

**The costs and benefits
of implementing
an environmental management system**

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July 1994

Information Paper No. 49

**Lincoln Environmental
Lincoln University**

©

1994

Lincoln Environmental
P.O. Box 84
Lincoln University
CANTERBURY

ISSN 0112-0875
ISBN 1-86931-092-6

Lincoln Environmental is a research, consulting and teaching organisation based at Lincoln University. Research is focused on the development of conceptually sound methods for resource use that may lead to a sustainable future. Lincoln Environmental acknowledges the financial support received from the Foundation for Research, Science and Technology in the production of this report. Lincoln Environmental offers staff the freedom of enquiry. Therefore, the views expressed in this report are those of the authors and do not necessarily reflect those of the organisation.

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Acknowledgments

This report has been written with the assistance of a number of different people with whom the author has had discussions and correspondence. In particular, I would like to express my gratitude to Nigel McManus of the Open Polytechnic of New Zealand (TOPNZ), Craig Hind of Lincoln Environmental, Stan Rodgers of AVTEQ, Australia, Noel Clark of Pasminco, Australia, Brennan Allen of Waikato University, Ray Lambert of Fulton Hogan Ltd and other members of the joint Australian and New Zealand Standards Associations committee QR/11. Any errors, misinterpretations or omissions are solely my responsibility.

Preface

Over the past decade there has been a growing business and industry awareness of the need for environmental protection, driven partially by the general public and consumers. As a result of this shift in values, environment decision making in both the public and private sector has assumed greater importance.

The concept of environmental management systems (EMS) has developed as a way of recognising the need for change in the way individuals and organisations manage resources. The EMS approach has derived from quality management with the primary aims being to allow organisations to demonstrate consistent environmental performance as well as assisting in meeting environmental objectives as dictated by legislation and the organisation's policy.

The types of areas that are addressed include preservation of resources, waste reduction and pollution prevention.

An EMS is best driven from within rather than without. Best performance in terms of best environmental outcomes will be achieved when an organisation is committed to an established environmental policy, rather than simply seeking to comply with legislative requirements.

Links with quality management have already been noted. Quality issues concentrate on the information requirements side of the implementation of EMS. The quality of information is critical to establishing and evaluating the outcomes of EMS. Some of the tools that may be applied in assuring the quality of information include environmental auditing, life cycle analysis, and risk assessment.

This report is concerned primarily with the costs and benefits to an organisation of implementing an EMS. The costs and benefits of accreditation and certification to a are also considered. These are used to derive a set of criteria that can be used to assess the costs and benefits for a particular organisation, within the established legislative framework. This will be of value to the organisation in enabling it to measure the net benefits of implementing an EMS.

Finally, the criteria developed are specified in a checklist form that can be applied by different organisations to determine the relative importance of the costs and benefits specific to that organisation.

1 Sustainable development and environmental protection: the origins of Environmental Management Systems

Over the past few years both public and private organisations have become increasingly aware of the need for resource users to develop strategies for the more efficient use of physical resources.

Triggered by concern about the growing number of international problems of waste, pollution, resource depletion and global impacts, there was a call by the General Assembly of the United Nations to establish a Commission to consider long term strategies for achieving sustainable development. This Commission, which became known as the Brundtland Commission, met over a four year period and produced a report entitled 'Our Common Future' (World Commission on Environment and Development, 1987) in which they formulated "a global agenda for change". An important aspect of this report was that it included a definition of the concept of sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their own needs".

The report was divided into a number of sections addressing specific areas of the community. In the section on industry the Commission concluded that "Resource and environmental considerations must be integrated into the industrial planning and decision-making processes of government and industry. This will allow a steady reduction in the energy and resource content of future growth by increasing the efficiency of resource use, reducing waste, and encouraging resource recovery and recycling." The emphasis on efficiency of resource use and waste minimisation indicates a shift in attitude and a recognition that it is preferable to address all environmental problems at source.

An important step towards achieving environmental and sustainability goals was seen to be the establishment of clear environmental goals and the enforcement of environmental laws, regulations, incentives and standards on industrial enterprises. Further to this, the Commission determined the areas that need to be addressed as including air and water pollution, waste management, occupational safety and health, energy and resource efficiency and the management of hazardous substances. This categorisation provided a foundation for governments and private and public organisations to assess environmental impacts and to establish benchmarks for dealing with industrial pollution, and resource degradation and depletion.

Over the next few years the approach developed by the Brundtland Commission was further evaluated and implemented by individual governments and in 1991 the Rio Declaration followed it up by stating that:

"Human beings are at the centre of concerns for sustainable development.

They are entitled to a healthy and productive life in harmony with nature".

In New Zealand the Resource Management Act (New Zealand Government, 1992) adopted the concept of sustainable development and derived from it the related concept of sustainable management. This was embodied in the Act in Section 5(2)

"Managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic and cultural wellbeing and for their health and safety while -

- (a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
- (b) safeguarding the life-supporting capacity of air, water, soil and ecosystems; and
- (c) avoiding, remedying or mitigating any adverse effects of activities on the environment."

The definition of environment within the Act is also broad and includes the natural environment as well as people and the things that they value, thus recognising the interdependence of people and natural systems.

Internationally there have been attitudinal changes on the part of the general public and organisations resulting from a recognition that human activity is having impacts on the global environment that in some cases may be irreversible. Major problems such as global warming have helped in initiating this awareness. Other related issues include ozone depletion and growing concern over the disposal of hazardous waste, general pollution issues, depletion of fish stocks and the effects of deforestation.

As a result, public and private organisations find themselves required to comply with increasingly stringent legislative, economic and social pressures. A recognition of the public's attitude towards environmental performance and commercial and political implications are triggering a desire to demonstrate good practice and improved environmental performance.

