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Environmental Management Systems: Empirical Evidence and Further Perspectives

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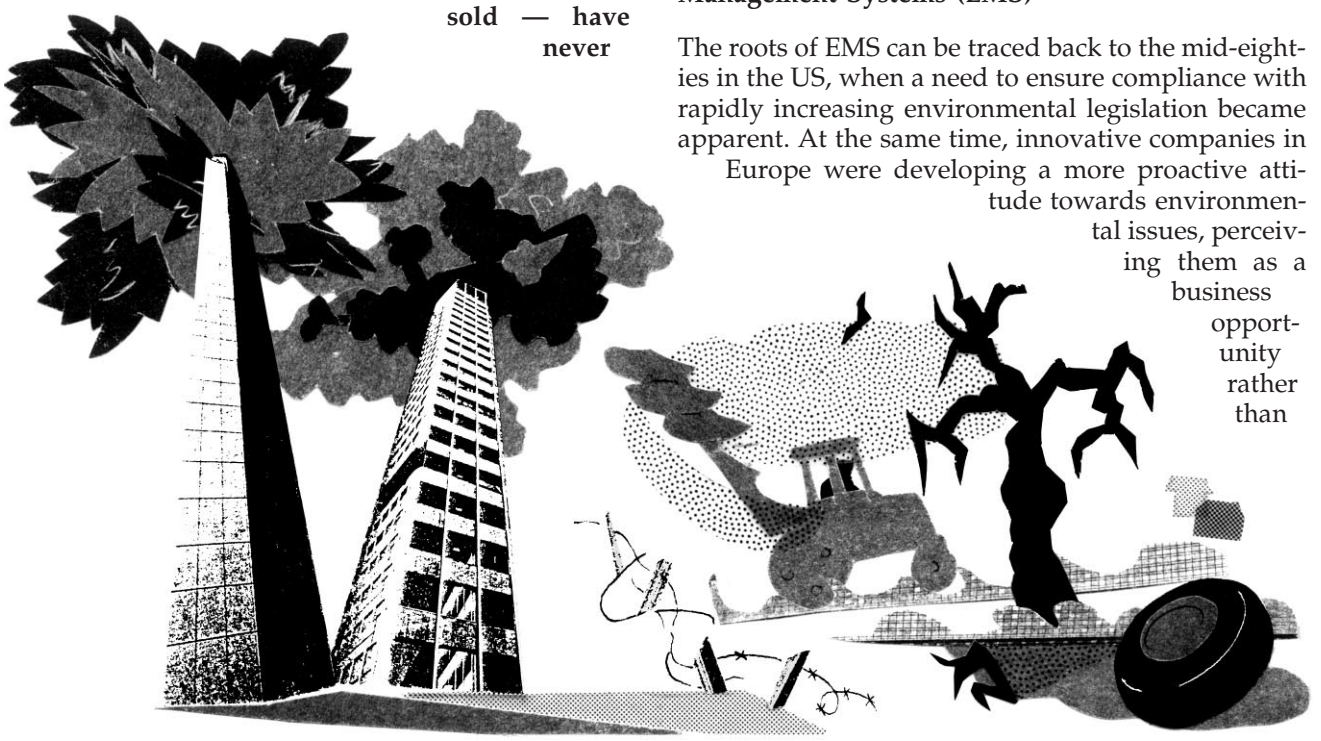
Since the mid-nineties, a significant number of companies have been applying environmental management systems (EMS), especially ISO 14001 and EMAS. This article reviews the empirical evidence of the validity of EMS and discusses the further implications of this new management tool. Empirical studies indicate that use of EMS leads to a more effective organisation and information flow, a higher degree of legal compliance and a more comprehensive exploitation of the 'win – win' potential of ecological and economic benefits. However, the external benefits — on which the politically promoted EMAS were sold — have never materialised. Further developments of the impact of EMS on regulation, corporate environmental goal setting, and ecological transparency are reviewed, and the political and cultural factors of EMS and their contribution towards sustainability are analysed. © **2000 Elsevier Science Ltd. All rights reserved**

Introduction

Historical Development of Environmental Management Systems (EMS)

The roots of EMS can be traced back to the mid-eighties in the US, when a need to ensure compliance with rapidly increasing environmental legislation became apparent. At the same time, innovative companies in Europe were developing a more proactive attitude towards environmental issues, perceiving them as a business opportunity rather than



a burden. In their search for managerial tools that would help them implement environmental strategy, they developed environmental audits as risk management instruments (Steger, 1991).

The 'Earth-Summit' in Rio 1992 brought a new global emphasis to the corporate role in environmental protection. The International Standardisation Organisation (ISO) set up a committee to develop an EMS, which was finalised in 1995 (much more quickly, for instance, than norms for ensuring quality). The first module was ISO 14001, which covered EMS in general, and was soon followed by a series of other norms which covered the requirements for audits (ISO 14010–14012) or environmental life cycle assessments (ISO 14030ff). Similarly, the European Union developed a regulation for voluntary participation in an 'Environmental Management and Auditing System' (EMAS) in 1993. Originally, this regulation applied only to industry and used sites as the regulated entity (sites had to submit an environmental declaration to be validated by an independent, government-accredited verifier).

Both versions of 'standardised' EMS spread across the world (see Table 1) EMAS with a stronghold in the German-speaking countries, and ISO 14001 in Japan and the UK (note: in Germany, Austria and the Scandinavian countries, up to 50 per cent of EMAS companies acquire, in addition, ISO 14001 certification). Further, one can also find industry specific versions (most prominently the global 'Responsible Care Program' of the chemical industry) and of course many company-specific environmental management systems that evolved out of companies deciding to tailor EMS to their specific needs.

An environmental management system is broadly defined here as a transparent, systematic process known corporate-wide, with the purpose of prescribing and implementing environmental goals, policies, and responsibilities, as well as regular auditing of its elements. The line to more *ad hoc* implemented, mostly compliance-driven environmental rules and actions is not crystal clear. But this fact reflects the broad range of EMS applied in European and global corporations. The 'standardised' EMS of ISO 14001 (based on certification by industry bodies) and EMAS (based on voluntary participation in a regulated system) are just two variations in a broad spectrum, although for political reasons they are the most important (and therefore the dominant subject for research).

