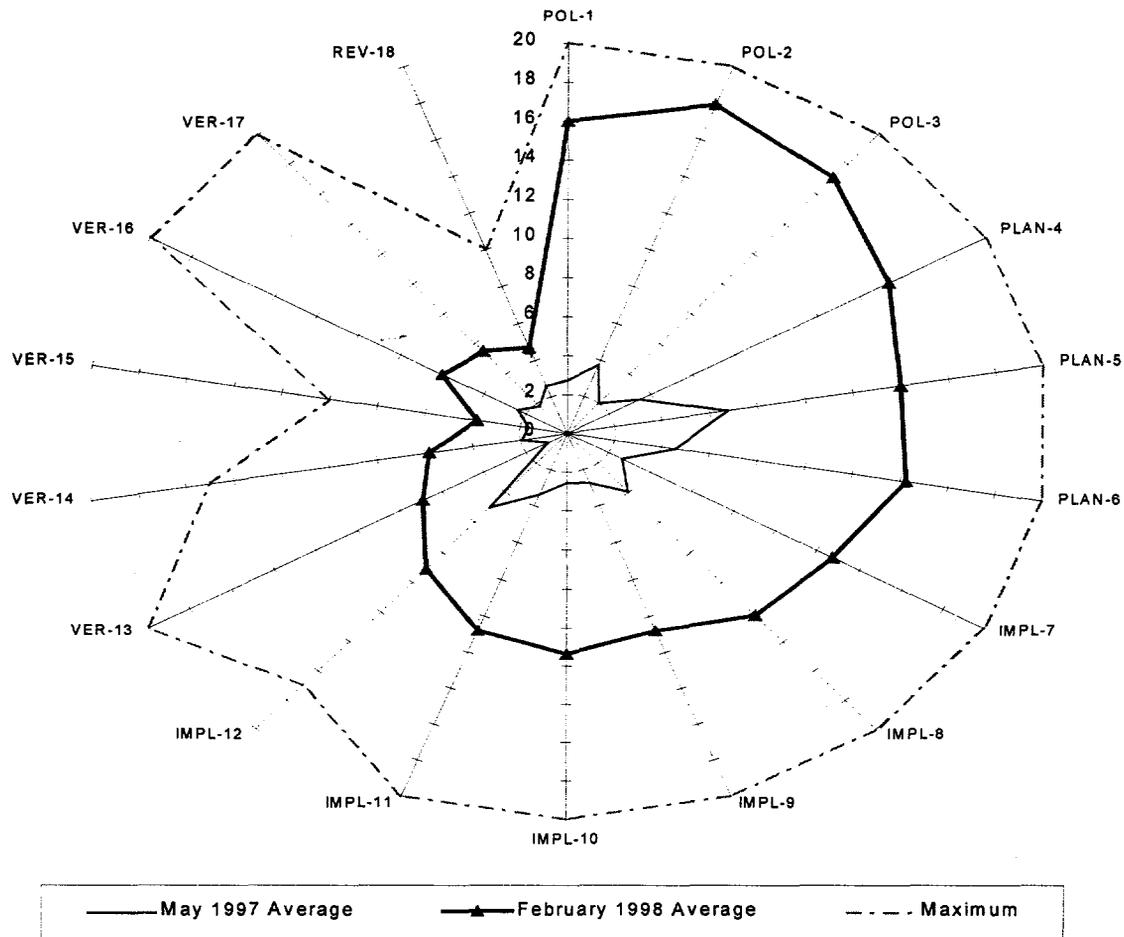
74. To monitor their progress toward developing ISO 14001-based EMSs, SMEs were asked to complete self-assessment of their environmental management practices in May 1997 (before beginning EMS development) and in February 1998 (9 months after beginning the initial EMS training). The self-assessment, developed by The Lexington Group, consisted of 18 questions that mirror major ISO 14001 elements and was usually carried out by an internal cross-functional team, with support from the company's local consultant.

75. As Figure 4.1 shows, the 11 SMEs that have completed and submitted two EMS self-assessments have made considerable progress toward developing an ISO 14001-based EMS. The average scores in May, 1997 were extremely low. Few firms had any EMS elements in place. The average score exceeded 5 points out of a possible 20 (indicating a very rudimentary existence of a given element) for only one element—existence of a process to identify legal requirements — and it reached five points only for one additional element—emergency planning. Beyond these two elements that existed in a very rudimentary form, it can be safely said that the participating companies effectively had no EMS elements in place.

76. By February, 1998, these SMEs had made considerable progress in implementing elements of an EMS. The average scores for the planning and policy elements of the EMS were between 14 and 18 points (out of a possible 20) for all planning policy elements. These elements were the subject of the initial May, 1997 training session, and the firms had had time to implement the systems elements fully by February, 1998. Most firms had prepared a policy that was appropriate to their business and includes key commitments to compliance, continuous improvement and prevention; identified their significant environmental aspects and legal requirements; and developed environmental objectives and targets coupled with specific actions, responsibilities, and resource commitments needed to meet those objectives and targets.

77. Average scores of between 9 and 13 points for the implementation components of the EMS indicate the work has begun for these components but is not complete. Implementation training was provided in August, 1997, and not all firms have progressed to full implementation. In a number of cases competing demands (for example, mergers with other companies, very substantial facility expansions, or implementation of ISO 9000 quality management) have competed for time and resources. In other cases, implementation of certain EMS components, such as training, control procedures, and documentation, is time consuming, and the participating firms have not completed the required tasks. As shown by the outer circle in Diagram 4.1, however, at least one SME has substantially progressed towards full implementation of each element.

Figure 4.1 SMEs' Assessment of EMS Implementation



The "radar chart" above shows the average scores attained by 11 SMEs in EMS self-assessments which they performed in May 1997 and February 1988. Each of the self-assessment's 18 questions refers to a specific EMS element (noted below), with potential scores ranging from 0 (no evidence of the element) to 20 (full implementation of the element).

- | | | | |
|--------|--|---------|--|
| Pol-1 | Environmental policy exists | Impl-10 | EMS documented |
| Pol-2 | Policy appropriate to business | Impl-11 | Operational control procedures established |
| Pol-3 | Policy includes key commitments | Impl-12 | Emergency procedures exist |
| Plan-4 | Significant environmental aspects identified | Ver-13 | Environmental monitoring, measurement |
| Plan-5 | Process to identify legal requirements | Ver-14 | Compliance evaluation |
| Plan-6 | Environmental objectives and targets | Ver-15 | Non-conformity procedures |
| Impl-7 | Roles and responsibilities established | Ver-16 | Records |
| Impl-8 | Training needs identified | Ver-17 | EMS audits |
| Impl-9 | Internal communication process established | Rev-18 | Management Review |

78. The final components of an environmental management system—performance measurement, auditing, corrective action and management review—are not yet in place. These were the last elements presented to the course participants, and they require the existence of an operating EMS before they can be effectively put in place. Ultimately, these components, the essential organizational learning elements, will be critical for the long term sustainability of EMSs within the participating facilities.

79. **Preliminary conclusion:** Given sufficient assistance with analytical tools and breaking the implementation of an EMS into manageable stages, the ISO 14001 model is appropriate for adoption by SMEs. The preliminary project findings indicate that:

- *The ISO 14001 model can be applied by SMEs with no modifications (with possibly the exception of documentation).* After receiving initial training on the ISO 14001 model, the participating companies decided that no modifications were necessary. A survey administered in February, 1998 justified this approach: only 8 percent of the SMEs suggested simplifying the EMS model. ISO 14001 provides a flexible, generic management systems model that can be applied by a wide variety of organizations. Most ISO 14001 requirements flow from the “significant environmental aspects” (SEAs) identified by the organization itself. These SEAs (and hence ISO 14001 requirements) will vary with the size and type of organization. Generally, the SMEs participating in the project identified fewer than 10 and often fewer than five SEAs, as compared to a large, complex chemical or refining operation which may identify several hundred SEAs. This means that for an SME the application of ISO 14001 is correspondingly simpler. However, one potential exception may be the requirements for documentation and document control. Many SMEs chose not to focus their energy on these elements because the required procedures would have added an unwanted layer of bureaucracy to their operations.
- *Although the ISO 14001 EMS model is appropriate for SMEs, most SMEs require substantial implementation support.* The project assigned one consultant to each SME to provide implementation assistance as well as a mentor company to monitor progress. In addition, the project involved tri-weekly meetings for the university consultant group with an expert on ISO 14001 implementation, and periodic training on ISO 14001 provided by The Lexington Group. Although in future projects this support could be streamlined, the fact remains that SMEs require substantial assistance implementing ISO 14001.
- *Particular areas where SMEs need implementation support include simplified formats, discrete milestones, management systems thinking and staff assistance.* Simplified formats and methods, developed by the project team, were critical to the success of the project in the opinion of 77 percent of the SMEs responding to the February 1998 survey. The assignment of discrete milestones for the accomplishment of specific implementation tasks proved quite important in maintaining discipline in schedules and a sense of accountability as well as in giving the participants a logical order of activities. For many of the SMEs, the ISO 14001 training was their first exposure to management systems concepts such as the plan-do-check-act cycle or to systematic description of procedures. Thus, it was necessary to introduce

generic management systems concepts as well as environmental management systems concepts (presumably, if successful, this process should result in improvements in both environmental and management performance). The local consultants, who were more experienced in systems thinking, also provided critical support in this area. Finally, the key scarce resource among the SMEs was time. Fifty-four percent of the SMEs considered lack of time a “critical” or “very important” barrier to EMS implementation. Usually, the SME representative also had very significant non-environmental responsibilities (operations or production manager, quality manager, maintenance manager, purchasing or sales manager). Significant help was provided by the assigned project consultant who often acted as a staff extension for the SMEs, providing not only expertise but “an extra set of hands” to assist the SMEs in completing the necessary tasks for EMS implementation.

- *The business culture of the firm, rather than its size, is probably a more important factor, in determining whether a firm can implement an EMS.* One of the major findings of the CIESAS study is that size alone was not a determinate factor in the implementation and effectiveness of EMSs (see Box 4.2 on the case study of *Articulos de Limpieza*, a micro-sized firm that implemented an EMS). In fact, it may be that small and medium-sized firms can introduce EMSs more rapidly and easily than large companies exactly because of their smaller size and less formal social organization. However, there are several other factors within the “business cultures” of these firms which seem to be determinate elements in both their response to the training course, as well as their capacity to introduce functioning EMSs. In addition to size of firm, these business culture factors are the type of firm, the styles of administration, the education of the workforce, the firm’s management/production efficiency, its profitability/security, and finally its level of environmental consciousness (see Box 4.1 below on the case of *Printamex*). Another important factor in whether a firm did or did not institutionalize an EMS, according to CIESAS, was economic incentives, in particular, the perception that an EMS was needed to penetrate or increase both local and export markets, particularly in an area such as Guadalajara with a high concentration of multinational firms.

