

# **Environmental Management Systems**

## **- Improving Environmental Performance?**

**by**

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## Abstract

This dissertation seeks to examine environmental management systems (EMS) such as ISO 14001 and EMAS and to find out if they improve environmental performance.

ISO 14001 has been in existence since 1996 and EMAS was first established in 1993 and has been available for participation by organisations since 1995. Some views have been expressed regarding EMSs generally that have not been complimentary in terms of their effectiveness as a means of improving environmental performance.

Some of this negative opinion may be linked to inconsistencies between the application of these systems within organisations and to inconsistencies among certification bodies and also in the approach of those providing accreditation to the certification bodies. The ISO 14001 standard is an international standard and EMAS is confined to Europe and again there have been suggestions of different approaches in different countries and also differing attitudes being evident depending on the regulatory environment.

This dissertation primarily focuses on environmental indicators used by organisations and how these might demonstrate improved environmental performance.

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# 1 Introduction

The implementation of environmental management systems has become common place around the globe and range from in-house derived systems to systems aimed at particular sectors such as forestry to more widespread international standards such as ISO 14001 and EMAS.

There has been a large uptake of these standards and there is evidence to support their effectiveness in improving environmental performance. There are also some detractors who suggest that EMSs are not successful in improving environmental performance and organisations that do implement these systems may have compliance failures.

It is apparent that if these environmental management systems are successful in improving the environmental performance of organisations, this message is not being successfully communicated in a way that those observing from the outside find credible.

In order to communicate how an organisation is performing in respect of the environment, a series of indicators is a useful if not a crucial mechanism. It would be useful to have information on the use of indicators and how they might be used effectively to communicate environmental performance.

## 1.1 Objectives

1. To conduct a literature review to examine attitudes to environmental management systems and to broadly answer the question – do they improve environmental performance
2. To examine environmental systems in practice and how they are communicated and by what means through:

- a. Interview with an environmental manager
  - b. Survey of those operating environmental management systems
  - c. Review of environmental statements made available by organisations
3. To consider the information gathered in the course of research and establish how environmental management systems could be improved in terms of indicators and how these are communicated.

## 1.2 Methodology

The approach to information gathering in this dissertation is based on an initial interview with an environmental manager to scope out attitudes to environmental management systems from an operational point of view.

Following this a survey was conducted which sought to gather information from a group of individuals within organisations concerning environmental management systems. This ranged from, in the first instance, gathering information about environmental management systems generally and examining the level of knowledge about supporting mechanisms, e.g. certification and accreditation, to more detailed information about indicators.

Environmental indicators are the primary tool for both measuring the impact of a system on environmental performance and in communicating that performance internally, to regulators and to the wider public.

Finally, a number of environmental statements were reviewed to examine how the use of indicators was implemented in practice and how consistent these statements were in the way they reported on environmental performance.



## **2 Review of Relevant Literature**

### **2.1 Introduction – Standards**

International standards in the environmental area can trace their origin to the founding of the International Organization for Standardisation or ISO (derived from the Greek word isos meaning equal) which was established in 1946.

The need for standards was evident in bomb making factories in Britain during the period of the Second World War when bombs would inadvertently explode. The Government insisted on procedures being adopted by these factories and also instigated a system of inspection, thus introducing an early version of standardisation (Systems Thinking for Service Organisations - A Brief History of ISO 9000 [Online] ).

The standards that people will be most familiar with today are the ISO 9000 and ISO 14000 series of standards. Of these, ISO 9001 and ISO 14001 are the most prominent. The latest revisions of these two standards have been in 2008 and 2004 respectively with the year included when referencing each standard i.e. ISO 9001:2008 and ISO 14000:2004.

ISO 9001 specifies requirements for a quality management system for any organisation that needs to consistently provide product that meets customer and applicable legislative requirements and aims to enhance customer satisfaction.

### **2.2 Environmental Management Standards**

An environmental management system (EMS) is the term used to describe the overall management system an organisation uses to integrate environmental issues within the existing management and operating systems. It is based on a concept of continual improvement.



The most prevalent forms of EMSs are the standard ISO 14001 and the Eco-Management and Audit Scheme (EMAS). These schemes represent a move away from old style “command and control” environmental legislative regimes to the use of voluntary system based schemes. Other types of environmental management systems include the Forest Stewardship Council (FSC) scheme which is often considered to be the “gold standard” for sustainable forestry management (ENDS, December 2007).