Purpose and Factual Basis of This Review

The following article tries to assess the impact EMS have had on companies, their business environment and — last but not least — the natural environment. The review is based on an evaluation of most (smaller) empirical investigations of EMS and two

Table 1 Reinhard Peglau (Federal Environmental Agency Berlin, Germany) e-mail: reinhard.peglau@uba.de. Date: 10 June 1999

EU ('EMAS')-country	EMAS-registration	ISO 14001-certification
Germany	2.085	1.400
Austria	189	200
Sweden	155	645
Denmark	102	350
UK	70	947
Norway	58	72
France	33	285
Spain	36	234
Netherlands	23	443
Finland	20	191
Italy	18	150
Belgium	9	130
Ireland	7	82
Luxembourg	1	6
Portugal	2	8
Greece	1	6
Iceland	0	1
Liechtenstein	0	1
Japan		2.124
Taiwan		506
US		480
Korea		463
Switzerland		370
Australia		300
China/Hong Kong		81/42
Thailand		121
Malaysia		101
Canada		100
Brazil		90
Singapore		80
Argentina		67
India		60
Hungary		53[a]
Mexico		50
Indonesia		48
Turkey		45
Czech Republic (CZ)		36
Philippines		30
South Africa		30
New Zealand		28
Egypt		15
Slovak Republik (SK)		13
Israel		13
Poland		13
Slovenia (SLO)		13
Iran		5
Chile		5
United Arab Emirates		4
Costa Rica		3
Croatia (HR)		3
Colombia		3
Barbados		3
Morocco		3

Continued

Table 1 Continued

EU ('EMAS')-country	EMAS-registration	ISO 14001-certification
Oman		2
Mauritius		2
Pakistan		2
Vietnam		1
Malta		1
Peru		1
Russia		1
Saudi Arabia		1
Jordan		1
Romania (RO)		1
Uruguay		1
Lebanon		1
Venezuela		1
Guatemala		1

[a]The number of certified companies (by accredited certifiers) in Hungary is 53. Furthermore, 17 certifications have been issued without accreditation. ('Wild certification' is not counted in the statistics.

Source: Peglau, Reinhard: Worldwide statistics on EMAS-registered company sites and ISO 14001-certified organisations. Berlin: Federal Environmental Agency, June 1999.

comprehensive studies for the German and the Austrian Environmental Ministries, conducted by a research group and chaired by the author. (Appendix A lists all the evaluated studies and the author's own research. The latter has so far only been published in German.)

For the readership of EMJ we have tried to extract those findings that are of general interest for managers and scholars alike, both of whom do not deal regularly with environmental issues. Given the broad range of the available studies, with different research questions and a wide variety of research methodology, we do not quote individual, and always debatable, figures, but instead report the overall findings that emerged from the wealth of data (second section) and discuss the further implications of EMS and their relevance for companies (third section). Finally, I briefly review EMS in the broader context of sustainability (fourth section).

The Context of EMS

To understand the effect of EMS and the way corporations are formulating and implementing their environmental policies, one has to look at the context of important trends that are currently influencing corporate behaviour. The economic context is familiar to the reader: globalisation and the battle cry for shareholder value have intensified competition nearly everywhere, further increased the dominance of financial targets and the pressure for efficiency. In terms of internal organisation, there has been a basic shift from functional–hierarchical to process-driven organisations of the complete chain of value creation. For environmental policy this is not necessarily bad news: the drive for efficiency also implies better management of resources and more successful avoidance of pollution and waste generation. In addition, economically feasible pollution prevention and resource conservation is often more apparent if it is enacted along the whole value chain, rather than fragmented in its individual steps. New technology, from material science to IT, also favours this trend.

In the context of (public) environmental policy, EMS signalled a new approach to dealing with environmental problems — simply because the nature of the problems has shifted considerably after 22–30 years of governmental environmental protection policy. In the first phase 'clean-up' was the priority. The target was single-source, heavy polluters like power-plants, refineries or textile mills that were often producing unsustainable pollution levels which, at best, represented a nuisance, and at worst represented serious health hazards. Now we have (in Europe at least) become 'clean, but not sustainable'. With many restrictions on emissions and waste management regulations, etc., industry is no longer the only 'big sinner'. Most of the pollution now comes from diffuse sources in households, transportation or agriculture. The environmental risks — whether the 'greenhouse effect' or endocrine disrupters — are no longer visible. They are scientifically uncertain and long-term and therefore they are difficult to understand and to keep the public attention on these problems.

The regulatory framework — not only in Europe — does not fit into this new constellation. Red tape, lack of clear ecological priorities, economically inefficient rules are common complaints of companies throughout the OECD world — with good reason. Government response has been to try to modernise the environmental tool kit. Beside voluntary, but negotiated agreements, more market-based instruments, essentially tools that 'price' the environment, are heavily debated and partly applied. Environmental management systems fit into a third stream: more responsibility for corporations, implementation of environmental regulation in a 'self-governance' approach with the exception that companies set environmental goals beyond the legally required standard. (for an overview of the debate: Steger, 1998). This implicitly assumes that there is a 'win – win' potential for a company to improve both its economic *and* its ecological performance. Otherwise no (rational) company would go for a strategy that goes against its organisational interest, which is usually as simple as 'make a profit.'

But in reality, life isn't that simple: incomplete, biased and asymmetrical information, uncertainties about the results of implemented strategies, responses by competitors or customers, core values, etc., make this question less clear than in (neo-classical) economic models. But in principle it still holds true that compa-

nies must have a positive economic return on their environmental activities (Forest, 1999). This, of course, also applies for EMS; therefore, cost–benefit analysis has been a central part of many empirical investigations. However, this economic view is not always shared: many shareholders look mainly at the (positive) ecological benefits of EMS, and not at whether the (monetary) benefit exceeds the cost of implementing and operating an EMS.

Results of and Success Factors for EMS — the Empirical Evidence

Ecological Goals and Impacts

Environmental management systems require corporations — some more explicitly (EMAS), some more implicitly (ISO 14001) — to set ecological goals (e.g., emission reductions) in a transparent way, both on the corporate and the unit/plant level. But many companies set targets long before they formalised their EMS. Therefore the implementation of (standardised) EMS does not lead to dramatic changes in goal setting. Management systems can help management to achieve its goals more effectively, but do not necessarily lead to a change in the goals themselves (as some proponents of EMS have been hoping). A majority of the companies, therefore, maintain that they would have achieved their environmental goals anyway, *regardless* of the EMS.

Most of the corporate or plant environmental goals were driven by 'common sense' (questions like, 'Where can I achieve something?'), economic consideration (e.g., potential to cut waste management costs or increase resource efficiency). Environmental officers clearly had a tendency to justify the introduction of an EMS by citing tangible economic benefits that could be reaped by a more comprehensive, professional and transparent approach to environmental management.

Two politically surprising results came out of the empirical investigations: first, there is no visible or measurable difference in environmental performance between EMAS, ISO 14001 or company specific systems. The goals were very similar and depended much more on the companies' specific situations, expected legislation or corporate history than on the chosen variety of EMS. The reason for the surprise: there was a long and rather heated debate about the difference between EMAS and ISO 14001. The first requires the explicit setting of environmental goals and their continuous improvement; the latter does not (mainly due to opposition from the US, where there were concerns about potential liability risks resulting from such a provision). But companies did use EMS to achieve their environmental goals and did not care about the political compromises they entailed or the intentions they appeared to signal. If management systems are not driven by goals, they degenerate to bureaucracy — not only in the environmental domain.