80. Finally, it is interesting to note that the International Standards Organization’s (ISO) Technical Committee (TC) 207, which developed the 14000 series of standards, itself had set up a special Task Group in 1996 to review whether a new EMS standard needed to be developed for SMEs. The recommendations of this Task Group to Sub-Committee 1 of TC 207 (as reported in a workshop during the ISO TC 207 Annual Meeting in June 1998) are that (i) no new standard for SMEs should be developed at this time; (ii) Sub-Committee 1 of TC 207 should take special account of the needs of SMEs at its next revision of ISO 14001 and ISO 14004 and should address the issues raised by members of the Task Group during their review process starting in July 1998, noting especially the concerns with the wording of ISO 14001 and its annexes and the usability of ISO 14004; (iii) ISO TC 207 should encourage its member organizations to continue to establish national groups to research and develop SME responses to its review process and to develop assistance/guidance to SMEs in their own countries, as well as to share this guidance via the Secretariat of Sub-Committee 1 with other member organizations; (iv) TC 207 should use its liaison with the ISO Committee on Conformity Assessment (CASCO) to promote understanding in certification bodies of the special needs of SMEs in implementing ISO 14001; and finally (v)

Sub-Committee 1 should continue to hold a special SME workshop at its plenary meeting and to promote interchange of information (through, for example, an electronic website) between all member countries. These recommendations, which are based on information from over 15 countries, and which required consensus-building from many more countries, are entirely consistent with the findings of this pilot.

Box 4.1. The Case of *Printamex*¹⁹

Printamex (PMX) is a relatively large (210 employees) printing business which is characterized by its pro-active and participatory management style. Having been established several years ago as a small family-owned shop which made business cards and stationary using traditional offset technology, it has since grown into one of Guadalajara's largest print shops, producing user manuals for such large multinational companies as IBM. Over the past three years, the company has grown by more than 300 percent, enabling it to establish itself in a new location and to introduce a number of new machines, including modern computer-based printing and copying technology.

The owner of PMX has been influenced by some of the large electronics companies to whom it provides services, and has participated actively in several Supplier Development and Total Quality Management (TQM) Programs prior to asking his staff to participate in the EMS course. His leadership style and that of his administrative staff has produced a company which is extremely dynamic, which has great capacity for establishing teams within and across each of the company's departments, and which has a high degree of employee participation at all levels.

This management style is reflected in the generally controlled nature of production within the plant. Work stations are quite ordered, the rhythms of work are under the control of the plant's administrators and supervisors, and there is an ordered movement of materials and products. The human resources policies of the company come directly from the various Supplier Development and Quality Management Programs in which the company has participated, and are reflected in the company's "Cultural Policy." The latter is prominently shown on one of the bulletin boards of the company and promotes the need for continuous cultural change and quality work effort and production.

The company's past performance and current economic success have enabled it to respond quite positively and rapidly to the EMS training course. From the beginning, there has been a strong commitment on the part of the upper management of the company to the implementation of an EMS, the assigning of human and financial resources for such purposes, and the formation of a highly effective cross-departmental Inter-Disciplinary Group (IDG) to design and implement the EMS. Time has been set aside for participants in the IDG to attend the training workshops, to meet with the university consultant assigned to the company, and to conduct informal discussions within the plant concerning materials use, storage and disposal. Further, the mentor company has conducted regular on-site visits to review PMX's TQM program and also to work with the IDG and the university consultant on their EMS.

(Continued)

¹⁹ Name of SME changed to preserve confidentiality.

Box 4.1. The Case of *Printamex* (Continued)

The company's environmental policy includes strong commitment to the appropriate use of natural resources, compliance with regulatory requirements, and fostering of environmental consciousness through staff training. Early on, the IDG, incorporating representatives from several departments, recognized that the company was losing significant amounts of paper and ink during the production process, generating vapors from solvents, and producing large amounts of unnecessary machine noise. It also recognized that there were effluent composition problems and a need to separate wastewater contaminated with solvents and oils from non-contaminated wastewater which was being sent down the drain and outside the plant.

The company's own self-assessment indicates an improvement from 21 to 55 percent in EMS implementation during the period of the EMS training course. There is currently significantly less solid waste being produced in the plant as suppliers are being asked to supply paper cut to the company's needs; separation of hazardous aqueous wastes is leading to a reduction of contaminated effluent from 700 to 60 liters per month; and, there is greater use of recycled paper. The company has also designed training programs (albeit still not implemented at the end of the course), is slowly introducing the EMS into its quality documentation system, is planning a formal and regular management review of environmental performance based upon reports of the IDG, and is considering applying for ISO 14001 certification. Printamex feels that the latter is important for its market development, as its clients are primarily international companies that value supplier EMSs.

All of these steps reflect a strong commitment on the part of PMX to improved environmental management, as part of a broader commitment to TQM and continuous improvement and change.

B. QUESTION 2. ARE NETWORKS BETWEEN SMEs, LARGE COMPANIES, UNIVERSITIES AND GOVERNMENT EFFECTIVE MECHANISMS TO PROMOTE IMPLEMENTATION OF EMSs BY SMEs?

81. **Mentor Company Networks:** The most important role of the mentor large companies was to invite the SMEs to participate in the pilot. Of the SMEs that completed an informal survey during the Progress Review Sessions in October 1997, about half stated that they would not have participated if they had been invited by either the government or a university. During the early stages, the motivation for participation in GEMP appeared to be largely based on the commercial interest of the SMEs in strengthening ties with their major clients, as demonstrated by the sudden loss of interest by SME management when a mentor ceased to be a customer during the course of the Pilot.²⁰ A potential negative aspect of close ties with mentor companies was expressed by another SME, which has suffered from the poaching of employees by large clients.

82. The motivation provided by the mentor companies was particularly strong in those cases where, separate from any GEMP activities, they conducted combined quality assurance and

²⁰ As was the case of SME #16.

environmental management audits of their suppliers.²¹ The links with the mentors have also allowed some SMEs to elicit cooperation from them in addressing environmental concerns, for example in the recycling of containers, or reaching agreement on the need to raise costs to cover specific environmental improvements.²² Another important motivating aspect has been the regular on-site visits of some mentor companies to their nominated SMEs to review and discuss their EMSs, as well as their participation in progress review sessions.

83. Aside from such motivation and cooperation, the quality of the technical assistance for EMS development provided by the mentors to their SMEs has been mixed. Some multinational mentors, that have strong in-house EMS capacity and conduct supplier audits, have proven to be important sources of guidance for their SMEs. In other cases, lower levels of commitment to supplier development, and EMSs that are less developed than those of their SMEs, have limited the assistance the mentors can provide. Reflecting this variance in EMS expertise among the large companies, only 31% of the SMEs described mentor company support as “very important” or “critical” to the success of the project. Similar future initiatives could reduce such difficulties by placing greater emphasis on the EMS training provided to the mentor companies,²³ and by building into the initial commitment of the mentors agreements to audit the EMSs of their SMEs at the end of the program, and in the longer term to provide second-party certification of any EMSs that fully meet the ISO 14001 requirements.

84. **University Consultant Networks:** The assistance provided to the SMEs by the consultants has been essential in ensuring progress in EMS implementation. Four aspects stand out:

- each SME was assigned an individual consultant from the UdG or ITESM as their main point of contact for assistance, providing the companies with an easily accessible, local source of support;
- each of the university consultants was able to draw on advice from other members of the team, whose backgrounds are diverse, and as a result, the SMEs had access to a wide range of skills. Nevertheless, none of the consultants were experts in the particular technologies of the SMEs, and it is noteworthy that this did not prove to be a source of complaint. Instead, the SMEs placed more value in the ability of the consultants to guide them in the development of a management system, and in the legal analysis of their compliance status, relying on in-house expertise for the more technical analysis of their processes;
- although the consultants from UdG and ITESM were entirely new to the ISO 14001 model at the start of the pilot, they have been effective in providing EMS advice to the SMEs. This

²¹ SMEs #6 and #7 both reported that they are audited by IBM, who are increasingly incorporating elements of ISO 14001 in their requirements. SME #7 is similarly audited by Microsoft and Hewlett-Packard, and reported that they received their first client audit incorporating environmental issues in 1989. For this SME, client pressure was the main motivation for adopting an EMS, and they are beginning to apply the same requirements when subcontracting work.

²² Reported by SME #19. The possibility was raised that their mentor might even be able to help provide the credit needed for specific investments in environmental improvements.

²³ Over three-quarters of the large companies participating in the Pilot suggested that large companies receive more EMS implementation support in future projects.

was largely because The Lexington Group (which has extensive ISO 14001 experience) has provided standard formats and methodologies, and supplemented the two main training sessions with monthly review meetings. A number of SMEs have commented, however, that the consultants could have been more effective if they had learnt about EMS implementation before the SMEs, rather than at the same courses; and,

- some consultants (as in the case of the consultant for SME #9) were able to adapt specific cultural knowledge to the training process that resulted in improving and speeding up the implementation of EMSs in the SMEs. Further, the expertise of the university consultants in teaching and effectively working with groups was of considerable use as they worked with management and employees within the SME to help them better understand how to implement EMSs.

85. Finally, it is worth noting that this aspect of the project probably has the greatest developmental impact, in that by training and giving hands-on experience to 15-20 university consultants in EMS, the Pilot has helped to build long-term capacity in EMSs in Guadalajara. It is significant that even in February 1998, a number of university consultants participating in GEMP had been approached by companies outside of the Pilot (and SMEs, in particular) to help them develop and implement their EMSs in order to respond to large company client demands.

86. **Government Networks:** During the course of the Pilot, representatives of local and national environmental authorities attended many sessions of the project as invited observers, and in several sessions made presentations about how the pilot fitted into new initiatives they were planning. Generally, though, the impact of this involvement was limited. The pilot was undertaken at a time when SEMARNAP was defining the extent to which the federal government will promote EMS adoption, so the principle role of SEMARNAP representatives was to observe progress and update the participating companies on policy decisions. Although this involvement may have helped raise the profile of the initiative, perhaps stimulating management interest, there was also concern among the participating companies that such federal attention would attract additional enforcement actions, combined with a skepticism over the immediate relevance of the policy deliberations.

87. The most practical form of assistance received from the federal government was a review of the compliance checklist prepared by some of the mentor companies and used as an analytical tool by the SMEs in their initial self-evaluation. Written comments were received from the national headquarters of PFPA, supplemented by discussions with PFPA's regional representative on the interpretation and application of the law.

88. Although state and municipal agencies have pledged their support for the initiative, such assistance was largely limited to the participation of current and recent office-holders in the consultant team. This in itself proved an ambiguous benefit: on the one hand, they provided valuable assistance in interpreting local regulations, but on the other, their uncertain status made participating companies fearful of attracting more stringent enforcement.

Box 4.2. A Case Study of *Articulos de Limpieza* (ADL)²⁴

Articulos de Limpieza (ADL) is a microenterprise which mixes and distributes chlorine and other chemical products used for cleaning to industries, hotels and other businesses in the Guadalajara area. The business was started by a young industrial chemist, who was trained in Mexico City and moved to Guadalajara to work in a large Japanese chemical firm. After being laid off from his job, he decided to start his own business, setting up a laboratory in his small house in a suburban neighborhood. The laboratory is in his verandah and garage and many of the materials used for mixing chemicals--mainly large cans, tubs and barrels-- are stored in various places around the house, including in the living room itself.