ISO 14001 – *Environmental Management Systems – Specification with guidance for use* (ISO, 2004) is primarily concerned with environmental management of organisations through minimising harmful effects on the environment caused by its activities and achieving continual improvement of its environmental performance (ISO History and Definitions [Online]).

It applies to environmental aspects that the organisation identifies as those which it can control and those which it can influence. The standard does not state specific environmental performance criteria which must be met which has been suggested is a drawback (Clapp, 2001)

The Eco-Management and Audit Scheme (EMAS) is a management tool for organisations to evaluate, report and improve their environmental performance. The current EMAS specification is defined in Regulation (EC) No 761/2001 and there is no legal obligation to use EMAS. An important aspect of the EMAS scheme is that it involves the production of an externally verified Environmental Statement.

Interestingly the Irish EPA requires any site with an Integrated Pollution Prevention and Control (IPPC) Licence or a Waste Management Licence to develop an EMS for the management of all environmental issues so it would seem that the Irish environmental regulatory authority can see a benefit in adopting an EMS.

## 2.3 Certification and Accreditation

Organisations are free to adopt an EMS without recourse to external verification by an independent third party. Some organisations may satisfy their requirements by setting up a management system that uses 14001 as a template which may meet their own internal and corporate needs. More often, an organisation will seek third party certification from a body specifically set up to conduct an assessment of conformance with the requirements of ISO 14001 through an on-site audit. Typically, a third party audit of an organisation is conducted and following the correction of any deficiencies identified, a certificate is issued by the certification body to the effect that the organisation complies with the requirements of ISO 14001.

The certification body will conduct periodic surveillance visits to ensure continuing conformance with the requirements of the standard. An organisation having certification will give added confidence as to the environmental performance of the organisation. The value of the certification is largely dependent on the competence of the certification body to conduct audits and will rely on the training and experience of the auditors and also on other factors such as the management system operated by the certification body in terms of adherence to quality, training of staff, a documented and effective management system, internal audits and an absence of outside influences and conflicts of interest.

To help achieve these aims and ensure the system is one of a robust nature, certification bodies may be accredited to the international standard ISO 17021:2006 – Conformity Assessment – Requirements for bodies providing audit and certification of management systems. Conformance with this standard may be assessed by a national accreditation body such as the Irish National Accreditation Board (INAB) or the United Kingdom Accreditation Service (UKAS). Each country in Europe has one recognised accreditation body that can undertake accreditation and certificates issued by these bodies are accepted as of equal value in other countries through the adoption of multilateral agreements (MLAs). To remain signatories of these MLAs, the accreditation bodies undergo periodic assessment through a system of peer review which involves witness audits and audits of the accreditation bodies' management systems. The accreditation bodies in turn operate a management system in

compliance with the standard ISO 17011:2004 – Conformity Assessment – General Requirements for accreditation bodies accrediting conformity assessment bodies.

Therefore, there is a tiered approach to ensuring that organisations are effective in implementing an EMS such as ISO 14001:2004 - through the work of the certification body, accreditation body and the peer evaluation system which is operated by accreditation bodies at an international level.

There are dissenting voices in this process as no system is entirely robust with many reports of criticism of the effectiveness of the implementation of an EMS in terms of environmental performance and also of certification bodies and in turn the accreditation bodies. The Environment Agency of England and Wales has reported that improved standards of certification will be required to gain regulators' trust and that many certification bodies were inadequately assessing the environmental performance and legal compliance of their clients (ENDS, May 2003). In March of 2003, the Environment Agency recommended that EMAS registration of the chemical company A H Marks should be suspended and its verifier BSI investigated by UKAS following an unauthorised solvent release. In its investigation of the leak, the Agency had revealed that a factor in the incident was the lack of "proper training" for staff who failed to replace carbon absorbers correctly (ENDS, March 2003).

This would seem to be an example of a regulator getting tough and of the failure of the environmental management system to do what many would consider to be its primary function – protect the environment. From the view point of the company, A H Marks, it considered the actions of the Environment Agency to be an over-reaction and a spokesperson went on to say that they had informed the Agency of what they termed a "minor release" as required under the conditions of its integrated pollution control licence.

## 2.4 Perceptions of Environmental Management Systems

Several studies of Environmental Management Systems have been conducted in the last ten years.

### 2.4.1 REMAS Project

There have been attempts over the last 10 years to examine the benefits of environmental management systems in the context of regulation. One such initiative is known as REMAS which was a €2 million project co-financed by the LIFE Environment Fund, the Environment Agency, the Scottish Environment Protection Agency, the Institute of Environmental Management & Assessment and the Irish Environmental Protection Agency. The three-year project was launched in November 2002 and more than 300 sites provided information on their environmental management and performance via an online questionnaire.