Second, companies implementing EMAS practically ignored the complicated provisions for deducing their environmental goals from an in-depth analysis of the environmental impacts of their activities. The verifiers accepted this approach and validated the environmental statement so long as it described environmental goals at all, admitting implicitly not only the impracticality of the provision, but also that in today's world of diffuse emissions, it is irrelevant to single out one of many individual polluters.

However, a review of the (quantitative) environmental goals revealed that many companies are already beyond compliance in their emission standards and are reducing their pollution continuously anyway. It should be noted, however, that the companies investigated belong to the small group of proactive corporations that put high emphasis on their environmental performance and have therefore invested in sophisticated environmental management systems. Only very few studies have looked at companies that lack EMS altogether, and there is no reliable information on their goal setting.

But even in environmentally conscious corporations, legal compliance has increased with the introduction of a (standardised) EMS. Both ISO 14001 and EMAS require checking legal compliance and documenting all relevant regulations. Companies maintain that most of the violations they discovered were of a formal nature (e.g. the expiration of a permit, or not exceeding emission limits). There is no practical way to check those declarations, of course, but given the fact that these were environmentally proactive companies, there is a certain plausibility to the sample investigated.

The positive environmental impact of EMS stems, therefore, mainly from the fact that a systematic and comprehensive approach to environmental management leads to the discovery and exploitation of new 'win–win' potential, not more ambitious or new goals. Companies set their goals independent of the EMS (and regardless of the variety of EMS they choose).

Economic Cost–Benefit Analysis of EMS

The data for a cost–benefit analysis of EMS are fragmented and contradictory. First, we observe perceptions and often perceptions of perceptions. The bias resulting from the perspective (and interest) is obvious: in Austria, for example, environmental consultants estimated the (economic) cost of EMS, especially EMAS, to be only one third of the companies' estimates. Second, a closer investigation of the cost esti-

mates revealed that there was no common definition of the elements that count toward the cost of an EMS. Some companies counted only the cash cost, others included the follow-up actions triggered by a discovery in the process of establishing the EMS. Third, whereas the costs are immediate and (at least in principle) measurable, the benefits are partly long-term and immaterial, which means in other words, that they are hard to measure. The often quoted positive image factors or increased motivations of employees related to EMS are a case in point. They are *perceived* benefits, neither measurable nor empirically verifiable. For a researcher it is therefore difficult to assess how far the arguments are merely *ex post* justifications of the decision to establish an EMS.

With these provisions in mind, it can be reported that the cost estimate for EMAS range from 15,000 to 2 million Euro, with a cluster around 50,000–100,000 Euro. The environmental declaration cost estimates vary between 10,000 and 45,000 Euro.

The investments made by companies to acquire ISO 14001 certification centred around 50,000–100,000 Euro. The main determining factors are size and branch of industry, but also to a considerable degree the 'pre-standard' of environmental management. Some companies had to close huge gaps to live up to the requirements of a (standardised) EMS; to the contrary, for companies with a full blown 'Responsible Care Program' already implemented, all appeared to be routine. Further, experiences with other standardised management systems, like the quality insurance norm ISO 9000 series, helped companies to set up environmental management systems cost effectively.

On the benefit side, the majority of companies were satisfied. To justify the implementation of the EMS, most firms reported cost savings and a relatively small number of market opportunities. Resource efficiency and pollution prevention ranked high on the list of 'win–win' potential reported, along with the concern that once the 'low hanging fruit' is picked, the current justification may lose its validity. A push to exploit further potential, either by tougher or new regulation or changed consumer behaviour, seems not to be on the horizon of those interviewed.

Companies reported other, rather more tangible benefits. Among the positive impacts were increased compliance with the many and complicated regulations, higher motivation of employees, more transparent and effective organisation, lower risk of liabilities, allocation of responsibility and information flow for all environmental issues.

The concerns, especially voiced by those who had not implemented a (standardised) EMS, equated bureaucratisation of environmental management and risk of environmental retrofit investment, which were needed to close discovered gaps between the audit findings and regulatory compliance. Empirical and anecdotal evidence indicated that only in very few, specific cases did the implementation of EMS trigger this retrofit investment. However, even the proponents of EMAS admit that the politically negotiated ordinance was more complicated, even partly contradictory, more difficult to understand, redundant and too narrowly focused on organisational details (the criticism has lead to a revision that responded to these concerns, see below).

Basically it seems safe to conclude that 'environmental self governance' of companies through EMS is feasible and working. But the jury is still out on the question of whether companies generally maintain sophisticated environmental management systems over the long run — or are integrating them more into line operation (see third section). In particular, EMAS appears to be an 'endangered species'. Being more demanding, especially with the verified environmental declaration, the external benefits on which EMAS was 'sold' to companies by politicians, consultants and industry associations alike, have not materialised. This has lead to considerable frustration. Nobody was really interested in the environmental declaration — except academics and consultants. Not only were the responses from customers and the public lukewarm at best, but investors, banks, insurance companies, etc. didn't even care. Especially disappointing was that the local environmental enforcement agencies didn't even know how to deal with EMAS. Therefore mostly their attitude toward EMAS companies did not change (note: improving the relation with local regulators was an important motive to go for EMAS instead of ISO 14001). With few exceptions, expectations of a 'deregulation' of environmental laws have been disappointed, too.

Organisation and Information

Environmental management systems were mostly implemented as a top-down process in a period of 6–12 months. Sometimes the new standard required interpretation, learning, discussion with verifiers/certifiers, etc., but no major implementation hurdle was reported, especially not in the auditing process (where hurdles had been most often expected). Again, previous experiences with standardised management systems helped (especially ISO 9000 series), but not against the 'usual suspects': operational 'overload' and scarce resources (financial and human). Small- and medium-sized companies (SME) reported this to a higher degree than larger ones. But it was a difference in degree, not an order of magnitude. The only real difference was that a minimum of formal structure is needed for EMS, which starts with approximately 50 employees; SMEs, on the other hand, more often used external help. However, it was very difficult to involve sup-

pliers, service contractors and customers in the process (as required by the provision of both EMAS and ISO 14001). The environmental management of the value creation chain appears to be the real bottleneck for reaping the full potential of EMS, given that only a small minority of companies (in most countries less than 1 per cent) are ready to start an EMS. But in the optimisation of the whole chain, a larger potential of 'win – win' opportunities can eventually be discovered than just inside the 'factory fence'.

Often a project group of different functional experts and managers, chaired by a senior manager (e.g. plant director), was formed with the environmental officer as the main implementer. This process helped to raise top and senior management awareness for environmental issues, but it didn't really involve the 'normal' workforce (as many scholars have recommended). Still, as one can expect from an EMS, the information available to the workforce on environmental issues related to their workplace, and the requirement to handle them appropriately, improved.