The owner of ADL started his small, household-based industry about four years ago, and does all of the work himself although he is helped in some activities (such as book-keeping and other tasks) by his wife and his daughter. During the year prior to his involvement in the EMS course, his business grew nearly 150 percent, and this has enabled him to purchase a small pickup truck for making deliveries and carrying supplies (as a direct result of his EMS action plan). With the truck, he feels much safer in transporting sometimes hazardous chemicals, but his major desire is to relocate the business outside of his house, both for safety reasons and so as to continue his current growth. While some business is generated by selling small quantities of detergents to his neighbors, he fears that if an accident should occur it would endanger not only he and his family but also other nearby houses.

Interestingly, because of the small size of the company, it has been possible to introduce immediate changes in the storage, use, transport and disposal of materials which would take much longer to do in a larger firm. There have also been pressures by the wife of the owner to handle and store materials with greater care and safety. The wife, in fact, is quite aware of the danger of the entire enterprise, has to live with all of the materials and smells in her domestic environment, and seems to be the major force in motivating her husband to purchase the truck and seek a separate location for the business.

Both the training course and the direct contact he has had with the university consultant has enabled the owner of ADL to improve the safety and environmental performance of the company. He himself has begun to wear rubber gloves and goggles, and to label all chemicals used in the production process. He has also purchased a fire extinguisher and designed a simple emergency plan in case of spills or fires. The purchase of the new pickup truck has enabled him to transport materials much more safely, separating himself from the cans and barrels which he now securely ties on the back of the truck.

However, there is a limit to the possibilities of improved safety and environmental control in the context of a household enterprise which uses hazardous chemicals and is located in a suburban neighborhood. The owner of ADL is prepared to move at short notice to a separate location, and his wife would probably be the first to help him make the move. However, with payments outstanding on his pickup truck, he lacks available capital for such a major relocation, and it has to be put on his medium or longer-term planning horizon. Should he move someday, however, one would expect him to improve even further his safety and environmental control performance, as he seems to have internalized the basic philosophy behind the EMS and would probably be able to adapt it to a larger enterprise rather than just a micro-sized firm.

²⁴ Name of SME changed to preserve confidentiality.

89. **Preliminary conclusion:** The influence of the mentor companies was crucial in convincing many of the SMEs to participate in the GEMP, but thereafter has been limited, especially among those without supplier development programs and EMSs of their own. The university consultants have played an essential role in providing the SMEs with continuous access to assistance, most importantly in management system design and legal analysis, and less so in the technical aspects of their processes. The contribution of government could have been enhanced through a clearer initial agreement on the exposure of the participating companies to regulatory sanctions.

C. *QUESTION 3. DOES AN EMS IMPROVE THE ENVIRONMENTAL PERFORMANCE OF SMEs?*

90. Although it has only been three months since the SMEs completed the formal EMS training, and their systems are not yet fully complete, 14 of them have reported improvements in their environmental performance, as indicated in Table 4.1 below and Annex 1. Figure 4.2 also summarizes some performance improvements, as reported by a sample of the SMEs. Over 80 percent of the participating SMEs reduced their environmental releases, nearly 70 percent improved their work environment, and over 50 percent improved their economic performance while achieving environmental improvements. Slightly less than 50 percent of SMEs also reported improvements in waste handling, materials and energy efficiency, and compliance. It should be noted that these improvements have taken place *before* the full implementation of an EMS. The SMEs have yet to gain the full benefits of having established a systematic process to address the significant environmental aspects of their operations. However, this serves to illustrate the point that the gains from good housekeeping are potentially very large in the case of SMEs, and that an EMS provides a means to capture these gains very quickly.

91. Although these examples serve to illustrate improvements in environmental performance, the true impact of adopting an EMS is more profound. The ISO 14001 requirement for a commitment to continuous environmental improvement seems a realistic policy for the participating SMEs, largely because of two factors:

- the process of evaluating in a systematic manner their pre-existing environmental management, regulatory compliance, and environmental aspects has for many SMEs been instrumental in raising the environmental awareness of all staff, from directors down to production workers (see Figure 4.3 below); and,
- the establishment of measurable environmental goals and the assignment of responsibilities for environmental aspects have led to organizational changes that ought to help ensure that environmental improvement is a sustained commitment.²⁵

²⁵ For example, in analyzing their existing EMS, SME #4 found that no-one held responsibility for monitoring compliance with environmental regulations, a systematic failure the pilot helped correct.

92. **Preliminary conclusion:** Adoption of an EMS by the participating SMEs seems to have initiated a sustained process of improvement in environmental performance.

Figure 4.2 Environmental and Economic Improvements, by Category²⁶

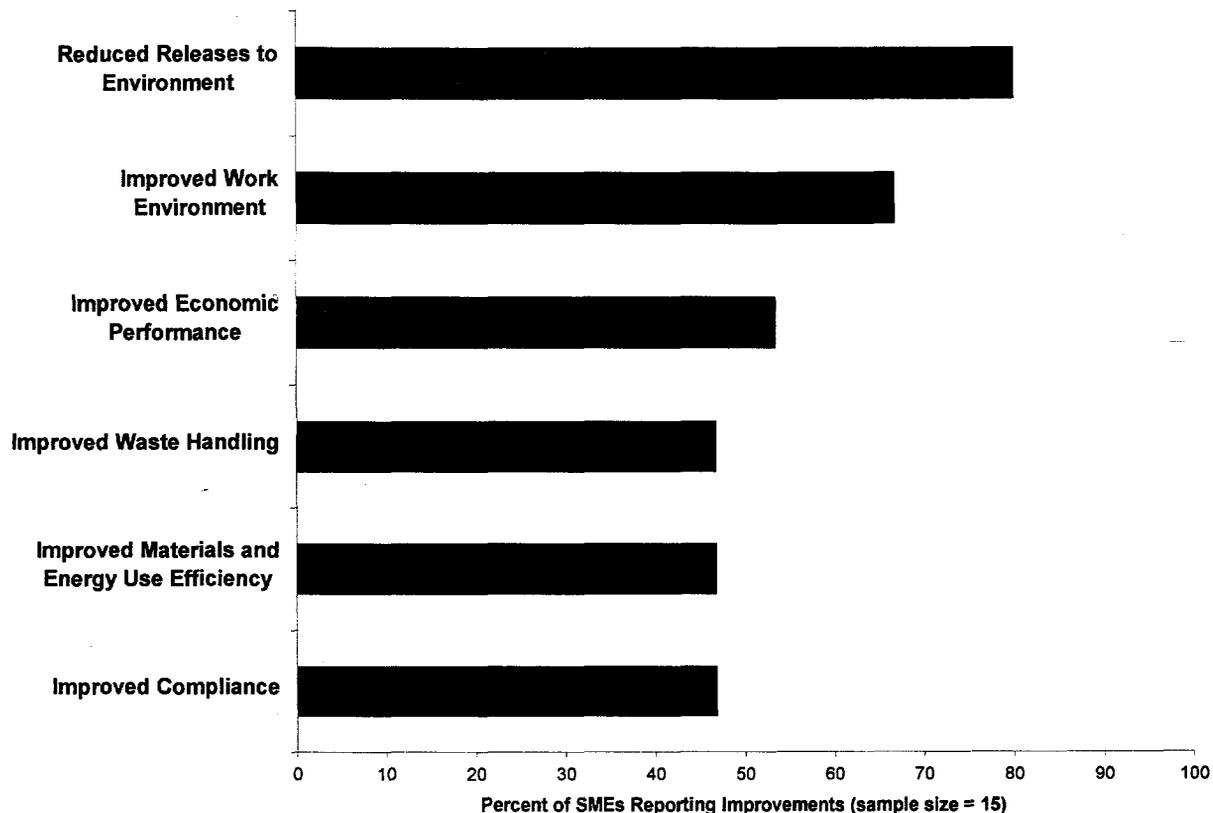


Table 4.1: Improvements in Environmental Performance²⁷

SME	Environmental Performance Improvement
2	Replaced a US\$ 5 gasket, eliminating the principal discharge of lubricating oil, cutting oil consumption by 50%, and saving US\$ 500 per year. As a result the municipal authority has reclassified the plant as not generating hazardous waste. Started ordering metal inputs in custom sizes better reflecting requirements, reducing wastage. Noise levels have been reduced through improved maintenance of machinery, based on control procedures developed for the EMS.
4	Installed dust extractor, allowing capture and recycling of raw material. Also installed basic waste water treatment.

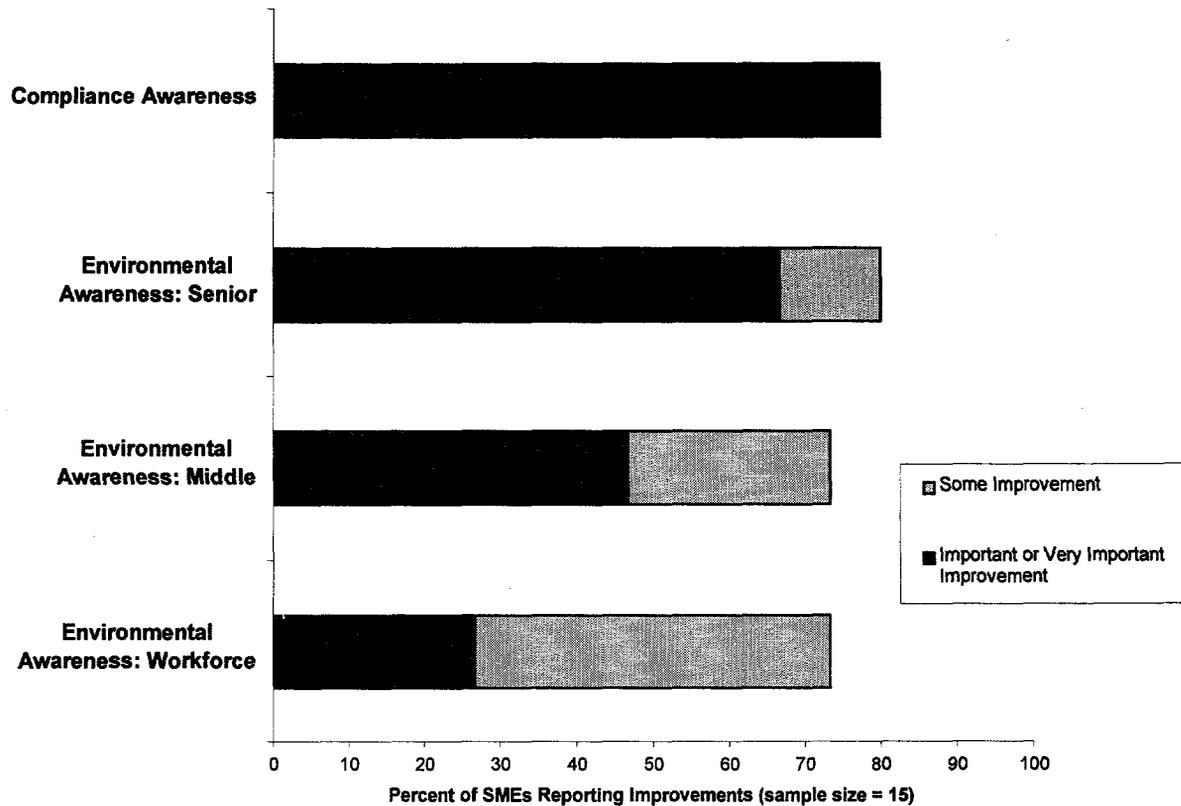
²⁶ Only the 15 SMEs that attended the February 1998 review session are represented.