The results as reported in the final issue (REMAS, 2007) can be summarised into three main findings as follows:

#### 1. EMS leads to better site environmental management

There has been a suspicion that only sites with better environmental management practices register for EMAS or certify to ISO 14001 and it is questionable whether the implementation of the EMS leads to better site environmental management. The REMAS study found with good confidence (less than 5% chance of error) that putting a progressively more robust EMS in place leads to better site environmental management. Sites certified under a national accreditation scheme such as those operated by INAB or UKAS score higher and those registered to EMAS performed best of all.

## **2. Better site environmental management equates to better environmental performance**


The data produced in this category did not produce an entirely consistent picture with only a few sites providing data on raw materials and energy use with benchmarks on waste production being largely absent. The final report has highlighted this as being worrying as measurement is a key part of effectively controlling and implementing overall resource efficiency. (A positive move in regard to energy use may be seen in Ireland through the adaptation of the energy management standard I.S. 393:2005 by many companies in Ireland). The REMAS project did confirm that, using data on water and air emissions, that there is evidence to link better site environmental management with better environmental performance. But a caveat that is entered here is that this statement varies in different regions and sectors and it is at its most valid when considering the food and drink sectors and in Scandinavia.

## **3. Links between better site environmental management and regulatory performance.**

Although differing across regions, the study found a reasonably strong link between better site management and regulatory performance; paradoxically in the UK, Ireland and Italy it was found that better site environmental management appears to lead to more instances of permit condition breaches and enforcement. In other regions the opposite was found and the report concludes that it is clear from the data that the overall regulatory approach strongly influences this relationship. Variables having an influence include the mix of permit levels, numbers of inspections and overall regulatory approach.

Overall, the results are mixed but this has proved to be a very useful exercise in providing data on environmental management systems. Adopting an EMS can lead to better site environmental management with the best performers being EMAS registered sites. Data on raw materials, energy and waste was poor but water and air emissions reacted positively





(decreased) when an EMS is used but there are sector and regional differences. Regulatory approaches can also influence environmental breaches by EMS sites. Breaches of licence limits by EMS registered sites are often taken as examples of deficiencies of ISO 14001 or EMAS and also a stain on the character of certifiers and those providing accreditation as evidenced in various ENDS reports. This may be an unfair assumption as it fails to consider what the situation might be if there were no environmental management systems and merely the command and control approach of earlier years. Indeed, one study suggests (Arimura, T.H.; Hibiki, A.; H., Katayama, 2008) that, when compelled by regulations, some sites may comply with a target level even when further improvement is possible within the EMS and advocated that that the optimum outcome for the environment could be achieved through the simultaneous use of regulation and a voluntary approach. There appears to be some evidence that regulators do recognise the implantation of environmental management systems with Johnstone and Labonne (2009) finding that sites with certified EMSs being more likely to report that they had not been inspected in the last three years than those with uncertified EMSs.

#### **2.4.2 EMS Survey – conducted by ENDS, the Institute of Environmental Management and Assessment, the Environment Agency and the United Kingdom Accreditation Service**

This survey was conducted in 2006 (ENDS, November 2006) and asked for views about the value of implementing EMSs in the guise of ISO 14001 or EMAS and also asked about the added value provided by external certification, whether environmental management systems were gaining or losing credibility and also about confidence in UKAS.

The results may be summarised as follows:

- **Do EMSs improve environmental management and performance?**

The majority believed that EMSs delivered worthwhile and sustained benefits over what would have been achieved by other means. 67% believed that EMSs provided the basis for significant environmental performance improvement that would not



have otherwise been achieved. Respondents highlighted the importance of top management commitment. Environmental consultants and regulatory inspectors were more sceptical than those from ISO 14001 certifiers and EMAS verifiers. Implementing an EMS does not mean that an organisation will attain a set level of environmental performance, rather that it has applied a set of procedures and practices (Johnstone & Labornne, 2009).

- **Do EMSs improve processes for ensuring legal compliance?**

75% of respondents believed implementing an EMS increases the frequency and scope of checking that an organisation undertakes to examine if it is in legal compliance with nearly all agreeing that an EMS improved understanding of the organisation's legal status to a certain extent. Interestingly the question of whether corrective action followed from this increased understanding divided opinion with a third expressing the view that action always systematically followed but one third did not.