To achieve goals of sustainability organisations are moving towards pro-active approaches to environmental protection rather than 'end of pipe' solutions. Two recent developments in the area of regulation and risk management have contributed (Tait and Levidow, 1991).

The *prevention principle* involves preventing the creation of pollution at source. This is described in the second Economic Community Action Programme on the Environment. However, requirements for proof of harm and the need to assess benefits along with costs (risks) mean that the prevention principle in this form is effectively a reactive process.

On the other hand, the more demanding *precautionary approach* is pro-active in that it advocates controls of pollution without the need for scientific proof and without consideration of costs and benefits. The precautionary principle derives from the German concept of *vorsorgeprinzip* which includes the concept of 'care' and incorporates the possibility of making mistakes through ignorance (O'Riordan, 1993). The precautionary principle therefore requires that action should be taken to control ecological (environmental) impacts even before linkages have been established scientifically: that is, circumstances where an adverse impact is suspected and also when the impacts are simply not known.

The precautionary approach is deemed to be justified on grounds of complexity, where the complexity of scale of an ecosystem is such that it is not possible to identify all cause-effect relationships, and also because of uncertainty in the form of ignorance, where we simply do not know the impact of new processes.

Within this context, organisations have attempted to develop management systems that allow them to have greater control over environmental impacts and resource use. One of these tools derived from the United States National Environmental Protection Act (NEPA, 1969), which led to the development of environmental impact assessment (EIA) and environmental impact statements (EIS). Early reactive approaches included 'end-of-pipe' solutions, or cleanup *after* the event.

More recently a further evolution, directed primarily to the private sector, has evolved in the concept of total quality management (TQM) and quality management models. The key concepts of quality management revolve around the development of a corporate culture that is committed to the achievement and maintenance of quality. An important aspect of quality management is a commitment to continual improvement including processes related to evaluating and monitoring, corrective action and improvement (of the system). The principle is that the organisation unit should be "continuously learning to perform better in the pursuit of its objectives, and this includes continual improvement in management and learning processes" (Canadian Standards Association, 1993). An essential element of the TQM approach is that staff must be involved and informed on a 'need to know' basis. Although the implementation of the TQM concept cannot guarantee *performance*, it can lead to greater long term consistency of the outcomes.

The five threads to TQM are:

customer satisfaction,
the quality concept centred around integration,
the development of a corporate culture that encompasses all employees,
the involvement of employees in training for quality improvement, and
the basis of continuous evaluation.

The impetus for the development of environmental management systems therefore arose from a desire for organisations to have a mechanism to *demonstrate* their environmental performance. Another important aspect of the development of EMS is stated in the introduction to the draft British Standard for EMS, BS7750 (British Standards Association, 1993).

"Many organisation have undertaken environmental 'reviews' or 'audits' to assess their environmental performance. On their own, however, reviews and audits cannot provide an organisation with the assurance that its performance not only meets, but will continue to meet legislative and policy requirements. To be effective, they need to be conducted within a structured management system, integrated with overall management activity and addressing all aspects of desired environmental performance."

This statement provides a rationale for the establishment of an EMS. An important aspect of an EMS is that it explicitly addresses the question of future risk resulting from changes in legislation and policy.

A large number of national and international organisations have developed guiding principles defining commitment to the environment. These guiding principles have been used to derive policy statements, and in some cases the guiding principles include a framework of actions and activities directed towards implementation of the policy statement. This framework has become known as an environmental management system.

The common elements of these principles and frameworks include: a policy statement, a commitment to conservation and protection of natural resources, waste reduction, legal compliance, promotion of the adoption of environmental principles by suppliers and customers, the integration of environmental issues into overall management and decision making, employee education and public information, measurement of environmental performance, continual improvement of policies, programmes and performance, co-operation with other organisations, and a commitment to action.

In simple terms, therefore, an environmental management system has five components:

- (a) environmental policies, objectives, strategies and targets,
 - (b) a process for environmental assessment and planning,
 - (c) processes for measure and control of impacts or effects,
 - (d) procedures for corrective action, and
 - (e) documentation and record keeping
- (South African Bureau of Standards, 1993).

Environmental quality objectives are driven by social adaptability, economic viability and ecological sustainability and therefore *will* change over time. The uncertainty needs to be taken into account when developing an EMS. Thus, periodic self review is necessary to maintain alignment of the EMS with ongoing environmental quality objectives.

2 International and national standards

In 1991, the International Standards Organisation (ISO) established a strategic advisory group for the environment (SAGE) with the specific objective of assessing the need for a series of international standards to deal with the environment and sustainable industrial development.

The SAGE addressed its task by setting up four subgroups to consider environmental labelling, environmental auditing (EA), EMS and environmental performance standards. Of these, the work of the EA and EMS subgroups is relevant to this report since EA is an intrinsic part of an EMS. Later, two additional subgroups were established: life cycle analysis, and environmental aspects in product standards.

The original mandate of the EA subcommittee was to focus on audits relating to the performance of an EMS. This was later modified to include other types of environmental audit including compliance audits, performance audits and site audits (see 3.2).

The original task of the EMS subgroup was to work on a draft for an EMS standard that would be separate from the ISO 9000 Quality Management Standards series, but compatible with them.

Support for the establishment of EMS standards came from a belief that as environmental regulations become increasingly stringent, industry, government and other organisations are looking for tools to achieve improved environmental performance leading towards the goal of industrial development that is consistent with the national goals of sustainable management of the environment.

The establishment of standards based on quality management systems would allow organisations to reach a specified performance level which would provide assurance within organisations and also demonstrate that performance and improvement to interested parties and the community at large. It was anticipated that these standards would develop along similar lines to the ISO 9000 series for quality management systems.