²⁷ Figures 4.2 and 4.3 includes SME #20 that reported an improvement in paperwork compliance. Table 4.1 does not include this SME.

Table 4.1: Improvements in Environmental Performance (Continued)

6	Replaced a polyurethane with a glue adhesive to a molded polyethylene, eliminating VOC emissions from the glue.
7	Eliminated a wash with detergent identified as an unnecessary process stage, reducing waste water by 90%. Waste paper has been cut by 30% by purchasing paper in custom sizes better reflecting product specifications. Improved machinery maintenance has reduced noise levels.
8	Applied green design principles to construction site, ensuring that minimum woodland area was disturbed. Subcontracts include requirement that trucks are covered and sprinklers used, for better dust control.
9	US\$ 8 investment in a spray nozzle and change in procedures to sanitize stainless steel tanks resulted in savings in orange juice (6% of total consumption) and water totaling US \$11,200 per year and correspondingly a reduced effluent discharge. Also reduced other raw material losses by working with suppliers to use different containers. Solid waste is now sorted into reusable and recyclable bins; vehicles are better maintained and so have lower emissions; and there is reduced use of sanitizing chemical.
10	Changed employee incentives to emphasize quality, lowering defect rate and consequently cutting waste. Improved employee awareness also reduced rag disposal (a hazardous waste) by 90%. Reduced noise by substituting mechanical for pneumatic process in one machine.
11	Now ensuring adequate disposal of hazardous waste received as sample material for analysis, by returning through the generator of the waste (the mentor) for disposal at a licensed facility.
12	Better management of hazardous waste ensures adequate disposal.
13	Separation of paper, plastic and rag waste now allows recycling. Monitoring of solvent use has promoted waste minimization.
14	Changed location to allow better control of environmental impacts. Eliminated a rinse stage, reducing volume of waste water. Installed carbon filter to reduce contamination of waste water, and extraction system with filter to treat fumes.
16	Better housekeeping, principally separation and reuse of waste raw material, has cut hazardous waste generation by 50%, reducing treatment costs and raw material consumption.
17	Reduced consumption of maintenance oil through good housekeeping; all used maintenance oil is now treated as a hazardous waste.
19	Risk associated with delivery of chemical products to customers was reduced by purchase of a small truck to substitute the use of the family car. The generation of hazardous waste was cut by reusing the containers used for product delivery.

Figure 4.3 Improvements in Environmental and Compliance Awareness²⁸



D. QUESTION 4. CAN THE EMSs IMPLEMENTED THROUGH THE PILOT BE SUSTAINED?

93. With the review workshop held in February, 1998, the first phase of the GEMP has been completed. The objective of the second phase (through February 1999) will be to observe progress, but no further training, assistance or direct motivation will be funded from World Bank or grant resources, raising the question of whether the participating enterprises will continue to implement their SMEs.

94. Most of the SMEs have indicated in review sessions that they would continue the implementation of their EMSs, principally for one or more of the following reasons:

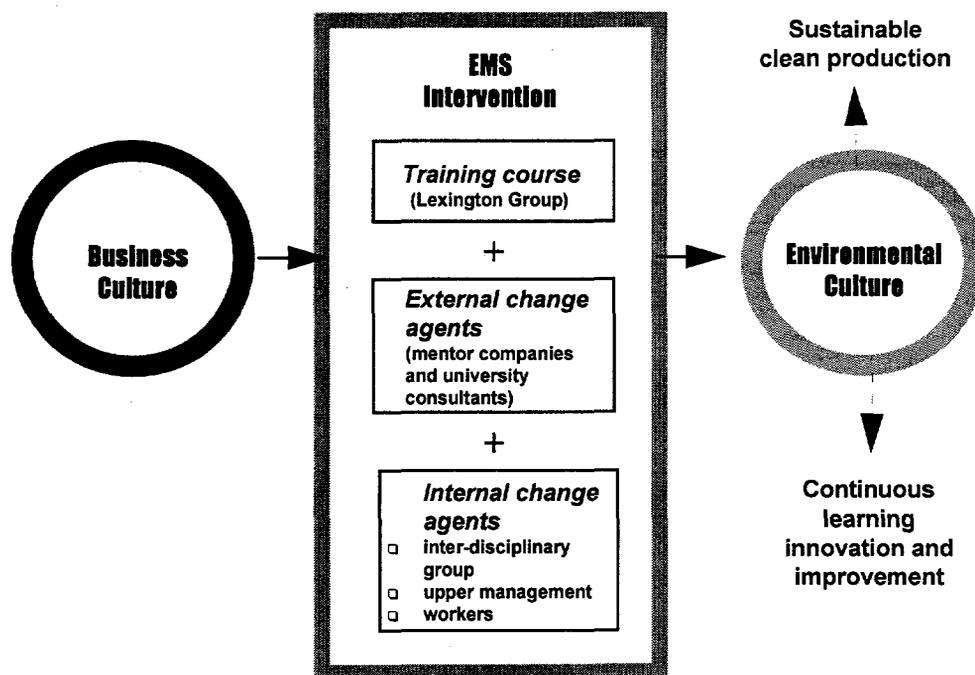
- the adoption of an EMS is a requirement of a major customer, usually the mentor company;
- the SME would like to achieve certification of their EMS for marketing purposes; and/or,
- implementation of an EMS is now company policy.

²⁸ Only the 15 SMEs that attended the February 1998 review session are represented.

95. All the SMEs noted, however, that the most important motivating force will be to schedule future review workshops to provide discrete targets for continued improvement. The majority also indicated that the preference was that these sessions be organized either by the participating universities or the mentor companies. Since February, the companies have held a number of joint meetings to review administration arrangements of the Pilot, and in fact have set up a steering committee consisting of both large company, SME and university representatives to guide the Pilot forward in this Second Phase. Visits during the coming year to review progress ought to provide a clearer answer to this question. Further, even though it remains to be seen whether GEMP can be sustained, there is already some evidence that it may be extending through the requirement by some of the SMEs that their own suppliers meet some environmental standards²⁹.

96. The culture change study also provides some indications of the sustainability of the EMSs. As per our hypothesis above, a culture change in the participating firms ought to result in a potentially more rooted, permanent system. CIESAS postulate that participation in the training course and the introduction of the EMSs began a process of cultural change in these firms. To understand the nature of this change process, the CIESAS researchers used the anthropological notion of “culture change agents” distinguishing among the training course itself (organized and executed by the Lexington Group), external change agents such as the mentor companies and the university consultants, and internal change agents such as the inter-disciplinary groups within each company, the company management and the company workforce (see Figure 4.4 below).

Figure 4.4 Process of Culture Change



²⁹ For example, SME #8 is requiring that its subcontractors cover their trucks and use sprinklers to control dust.

97. According to the CIESAS study, one of the outcomes of the training course was that it provided a new language and cognitive framework by which the participating company representatives could think about and discuss issues relating to industrial production and the environment. For many of the participating small and medium-sized companies, the EMS training was their first exposure to “management systems thinking” which, along with the other training course materials, provided a new way of thinking and talking about their own management and production processes. Learning a new language and logic became, in a profound cognitive sense, the first stage in the cultural change process.

98. At the level of the external change agents, CIESAS’s findings were completely consistent with the earlier conclusions of the value of the mentor company supplier-chain networks and the crucial role played by the university consultants as key agents of culture change. At the level of the enterprise or factory, the CIESAS team found three factors to be important: the nature of the so-called “inter-disciplinary group,” the role of upper management and the participation of the plant-level, workforce in the implementation of the EMS.

99. Within each of the factories or enterprises, the *inter-disciplinary group* took various forms depending upon the nature of the enterprise and its administrative style. In some firms, such as one of the micro-enterprises, the inter-disciplinary group (if that is what it can be called) was a single individual, who was also the owner and sole manager and employee of the firm; while, in other firms, such as one of the larger medium-sized companies, it was an informal group comprised of representatives of several different sections or divisions within the company.

100. In general, the inter-disciplinary group, like the university consultants, played a “cultural brokerage” role. The main roles of this group were those of communicators and translators. This entailed both outward communication to the university consultants and the Lexington Group trainers in terms of analyzing and discussing specific environmental and production problems, and inward communication to their own management, other technical specialists and the broader company workforce in terms of translating concepts introduced in the course into the firm’s management systems and production processes.

101. Interestingly, in no case were members of the inter-disciplinary group environmental specialists. Rather, they held multiple roles within their companies and had to balance their environmental responsibilities with other management and work responsibilities. Recent evidence from a national survey of Mexican industries, including large national and multinational firms, indicates that this assigning of environmental tasks to general managers (the so-called “mainstreaming” of environment responsibilities within industries) is more effective than the using of environmental managers or specialists.³⁰

102. Better internal communication also was a critical element in the culture change process, in order to get “buy-in” from all levels of the organization for the EMS. Communication of the EMS philosophy and framework within the firms also depended upon general styles of social

³⁰ See footnote 2.

communication and interaction among management, technical staff and workers; i.e., whether the management style of the company is authoritarian, paternalistic, participatory or some combination of these.

103. Extremely important to the success of the implementation of EMSs seemed to be how much upper management assumed “ownership” of the process, that is, how much it internalized the EMS philosophy and framework and was willing to incorporate it into the company’s overall business strategy. Again, there was great variability among the participating companies from those where upper management had limited interest in the specifics of EMSs and had assigned overall responsibility to a technician, to those firms where the owner or major manager actually attended the training course and took a personal interest in ensuring EMS implementation and compliance.

104. At the same time, successful EMS implementation also seemed to depend upon a “downward” dissemination process which “empowered” workers to participate in environmental management through adaptation of the system to their work habits and stations. In at least one of the factories investigated by the CIESAS team a comprehensive process of worker participation in EMS formulation and implementation has taken place, leading to significant improvements in environmental performance both inside and outside the plant (see Box 4.3 on the case of *Salsas de Laguna*).

Box 4.3. The Case of *Salsas de La Laguna*³¹

Salsas de La Laguna (SLL) is located in a village on the border of one of the State of Jalisco’s most magnificent lakes. The story of SLL began nearly three decades ago when a widow opened up a small restaurant where she sold a drink which, during his lifetime, was the joy of her deceased husband. The drink was made out of red orange juice, chili and salt, and imbibed with tequila (the alcoholic beverage for which Jalisco is famous). Known as the “widow’s sangrita,” the drink soon became a major treat of local residents and tourists who visited the lake.

Seeing the popularity of the drink, the widow’s son began to commercialize the mixture, and through the years it, along with a hot sauce mixture, became the two trademark products of SLL. Today, SLL supply all the *sangrita* distributed by one of the largest tequila manufacturers in Jalisco. Its hot sauce is also distributed internationally (mainly to the US market) and it produces over 350,000 boxes of hot sauce per year, with a drawing of the “widow” on the label that cover each bottle. There is a strong sense of pride and identity in this family-owned business, not only for the great demand for its authentically Mexican products marketed nationally and internationally, but also for its treatment of its 30 person workforce and its honored place in the modern history of the town of La Laguna.

(Continued)

³¹ Name of SME changed to preserve confidentiality.