- **What other benefits derive from implementing an EMS?**

60% of respondents believe an EMS can make an organisation more efficient by identifying opportunities to reduce resource use and waste but other business drivers such as legislation and customer demands are more important. A third expressed the view that resource efficiencies could be achieved that would not otherwise be possible.

Half of respondents believed an EMS can help improve the organisation's environmental reputation but that other factors are more important and 40% believed having an EMS significantly enhanced the organisation's reputation environmentally.

- **What drives companies to implement an EMS?**

Corporate culture was identified by 63% as the most common factor followed by competitive pressure, supplier request and regulatory requirement in that order.

- **Are ISO 14001 certification bodies and EMAS verifiers meeting expectations?**

- *Time on site*

75% felt that certification bodies were spending the appropriate amount of time on site with 20% believing they did not with consultants and regulators having a differing view whereby a third of this group felt time spent on site was not adequate.

- *Competence*

Half of respondents believed that certifiers did not have enough knowledge about business operations.

- *Consistency*

80% felt assessors within any one certification body either applied a consistent approach or different approaches but with consistent and comparable outcomes. The figure for consistency between different certification bodies was lower at 50%. 40% of respondents working for certification bodies and verifiers did not believe other bodies offer consistent and comparable conclusions.

- *Legal compliance*

25% of respondents expressed the opinion that certification bodies looked for documentary evidence that companies had initially evaluated compliance with all the applicable pieces of legislation.

25% felt that the certifiers fully reassess compliance status of organisations through internal audit and periodic evaluation processes. Only one third of respondents stated that certifiers looked for on-site evidence of compliance.

- *Costs versus benefits*

Nine out of ten believed that benefits were more or less the same or outweighed the costs which would indicate that organisations do see an overall benefit despite the deficiencies identified.

Overall, this survey presents a mixed view of environmental management systems and while the majority can see a benefit there are real problems identified which give a confused and uncertain picture. The survey produced subjective responses as can be seen by the differing views of the distinct groups surveyed e.g. regulators, consultants and organisations implementing an EMS.

## **2.5 Benefits of implementing an environmental management system**

Support for EMSs from the Environment Agency (EA) in the UK can be seen in its position paper on this topic (DEFRA, April 2008). The six main recommendations of the statement can be summarised as follows:

1. Organisations should put in place an EMS that is appropriate for improving their environmental performance.
2. Organisations implementing an EMS should consider the value of adopting a national or international standard or scheme e.g. ISO 14001 or EMAS.
3. Organisations should aim to achieve certification of their EMS that provides independent recognition of performance by using auditors accredited by the national accreditation body such as UKAS (or in Ireland's case INAB)
4. Organisations should aim to integrate the EMS into all their business activities, obtain senior management commitment and leadership and involve all levels of staff in the implementation and delivery of an EMS.
5. An EMS should be used to demonstrate compliance with legislation and performance against industry benchmarks and performance indicators. This information should be disclosed and communicated internally and also made available externally in an accessible format.

6. An EMS should be used by organisations to help drive performance through the supply chain and support and encourage suppliers to attain more transparent and higher levels of financial, environmental and sustainable performance.

In this statement EA makes its position clear in that it believes that positive environmental outcomes will result from a robust, effective and externally certified EMS. The Environment Agency's statement would suggest that the EMS must be robust, effective and externally certified. Otherwise, it is unlikely to deliver positive environmental outcomes.

## **2.6 Motivations for implementing and EMS**

Few studies have examined the motivation of companies for installing an EMS in their organisations. It has been suggested (Clark, 1999) that multinational companies are adopting an EMS to satisfy customer pressures and to ensure that their suppliers are operating in environmentally and socially responsible ways. The voluntary nature of standards such as ISO 14001 and EMAS gives companies more flexibility in developing EMSs that are appropriate to the particular characteristics of each individual case (Rondinelli and Vastag, 1996).

Some organisations exporting to "environmentally-conscious" Germanic and Nordic countries seek to implement an EMS and this has been suggested as a possible reason for the large number of ISO 14001 certified companies in Japan with many government agencies and industry associations promoting implementation of this standard (Steiger, 2000). In the same article, a reason suggested for a lower than expected take up of ISO 14001 in the United States of America is that companies hesitate to seek certification as there is concern of increased liability.

## 2.7 The case of I.S. 393:2005 – Energy Management Systems Standard

This Irish standard was developed to ensure that energy management becomes integrated into organisational business structures with the aim of saving energy and costs and improving energy and business performance. This standard is based on existing management standards such as ISO 9001 and ISO 14001 (SEI, 2006). Sustainable Energy Ireland, the state body charged with matters related to sustainable energy practices, developed a technical guideline that can be used by organisations installing the standard. This was in recognition of the fact that there was a significant technical component necessary in order to maximise the benefits of I.S. 393:2005.