The International Chamber of Commerce (ICC) has also demonstrated support for environmental management with the ICC Business Charter for Sustainable Development - a 16 point plan outlining principles for environmental management, supported by a large number of companies and organisations internationally.

The stated advantages of an ISO standard over a series of national standards are that they are characterised by:

- consensus, they are derived by consensus with participating industry;
- consistency, they have a common reference point;
- authority, ISO standards are authoritative documents;
- certification, compliance to a standard can be assessed and certified; and
- incentive, voluntary standards can stimulate a positive, pro-active response from industry.

The main objective of establishing EMS standards was stated by the SAGE as being to aid organisations in achieving and demonstrating sound environmental performance. The standard must therefore be a generic outline of the actions a business could undertake in order to manage the environmental aspects of their activities. It should be broad based and hence applicable to a wide range of organisations. An EMS should be established in such a way that it is an integral part of the overall management system of the organisation.

One of the key concepts of TQM and the quality management systems ISO 9000 series of standards is continual improvement. Absolute levels of performance are not defined, and continual improvement refers to the placement of procedures that ensure appropriate corrective action *for the system*. Early versions of EMS standards included this concept, however, there has been considerable concern expressed about the implications of continual improvement for environmental management systems where continual improvement might be viewed as being required for *performance* (the key issue here being associated with the difficulties involved in auditing this requirement).

The British specification BS7750 (referred to previously) requires that an environmental policy should include (4.2(d)) "a commitment to continual improvement of environmental performance." This is analogous to section 4.1 of BS5750, the British Standard equivalent to the ISO 9000 series. The 1993 draft revision of BS7750 includes a definition of continual improvement as "continuous efforts to improve, not in all areas of activity, but in those areas where environmental improvement may be achieved in line with environmental policy". This area is one of 'continuing' concern.

The output from the SAGE consisted of a position paper and a pilot document on standardisation. Much of the material produced was based on the draft British Standard BS7750. The SAGE made a strong recommendation for the establishment of a technical committee to prepare an ISO standard for EMS. Part of the reason for this was that there was pressure being put on ISO because of CEN (the European Organisation for Standardisation) moves to develop standards to meet the requirements of the proposed EC regulation for eco-auditing. This caused concern about potential trade barriers if the CEN standard was issued prior to an ISO standard.

In 1993, following on from the work undertaken by the SAGE, ISO established a technical committee TC207 with responsibility for drafting standards. This technical committee has itself established a series of sub committees similar to those established under the SAGE. Subcommittee 1 (SC1) is concerned with environmental management systems, SC2 is concerned with environmental auditing, SC3 is environmental labelling, SC4 environmental performance evaluation, SC5 life cycle analysis, and SC6 terms and definitions.

Subcommittee 1 has three tasks. These are to prepare:

- (a) a specification for EMS with guidance for use,
- (b) general guidelines on principles and their application, and
- (c) guidelines on special considerations affecting small and medium organisations.

Two working groups have been established. Working group 1 (WG1) is preparing a draft specification, and working group 2(WG2) is preparing draft guidelines (Guide to environmental management principles, systems and supporting techniques).

Subcommittee 2 has expanded its brief to include 'environmental auditing *and other investigations*'. This has been opposed by some members on the grounds that this extension has occurred without the approval of TC207. Three drafts have been prepared: General principles of environmental auditing, Guidelines for auditing of EMS, and Guidelines for qualification criteria for environmental auditors.

It has been accepted that there is some urgency required in preparing a specification for certification since there is a demand for a certifiable standard for EMS and because of CEN moves. Therefore a timetable has been prepared representing a minimum time frame for preparation. If this is adhered to, then both the WG1 and WG2 drafts will be able to be published in early 1996.

In the interim several countries have prepared either their own standards or guidelines. The first of these was the British Standard BS7750 on which much of the early SAGE work was based. Other Standards include the South African Standard approved in May 1993, the Canadian EMS Voluntary Guidelines published in October 1993, the Irish standard 'Guiding principles and generic requirements for EMS published in October 1993, and the French experimental standard of April 1993. All management system standards offer a framework by which system objectives can be met through planning, implementing, measuring and correction.

The Standards Association of Australia (SA) and Standards New Zealand (SNZ) have established a joint committee to monitor the ISO process and to assess whether Australia and New Zealand should prepare their own specification. This committee QR/11 has met several times and representatives from the two Standards organisations have taken part in all ISO meetings to date through the SAGE and TC207.

The current view within QR/11 is that it is not appropriate for Australia and New Zealand to prepare a specification in view of progress being made by ISO in the preparation of the international specification. Discussions are being held to determine whether or not the draft guide to EMS that has been prepared by QR/11 should be circulated within New Zealand and Australia as a discussion document that could act as a guide for organisations seeking further information about EMS.

3 Tools for environmental management

There are a number of tools available to an organisation that is seeking to improve its environmental performance. Three of the most common methods for the evaluation of the effects of human activities are EMS, environmental auditing and environmental impact assessment. Others include methods for evaluating the environmental effects of *products*, such as life cycle analysis and environmental performance evaluations. Environmental performance indicators are common to a number of these tools. They are quantitative parameters used to measure environmental performance at local, regional and global levels.

This section concentrates on the effects of human activities where the term 'activities' encompasses processes and services. It describes the components of an EMS and an environmental audit (EA) and discusses the different types of environmental audit that can be undertaken. Environmental impact assessment (EIA) is generally used to evaluate the long term effects of an organisation's activities or as a means of determining whether or not an activity should proceed.

3.1 Environmental management systems

The essence of an EMS is its integrative nature. An organisation's EMS should be integrated with its production management systems and financial management. If the organisation is concerned with total quality management (TQM), the EMS will be linked with its quality management system and in many cases the two will be developed simultaneously.