Another bottleneck was information about the environmental impact *within* the company. Given the specific nature of 'ecological goods', this is no surprise. Only in cases of 'end of the pipe technology' (e.g. sulphur scrubber) can the cost of environmental protection be measured as a (monetary) cost. In cases of more 'integrated technology' (e.g. fluidised bed combustion) this is impossible. The environmental impact of plant activity, in most cases a small fraction of the overall emissions in the region, is hard to measure and difficult to assess. And it is clearly without a 'price tag'. Up to now, companies have increasingly substituted physical calculations with monetary valuations. Now with EMS, companies have to embark on the tiresome road of re-installing mass flow accounting. An often rudimentary input–output analysis is the main tool for rough assessment of environmental aspects, complemented by emission registers (which are partly required by law). Given this deficit in environmental (impact) information, one does not wonder that companies set their environmental goals pragmatically, *ad hoc* for each situation (following the rule: 'less is always better').

Excursion: the Review and Redesign of EMAS

Most of the political and stakeholder attention, especially in the German-speaking countries, was focused on EMAS. With the verified environmental statement by an accredited expert, the more internally-orientated environmental management became more transparent for outsiders, both for potential evaluation of corporate environmental performance and as a basis for stakeholder dialogue. This should lead, as hoped, to more ambitious environmental targets, a continuous improvement process of environmental performance and greater responsibility in environmental protection by companies in general. As already reported in previous sections, these hopes were dashed by the empirical evidence. The external benefits of EMAS did not materialise: the environmental performance of companies with EMAS do not differ from companies with other EMS, and regulation was not only more demanding than expected, but more complicated and difficult to implement. Given the fragile cost–benefit ratio for companies, there were doubts that EMAS could survive the competition from ISO 14001 (and there was no justification for two similar versions of EMS).

Environmental ministries, finally, came to understand the fragile cost–benefit ratio for EMAS and responded with a completely 'redesigned' EMAS that addressed most of the concerns:

- ISO 14001 became a 'stepping stone' to EMAS — the basics of EMS no longer differ. The difference between the two is the additional demand by EMAS for clear (and quantified) environmental goals in a defined framework and the verified environmental declaration that has to meet minimum requirements in ecological information content (in the policy recommendation out of our research we called this 'environmental literacy', proved both by ISO 14001 as well as by the 'ecological star performance' of EMAS). All content-related rules are structured in a set of appendices so that environmental managers do not have to go through the buzz of regulatory speak and provisions.
- However, there are a couple of practical issues that cannot be resolved by decree, only through evolving practice. One is that the environmental verifiers are still very uncertain in their role. Most earn their life in the 'bread and butter' business of consultancy. Acting as a verifier requires a different mindset, much more like a certified accountant.
- Another issue is the switch from 'site' to 'organisation' of the verified entity. Given the strong emphasis on regulatory compliance as a precondition of participating in EMAS, it has to be seen just how verifiers and companies deal with this provision in large, complex multinationals.
- And last but not least, it will be interesting to see how the regulatory authorities pursue the promised 'added value (of EMAS) in terms of regulatory control'. With very few exceptions, there has not been much readiness by environmental agencies across Europe to honour participation in EMAS, although it is probably the most effective leverage governments currently have to encourage participation in EMAS.

The European Parliament, however, has developed a different view of EMAS; it looks at EMAS much more from the stakeholder view than as a management tool (and is therefore resisted by industry). Currently

there is no way to predict which view will finally prevail in the dynamics of European politics. So long as the participation in EMAS is voluntary (and there are good reasons to maintain choice), it should be clear to policy makers that companies must see a positive cost–benefit ratio to want to participate in EMAS.

The EU so far has resisted calls to 'export' EMS to countries (e.g. through licensing verifier organisations there), so EMAS remains a solely European affair. Global corporations in particular have regarded this insularity as a disadvantage and have therefore made ISO 14001 their preferred internal standard. With the 'new EMAS II', however, it is easier to build 'environmental star performance' on ISO 14001.

Perspective for EMS

After reporting the current *status quo*, the question of how environmental management systems are going to develop further and what role they should play in corporations is obvious. So far companies have just finished the experimentation phase and are grappling with the lessons learnt. Out of our research, we try to provide some provisional answers.

EMS and Regulation

Empirical researchers have come up with different labels for the various corporate attitudes towards the natural environment:

- The majority of companies, especially small- and medium-sized ones, generally less risk-exposed and therefore less regulated organisations, are doing whatever is necessary to comply with existing regulations, sometimes complemented by some *ad hoc* initiatives for waste separation, energy conservation, etc.
- The second group — mostly big companies or those in heavily regulated industries — is trying to develop a 'fit' between their normal business activities and the ecological dimension by implementing a comprehensive EMS and divulging their environmental performance to stakeholders.
- The third is the small group of ecological pioneers that use the environmental dimension of business as a 'stretch' to transform products and processes through innovation.

In our policy advisor role we have argued that ISO 14001 as 'environmental literacy' is appropriate for the second group, whereas EMAS as validated 'environmental star performance' should be reserved for the third group. But where could the incentives come from to maintain EMS, when 'win–win' potential is wearing thin and new pushes through more environmentally demanding consumers or new policies are not in sight, at least not in Europe? Our answer is: through a change in the design of regulation. Although it is empirically evident that companies behave differently in their environmental design both strategically and operationally, they are treated legally as equals. EMS might provide the option of designing the supervision and control of legal compliance on a negotiated case-by-case basis. The main criteria should be the proven environmental performance of the company and its systems of self-control and regulations.

So far environmental enforcement agencies across Europe have been reluctant to embark on that course (bureaucracies are never innovators and usually cover new ground only slowly and continuously, so nobody should wonder). But on a State level in Germany and in some negotiated agreements to solve environmental problems on a 'voluntary' basis both on a European and national level, movements in that direction can be discovered. And in the negotiation for EMAS II it was accepted in principle that one of the benefits of EMS should be in the area of 'regulatory control'. After all, it had been demonstrated in the empirical investigations that legal compliance is increasing through EMS and that those companies are setting goals for themselves that exceed the legal limits (but only as long as it is beneficial for the company).

The now clearer distinction between ISO 14001 and EMAS (or no EMS at all) lets companies choose their level of environmental ambition and commitment, and if governments wish to support a higher level of environmental pro-activity, they have to do so through regulatory incentives. From what we can see today, this would be the most powerful tool for companies to use in applying EMS on a larger scale.

Environmental Goal Setting and EMS

As reported, companies basically ignored the complicated EMAS provision on setting their environmental goals. Other companies that did implement EMS set their environmental goals rather pragmatically: where legislation was expected, where cost-savings could be realised, or where an obvious improvement potential existed. This 'common-sense' approach is understandable, but not always effective. Environmental management systems could help to improve environmental conditions further if companies would set their environmental goals more in line with overall ecological priorities ('micro–macro-link'). However, given the state of environmental protection, these ecological priorities are less obvious for companies.

Cases where one company was the main source of an environmental impact are rare. In most cases, a large number of diffuse emissions cause an environmentally unsustainable condition over time.