The guideline identifies technical stages and processes of an energy management system. It provides a range of possible methodologies and approaches which could be used in both satisfying the standard and ensuring the development and operation of an effective and documented Energy Management System. SEI has expressed the hope that organisations operating an effective energy management system will:

- Take action to improve energy efficiency
- Continually improve year-by-year with an improved performance in energy usage
- Conduct a more thorough analysis of areas with potential for energy savings, if no action on energy efficiency is being taken.

SEI reported, in a press release in November 2008 (SEI, 2008), that Ireland's largest business energy users made energy efficiency gains of €55 million during 2007. These users were part of the Large Industry Energy Network (LIEN) and working towards I.S. 393:2005 certification.

The first company in Ireland to become certified to a formal energy management standard was Aughinish Alumina (SEI, Year unknown). This company, which is Europe's largest alumina refinery, is one of Ireland's largest energy users with energy accounting for about 30% of the costs. The company implemented an energy management system known as DS 2403 which is a Danish standard on which I.S. 393 is largely based.

It was found by the Energy Manager in Aughinish, Brendan Thorne, that the implementation of the standard resulted in a more thorough analysis and faster resolution of problems than would otherwise have been the case. The fact that the standard is very similar to ISO 14001 was found to be a major benefit with small amendments needed to fit with existing 14001 procedures. The Managing Director of the company, Damien Clancy, stated that while it was hard to put an actual number on it, there had been individual areas of progress and those results had been quite dramatic. It was expected that there would be further cost reductions associated with these items in the future and that up to six-figure cost savings was achievable.

Some of these points appear rather aspirational and lacking in hard evidence, even though the company displays a commitment and belief in the effectiveness of implementing the standard.



## **2.8 Does the implementation of an EMS improve environmental performance and the attitude of regulators to systems approaches**

From reviewing literature on this topic there does appear to be quantifiable improvements in environmental performance achieved following the implementation of an EMS. In one study (Rondinelli and Vastag , 2000) the implementation of ISO 14001 in Alumax's Mt Holly industrial facility in South Carolina was examined in depth.

It was found that one of the strongest impacts of ISO 14001 certification was behavioural with an increase in awareness of environmental aspects, regulations and impacts. There was agreement among the employees of the plant that the single most significant impact of the process was the improved environmental awareness achieved. This was noted for all employees.

A decrease in waste production was also noted and it was observed that "third party audits helped to keep us more honest". It was felt that third party audits were more effective in changing behaviour than internal audits.

Managers noted that the ISO 14001 certification process made them aware that environmental improvement is a never-ending process and at times, the need to maintain systems and various forms of documentation was a significant burden.

There was disappointment with some aspects such as no discernible customer impact and the fact that the plant had received no regulatory benefits from State or local government agencies following certification. It was noted that implementing ISO 14001 did not ensure compliance and the people involved need to be fully aware of compliance issues.

This study highlighted that, with the exception of reducing solid waste and the number of chemicals used in the laboratory both of which are easily measurable, all of the other positive changes at this plant were in attitude and at managerial level and these changes were more difficult to quantify. There was a perception that the implementation of ISO 14001 had been noted and acted on by the regulatory authorities in terms of lessening reporting and monitoring requirements but these could not be documented. Johnstone and Labonne (2009) have suggested that implementing an EMS may help to decrease the

likelihood of unintentional non-compliance with regulations but have highlighted studies that have demonstrated a positive link between improved environmental performance and the adaptation of an EMS and also studies that have examined this area and have not observed any demonstrable improvement in environmental performance. Clause 9 of the EMAS regulation 761/2001 does suggest there is a possibility that regulatory authorities may take participation in EMAS into account:

“Organisations should be encouraged to participate in EMAS on a voluntary basis and may gain added value in terms of regulatory control, cost savings and public image”.

A number of studies have sought to examine environmental outcomes resulting from the implementation of an EMS (Nawrocka & Parker, 2009). A problem with examining environmental performance is that ISO 14001 does not require organisations to make public this type of information and the EMAS regulation 761/2001 under clause 14 states that “Organisations should be encouraged to produce and make publicly available periodic environmental statements providing the public and other interested parties with information on their environmental performance”. However annex III, clause 3.6 of the same regulation states that “The environmental statement shall be made accessible to the public”. So the picture regarding making environmental statements public under EMAS is somewhat confused with the annex seeming to state the case in stronger terms that presented in the main body of the regulation. This information, therefore, may not be readily available nor is it easy to make comparisons between different organisations in terms of environmental performance. Of those EMAS sites that do make their environmental statements available, the data may be presented in different formats as EMAS does not specify a structure for reporting (Priego & Palacios, 2008).