The process that a company will go through in establishing an EMS will involve developing an environmental policy and committing the company to this policy by preparing an environmental policy statement (to be published), undertaking an initial environmental review/audit, and establishing procedures for training, review and monitoring. The initial review is part of the establishment of the EMS but it is not part of the EMS itself. It is used to assess the current environmental performance of an organisation as a means of setting appropriate environmental objectives and targets.

The following diagram describing the stages in implementation is derived from BS7750.

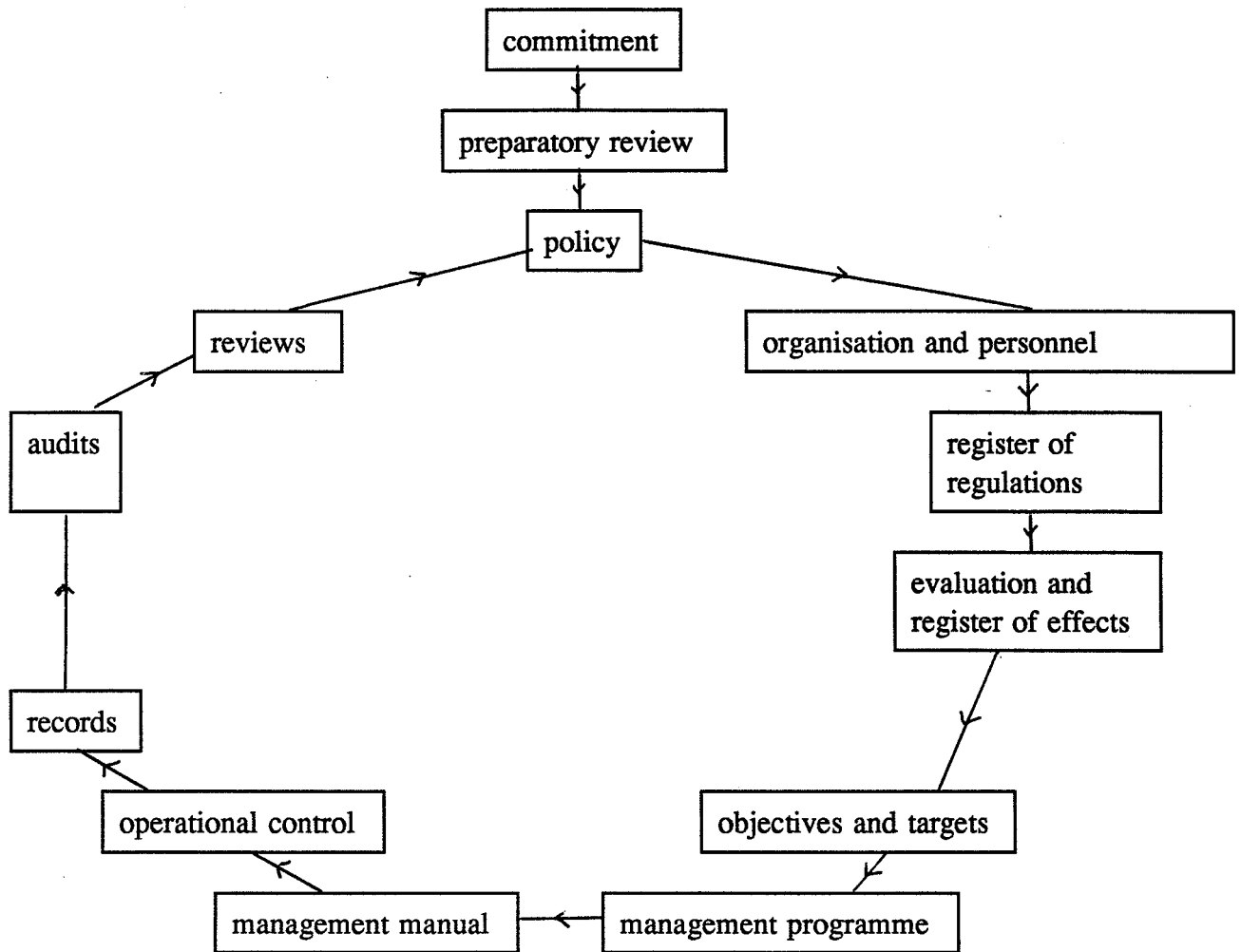


Figure 1: Schematic diagram of the stages in the implementation of an environmental management system.

The components of an EMS have been introduced in the previous section. This section considers the various elements in more detail. The definitions used originate from BS7750 but have been amended in line with current Australian and New Zealand approaches and ISO modifications.

An EMS consists of a series of components or key features all of which should be included.

Definitions

- a set of definitions than can be used to establish benchmark terminology and clarification of terms and meanings.

Environmental Management System

- the system to ensure the environmental policy of an organisation is applied. It should implement, adjust and where necessary define policy, objectives and targets, key roles and responsibilities, and define departmental linkages including the practices and procedures adopted to implement the policy.

Environment policy

- not an integral part of the system, but a key element setting out the principles and intentions of an organisation regarding its environmental performance.

Environmental impacts

- an organisation needs to be able to assess the relevant environmental impacts of its entire operation in order to develop appropriate objectives, targets and plans.

Communications and reporting

- an organisation should establish appropriate internal and external communication processes to ensure its environmental policy and programmes are clearly understood by all levels of the organisation.

Environmental programme

- the documented plan to achieve the environmental objectives and targets which should include relevant time scales.

Operational control

- a control system should exist to ensure day to day operations meet the environmental plans and programmes. Such a system should include monitoring and verification of processes and equipment which may have an environmental impact.

Environmental Management Records

- a system of records should be established to demonstrate compliance with the requirements of the EMS.