Box 4.3. The Case of *Salsas de La Laguna* (Continued)

For years, SLL directed relatively little attention to the environmental impact of its production processes, nor to its sometimes wasteful use of raw materials (especially water, and basic inputs such as oranges and chilies). It also sometimes caused problems for neighbors of the factory, who were bothered by the machinery noise from the bottling process which, when orders came in, often ran both day and night shifts. Along with excessive noise, the environmental problems faced by the company included discarding of raw materials, generation of excessive solid wastes, effluent discharges to the lake, and risks of fire.

Through its association with the large tequila manufacturer, SLL became a participant in GEMP and, in the process, established one of the most comprehensive SME EMSs. The major aspect of the SLL program was the reorganization of production processes and the mobilization of work teams to analyze and respond to recognized problems of industrial hygiene, raw materials use and control of wastes, effluent discharges and noise. Based upon the advice of the university consultant, who was a highly motivated and dynamic university professor from Guadalajara, the owner of the company hired a chemist to coordinate EMS implementation. These two, together with the TQM supervisor from the mentor company, and SLL's production supervisor (a strong advocate for EMS) formed the firm's Inter-Disciplinary Group. At the same time, the company organized production-line work teams to identify improvements which could be made in areas such as industrial processes and materials use.

The effects of the work team participation in the EMS design and implementation were particularly impressive, as a number of the young workers began to assume a growing "environmental consciousness" which went beyond the factory. Some of them began to wear T-shirts describing their new environmental concerns, to speak at local schools, and to participate in environmental cleanup activities in the community. They also encouraged the managers of SLL to place an advertisement in the local community newspaper describing the firm's environmental policy. Among the ideas which they, together with the management and university consultant, generated to improve environmental performance were the sorting of solid waste into reusable and recyclable bins, the cleaning up of work spaces, the improved maintenance of company vehicles, reduced effluent discharges through water conservation, reduced use of sanitizing chemicals, the requiring of suppliers to use stronger containers so as to reduce waste and loss, and the rinsing out of drums of orange juice to salvage concentrate. Some of the measures have resulted in savings of over US\$ 10,000 annually for the company in reduced raw material and water usage at a cost of about US\$ 10.

All of these actions have had a demonstrable effect on SLL's environmental performance, as well as on reducing costs in terms of material use and disposal. Perhaps even more important, the management of SLL recognizes that continuous environmental improvement is fundamental for a company whose products are increasingly being sold on national and international markets. Although relatively small in size, SLL has significant room for economic expansion and is preparing to market its hot sauce on the US market with a new label which will not only note that it is "made in Mexico" but also that it is an "ecologically clean" product.

105. Finally, the CIESAS study provides some insights into how to sustain the cultural change process initiated through the introduction of the EMSs. Perhaps the major finding of the study in terms of sustainability is that, in order to be effective, EMSs need to be incorporated into the overall business strategies of companies as part of a general cultural change process linked to continuous learning, improvement and innovation.

106. Much has been written on the need for “continuous improvement” and “quality management” as strategies for ensuring corporate competitiveness in changing global markets and economies. However, relatively little in this literature relates this “quest for quality” and the so-called philosophy of the “learning organization” to improved environmental performance, and almost the entire literature is focused upon changing patterns of culture and social organization in large companies and multinational firms.

107. If anything, the CIESAS study provides a counterpoint to this literature, demonstrating that small and medium-sized firms--many of them traditional family-owned and managed enterprises--have the capacity and desire to improve their environmental performance through increased learning, innovation and communication.

108. **Preliminary conclusion:** Many of the essential factors, such as management ownership, worker participation, good internal communications systems, point to the existence of fairly solid EMS in many of the SMEs. Indeed, the culture change study’s preliminary findings points to a measurable culture change in the firms that implemented EMSs. However, the definitive answer to exactly how sustainable these systems are over time can only be determined over a longer time frame.

5. REPLICATING THE PILOT

109. Given the positive preliminary results of GEMP, in this chapter we turn our attention to how to replicate and scale this Pilot up to a national program. Section 1 summarizes the successful experiences of GEMP. Section 2 discuss some practical lessons learned on how to improve the Pilot and to link it with broader initiatives, particularly if this is scaled up to a national program. Finally, Section 3 concludes with the major policy implications of the Pilot for development assistance to SMEs on environmental issues.

A. DRAWING UPON THE SUCCESSFUL EXPERIENCES OF GEMP

110. The pilot evolved during the course of the first phase, resulting in a practical model for delivering EMS support to SMEs. These successful experiences of GEMP include:

- The importance of the large company-SME network as a vehicle for recruiting and motivating SMEs. As mentioned earlier, about half of the SMEs, that fully participated in

GEMP's first year of activity, stated that they would not have participated in the Pilot if they had been invited by either the government or a university.

- The critical role of the university consultants in helping the SMEs with hands-on implementation support. From providing training to workers in general environmental concepts to advising on management systems and legal requirements to just being an “extra pair of helping hands”, this support was rated by 62% of the SMEs as “very important” or “critical”.
- Provision of “just-in-time” training and simplified formats made the training sessions more manageable. Further clear definition of milestones gave the SMEs achievable targets at the end of each training session.
- Regular review session helped to share and compare different approaches, as well as gave the SMEs networking opportunities. It is also worth noting the importance of maintaining the same workgroups over time to build cohesiveness within the group. These review sessions gave “teeth” to the milestones - the importance of talking about their own successful achievements in front of their peers was additional incentive for the SMEs to implement their training in time for the next review session.
- There was considerable industry “ownership” of the Pilot. One individual from a large company took on the role of “champion” of the Pilot, encouraging other large companies to participate, leading the process of setting project objectives and milestones, and advocating the project before regulatory authorities. Decision making and initiative were also in the hands of the industry participants from the start - with the large companies matching the World Bank's funding for the international consultant; the SMEs and large companies jointly making key decisions, such as whether to use the ISO 14001 EMS model without adaptation; and the companies jointly participating in the identification of internal barriers to better environmental management, the development of formats, and the establishment of project milestones.
- The initial focus on senior management was important in giving the Pilot priority within the participating firms. The companies themselves identified senior management commitment as a key hurdle to achieving better environmental management, and as a result at the start of the Pilot, a two-hour session on EMS was scheduled purely for senior management of the large and small companies.
- The Pilot's *convenio* and other contracts between the various parties provided the legal terms of reference. Given the large number of players involved in the Pilot, these documents were a way of clarifying the roles and responsibilities of the participants.
- Confidentiality of discussions and data was maintained, and this was essential in allowing the companies to talk freely about their environmental issues (particularly those related to compliance).

B. SCALING UP TO A NATIONAL PROGRAM

111. It is worth noting that the SMEs in GEMP were probably a more sophisticated sample than the Mexican average, given their selection by a more sophisticated sample of large companies, and as demonstrated by the high level of education of many of the SMEs' chief executives.³² Whether the experiences of this group were unusual, or whether they still provided a typical SME response remains to be seen. Further pilots and national programs based on GEMP in Mexico and in other countries ought to provide more information to better answer this question. The following subsections describe the steps in scaling GEMP up to a national program.

(1) Improvements to the Model

112. Clearly large scale replication of this Pilot needs to draw upon and utilize the successful experiences from this Pilot, as noted above. However, future such projects will benefit from a number of lessons learned through GEMP. The major areas that were identified for further improvements include the following:

- With hindsight, the large companies required greater support in EMS implementation than provided by GEMP. As noted earlier, many of the SMEs left their mentors behind with respect to EMS capabilities, and future projects will help to strengthen the mentor-SME link and utilize this even more effectively by providing assistance to the large companies as well, in return for the large companies' financial contributions. The mentor-SME link would also be further strengthened if the large companies were required to implement an EMS in part or all of their installations, as well as commit to auditing their SMEs' EMSs at periodic intervals.
- During GEMP, the university consultants, mentors and SMEs all attended training sessions together. Future pilots need to provide training to the large companies and university consultants in advance, so that they can better support their SME clients.
- GEMP involved at any one time as many as 60 to 70 participants. Despite *convenios* and contracts between the various parties, misunderstandings arose due to different expectations on the part of these parties, partly due to each contract being negotiated separately from the others, with only the priorities of those concerned individuals. Future pilots need to allocate a significant amount of time in building joint consensus of expectations of all the players and establishing an open communication process to avoid misunderstandings

³² It is interesting to note that at least three of the micro/small companies in GEMP, who were real success stories, were led by people with university degrees and therefore may not be representative of this sector in general.

- In GEMP, the role of the university consultants turned out to be more critical than originally anticipated. As a result, not much thought was given to the incidental expenses for university consultants (such as for travel to SMEs). This needs to be taken into account in future Pilots.
- The relationship of the Pilot to national, state and local regulatory programs needs to be well-defined. GEMP took place during a time of important changes in Mexico's industrial regulatory programs. Therefore, the relationship of the project to the emerging systems could not be defined. For future projects, it will be important to define at the outset the rights, responsibilities, and recognition the participating companies will receive within the regulatory system. In other words, the companies need to know what is expected of them and what they will receive in return.

(2) Linkages with Broader Initiatives

113. In line with the lessons learned from the Pilot and the clear direction of the culture change study, scaling up to a national level program needs to further mainstream this initiative with other more broad initiatives, such as (i) linkage with industry associations and centers of general assistance to industry; and (ii) linkage of this Pilot with other supplier development programs in large companies, such as for quality management. In doing so, these linkages will result in mainstreaming the environment within the general business needs of the firms. In this way, the small-and-medium sized business sector can contribute to broader societal goals of environmental sustainability while increasing its chances of economic survival in a world of global markets and competitiveness.

114. Another potentially interesting linkage that could be tested in future pilots would be to use geographical proximity (for example, an industrial park, a small industrial town, or firms located around a water basin) as a basis for choosing firms. Whilst this might lose some of the advantages to be gained (as was the case in this pilot) from commercial linkages, it would have the advantage of being able to better measure changes in the location's environmental quality, as well as allow more collaboration between the local neighborhood, the authorities and the firms themselves. Further, the proximity of firms might bring significant economies of scale to their control processes for managing effluents and hazardous waste.

115. Linkages of a national program with other industrial and environmental initiatives within the country, such as clean production programs, credit lines for industry, general programs for assistance to industry (e.g. enhanced competitiveness /export development programs) is also essential. EMSs and promotion of EMSs ought to fit within the country's broad strategy for industrial and environmental management.

116. Finally, a critical aspect of GEMP was the involvement of the universities and through their involvement, the building of local capacity in EMSs. University courses related to environmental management (whether through engineering, law, industry, environment degrees) could provide a flow of people who could potentially assist SMEs. Indeed, GEMP could equally be viewed as a model to deliver hands-on training experience in EMSs to such people.

Sustainable replication at the national level needs to consciously build this in-country capacity in a systematic manner within several organizations (to prevent monopolies) and to encourage information exchange and sharing between these bodies in order to build a strong national foundation, by assembling simple tools such as tried and tested formats, case studies, compliance check lists, EMS training modules, and a basic database of sectoral level information on raw material usage per unit of output in environmental leader firms.

C. CONCLUSIONS

117. In conclusion, the GEMP model appears to be a practical tool to help SMEs to improve their environmental performance. The preliminary results of GEMP are consistent with the “new environmentalism” and illustrate the key role EMSs can play in improving environmental performance. The GEMP model itself demonstrates the value-added of using partnerships to target and support SMEs. One question, however, remains unanswered: what policy tools can be employed to promote such initiatives? This final section presents some suggestions.