A study has highlighted the importance of environmental performance indicators (EPIs) which are defined as numerical measures that provide key information related to environmental issues (Henri & Journeault, 2008). This is a key component of measuring and communicating environmental performance. Henri & Journeault (2008) mention four dimensions of environmental performance that EPIs should measure and these are: internal; external, process and result. For the purposes of their study, they utilised two

classifications: 1. Financial and non-financial indicators and 2. ISO 14031 guidelines. The uses of environmental performance indicators examined were:

- To monitor compliance with environmental policies and regulation
- To motivate continuous improvement
- To provide data for internal decision making
- To provide data for external reporting

This study concluded that the importance of environmental performance indicators is associated with firms that:

- have a more active environmental strategy;
- are ISO 14001 compliant;
- are larger;
- are publically quoted.

## 2.9 Environmental Management Systems under fire

When studying literature available on various types of EMS, it becomes apparent that a lot of the comment is of a negative nature or at best extremely sceptical. This is particularly noticeable when reviewing various ENDS reports. These reports emanate from the Environmental Data Services which is a reputable source. Some of the ENDS surveys are carried out in conjunction with the Institute of Environmental Management and Assessment (IEMA) and the Environment Agency in England and Wales which adds to its credibility as a source.

### 2.9.1 FSC

One report (ENDS, December 2007) highlighted the case of an EMS that is targeted at a specific area and has had a relatively good press and is regarded as a good example of an effective EMS, viz. the Forest Stewardship Council (FSC) Scheme.

This scheme was set up in 1993 and is regarded as the most robust forestry standard in existence. But it has been claimed in this report that some of the certification companies auditing against the FSC's principles have been putting commercial interests to the fore to the detriment of the scheme in order to increase their market share. The end result, it is argued, is that consumers and organisations are buying products with the FSC logo and these products are derived from companies that have practices that are damaging to forests.

The uptake of these schemes has been relatively low at 8% of global forests certified and 85% of this area is in the northern hemisphere whereas damaging forestry practices are more likely in the developing world.

While the FSC operates the most well known and respected forest certification scheme, some have questioned the group's commercial relationships with certification bodies and also the need to keep pace with the demand for FSC certified timber products. Some have

identified the problem of variable auditing with the big US and European certification bodies subcontracting to local companies.

### 2.9.2 Non-compliance issues

Another popular topic in ENDS reports is the issue of companies who have an EMS and who cause pollution. Various ENDS reports have highlighted this topic with titles such as:

- Chemicals firm fined for “deliberate” pollution
- “Incredibly polluting” leaks cost chemicals manufacturer £180,000
- BP’s green image takes a battering

A common theme in these reports is that these organisations which are certified to an environmental standard can still cause pollution. Grosvenor Chemicals was fined £8,000 for operating its plant near Huddersfield while air pollution abatement equipment was not working (ENDS, August 2007). The company admitted to failing to maintain equipment in good working condition. An environment agency inspector found a scrubber not working and under repair and the piece of equipment had not been working for twelve days. The company had not fitted alarms to all of its scrubber systems. The company had been certified to the ISO 14001 since 2003 and the report concluded that this was a further blow to the credibility of environmental management systems.

In another case, that of Robinson Brothers which is an independent speciality organic chemical manufacturer, the company was fined £63,000 with costs in excess of £120,000 (ENDS, June 2007). The Environment Agency found leaks of chemicals to canals, deaths of up to 2,000 fish, effluent leaking from an effluent pit and CCTV revealed more than 90 sections of broken or displaced drainage pipes.

Bigger organisations have also had compliance issues as in the case of BP (ENDS, September 2000). An incident at the Grangemouth facility included large smoky emissions, a steam line bursting and a major fire at a catalytic cracking unit. At another site, Sullom Voe, there were a number of smoky flaring incidents as well as exceedances of the oil content of the



site's effluent discharge. The Scottish Environmental Protection Agency informed the competent body, the Institute of Environmental Management and Assessment (IEMA), about these exceedances and the IEMA decided to suspend the site's registration with the EMAS scheme which was the first time this had happened in the United Kingdom. The registration which was removed in May 2000 was restored in August of the same year. The company's oil refinery at Grangemouth is certified to ISO 14001 and the ENDS report raised doubts over the merits of its certified status.