Internal environmental audits

- periodic audits of the EMS should determine whether or not the system is fulfilling the organisation's environmental policy. The audit plan should include activities to be audited, the roles and responsibilities of people and procedures for reporting findings, conclusions and recommendations.

Education and training

- employee education and training programmes should be defined in the system to ensure staff are qualified to perform assigned work and clearly understand the organisational policy, objectives and systems. The system should ensure understanding of the individual's role in relation to the EMS.

EMS review

- process by which it is established whether the EMS of an organisation is suitable and effective, and, if not, in what respect it is not. Including the initial review, such reviews are an essential part of an EMS.

One of the important features of both an EMS and a quality management system is continual improvement. Within quality management systems this refers to continual improvement in the system. Although most organisations are committed to the concept of continual improvement within an EMS, there is some concern that if continual improvement is included within a *specification* then it may carry the implication that continual improvement in *performance* is required.

3.2 Environmental auditing

According to the International Chamber of Commerce (ICC) 1989 - an environmental audit is:

"A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organisation, management and equipment are performing with the aim of helping safeguard the environment by:

- (i) facilitating management and control of environmental practices; and
- (ii) assessing compliance with company policies, which include meeting regulatory requirements."

The sub group SC2 of ISO TC207 has defined five different types of environmental audit (ISO/TC 207/SC2 N11 and ISO/TC 207/SC2 N6):

- environmental management system audits,
- regulatory compliance audits,
- performance audits
- site audits, and
- audit of an environmental statement.

An environmental management system audit is defined as "an audit to determine whether or not the environmental management system and environmental performance comply with planned arrangements and whether or not the system is implemented effectively, and is suitable to fulfil the organisation's environmental policy".

Regulatory compliance audits and performance audits can be grouped together as 'compliance audits'. The regulatory compliance audit is "an audit to determine whether current operational practices and controls in place at the facility comply with applicable regulatory requirements, resulting in a statement of the compliance status."

A performance audit on the other hand, is "an audit to determine whether the actual environmental performance is in conformity with stated objectives".

A site audit is an audit "to determine the environmental risk of assets for financing, purchase and sale and insurance purposes". This includes take-over audits and liability audits depending on the purpose for which the site audit is being carried out. It will address whether the actual environmental performance of a specific site complies with governmental regulations, company policy etc. Under the strict liability terms of the Resource Management Act ignorance is not a legal defence and therefore site audits may be used more in the future in New Zealand.

The audit of an environmental statement is "an audit to determine whether the contents of an environmental statement, which should reflect the actual environmental influence of the organisation which issues the statement, is a representative (correct and complete) description."

At different stages in the development of an EMS an organisation will be involved in a number of different types of audit, and will need to be familiar with these different types and the varying requirements. At the same time as ISO is preparing a specification for EMS, specifications for environmental auditing (EA) are being prepared (TC207 subcommittee 2 - SC2). Areas that will be addressed in the EA specification include audit teams, qualifications of auditors and details of documentation requirements. The specification for EA will therefore have considerable implications for organisations seeking certification for EMS.

An EMS audit is a *system audit* and will not provide any direct information about the organisation's environmental performance in a general sense. The only reference to performance is as to whether the performance meets the requirements of the established system. Other types of environmental audit that are related to environmental performance may be undertaken as part of establishing an EMS.

The types of 'audit instrument' available include checklists, interviews, internal EMS documentation, analysis of organisational procedures, data systems, internal control systems, environmental policy and site visits. It could be reasonably expected that this type of environmental audit would take place every two or three years. It is important to note that auditing activity may be carried out for internal or external purposes. One requirement in either case is that the audit should be carried out by auditors without any direct responsibility in the area being audited.

3.3 Risk assessment

Risk assessment is an integral part of quality management systems. It is required to ensure that objectives are appropriately identified and that the activities and resources applied to the achievement of the specified objectives are appropriate. Risk analysis is also required to address the cost-benefit considerations of setting and achieving objectives in light of residual risk tolerances (Canadian Standards Association, 1993).

Risk analysis has not been explicitly included in environmental management systems. This is largely because the methodologies of environmental risk analysis are not as well defined as those of technical or engineering risk analysis. However, risk analysis can play a useful role. The joint SA/SNZ Associations' committee (QR/11) considered the implications of risk in preparing a discussion paper on EMS. Risk was used as the catalyst or trigger for recognising the need to improve environmental management and implement an EMS.

Risks are defined as being either primary or secondary risks. Primary risks are direct risks. These are the risk of an organisation's activities causing direct damage to the environment, and the risk of non-compliance with existing consent conditions. Secondary risks are those associated with non-compliance with future consent requirements and cradle-to-grave impacts or effects. The QR/11 discussion paper provides a questionnaire in checklist form designed to assist organisations in assessing whether or not they are 'at risk' in any of these categories.

Risk assessment and risk management provide a structured approach to identifying, estimating, assessing and managing risks. Although risk analysis may not be formal requirement or component of an EMS it provides an approach to determining the areas an organisation needs to address in improving its environmental performance. Risk criteria and residual risk considerations can be used to evaluate environmental problem areas and establish priorities for actions to reduce risks and impacts.

4 Costs and benefits

4.1 Costs and benefits of installing an EMS

Before an organisation is willing to undertake the considerable investment requirement to implement an EMS it will need to have a clear understanding of the costs and benefits. These costs and benefits can be categorised as direct and indirect.

Costs may further be divided into two groups: one-off costs and on-going costs. The one-off direct costs are the costs of undertaking an initial environmental review of activities and sites, and training costs for personnel. As implementation proceeds, costs will be incurred for further staff training and possibly the installation of new equipment or the modification of old equipment required to improve environmental performance. On-going direct costs include the cost of keeping records and undertaking periodic audits.

Direct benefits will accrue from costs savings resulting from improvements in the operating environment identified as part of initial review, such as reuse of materials, and reduction of waste. Other direct benefits may include increased energy efficiency.