But the information on what environmental priorities should be, either in the region or on a national/European level, has to come from long-term public environmental policy priorities, based on science and political evolution. This is especially important in the case of conflicting priorities, which cannot be dealt with at the micro-level (for example, the question in transportation of whether reduction of energy use, and with that CO_2 emission, should have priority over further reduction of NOx emissions). In a couple of cases, governments have set up national environmental plans, and the EU-program 'Towards Sustainability' contains elements of such priority setting. Far better elaborated are the national environmental plans of Austria or The Netherlands. Information on ecological conditions is available at the regional level, but mostly stored in unknown data banks or in a form that is not relevant to the needs of companies.

Arguing that public authorities should set and communicate clear long-term environmental priorities does not mean that companies should not be encouraged to look at their environmental impact (through a mass-flow balance or input–output analysis, for example). But it does imply arguing for a better micro–macro-link in order to achieve a better fit between corporate efforts and ecological needs. Once the priorities have been established, companies will look at their own situations and select the measures with the highest 'win–win'-potential. To anticipate or prevent regulation is eventually not the smallest incentive to behave environmentally proactively.

Integration of EMS Into Other Management Systems in Process-driven Organisations

The biggest change in the last decade in companies has been the evolution from structured, functional hierarchies to process-driven, flatter, leaner organisations that can rapidly adjust to changes in the market place, technical breakthroughs or emerging needs and that try to cover the whole value chain. Management systems create a certain tension between the more 'fluid' organisations and the *status quo*; they 'freeze' the system of information links, job responsibilities and process descriptions. Every step in the continuous improvement of the core value-creating process and every job change create additional repercussions in EMS (as in other management systems) that have to be documented. Such tensions are not typical for EMS, but rather of management systems in general. But given the huge 'base load' of regulation they have to cover, their impact might be more strongly felt by companies. The concerns about bureaucratisation expressed by those who did not implement (standardised) EMS are the manifestation of this tension.

Another concern is that management systems fragment value chain processes by 'cutting' of the links to other tasks that are not formalised, and therefore neglected. Or that the friction increases with increased specialisation of management systems. Finally all tasks have to be handled by the same people in operational management. In the US, the integration of environment, health and safety (EHS) is common, although sometimes it is merely represented by a single, common executive on top of three separately-acting departments (whose job it is to hold the departments together). In Europe, legal specification as well as co-determination rights of workers' councils and trade unions make the integration more difficult. In the metal and chemical industry, one can see a movement in that direction; in other industries, construction for example, there is much insistence on a clear separation.

The integration of quality and environment is a similarly controversial issue, although here two standardised ISO systems exist, which should make a combination easier (ISO 9000 series for quality, ISO 14000 series for environment). While again in the chemical industry there are some examples of integration, in the food industry most companies separate environmental issues strictly from quality and food safety.

Today there is no apparent common development in the ways EMS is integrated with other management systems. A lot will depend on the results of the experiments that pioneering companies are currently running. One of the most interesting examples will be Hoechst, which pulled health, safety, environment and quality together into one system. The basic idea was to move all common items — definitions, general procedures (e.g. auditing) — 'before the bracket' and leave only the specifics of individual policies to separate chapters in the common 'handbook' (which is, of course, in a data bank and linked to the environmental information system that deals with mass-flow, product features and legal requirements).

'Ecological Transparency' and the Role of EMS

'Don't trust me — track me'. This is the slogan of enlightened enterprises, which have understood that in today's world of global and 'instant' news, companies and other institutions no longer enjoy a comfortable credit of trust that their actions are, in principle and *de facto*, right. Nor are there places to hide. Environmental issues are a prominent example of this new reality. Even 'sins' in places far away are covered extensively in the home country. If there is any problem here, it is not a lack, but a glut of information. Many communication efforts of corporate environmental performance have fallen victim to the 'information flood'. The validated environmental

statement, the hallmark of EMAS that failed to attract stakeholder attention, is a very recent, but by no means only casualty.

If there is any hope of changing this situation, industry probably needs to initiate two major efforts:

- First, there is an urgent need for standardisation of definitions, formats, measurements and performance indicators. As long as they differ widely, environmental statements, reports and declaration will be hard to compare and benchmark (the preconditions for any meaningful assessment).
- Second, in order to gain acceptability, there has to be an independent third-party evaluation of the environmental reports or declarations.

Slowly but steadily, industry is moving in that direction. Discussions within the ISO 14000 framework, another example the 'Global Reporting Initiative', which was initiated by major multinational companies and environmental organisations, are one milestone of progress. Some best-practice companies have started to let certified accountants review their environmental reports. Shell Germany, for example, asked a widely-known 'green consultancy' to write its environmental report.

EMS can contribute to this development in three ways:

- First, the EMAS ordinance sets a standard for third-party evaluation of environmental statements (independence and professional qualifications of the verifier, standards, scope and methodology of the review and audits), which had to be matched by other initiatives as well.
- Second, environmental management systems provide in a transparent and systematic way the information needed for all kinds of (internal and external) requests. (However, we have seen that in the environmental information systems there is much room for improvement).
- Third, there is a strong correlation between 'good conscience' and readiness for open communication — EMS gives companies the insurance that they are not vulnerable to nasty surprises caused by an undiscovered 'skeleton in the closet'.

This might explain why many companies with an environmental report also choose to go for an EMS.

Cultural and Political Preconditions for EMS

As Table 1 reveals, there is a wide variety of the use of EMS across nations, and especially visible in the 'North-South Divide' within the European Union or Japan and the US, as well as the huge gap between developed and threshold countries.

There is a lot of anecdotal evidence for these differences, but few solid empirical investigations exist. One interview-based study looked into the difference in EMAS participation (and, in analogy, ISO 14001) between French and Spanish companies on the one hand and German corporations on the other and discovered the following:

- First, there is a difference in the perceived benefit of EMS due to different priorities in environmental protection, both in degree and issues. For example, in Spain forest fires and water scarcity are the two main environmental problems as perceived by the public. EMS contributes little to solve such problems.
- The corporate cultures in French and Spanish companies are perceived as not very favourable to standardised management systems in general.
- Government did little to promote the introduction of EMAS or ISO 14001, neither with (financial) support programs nor with regulatory relief.

Therefore many of the participants in EMS in Southern Europe are either subsidiaries of multi-nationals that had to implement EMS as part of internal environmental policy, or they had large export interests in the more 'environmentally-conscious' Germanic and Nordic countries.