## 2.10 Summary

In this review of the relevant literature in relation to environmental management systems the origin and evolution of these schemes has been examined and also their strengths and weaknesses and their role in improving environmental performance. The picture that emerges of environmental management systems is that these can be worthwhile and the consensus seems to suggest that an organisation operating an EMS is better than having no environmental system.

The next level up from operating an EMS is to have the EMS certified by an accredited certification company which may bring added confidence to the system. Measuring the impact of an EMS in an organisation seems to be a difficult task with many organisations able to track some environmental improvements e.g. waste reduction but unable to monitor other less tangible measures.

Other evidence has highlighted compliance issues for some organisations operating an EMS but perhaps the expectation that all organisations operating EMSs would have zero compliance issues is unrealistic.

In this dissertation an attempt will be made to examine the use of indicators for identifying the benefits of implementing EMSs which in turn can lead to greater confidence in EMSs as there appears to be a deficiency and lack of consistency in this area.

## 3 Research

### 3.1 Introduction

As identified in the initial literature research for this dissertation, there is some confusion among the users of environmental management systems, regulators, certifiers, accreditation bodies and the general public as to the affect and worth of implementing such systems. This is discernible when reading the related literature and examining the actions of regulators when determining the level of monitoring required.

For research purposes in carrying out this dissertation it was decided to take a three-stranded approach and concentrate efforts in the following areas:

1. Interview with an environmental manager
2. Survey of users of environmental management systems
3. Review of environmental statements of companies that are EMAS registered

As a starting point for the research in this area, an interview with an environmental manager from a large multinational company was conducted. This allowed for the formation of some initial impressions regarding EMSs from the point of view of one operating an EMS and allowed for the collection of some preliminary views on the topic. This was also an aid to the construction of the survey that constituted the second part of the research. The survey was targeted at those operating an environmental management system and the overall aim of the dissertation and the outcome of the literature research shaped the formation of the survey in terms of questions. In the third part of this dissertation the findings from part 1 and 2 were applied to environmental statements of some organisations that were registered as EMAS sites.

## **3.2 Interview with Environmental Manager**

### **3.2.1 Introduction**

It was decided that it would be beneficial to this research for this dissertation to interview an environmental manager of a facility that operates a system such as ISO 14001 or EMAS.

### **3.2.2 Methodology**

A phone interview was conducted with a manager and this was a broad based interview to establish the views of the manager on environmental management systems as a concept, as there have been some views expressed that have sought to question the validity of a systems based approach. Furthermore, the views of the environmental manager were sought on the value of environmental reporting and how it was possible to measure environmental improvements (or the converse).

### **3.2.3 Research**

The interview was conducted on the 26<sup>th</sup> January 2009 from 14.40 to 15.30 with the Environmental Health and Safety Manager of an organisation located in Ireland. The company where this person works has both ISO 14001:2004 certification and is also a registered EMAS site.

Open questions were asked about different elements of EMSs and the interviewee was given an opportunity to respond.

### 3.2.4 Results

The results of the interview with the environmental manager are presented in this section. Each bullet point represents the broad question or discussion point put to the manager and the views expressed by the manager follow underneath.

- **Project based versus a systems approach**

The interview began by asking about a project based approach to environmental challenges as opposed to taking a systems approach. The interviewee expressed the opinion that a project based approach would only work for establishing objectives and targets and that although it might be possible to demonstrate that concentration levels of a pollutant were within exceedance levels, the underlining trend analysis would be absent. For instance, total mass emissions could have greatly increased but this would not be visible. Utilising a trend analysis comparing with other years will demonstrate such an increase has taken place.

Measuring variable outputs is a dynamic process and a change of personnel during the monitoring period could have an impact and averaged figures would potentially miss this linkage whereas a total mass emissions figure would enable this problem to be detected.

You may also be meeting regulatory limits but again total emissions may have increased and trending results would identify this.

- **Review of environmental aspects**

This is conducted every year and this would not happen with a project based approach which would be viewed as a weakness or disadvantage.

- **Small organisations**

A project based approach may work in some way in a small organisation.

- **EMAS and Integrated Pollution Prevention and Control licence requirements**

These both require the production of an annual report and this was highlighted as an advantage of these types of approach. It was identified that under EMAS the figures produced are verified by a third party and that this was the only benefit of EMAS over ISO 14001. Independent verification adds credence to the figures and the manager interviewed also felt more confident about their inclusion for corporate reporting purposes post independent verification

### **3.2.5 Discussion**

The manager interviewed identified that there was a definite advantage in implementing a systems based approach to environmental management rather than implementing projects to address specific areas of environmental concern.