(1) Environmental Management Systems

118. GEMP demonstrates that, by developing EMSs and by building internal awareness of environmental issues, SMEs can attain very substantial improvements in environmental performance. In some cases, these improvements are accompanied by enhanced economic performance as well. These results confirm two key findings of the World Bank’s Development Research Group’s analysis of data from a 1996 survey of Mexican industry, as quoted below:

“(1) Process is important. Plants which institute ISO 14001-type internal management procedures exhibit superior environmental performance.

(2) Mainstreaming works. Environmental training for all plant personnel is more effective than developing a cadre of environmental specialists; assigning environmental tasks to general managers is more effective than using special environmental managers.”³³

119. Further, GEMP shows that business culture, rather than size, is important in determining a firm’s ability to implement an EMS. In doing so, it suggests that these internal differences result in different external behavior, and that the general assumption of a firm as a homogeneous rational economic actor is perhaps inaccurate. Interestingly, the CIESAS study also suggests that economic incentives (especially the perception of companies that an EMS is needed in order to penetrate or respond to greater markets) are a major motivating factor in why companies participated in GEMP and did or did not institutionalize the EMS sufficiently.

³³ See footnote 2.

(2) Partnerships for Environmental Management

120. Another dimension GEMP adds to these previous findings is that partnerships between authorities and industry, as well as local academic institutions, can be effective mechanisms to promote environmental improvement in SMEs. In many cases, large firms are better able to reach their small company suppliers than are regulatory agencies, which often do not have the capability or level of trust necessary to provide technical assistance. Although the large firms themselves in many cases lacked the expertise required to provide technical assistance, in funding GEMP they made this expertise available through local and international consultants. Most importantly, the large companies have a kind of leverage over their small suppliers that government agencies lack.

(3) Flexible Regulatory Mechanisms for Promoting EMSs

121. Finally, one aspect that GEMP does not tackle is the necessary interface with the regulatory system in order to encourage the implementation of EMSs. In GEMP, government and industry worked together to improve environmental management both within and beyond the facility fence line. To promote similar improvements on a larger scale, policy tools based on performance measurement and disclosure, accountability, and recognition and rewards will be needed. As these new policy tools are tested, it will be useful to keep two principles in mind: government can promote, but not require, the adoption of particular management methods within firms, and industrial environmental initiatives do not relieve industry of the responsibility to comply with basic regulatory requirements.

122. A government's decision on how actively it should promote such a model should be subject to (i) an evaluation of the significance of pollution from SMEs, and (ii) the potential benefits from bearing the costs of such an activity. Examples of the latter are the reduction of costs as a result of reduced inspection frequency in the SME sector, enhanced economic performance by SMEs addressing environmental concerns more cost-effectively, and better environmental performance from this sector. It is interesting to bear in mind that at the start of GEMP, many of the SME representatives were not aware of all their legal regulatory requirements. The process of implementing an EMS heightened this awareness. Further, many SME representatives commented in the February 1998 progress review session that the process of implementing an EMS considerably increased their capability to comply with the law as it helped to set up a framework within which they could identify and tackle areas where they were out of compliance.

123. If a government were to decide to support EMS adoption by SMEs, a range of policy tools is available for use. Low cost options include promotional activities for the creation of private sector EMS networks, public recognition of participating companies, reduced or accelerated administrative requirements (such as faster environmental approvals and permitting procedures or fewer inspections), and efforts to harmonize environmental and other regulations with EMS implementation. More active promotion could include partial financing for EMS

training, or even fiscal incentives for companies with certified EMSs. At the very least, governments could learn much from further similar pilots, particularly regarding the difficulties faced by small and large firms in complying with regulations, how to build partnerships for improved environmental management, and finally, how to develop more effective regulatory frameworks.

124. Finally, depending on a government's decision to promote such a model, a number of World Bank instruments could be used to support such initiatives in developing countries. In this particular case, due to the pilot nature of this activity, the costs of the pilot³⁴ were borne by the Bank from its own budget as part of its non-lending services program, as well as through grant financing from the Norwegian Government, and by the participating large companies. In future initiatives, potential Bank instruments that could be used to finance such pilots, include stand-alone Learning and Innovation Loans (LILs) as well as regular Bank loans for environmental management or improved industrial competitiveness, where a national program based on this pilot could be one component of that loan. Additionally, the Bank could play an important role in acting as catalyst and facilitator to help build partnerships between private and public entities (for example, through its Business Partners for Development Initiative) or assist in the interchange of lessons learned as a result of such initiatives (through, for example, programs implemented by its Economic Development Institute).

³⁴ The cost of this pilot was approximately US\$ 135,000, excluding Bank staff time and travel costs.

ANNEX 1. SME PROFILES

Basic SME Information

The following table provides a basic description of the size, industry type, and project status of each SME involved in GEMP. One-page summaries of progress made by the SMEs that attended the February 1998, review sessions (listed as “full participants” in this table) are given on subsequent pages.

SME	Number of Employees	Industry Type	Status in Project
#1	230	Manufacturer of storage racks	Only attended August 1997 project sessions (dropped out due to lack of senior management commitment)
#2	20	Manufacturer of custom machine parts	Full participant
#3	30	Manufacturer of custom machine parts	Subsidiary of mentor company
#4	12 (in plant)	Environmental services such as analysis of industrial wastewater and production of chemical products for water treatment	Full participant
#5	100	Plastic manufacturer	Did not attend February 1998 review session (reasons unclear - potentially other conflicting commitment)
#6	100	Packaging manufacturer	Full participant
#7	210	Print shop (mostly owners' manuals)	Full participant
#8	45	Construction	Full participant
#9	30	Producers of hot sauce and <i>sangrita</i>	Full participant
#10	70	Manufacturer of PVC safety seals	Full participant
#11	10	Environmental services such as analysis of industrial wastewater and production of chemical products for water treatment	Full participant

SME	Number of Employees	Industry Type	Status in Project
#12	20	Environmental services such as analysis of industrial wastewater and residues, design and construction of water treatment plants, environmental assessment	Full participant
#13	16	Print shop	Full participant
#14	8	Laboratory analysis of industrial wastes and wastewater	Full participant
#15	50	Distributors of chemical products	Did not attend February 1998 review session (progress delayed by change in senior management)
#16	32	Chemical manufacturer	Full participant
#17	120	Air-bag and seat belt manufacturer	Full participant
#18	220	Manufacturer of acrylic fibers	Dropped out after initial meetings due to distance
#19	3	Mixing and transportation of chemical products	Full participant
#20	30	Production and distribution of concrete	Full participant
#21	45	Production and distribution of concrete	Subsidiary of mentor company
#22	120	Environmental services such as solid waste transportation and operation of water treatment plants	Bought out by mentor company

SME # 2: 20-employee custom manufacturer of machine parts.

Environmental Policy and Planning

- *Self-assessments.* Completed two, improving from 2 percent to 61 percent.
- *Environmental policy.* Draft under review, developed with participation from managers and workers. Commitments to improve worker health and safety; optimize natural resource use; reduce generation of hazardous waste; comply.
- *Significant environmental aspects (SEAs).* Include oil consumption and handling; machine noise; cleanliness of work area.
- *Compliance.* Previously unaware of some regulations; no longer classified as a hazardous waste producer.
- *Root cause analysis.* Completed for SEAs; for example, poor machine maintenance identified as root cause of oil leakage.
- *Objectives, targets, and plan.* Exist for commitments in plan; developed in conjunction with workers.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* EMS team includes managers of quality, purchasing, and HR. EMS management representative is owner's son. Workers' roles communicated during company-wide weekly Friday meeting.
- *Operational controls.* Integrated into operating manuals of machines. Example is procedure to inspect machines' oil levels before and after use.
- *Training.* Training program exists; awareness training given in weekly meetings.
- *Documentation.* Mostly complete.
- *Emergency plan.* In progress.
- *Indicators.* Include or will include number of accidents; results of periodic inspections of hygiene and safety conditions; oil use; weight of raw material bought versus weight of product shipped.
- *Audit, corrective action.* Not formalized for EMS; in process of installing ISO 9000 quality management system with similar component.
- *Management review.* Management is consistently informed of program.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Significant improvements in management, workers; high level of enthusiasm and participation.
- *Improvements in environmental performance.* Oil use halved through better machine maintenance (replacement of old seals); company reclassified from generator of hazardous waste to generator of non-hazardous waste; work area cleaner, safer; small garden built.
- *Improvements in economic performance.* Reduced oil use and reclassification as a non-hazardous waste generator are direct economic benefits.

SME # 4: 12-employee environmental services group (branch of 50-employee company) specializing in effluent analysis and manufacture of water treatment products.

Environmental Policy and Planning

- *Self-assessments.* Completed one (11 percent).
- *Environmental policy.* Draft; waiting for comments of one manager.
- *Significant environmental aspects (SEAs).* Include potential for spills; dust generated during chemical manufacture; composition of effluent.
- *Compliance.* Discovered certain required permits are missing.
- *Root cause analysis.* Completed for dust SEA using team from production area (root cause is process of mixing dry chemicals); not completed for other SEAs (waiting to train workers in other areas).
- *Objectives, targets, and plan.* Objectives and targets developed, including installing hood to collect the dust (for reuse) and building treatment system for water used to clean plant machinery. (Both of these objectives are completed.)

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* Chief of production is senior management representative; interdisciplinary EMS team composed of chief of production, head of laboratory, and accountant/head of training.
- *Operational controls.* Waiting for further progress on training.
- *Training.* Training on EMS given about once a month to managers; not yet diffused through plant. Some training on use of fire extinguishers given.
- *Documentation.* Not developed.
- *Emergency plan.* Not developed.
- *Indicators.* Not developed.
- *Audit, corrective action.* Not taken.
- *Management review.* Chief of production is brother of managing director; EMS progress is periodically reviewed.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Significant improvements at senior management level; some improvement at levels of middle management and workers.
- *Improvements in environmental performance.* Improved work environment; extraction hood reduces dust, improves efficiency; water treatment system improves quality of effluent.
- *Improvements in economic performance.* Recovery of product and raw material previously lost as dust.

SME # 6: 100-employee manufacturer of packaging materials; building EMS from quality management system.

Environmental Policy and Planning

- *Self-assessments.* Completed two, improving from 26 percent to 71 percent.
- *Environmental policy.* Commitments include safe work environment and reducing environmental contamination.
- *Significant environmental aspects (SEAs).* Include vapors from glue used to bind polyurethane; particulate matter; noise.
- *Compliance.* Receives compliance audits from mentor so compliance is good; see need to track changes in environmental regulations.
- *Root cause analysis.* Done for certain SEAs (e.g., one root cause of vapors from glue is that company has not switched to molded polystyrene).
- *Objectives, targets, and plan.* Objectives include use elimination of VOC emissions (from glue); reducing suspended particulate matter; certifying to ISO 14001.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* Quality engineer is management representative; managers from human resources, polystyrene, and other departments on EMS team; bimonthly report for distribution plant-wide is basis for internal communication.
- *Operational controls.* Not yet developed.
- *Training.* Procedure to determine training needs in place; awareness training on environmental policy under way.
- *Documentation.* Developed manual with procedures for implementing EMS elements.
- *Emergency plan.* Documented and periodically tested.
- *Indicators.* Main indicator is production of polyurethane as percent of total production.
- *Audit, corrective action.* Have procedures for corrective action based on problems identified in bimonthly environmental report; no audit yet.
- *Management review.* Done via reports of EMS management representative.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Significant improvement in management.
- *Improvements in environmental performance.* Reduced use of solvent-based glue and resulting reduction of VOC emissions; improved work environment.
- *Improvements in economic performance.* None documented.