The implementation of an EMS can be done in a progressive manner over a period of time. Therefore, once the initial review has been carried out the organisation can plan any required investment so as to minimise impact on cash flow and general financial performance.

The indirect benefits to a company may be significantly greater than the direct benefits. Some of these relate to the perception of the organisation in the market place. The primary indirect benefits are that an organisation will be viewed as forward thinking, and 'doing the right thing'. Increasing public awareness and concern about environmental issues means that the public is prepared to support products and organisations that are seen to exhibit environmental consciousness. The implementation of an EMS may therefore be seen to provide competitive advantage.

An second indirect benefit is that there will be considerable internal organisational benefits arising from better organisation and recording of processes. The implementation of an EMS requires the formal establishment of data bases and recording systems that as well as providing a better organisational base allow the organisation to respond more quickly and efficiently to requests for information and government requirements.

Within the organisation the implementation of an EMS requires formal training for staff that implement the procedures and communications processes so that all staff understand the organisation's environmental policy and commitment to it. Clear lines of responsibility and authority are established. One of the lessons of TQM is that staff who understand *why* a

particular task or way of operating is required are more likely to keep to that procedure that if they are simply told to 'do it that way' without any understanding. The benefits of an established channel of communication between operators and management are that any problems with procedures can be reported and communicated before problems arise. The aspect of 'no fault' reporting is critical also.

A further indirect benefit resolves around the possibility of pre-empting or avoiding regulation. For example, in Queensland some resource consent provisions are relaxed if the applicant has implemented an EMS (Allen, 1994).

Indirect one-off costs may include the costs of changing suppliers if this is identified within the EMS. An on-going indirect cost will be that of publishing material relating to the EMS. Other indirect costs may be seen as 'reversed benefits'. These may be associated with *not* having a good environmental performance or image, and not being able to demonstrate good environmental performance which is being increasingly demanded by investors and customers.

Costs and benefits may be seen as having short term and long term impacts on the overall performance of an organisation. In the short term, costs may outweigh benefits, however, if a longer term perspective is adopted then in most cases the benefits will outweigh the costs.

4.2 Costs and benefits of compliance with a voluntary standard

The current status regarding specifications and standards for EMS has been discussed in Section 2. One of the reasons for organisations seeking certification is as a means of demonstrating to the business community and the wider public that the organisation has made a commitment to improving its environmental management and performance. Certification is therefore a way of taking full advantage of some of the indirect benefits associated with installing an EMS, such as achieving a competitive advantage.

The essence of the EMS standard as currently proposed is that it should be voluntary, to encourage the setting of performance standards beyond that required by simple compliance with current legislation. Although this may appear unrealistically altruistic, it may be that an organisation is able to achieve high levels of environmental performance in particular areas due to early recognition of a potential problem and use of state-of-the-art technology.

If an organisation is fully committed to maintaining and enhancing its environmental performance, and has installed an EMS, there may not appear to be any benefits that it can gain from certification. If the organisation is fairly small, then the requirements of accreditation and periodic audits may not appear to be cost effective.

However, the main benefit of seeking certification of an EMS is that a company can then use the certification as a means of publicising its EMS. This can be expressed as the formal national and international recognition of environmental status, good working relationships with customers and suppliers requiring confirmation of environmental status, and a good environmental image with regulators and the wider community (McManus, 1993).

Although present proposals regarding standards are that standards for EMS should be voluntary, there is some valid concern that once an ISO specification has been established, it will over a reasonably short time frame become *de facto* compulsory for many types of organisations. This concern has been fuelled by the impact of the ISO 9000 quality management systems series of standards. In New Zealand, compliance with ISO 9000 is effectively a requirement for many exporting organisations. The General Agreement on Tariffs and Trade (GATT) has identified a number of environmental technical barriers to trade and in the future an EMS may also become a requirement for exporting.

4.3 Criteria for assessing costs and benefits of EMS

Different organisations will place different emphasis on the costs and benefits of implementing an EMS. The types of issues that will be important to organisations will include liability, public image and financial advantage. Organisations involved with primary products, such as agricultural products and minerals, will have different objectives and concerns to manufacturing organisations and service organisations. The weightings that these different groups will give to the issues will vary. The size of the organisation will also have an impact.

When assessing the costs and benefits of implementing an EMS, the types of criteria that a company will use will include:

- whether direct benefits outweigh direct costs (short term and long term),
- the level of anticipated indirect benefits,
- whether primary risks associated with the organisation's activities are greater than the organisation is prepared to accept,
- whether secondary risks are considered significant,
- the quantity of resources required to install and implement the EMS,
- the availability of these resources,
- the length of time it is expected that the implementation will take,
- the need for use of external consultants for implementation and assessment, and
- the size of the organisation and the (perceived) size of the problem(s).

This purpose of this project is to investigate and test approaches to environmental decision making that will lead to improved environmental outcomes. The two criteria that are used to assess these approaches are efficiency and effectiveness. Efficiency refers to the process being used, and effectiveness to the outcomes. The results of environmental decisions are often not able to be assessed directly because of the time lags involved, therefore the emphasis is on establishing good processes. Uncertainty is a key issue in environmental decision making: good process does not necessarily lead to good outcomes. However, good process does allow for targets to be set and measured at specified time intervals.

The implementation of an EMS provides an organisation with a clear structured approach to environmental decision making that allows objectives and targets to be measured on a regular basis. It is important to remember that good process can't guarantee good outcomes, but monitoring of objectives and targets allows an organisation to check its progress and make appropriate adjustments.