The latter reasons may explain the large number of ISO 14001 companies in Japan: it was perceived as a 'second licence to export', and so many government agencies and industry associations promoted the implementation of ISO 14001. The electronic industry was very active. The results in Japan are reported to be also very satisfactory in terms of positive cost–benefit ratios for the companies. This indicates how flexibly the ISO-norm can be adapted to very different national and corporate conditions — if companies want to use them. Otherwise, as in the French and Spanish study, it could be used as an excuse. Somewhat surprising is the low penetration of ISO 14001 in the US, which is, after all, the country where (environmental) management systems were 'invented' and where, for example, the 'Responsible Care' program is widely applied in the chemical industry. Some studies indicate that the environmental management systems (in the better managed companies) are coming close to meeting the criteria of ISO 14001, but companies hesitate to certify this officially due to the omnipresent concern of increased liability (similar problems were observed in the beginning with ISO 9000). Given low energy prices and plenty of landfill capacity, the economic incentives to maintain and operate an EMS are not as high as in Northern Europe (except in the chemical industry). In addition, the US Environmental Protection Agency is very reluctant to recognise the benefits of EMS (for instance, in terms of increased legal compliance). Dominated by lawyers, the agency is moving slowly on some small pilot programs to

assess the impact of EMS, especially ISO 14001. However, some States are pushing for higher recognition of ISO 14001 and are starting to provide incentives for participation. It remains to be seen, however, whether this leads to a higher penetration of (standardised) EMS in the US.

As far as threshold countries are concerned, it should be noted that key preconditions for a proactive corporate environmental policy, and with it EMS, are missing. The only exceptions are subsidiaries of multinationals that have to comply with internal standards as part of the global value chain. For all others, it holds true that in most developing countries the environmental standards are still low, and the (emerging) environmental legislation is weakly enforced. This lowers considerably the 'win–win-potential' for environmental activities: if waste can be cheaply dumped in landfills, then few gains can be had from waste separation, recycling, etc. The situations in the emerging economies remind us that in most cases, high environmental standards have to be set and enforced by political authorities to make environmental efficiency work for the bottom line.

However, at least in the political and diplomatic circles of developing countries, environmental management systems are nevertheless hotly debated, but under two criteria. First, there are concerns that environmental management systems are used as 'non-tariff trade barriers', because companies in rich countries could make this a requirement for their suppliers. This would *de facto* exclude emerging-market companies from the market in developed countries because they are not certified and will have difficulties gaining certification. But no empirical or even anecdotal evidence has yet been found for that concern. (The same holds true for the quality insurance system).

In additional, the developing countries are concerned about their weak participation in international business organisations like the International Standardisation Organisation (ISO). They think that these organisations are dominated by companies from the US and Europe, which may bias decision-making and consensus-building processes in these countries. Therefore, ISO has set up a program to promote the participation of companies from developing countries. The results cannot be observed yet. However, this ISO program has opened up another debate. Environmental Non-Governmental Organisations (NGOs) have been complaining that only business is deciding on ISO 14000, although the impact of these standards goes far beyond the corporate world. The NGO's demands are the topic of controversial discussions in several international organisations, and there is no solution in sight.

Do EMS Contribute to Sustainability?

Looking at all aspects of EMS together, the final question is: Does EMS contribute to more sustainable development, and if so, how? Clearly the social dimension in missing completely. But based on the methods and experiences of EMS, first pilot projects are being developed for a social auditing system (e.g. SA 8000). Given the many problems environmental management systems are still grappling with, it is probably wise to keep social and environmental issues apart for the time being.

Environmental management systems are tools to better reconcile corporate economic and ecological goals, but they cannot substitute politically set standards for environmental protection nor more environmentally sensitive consumer behaviour (and it is a fair observation to state that in all European countries, not to mention the US, consumers did not push companies with their demands for more environmentally proactive behaviour).

But to be relevant on the macro level, EMS must be applied over a longer time by many companies to further reduce diffuse emissions or resource consumption. This is obviously a weak spot of EMS and therefore the question of how to provide incentives for companies to implement EMS voluntarily is relevant. Another positive aspect of a broader application of EMS would be that it could help organise the whole value creation chain better under environmental efficiency criteria: everybody would be speaking the same 'language', so that friction at the interfaces could be minimised. As reported, this would exploit new 'win–win' potentials, because the potential is clearly larger if co-operation along the value chain can be ensured.

But real progress would most probably come through 'ecological limits-driven' EMS. First examples are the management schemes developed by the Marine and the Forest Stewardship Councils. With variations, both are joint ventures of industry and environmental NGOs (especially the WWF). Both try to manage a specific natural resource (fish or forest) in such a way that the ecological limits are not exceeded and a sustainable harvest be ensured in the long run. Contrary to 'normal' EMS, they are not 'neutral' on the ecological conditions in which they are applied, but they derive their standards and limits exactly from the specific condition of a specific eco-system. Similarly, although government-driven, is the concept of French water regulation, which is limited to a specific water basin — the particular water resource is managed taking account of the ecological boundaries and sustainable use of water. This indicates that EMS has not yet matured in its different forms and that more experiments and experiences are needed to judge its full potential.

References

Forest, L.R. (1999) Bringing the environment down to earth. *Harvard Business Review* **Jul.–Aug.**, 114.

Hideaki, A. (1999) Environmental standard bearers. *Look Japan* **45**, 4–10.

Steger, U. (Hrsg.) (1991) *Umwelt-Auditing. Ein neues Instrument der Risikovorsorge*. Frankfurt/Main.

Steger, U. (1998) Ist die Deregulierung im Umweltschutz vermeidbar? In *Friedrich-Ebert-Stiftung, Akademie der Politischen Bildung (Hrsg.), Umweltschutz zwischen Globalisierung und Deregulierung — Die Grenzen des Rechts in der Risikogesellschaft*, pp. 35–44. Friedrich-Ebert-Stiftung Bonn.

Appendix A

Characterisation of the existing empirical surveys on EMS[1]