SME # 7: 210-employee print shop; core business is printing users' manuals for large multinational corporations; 300 percent growth in last three years.

Environmental Policy and Planning

- *Self-assessments.* Completed two, improving from 21 percent to 55 percent.
- *Environmental policy.* Commitments include appropriate use of natural resources; compliance; fostering environmental consciousness through training.
- *Significant environmental aspects (SEAs).* Include loss of paper and ink during printing; vapors generated from solvents during several production phases; effluent composition; machine noise.
- *Compliance.* Worked with local authorities to identify regulatory requirements.
- *Root cause analysis.* Completed within appropriate departments.
- *Objectives, targets, and plan.* Objectives exist for SEAs (e.g., for effluent composition, objective is to separate wastewater contaminated with solvents and oils so that non-contaminated wastewater can be sent down drain).

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* Interdisciplinary EMS team includes managers from major departments; responsibility of each of these managers defined and documented; documented weekly meetings; quality manager is management representative, EMS team leader. Reward for employees who make useful suggestions.
- *Operational controls.* Being developed.
- *Training.* Needs identified but training is behind schedule; HR manager has changed several times recently.
- *Documentation.* Slowly incorporating EMS into quality documentation system.
- *Emergency plan.* Revising draft; plan is tested.
- *Indicators.* Include amount of paper bought versus amount in product; quantity of water contaminated with non-biodegradable solvent; number of rags used.
- *Audit, corrective action.* May ask large customer for EMS audit.
- *Management review.* Formal management review scheduled for April, 1998; managing director receives regular reports and is member of interdisciplinary team.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Significant improvement in senior management; some improvement in middle management and workforce.
- *Improvements in environmental performance.* Less solid waste, especially paper (suppliers asked to supply paper cut to company's needs); separation of hazardous aqueous wastes and corresponding reduction of contaminated effluent (from 700 to 60 liters/month); greater use of recycled paper; cleaner plant.
- *Improvements in economic performance.* Reduced waste of raw material is direct economic gain; EMS used for international marketing advantage (considering ISO 14001 certification).

SME # 8: 45-employee construction company, specializing in construction of gas stations. Recently largest customer changed from one major U.S. corporation to another, prompting a revision of company strategy and policy.

Environmental Policy and Planning

- *Self-assessments.* Completed two, improving from 18 percent to 51 percent.
- *Environmental policy.* Commitments include compliance and continuous improvement in environmental quality of construction services.
- *Significant environmental aspects (SEAs).* Include hazardous and non-hazardous waste; dust; noise; damage to native flora; impact on soil (compaction and contamination).
- *Compliance.* Already had major permits in place; EMS helps focus compliance efforts.
- *Root cause analysis.* Completed for SEAs of building gas stations. For example, the lack of procedures and training on tarpaulin use is a root cause of dust emissions.
- *Objectives, targets, and plan.* General objectives and targets exist; in process of revising plan with specific actions.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* EMS team has weekly meetings and includes representatives from senior management, finance, construction; led by senior management representative who is head of environment department. Responsibilities have been changing with redefinition of company.
- *Operational controls.* Developed/implemented for one process/site; extend to subcontractors (for example, requirement for tarpaulin during transportation use built into contract).
- *Training.* General awareness training begun, with modules on environmental problems (air, water, solid waste), their consequences, and sustainable development; focused training implemented at one site.
- *Documentation.* Developments to-date are documented; files kept with meeting minutes.
- *Emergency plan.* Detailed plan developed.
- *Indicators.* Developing indicators for community relations; damage to native plants; generation of hazardous waste; and impact on soil (assessed by eyeball now).
- *Audit, corrective action.* Lack local consultant to organize audit.
- *Management review.* Senior management participates in some meetings and receives progress reports; participation is documented.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Greater environmental consciousness in workforce.
- *Improvements in environmental performance.* Include reduced dust emissions because of increased tarpaulin and sprinkler use at one site (required of subcontractors); several native trees saved because of modified construction plan at another site.
- *Improvements in economic performance.* No measurable improvements; however, new customer is inquiring about environmental policies.

SME # 9: 30-employee manufacturer of hot sauce and *sangrita*.

Environmental Policy and Planning

- *Self-assessments.* Completed three, improving from 3 percent to 64 percent.
- *Environmental policy.* Commitments include efficient use of raw materials and energy; compliance; fostering environmental awareness.
- *Significant environmental aspects (SEAs).* SEAs include discarding of raw materials; generation of solid waste; effluent discharge (into lake); noise; and risk of fire.
- *Compliance.* Became aware of low compliance and have improved drastically; only missing a permit as producer of non-toxic solid waste.
- *Root cause analysis.* Completed for all SEAs. For example, lack of system to recycle or reuse containers is one root cause of solid waste generated.
- *Objectives, targets, and plan.* Objectives for each SEA; targets for each objective; specific actions to reach targets, each with budget, date, and responsible person specified.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* Hired former employee to coordinate EMS implementation; responsibilities documented and divided between managers; work teams formed from each area, including workers.
- *Operational controls.* Developed and documented where appropriate (e.g., for transfer of raw materials from container to mixing tank).
- *Training.* Needs identified, program developed and implemented; focus on environmental awareness, industrial hygiene, emergency plan.
- *Documentation.* Actions and meetings are documented.
- *Emergency plan.* Includes procedures for fires, spills.
- *Indicators.* Include amount of raw materials discarded per unit of production.
- *Audit, corrective action.* Audit completed by consultant.
- *Management review.* Management involved in meetings as appropriate.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Significant improvements in management and workers. Workers are closely involved in project and have taken initiative in raising environmental consciousness in their homes and community.
- *Improvements in environmental performance.* Solid waste sorted into reusable and recyclable bins; work area maintained in cleaner state; vehicles better maintained to reduce emissions; reduced effluent discharge; reduced use of sanitizing chemical; discarding of raw material reduced by requiring suppliers to use stronger containers (or plastic bags, in the case of chilies) and by rinsing out drums of orange juice concentrate to salvage all concentrate. Formerly, drums were discarded without rinsing or the rinsewater was treated as effluent.
- *Improvements in economic performance.* Reduced waste of raw materials. 3,000 pounds of orange juice concentrate saved annually (6 percent of total consumption), representing US \$4,195, from change in washing procedure. Change in procedure to sanitize stainless steel tanks reduces use of water and sanitizer at estimated savings of US \$580 per month.

SME # 10: 70-employee company that shapes, cuts, and prints customer logos on PVC to make safety seals.

Environmental Policy and Planning

- *Self-assessments.* Completed three, improving from 12 percent to 37 percent.
- *Environmental policy.* Signed and displayed prominently. Schedule exists for dissemination. Commitments include compliance, increasing materials-use efficiency, and fostering environmental awareness of workers.
- *Significant environmental aspects (SEAs).* Include use of solvents and inks, generation of hazardous waste (contaminated rags), waste of raw material, machine noise and safety.
- *Compliance.* Gaps identified and addressed in part. For example, the company now fills out the required records for hazardous waste disposal.
- *Root cause analysis.* Undertaken for SEAs. For example, the incentive structure in the printing area (rewards linked to volume, not quality) was identified as a root cause of discarding PVC in the cutting area.
- *Objectives, targets, and plan.* Set for each SEA.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* EMS team has representative from each operational area, led by three middle managers who report to the managing director. Team has three meetings per month.
- *Operational controls.* Implanted in a few areas (e.g., for waste handling).
- *Training.* Specific training on hazardous waste handling and other relevant procedures has occurred or is planned. General environmental awareness training planned.
- *Documentation.* Policy and planning documented; documentation of procedures underway.
- *Emergency plan.* In draft form.
- *Indicators.* Exist for almost every SEA, measured against ton of product processed.
- *Audit, corrective action.* EMS audit performed by local consultant, but procedures for corrective and preventative action have not yet been implemented.
- *Management review.* Done for policy and planning documents.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Throughout company.
- *Improvements in environmental performance.* Improved compliance; reduced waste of raw materials (by changing the incentive structure in the printing area); reduced hazardous waste (from 5.5 to 1.7 kilograms of contaminated rags per ton of product); improved work environment (machine noise has been significantly reduced in cutting area by modifying pneumatic machine); reduced electricity consumption; and extension of environmental programs to employees homes (e.g., battery collection program).
- *Improvements in economic performance.* Direct economic benefits from most of above improvements in environmental performance. EMS should help company reduce turnover rate (by addressing occupational safety and health issues). Company may pursue ISO 14001 certification as marketing tool for the export market.

SME # 11: 10-employee environmental services company, including wastewater analysis and production of chemical products for water treatment.

Environmental Policy and Planning

- *Self-assessments.* Completed two, improving from 8 percent to 46 percent.
- *Environmental policy.* Commitments include compliance and development of environmental culture through training.
- *Significant environmental aspects (SEAs).* Include discarding of unanalyzed and analyzed samples; discarding of washwater with biological material; vapors from several processes.
- *Compliance.* Minimum initial score on compliance checklist; increased awareness of federal and local regulations; beginning to separate hazardous waste.
- *Root cause analysis.* Completed for several SEAs. For example, lack of training on preserving samples is one root cause for discarding unanalyzed samples.
- *Objectives, targets, and plan.* Developed for each SEA. Compliance is primary objective, e.g. building a tank to treat biological waste (and so comply with discharge laws).

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* Director general heads EMS.
- *Operational controls.* Developed for some procedures (e.g., for classification of waste as hazardous or non-hazardous).
- *Training.* Informal; use course video for EMS and environmental awareness training.
- *Documentation.* Developed for policy and planning components, not for operational controls.
- *Emergency plan.* Draft.
- *Indicators.* Qualitative baselines developed (e.g., in March 1997, analyzed samples were disposed down the municipal drain without being treated).
- *Audit, corrective action.* Not yet.
- *Management review.* Implicit (director general leads EMS effort) but undocumented.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Significant improvements throughout company, especially in compliance awareness.
- *Improvements in environmental performance.* Separation and proper disposal of hazardous waste; less waste and evaporation of hexane and less generation of certain gases through changed analysis procedures; extraction hood for gases planned.
- *Improvements in economic performance.* Additional cost: company pays to treat hazardous waste properly.

SME # 12: 20-employee environmental services company offering laboratory analysis and chemical products for water treatment.