4.4 Legislative background

This report to date has described the origins of EMS, outlined the elements of an EMS and discussed the current situation with respect to standards. To date only voluntary standards have been considered. The concern by organisations that regulation may follow or that a similar situation to that which has occurred with TQM may develop where it becomes *de facto* regulation for exporting organisations, has been mentioned.

Within New Zealand, all environmental management must take place under the auspices of the Resource Management Act (RMA). The RMA deals with the functions, powers and duties of central and local government, standards, policy statements and plans; resource consents, enforcement in terms of enforcement orders and abatement notices. Strict liability holds so that an organisation may find itself responsible for situations not of its own making.

Other Acts which will be relevant include the Health and Safety in Employment Act (1992), the Hazardous Substances and New Organisms Act (coming before the house shortly), and the Building Act 1991. The implications of the new Health and Safety Act are only just becoming apparent with liability being a major concern.

One of the elements of establishing an EMS is to determine all legislative liability including civil liability, criminal liability and due diligence. The Acts that require to be considered will be different for each activity/operation. Organisations will need to make thorough assessments. The main area of concern will be the RMA. Although the RMA has been developed as 'enabling legislation', it allows for stricter penalties for infringement than in the past. Organisations are bound by duties and restrictions most of which will be linked back to regional and district plans, national and regional policy statements and in some cases national standards. It is timely that major organisations rethink their environmental responsibilities.

5 Framework for assessment

5.1 Why is a framework required

There are very many different types and sizes of organisations that might consider implementing an EMS. One of the main factors involved in determining whether or not to proceed will be whether the benefits of implementing an EMS outweigh the costs. A framework that allows an organisation to make a fast and simple assessment of the likely costs and benefits will be a useful tool for organisations considering this step. It needs to be simple, flexible, and easy to apply to different organisations.

5.2 Risk criteria

The trigger for implementing an EMS is often the recognition of the existence of risk associated with the environmental management of the organisation. Different types of risk including business risk, financial risk, institutional risk (legal) or direct environmental risk may be involved. Once the presence of risk associated with environmental management is recognised, or a problem identified the organisation will assess the environmental management options available to it and may choose to investigate the implementation of EMS. At this stage, the organisation will want to examine the costs and benefits of implementing an EMS.

A useful way of addressing this task is by using a checklist approach that incorporates different types of risk and the direct and indirect benefits of implementing an EMS. The approach therefore becomes a form of generalised cost-risk-benefit analysis.

Risk assessment involves three steps: risk identification, risk estimation and risk evaluation. The other critical characteristic of the risk based approach is that risk itself has three components, choice, probability and magnitude. The inclusion of choice means that we are considering decision-making processes, and that the existence of 'a problem' has already been introduced.

In the context of an organisation considering the possibility of implementing an EMS, a problem has been identified. Risk is present, and the specific choice can be presented as either implementing an EMS or not (in which case other direct environmental management tools may be employed).

Although the problem has been identified the specific risks may not have been. Therefore the next stage will involve a scoping process examining the operations of the organisation and directly specifying the primary and secondary risks that exist. This will require investigation of current and prospective legislation, and an examination of the environmental effects or impacts of the organisation's activities providing the basis for an initial environmental review.

In this context, the estimation phase of the risk assessment does not require any form of direct quantitative assessment of the risks since we are concerned solely with determining whether or not it is appropriate for the organisation to proceed to the implementation of an EMS. Estimation in this case requires simply that the probability and significance of the risks be addressed in a comparative sense in the form of a probability - consequence matrix. At the same time, the direct and indirect costs and benefits can be assessed in a similar framework.

The third stage of risk assessment, evaluation, is the process of including any additional factors that may appear relevant and making the decision as to whether or not to proceed to implement the EMS. Relevant factors might include managerial considerations such as the need to incorporate the EMS with other management systems, or time factors that suggest that although implementing an EMS is consistent with company philosophy and the assessment would indicate that it should be done, either delay or a phased approach is considered most appropriate. The criteria described in 4.3 will require to be considered at this stage.

A risk assessment approach is therefore proposed as the basis for the framework for assessing costs and benefits of implementing an EMS.

5.3 A cost-risk-benefit framework

Cost-risk-benefit balancing is an important risk assessment tool. It is an extension of the welfare economics cost-benefit analysis. Risks can be included directly in the analysis as costs, or used as an entry point.

This section of the report suggests a framework that can be used for this type of risk assessment. How the framework is applied will depend on the size, type and operations of the organisation. Value judgments will be required to assess the *significance* of the effects or impacts. Some effects will be rejected as being insignificant, but it is important that this judgment is a conscious choice that can be justified if required.

The framework consists of several parts and considers several areas: one-off costs (direct and indirect), direct costs, indirect costs, direct benefits, indirect benefits, primary risks and secondary risks. Since these are all measured on different scales it is not possible to aggregate the costs and benefits and directly compute a net benefit. For this, managerial judgment incorporating subjective weightings related to the corporate culture of the organisation is required.

The following series of steps can be used as a framework outline, that allows an explicit, structured approach to making these judgments, using impacts or effects on the environment.

1. Examine the structure and operations/activities of the organisation and separate these into sectors or areas for assessment.

The way in which this is done will depend on the size of the organisation and the scope or range of its activities.

2. Undertake a preliminary assessment of each sector to identify principle activities that impact or have effects on the environment.

3. Use a risk assessment framework to rank the identified impacts or effects.

Activities are assessed according to this framework and grouped. This assessment should be done for both primary and secondary risks.

Risk has two main components, probability and magnitude. Probability is generally assessed as a *frequency* of occurrence as it obeys all the normal statistical laws of probability. The magnitude must be assessed in terms of the *type* of occurrence (or effect) and will include spatial and temporal components.