[1]	KPMG Survey	KPMG Umweltprüfung und beratung: 'Trends im Umweltmanagement der Automobilzulieferindustrie. Eine empirische Untersuchung'; 1996.
	Objective	Examination of the reaction of automotive suppliers towards the increasing number of EMAS validated production sites of automobile manufacturers in Germany
	Timing of the Survey	20 February to 18 March 1996
	Survey Design	Written survey of 292 suppliers in the automotive sector and evaluation of the usable responses (10 per cent)
[2]	Steinle Survey	Steinle, Claus; Baumast, Annett: Öko-Audit: Problemstand und Empfehlungen für eine erfolgreiche Praxis; in Steinle, Claus; Baumast, Annett; Burschel, Carlo (Hrsg.): Umweltmanagement und Öko-Audit. Erfahrungen für eine erfolgreiche Praxis; Osnabrück 1997, pp. 11–64
	Objective	Evaluation of the EMAS implementation in Germany.
	Timing of the Survey	April 1996
	Survey Design	Representative survey of 600 companies in the manufacturing sector by telephone (CATI-technique). Contacts were the environmental management representatives in larger organisations and the management in SMEs
[3]	Seidel Survey	Weber, Frank M.: Umweltmanagement und Umweltauditing in deutschen Unternehmen, in: Arbeitspapier 19 des Instituts für ökologische Betriebswirtschaft (IÖB) an der Universität Siegen, 2. Aufl., Siegen 1998
	Objective	Assessment of the experiences of German companies.
	Timing of the Survey	April to October 1996
	Survey Design	Written survey. The focus of the survey was large- and medium-sized enterprises as well as an evaluation of the 202 usable responses, including 162 companies that had started or finished an audit project and 140 companies that did not strive for an EMAS validation.
[4]	Sietz Survey	Höppner, Nils Oliver; Sietz, Manfred; Seuring, Stefan: Analyse der Effizienz des Öko-Audits; in Sietz, Manfred: Umweltschutz, Produktqualität und Unternehmenserfolg; Berlin/Heidelberg 1998, pp. 1–52
	Objective	Assessment of the operational use and the efficiency of the Eco-Audit-Scheme
	Timing of the Survey	Late 1996 to early 1997
	Survey Design	Written survey of all companies that were EMAS validated up until 19 November 1996 or known to be planning a validation. Evaluation of the 104 fully completed questionnaires (26 per cent).
[5]	UGA Survey	Unternehmensbefragung des Umweltgutachterausschusses
	Objective	Evaluation of the reasons for an EMAS participation and its effects; evaluation of the cost–benefit ratio and the attitude of EMAS sites regarding ISO certification.
	Timing of the Survey	20 November 1996 to 17 April 1997
	Survey Design	Written survey of 465 sites and evaluation of the responses from 398 sites (86 per cent)
[6]	Swedish Survey	Miljöeko AB Environmental analysis and consulting in co-operation with the Swedish EMAS Council, the competent body for EMAS in Sweden. Review of

		465 EMAS Environmental Statements. Results in 10 recommendations; Stockholm 1997
	Objective	Documentation of the current standard of environmental statements, identification of weaknesses, derivation of recommendations for the EMAS revision, and development of a guideline for Swedish enterprises
	Timing of the Survey	March 1996 to September 1997
	Survey Design	Environmental statements were ordered from all EMAS validated enterprises, approximately 2/3 of the 465 supplied statements.
[7]	Wagner Survey	Wagner, Hellmut; Budde, Andreas: Erfahrungen mit dem Umwelt-Audit-System in Deutschland, in: Zeitschrift für Umweltrecht 5/97, pp. 254–260
	Objective	Documentation and assessment of the EMAS implementation in Germany
	Timing of the Survey	16 August 1996 to 22 January 1997
	Survey Design	Written survey of the executives of all 294 validated sites in Germany and evaluation of the 142 filled-out questionnaires (48.3 per cent)
[8]	AQ Survey	Befragung von Geschäftsleitungen und Betriebsräten zur Einführung des betrieblichen Umweltmanagements — Auswertung, in: Arbeitnehmerorientierte Qualifizierung für Umweltmanagement (Hrsg.): Fachtagung — Zwei Jahre Öko-Audit. 19. Juni 1997; Düsseldorf 1997
	Objective	Evaluation of practical corporate communication in the context of the Eco-Management and Audit Scheme's introduction
	Timing of the Survey	September 1996 to June 1997
	Survey Design	Written survey of all 332 sites validated before September 1996 and evaluation of the 145 responses from executives (43.7 per cent) and 121 responses from employee council representatives (36.5 per cent). In addition, evaluation of the environmental statements with respect to communication effects and employee engagement.
[9]	EU Survey	Adolf von Röpenak (Hrsg) et al.: Öko-Audit in kleinen und mittleren Unternehmen, Erfahrungsberichte aus 74 deutschen Unternehmen im Rahmen des Euromanagement-Umwelt-Pilotprogrammes der Europäischen Union — Schlußfolgerungen für die Revision der EG-Umwelt-Audit-Verordnung, 1997
	Objective	Information from SMEs about the Eco-Management and Audit Scheme in Europe and support during implementation and validation of EMA according to EMAS. Derivation of conclusions for the revision of the scheme
	Timing of the Survey	1996 to 1997
	Survey Design	Support and consulting for 74 selected SMEs in Germany that wanted to implement an EMS according to EMAS, up to their validation. Reports on experiences and conclusions for the revision process.
[10]	[ISO Survey]	Jäger, Thomas; Wellhausen, Anja; Birke, Martin; Schwarz, Michael: Umweltschutz, Umweltmanagement und Umweltberatung — Ergebnisse einer Befragung in kleinen und mittleren Unternehmen. Berichte des ISO 55; Köln 1998
	Objective	Overview of the level of use and significance of, as well as expectations regarding EMS in SMEs. Evaluation of the implementation problems and the need for advice
	Timing of the Survey	March to May 1997
	Survey Design:	Written survey of 4863 randomly selected enterprises in Germany with a focus on SMEs (up to 500 employees) in the following sectors: — chemicals, rubber and plastics, — facility construction and mechanical engineering, — publishing, print and paper, — food and drink, and evaluation of the 642 responses (13.2 per cent)
[11]	UNI/ASU Survey	UNI/ASU-Umweltmanagementbefragung: Öko-Audit in der mittelständischen Praxis — Evaluierung und Ansätze für eine Effizienzsteigerung von Umweltmanagementsystemen in der Praxis; Bonn 1997
	Objective	Comprehensive documentation of German SMEs' experiences with EMS in general and EMAS in particular from different perspectives. Analyses of and conclusions from the revision of the Eco-Audit and Management Scheme