Environmental Policy and Planning

- *Self-assessments.* Completed two, improving from 31 percent to 70 percent.
- *Environmental policy.* Commitments include compliance; eliminating risk to workers; secure management of chemicals; reducing environmental impact on the community.
- *Significant environmental aspects (SEAs).* Include risks to worker safety; water effluent contaminated with laboratory wastes; potential for chemical spills from storage and transport; and impact of noise and emissions on neighboring tenants (company rents space in office building).
- *Compliance.* In process of identifying all applicable regulations; some actual improvement.
- *Root cause analysis.* Completed for each SEA. Lack of appropriate training is important (e.g., training on how to recognize/classify hazardous waste).
- *Objectives, targets, and plan.* Exist for each SEA, with timeline and responsible person identified. For example, one objective is to reduce laboratory waste to a minimum; corresponding targets include returning excess samples to client and monitoring wastewater.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* EMS developed by team of nine, including managers and workers. Technical Director is management representative; other roles defined in manual.
- *Operational controls.*
- *Training.* Plan for training exists.
- *Documentation.* Comprehensive EMS manual developed.
- *Emergency plan.* Lab's emergency plan being expanded to include chemical division.
- *Indicators.* Quantity of hazardous waste produced per unit of production; composition of effluent.
- *Audit, corrective action.* Will request mentor company to perform audit.
- *Management review.* Documented, regular meetings between managing director and EMS representative.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Significant improvements in upper and middle management, improvements in workers, especially in terms of effluent composition.
- *Improvements in environmental performance.* Less effluent generated; separation and appropriate disposal of hazardous effluent and waste, including chloroform and hexane; precipitation and/or neutralization of heavy metals.
- *Improvements in economic performance.* Not quantified.

SME # 13: 21-employee print shop; recently took over another small print shop.

Environmental Policy and Planning

- *Self-assessments.* Completed one (22 percent).
- *Environmental policy.* Draft exists but needs management review in light of recent growth.
- *Significant environmental aspects (SEAs).* Include waste of paper and plastic; contaminated rags.
- *Compliance.* Found few regulations that apply.
- *Root cause analysis.* Not done.
- *Objectives, targets, and plan.* Not done.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* Senior management representative appointed but has not been successful in involving more employees in project because of time constraints.
- *Operational controls.* Implemented for waste separation.
- *Training.* Not done.
- *Documentation.* Not done.
- *Emergency plan.* Not done.
- *Indicators.* Not developed.
- *Audit, corrective action.* Not done.
- *Management review.* Not done. Managing director is supportive but does not have time for the project now.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Important improvement in senior management; some improvement in middle management and workers.
- *Improvements in environmental performance.* Waste separated so used paper can be recycled (four 55 gallon containers of paper recycled each week); number of trial runs reduced; reuse of paper for trial runs (i.e., both sides of paper used).
- *Improvements in economic performance.* Reduction in paper waste is direct economic benefit.

SME # 14: 8-employee company performing analysis of hazardous industrial waste. Company recently moved into larger laboratory with better infrastructure for environmental protection.

Environmental Policy and Planning

- *Self-assessments.* Completed two, scoring 30 percent on the first (results of second not yet available).
- *Environmental policy.* Commitments include controlling environmental contamination and providing accurate results to their clients; diffused throughout company.
- *Significant environmental aspects (SEAs).* Include quantity and composition of effluent; emission of gases during analysis.
- *Compliance.* Improved understanding of regulations; increased compliance by moving to new facility where separation of highly contaminated water is possible.
- *Root cause analysis.* Done for SEAs. One root cause of effluent quantity is excess samples arriving from client; another is procedure for washing and rinsing laboratory equipment.
- *Objectives, targets, and plan.* Developed; some objectives relate to improving EMS (e.g., documentation), others include testing new procedures for separating and treating effluent and for reducing atmospheric emissions.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* EMS structure and responsibilities delineated and hung on wall of laboratory; managing director is in charge of EMS development; communication and discussion occurs informally and during regular staff meetings.
- *Operational controls.* Developed for many procedures. For example, a procedure for conserving water while washing lab equipment is hung in the washing area.
- *Training.* No formal plan yet, but training occurs during meetings and informally.
- *Documentation.* Not yet developed.
- *Emergency plan.* Extensive emergency plan developed and communicated to workers.
- *Indicators.* Plan to measure volume and composition of effluent.
- *Audit, corrective action.* Not taken.
- *Management review.* Continuous but not formal.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Significant improvement throughout company. Employees have broader understanding of environment; for managing director, improvement is better understanding of how to manage environmental performance.
- *Improvements in environmental performance.* Switch to new laboratory (in part attributable to project) improves quality control and improves ability to separate and treat effluent as necessary. Effluent from new treatment system not yet tested, but company expects system capacity to be three times average daily volume. Previously, all effluent went straight down municipal drain.
- *Improvements in economic performance.* Not evaluated.

SME # 16: 32-employee chemical manufacturer. Company now competes with mentor company and is trying to develop market in U.S.

Environmental Policy and Planning

- *Self-assessments.* Completed two, improving from 13 percent to 40 percent.
- *Environmental policy.* Draft exists but managing director may not sign it. Commitments include compliance; continual improvement in addressing SEAs.
- *Significant environmental aspects (SEAs).* Primary SEAs are quantity and composition of effluent from nickel catalyzing process. Untreated effluent (which has high pH and contains nickel and aluminum sulfate) currently poured into neighboring field.
- *Compliance.* Identified areas of non-compliance. Expecting compliance audit in May 1998.
- *Root cause analysis.* Completed for contaminated effluent.
- *Objectives, targets, and plan.* Objectives include neutralizing the effluent; removing nickel; reducing the quantity of water used in the washing process. Specific actions, such as installing a wastewater treatment plant, filtering the crude catalyst, and changing the washing cycle, have been planned but not taken.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* Interdisciplinary EMS team composed of managers and supervisors from different departments; team led by engineer in charge of environment; other team members have not bought into EMS concept.
- *Operational controls.* Developed, but not documented, for procedures related to hazardous waste generation and management. Not developed to control water use during nickel catalyzer process.
- *Training.* Needs identified; awareness training delivered to supervisors and managers; legally required training also delivered.
- *Documentation.* Policy and planning efforts documented.
- *Emergency plan.* Draft.
- *Indicators.* Liters of effluent per unit of product for each product category; pH of effluent (10-12 when producing nickel catalyst).
- *Audit, corrective action.* Not taken.
- *Management review.* Communication between environmental engineer, managing director (brother-in-law); managing director currently not very supportive of project.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Some improvements in middle management; workforce much more conscious of environment, health, and safety issues at plant.
- *Improvements in environmental performance.* Hazardous waste generation reduced from 4 to 2 drums per month because of more careful handling; cleaner work environment.
- *Improvements in economic performance.* Reduction in hazardous waste treatment cost of US \$50/month. Wastewater treatment plant unlikely to be built because of prohibitive cost (US \$100,000); company will investigate option (identified in review session) of selling/giving effluent to neighboring company (large company participant) that needs high pH water.

SME # 17: 120-employee manufacturer of seat belts and air bags; in process of certifying to QS 9000.

Environmental Policy and Planning

- *Self-assessments.* Completed one (32 percent).
- *Environmental policy.* Draft; commitments include preventing environmental contamination by reusing and recycling where possible and by providing appropriate training to employees.
- *Significant environmental aspects (SEAs).* Include rags contaminated with oil and solvents from machine maintenance; fine particulate matter in air.
- *Compliance.* Compliance tracking system computerized; used maintenance oil now treated as hazardous waste.
- *Root cause analysis.* Done department by department for SEAs. Find that dust is generated during perforation of air-bag material.
- *Objectives, targets, and plan.* Not developed.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* EMS interdisciplinary team composed of representatives from each department; management representative's chief responsibility is currently QS 9000 certification.
- *Operational controls.* Developed for QS 9000, but not focused on environment.
- *Training.* Concentrating on QS 9000.
- *Documentation.* Concentrating on QS 9000.
- *Emergency plan.* Draft; not tested.
- *Indicators.* Plan to measure dust levels and amount of material discarded.
- *Audit, corrective action.* Not yet.
- *Management review.* No formal review; management is supportive but focused now on QS 9000.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Some improvement throughout company.
- *Improvements in environmental performance.* Now treating all used maintenance oil as hazardous waste instead of dumping some of it into the ground (thus coming into compliance as well); using less oil through better housekeeping; cleaner work environment in general.
- *Improvements in economic performance.* Not yet realized/measured.

SME # 19: 3-employee (owner, wife, son) mixer and distributor of chemical products such as chlorine. Company is based in family's house and garage.

Environmental Policy and Planning

- *Self-assessments.* Completed three, improving from 19 percent to 46 percent.
- *Environmental policy.* Commitments include compliance; reducing risk to personnel (especially in transportation); reducing contamination from spills.
- *Significant environmental aspects (SEAs).* Risk of spilling chemical products, especially chlorine, during production and transport.
- *Compliance.* Identified applicable environmental regulations.
- *Root cause analysis.* Root causes for chlorine spills include poor training; emphasis on production volume; inadequate equipment and facilities (mixing performed in domestic garage).
- *Objectives, targets, and plan.* Objectives include protecting worker safety; avoiding spills; improving transport; and relocating the business to a commercial property. Targets and plans exist for each objective.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* All employees participate.
- *Operational controls.* Partially developed, such as those for wearing protective equipment during mixing.
- *Training.* Provided by consultant and mentor on use of extinguishers and personal protective equipment; materials management; applicable legal requirements.
- *Documentation.* Not considered a priority.
- *Emergency plan.* Developed for fires, spills.
- *Indicators.* Not developed.
- *Audit, corrective action.* Mentor company will perform an audit.
- *Management review.* Continual.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* In all employees regarding worker safety and legal requirements.
- *Improvements in environmental performance.* Use of personal protective equipment; purchase of new truck that can store products separately from each other and from driver; labeling of storage drums and use of alternative drums that make it easier to transfer product, resulting in fewer spills. Search for new location is underway.
- *Improvements in economic performance.* Some spilling of raw materials and product avoided.

SME # 20: 30-employee mixer and distributor of concrete.

Environmental Policy and Planning

- *Self-assessments.* Two completed, improving from 14 percent to 52 percent.
- *Environmental policy.* Commitments include compliance, minimizing environmental impact, and conserving natural resources.
- *Significant environmental aspects (SEAs).* Include dust from cement, noise, and fuel used for transportation.
- *Compliance.* Difficulty determining which regulations are applicable; discovered that they are missing certain permits. Plan to invite inspector for a compliance audit.
- *Root cause analysis.* Done for each SEA; for example, dryness of material is root cause of dust emissions.
- *Objectives, targets, and plan.* Developed for each SEA, with responsible person and necessary resources identified; for example, actions identified to reduce dust emission at various stages of process.

Implementation, Checking and Corrective Action, and Management Review

- *EMS structure, responsibility, and communication.* Interdisciplinary EMS team formed, management representative defined; managing director participates in some of the weekly 2-hour meetings.
- *Operational controls.* In process of being defined; not yet implemented.
- *Training.* Needs identified.
- *Documentation.* Completed for policy and planning components.
- *Emergency plan.* Not yet.
- *Indicators.* Chosen but not yet measured. Include loss of cement as dust (measured by mass balance calculations); noise levels; quantity of diesel fuel consumed.
- *Audit, corrective action.* Not yet.
- *Management review.* No formal review, although managing director involved in EMS.

Improvements Attributable to the Project

- *Improvements in environmental awareness.* Greater environmental consciousness, especially in workers and middle management.
- *Improvements in environmental performance.* Not yet measured/realized.
- *Improvements in economic performance.* Not realized.