In terms of this framework it is not possible (or necessary) to consider probability and magnitude in terms of absolute measurements. It is the *comparative* size of both components that is of importance. Probability of occurrence is measured on a 1-4 scale where 1 is very frequent, 2 is frequent, 3 is infrequent and 4 is rare. Magnitude, or the significance of the effect is similarly measured on a scale of 1-3 as level of effect or damage, with 1 being significant impact, 2 being moderate effect, and 3 being minimal impact.

The following table, or 'risk level chart' has been adapted from the report of Working Group 2 of Committee QR/11. Permission to use this chart has been given by Noel Clark who chaired the working party. The purpose of this type of chart is to set priorities for action.

Significance	Probability			
	1	2	3	4
1	A	A	B	B
2	A	B	B	C
3	B	B	C	C

This table is simply an example. An organisation may use different numbers of rows and columns and set its own rules or criteria for the assignment of grades (A,B,C, etc). Activities or impacts scoring A should be considered before those scoring B or C. Activities scoring C should not, however, be ignored.

4 One-off costs are identified and estimated.

These will include:

- cost of undertaking an initial environmental review
- staff training costs

5 Direct costs and benefits of implementing an EMS are likewise identified and estimated.

Direct costs will include:

- on-going staff training
- purchase and installation of new equipment, or modification of old equipment
- record keeping costs
- audit costs

It will obviously not be possible to make an accurate measurement of these costs and either 'ball park' figures or ranges will be used.

Direct benefits will include:

- reduction in material costs resulting from recycling and re-use
- reduction in energy costs

- 6 One-off direct costs and on-going direct costs are aggregated to determine whether there is a direct net benefit in proceeding. If this is the case then it is not necessary to proceed with the analysis as in most cases indirect benefits will exceed indirect costs.
- 7 If one-off and direct costs exceed direct benefits then indirect costs and benefits are assessed. It is unlikely that indirect benefits will be able to be estimated in dollar terms and therefore evaluative judgements will be required. Indirect benefits may be assessed in a similar fashion to risks, using, for example, a scale of 1 to 5 where 1 is small benefit and 5 is very large benefit.

Indirect benefits include:

- improved public image
- increased competitive advantage
- potential for improved internal organisation

These indirect benefits may be calculated as net benefits, by taking into account the reversed costs of *not* having a good environmental image etc.

- 8 The final balancing of costs and benefits is not a simple aggregation but requires balancing and weighting of organisational objectives, incorporating the primary and secondary risks that the organisation may be exposed to. Risks can be used as part of the identification process.

Having assessed the costs, risks and benefits using this framework, the criteria from 4.3 are used to rank the organisations activities.

As a starting point, the types of effects that should be addressed include air and water pollution, waste management, occupational safety and health, energy and resource efficiency of products or processes, and the manufacture, marketing, use, transport and disposal of toxic substances.

Within this framework, there are several areas of operations that must be considered. These include normal operating procedures, abnormal operating procedures, incidents and potential emergencies, and past current and planned activities. Effects arising from support functions as well as activities impinging directly on the environment also need to be considered. All these processes may best be assessed by establishing a series of possible scenarios covering all these operational activities.

An alternative approach would be to adopt a source based rather than an effect based framework. If the organisation were seeking to be proactive the source based approach would be preferable. In most circumstances, however, effect based approaches are much easier to comprehend and apply.

This simple structure does not seek to provide an organisation with instant answers as to whether or not it should implement an EMS. What it is designed to do is to allow an organisation to systematically assess the relevant costs and benefits related to its own position and how it views its risk exposure.

6 Conclusions

An EMS enables an organisation to identify, assess, and manage its impacts on the environment with an emphasis on improving environmental performance. This report has concentrated on identifying the costs and benefits to an organisation of implementing an EMS.

Environmental management systems are primarily an internal management tool, and the trigger for many organisations considering implementing an EMS is a concern about their obligations under environmental and related legislation. Nevertheless, when an organisation implements an EMS it adopts an obligation to continual improvement in a similar manner to that incorporated in the quality management systems approach. Although this improvement concerns the *system* rather than environmental performance directly, the medium to long term outcome of implementing an EMS is that an organisation will have increased awareness of its impact on the environment and will have formal procedures established to deal with both normal and abnormal effects on the environment.

The prevention principle and precautionary principle are important considerations for organisations whose processes impact on the environment. The prevention principle, which is essentially reactive, involves preventing the creation of pollution at source. The precautionary approach adopts a proactive stance and advocates controls of pollution *before* causal relationships have been established scientifically. In this way it takes account of ignorance as well as scientific uncertainty.

Environmental reviews and audits of an organisation cannot on their own provide an organisation with the assurance that its performance not only meets but will continue to meet legislative requirements and its own policy requirements (SABS, 1993).

A structured management system such as EMS can provide this assurance by providing management with an integrated framework linked to management activity that addresses all aspects of environmental performance. This system can be linked to an organisation's quality management system.

The existence of an EMS does not guarantee environmental performance. Periodic review and revision of objectives and targets, and measurement of progress is also required.

Environmental management systems specifications or standards, as presently being proposed, are system based standards rather than performance based standards. Performance is measured in terms of achievement of objectives and targets.

An EMS is a decision making tool that an organisation can use to assist in making decisions about its activities that impact on the environment. It should be used in conjunction with other environmental decision-making tools such as environmental auditing and environmental risk assessment. Environmental management systems are not stand-alone tools, and an EMS requires to be integrated into an organisations's product management, financial and quality management systems.

The criteria that an organisation can use to assess the way in which it makes decisions affecting the environment are efficiency and effectiveness. In this context efficiency is determined by the process, and effectiveness by the outcome. The implementation of an EMS is an efficient means of environmental decision making. It must be remembered, however, that good process does not guarantee good outcomes. The effectiveness of EMS as a decision-making tool depends on the commitment of the organisation and its willingness to provide the required resources to the process.

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