	Timing of the Survey	May to July 1997
	Survey Design	Written survey of German enterprises (mostly members of the working group of independent entrepreneurs, members of the Förderkreis Umwelt future e.V. and all EMAS validated companies) addressed to the executives, operational managers, and employee council representatives. Evaluation of the 756 responses from 368 enterprises (326 executives, 258 environmental managers, 172 employee council representatives). Additional interviews with nine experts from SMEs
[12]	Danish Survey	Andersen, Tage V.: Companies in Denmark with an environmental management system. Status as per 1 July 1997
	Objective	Documentation of the development of EMS in Danish enterprises
	Timing of the Survey	May to September 1997
	Survey Design	Written survey of 150 Danish companies that were certified to ISO 14001 or BS 7750 or EMAS validated by 1 July 1997. Evaluation of the responses, follow up telephone calls and information material produced by the company (with a focus on the secondary and tertiary sector)
[13]	ÖFEU Survey	Steger, Elsener, Raschauer, Gutwinski, Hauer, Hechenberger et al.: 'Evaluierung der Umsetzung der EMAS-Verordnung in Österreich sowie der Teilnahme von Unternehmen am Gemeinschaftssystem'
	Objective	Empirical investigation of validated, certified and environmentally proactive companies, stakeholders and authorities, which have been involved in EMS in Austria; derivation of recommendation for EMAS.
	Timing of the Survey	March 1997 to March 1998
	Survey Design	Questionnaire-based survey conducted by mail and telephone, and the facilitation of feedback in a number of workshops with all individuals involved in EMAS in various groupings. In addition, evaluation of model projects and comprehensive literature analysis. Evaluation of the responses and workshops
[14]	Hessia-Survey	ERM Lahmeyer International und Institut für Ökologische Wirtschaftsforschung: Fachwissenschaftliche Bewertung des EMAS-Systems (Öko-Audit) in Hessen. Endbericht zum Forschungsvorhaben. Entwurf; o.O., 1998
	Objective	Evaluation of the effectiveness of EMAS with respect to ecological impact, compliance, activities of auditors, potential for substitution and deregulation, and the economic efficiency of corporate environmental protection measures.
	Timing of the Survey	June 1997 to May 1998
	Survey Design	Written survey of two corporate representatives at 112 EMAS sites in Hessia, statistical evaluation of the 88 returned questionnaires, and follow up interviews with the auditors involved.
[15]	EU Survey	Hillary, Ruth: An Assessment of the Implementation Status of Council Regulation (No. 1836/93) Eco-management and Audit Scheme in the Member States (AIMS-EMAS). Final report; London 1998
	Objective	Evaluation of the experiences using and implementing EMAS in the member States of the EU and the derivation of suggestions for the EMAS revision.
	Timing of the Survey	23 October 1997 to 23 February 1998
	Survey Design	Interviews conducted by telephone with: —14 representatives of the competent bodies or administrative individuals in 10 member States —representatives of the accreditation bodies of all member States —42 (17.4 per cent) accredited environmental verifiers (AEVs) in ten member States —140 (11.6 per cent) registered EMAS sites in 12 member States
[16]	Diploma Dissertation	Schindel, Claudia: EMAS in Spain, 1998
	Objective	Evaluation of the experiences of seven Spanish companies, three of which are validated according to EMAS and the other four of which have declined to participate in EMAS so far (those four plan to get validated by 2004)
	Timing of the Survey	31 August 1998 until 4 September 1998

	Survey Design	A two-hour interview was conducted with seven of a total of fifteen validated companies
[17]	Kirkland Survey	Kirkland, Lisa-Henri und Thomson, Dixon, Challenges in Designing, Implementing and Operating an Environmental Strategy, in Business Strategy and the Environment, Band 8, Number 2, 1999, pp. 128–143
	Objective	Evaluation of the degree to which current EMS models address practical EMS design and implementation
	Timing of the Survey	The interviews were conducted in 1997
	Survey Design	The observations are based on the authors' experiences introducing EMS's to companies in western and northern Canada, a review of management literature, a survey of 32 resource-based companies, and six case studies
[18]	Mac Arthur Survey	Mac Arthur, John and Bellen, Gordon, ISO 14001 in State Regulatory Offices: A Survey of Activities, in Environmental Quality Management, Band 7, Number 4, 1998, pp. 19–47
	Objective	Looking at EMS pilot projects at the US-state level and the experience with regulatory compliance; trying to collect evidence that regulators should take ISO 14001 into account (contrary to the position of the US-EPA)
	Timing of the Survey	1996/97
	Survey Design	Report based on various pilot projects, not specified
[19]	Maxwell 1 Survey	Maxwell, James, Rothenberg, Sandra, Briscoe, Forrest, Marcus, Alfred, Green Schemes: Corporate Environmental Strategies and their Implementation, California Management Review, Band 39, Number 3, pp. 118–185, Spring 1997
	Objective	Development of a framework for the implementation of a 'proactive' environmental strategy
	Timing of the Survey	1996
	Survey Design	Three case studies in which the companies had to choose 'programmatic alternatives' from a number of representative categories to fit their overall strategy.
[20]	Maxwell 2 Survey	Maxwell, James, Briscoe, Forrest, Schenk, Brian, Rothenberg, Sandra, Can lean production practice increase environmental performance?, in Environmental Quality Management, Band 8, Number 1, 1998, pp. 53–61
	Objective	Indicates how EMS could support strategy implementation, especially by 'stabilising' process integration through management systems.
	Timing of the Survey	Using four case studies that the authors have observed over the last 4–5 years
	Survey Design	Case study approach
[21]	NSF Survey	NSF International, Environmental Management System Demonstrative Project, Ann Arbor, Michigan, December 1996
	Objective	Documentation of the experiences of a variety of organisations while developing an EMS based on ISO 14001, demonstration of the benefits and challenges of, and incentives for, EMS implementation, identification and assessment of the differences between smaller and larger organisations in their ability to implement an EMS
	Timing of the Survey	March 1995 to October 1996
	Survey Design	18 organisations of a variety of types and sizes were trained in EMS based on ISO 14001, conducted self-assessments of their EMS, submitted responses to specific questions and a self-written EMS implementation case study, and had their EMS assessed by an independent auditor
[22]	Schindel Survey	Schindel, Claudia, Difficulties with the Implementation of Eco-Audits — The example of EMAS in the French and Spanish Chemical Industry, European Research Project, EAP, Paris 1999
	Objective	Using the example of the chemical industry, to investigate the reasons for the low EMAS participation (and EMS in general) in France and Spain, analysing the business environment (including the national culture) as the determining factor
	Timing of the Survey	1998/99

	Survey Design	18 Interviews with companies and relevant institutions (6 comp) and literature analysis
[23]	IEFE Survey	IEFE Bocconi — Environmental Department (1998): Environmental Management System Implementation by SMEs: EU Experiences and Perspectives, Mailand
	Objective	Reports the experience of an EU pilot project with an Italian SME and discuss the pre-conditions for a broader application of EMS in Italy
	Timing of the Survey	1995/96
	Survey Design:	Survey of pilot projects
[24]	FEU Survey	Steger, Steven, Krcmar, Kloepfer, Frings, Kottman, et al.: Evaluierung von Umweltmanagmentsystemen zur Vorbereitung der 1998 vorgesehenen Überprüfung des gemeinschaftlichen Öko-Audit-Systems, Modul I–III UBA-Texte 20/1998, Modul IV unpublished paper, Modul V–VI Working paper Nr. 31, Institut für Ökologie und Unternehmensführung an der European Business School e.V., Oestrich-Winkel 1997
	Objective	Empirical investigation of validated, certified and environmentally proactive companies, stakeholders and authorities, which have been involved in EMS in Germany; derivation of recommendation for EMAS
	Timing of the Survey	1996/97/98
	Survey Design	Six 'spotlights' were used to investigate the different aspects of EMS and utilise all available information sources *Module I*: Systematic evaluation of the existing EMAS literature *Module II*: Checking the participation of small or medium size businesses at EMAS in 96 model projects and aid programmes *Module III*: Analysis of more than 200 environmental statements *Module IV*: Investigation of legal aspects of EMAS publication and its position within the existing structure of the European and single states legislation *Module V*: Using document analysis and interviews, detailed investigation of 27 businesses *Module VI*: Running through 50 interviews done by representatives of different stakeholders

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Note

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