One of the areas that the interviewee highlighted was the problem of being legally compliant but with mass emissions increasing greatly from one year to the next. One of the problems identified in ENDS reports (ENDS, September 2000)/ (ENDS, June 2007) was where companies exceeded limits and this has been a major criticism of EMSs with this argument suggesting you can be certified to an EMS yet you may have compliance problems. The corollary of this, as suggested by the interviewee, was that you may always be compliant but your total mass emissions may be greatly increasing and thus the total environmental load may be greater.

The complex nature of environmental monitoring was also identified by the interviewee as a factor in choosing a systems based approach with total mass emissions helping to identify if there were, for instance, problems with the monitoring staff.

Reviewing environmental aspects on a yearly basis is a requirement of the EMSs operated by this environmental manager and this was seen as a benefit in that new environmental aspects should be more easily identified.

The final area that the interviewee focused on was environmental reporting and highlighted advantages between different systems based approaches. The production of an auditable set of figures was seen as a major advantage of EMAS over ISO 14001. This aspect of EMAS is highlighted in clause 12 of Regulation 761/2001 of the European Parliament:

“The transparency and credibility of organisations implementing environmental management systems are enhanced when their management system, audit programme and environmental statement are examined to verify that they meet the relevant requirements of this Regulation and when the environmental statement and its subsequent updates are validated by accredited environmental verifiers”.

### 3.2.6 Summary

A system based approach was preferred by the environmental manager interviewed. It was accepted that for small organisations a project based approach may be possible.

Compliance is not always a comprehensive indicator of environmental performance and it does not represent the complete picture of what is happening within an organisation.

Environmental reporting and the production of verifiable figures are a major benefit and advantage of participation in EMAS. It must be recognised that the interview conducted in this section was with one individual and merely provides a snapshot of a viewpoint of an environmental manager.



## **3.3 Survey of users of environmental management systems**

### **3.3.1 Introduction**

A survey was chosen as a means of gathering information about environmental management systems as both a way of finding out about attitudes generally and also specifically about the means of measuring environmental performance through the use of indicators.

A large sample was chosen from organisations:

1. That had submitted applications to the Environmental Protection Agency in Ireland for licences for waste and integrated pollution prevention control (IPPC)
2. That were registered as EMAS sites in Ireland, UK, Netherlands and Germany
3. That were accessed via some personal contacts

The survey was targeted at groups who would be likely to operate an environmental management system and this would cover ISO 14001, EMAS and systems outside of these two such as corporate systems unique to individual organisations.

### **3.3.2 Methodology**

As mentioned in the introduction to this section a survey was chosen as the main way of gathering data on environmental management systems from the point of view of the user.

An on-line facility called SurveyMonkey was used for the purpose of conducting this survey. This site allowed for the creation of a survey that could be distributed electronically to the target population. The individuals taking part could navigate through the survey by clicking various options and the options also allowed for the insertion of free text on many of the questions.

In order to distribute the survey electronically it was necessary to obtain the email addresses of the intended recipients. This was possible for the groupings as follows:

1. Those applying to the EPA are required to complete an application form and one of the contact details requested is an email address. This was in most cases an identifiable person and in other cases it was in the format of info@acme.ie. The role of the person was also given on many of the forms. Using the email address of an identifiable person allowed for the targeting of the person who was likely to have the most involvement with the EMS within a particular organisation.
2. Those organisations that are listed as EMAS sites are on a register maintained by the relevant competent authority in each EU country. The registers for Ireland, UK, Netherlands and Germany were used to obtain email addresses and, as with point one, in most cases the email address given was that of an identifiable person. The full registers were used in the case of Ireland, UK and the Netherlands and in the case of Germany a sub-sample was randomly chosen.
3. A small number of personal contacts were utilised as it was possible to target a number of organisations and named individuals by this method.

The type of questions posed in the survey ranged from questions that sought to identify the country where the organisation was located to more complex multiple choice type questions. These were written using the Likert scale as a model with a scaling based on questions rather than a simple number series e.g. rate the following from 1 to 5. The Likert scale necessitates the use of responses such as: strongly disagree, slightly disagree, neither, slightly agree, strongly agree.

An explanatory email was circulated with the survey. This email was circulated to all those surveyed except those surveyed in Germany and they also received a German translation of the email content.

The survey was tested before use to ensure that all options were available.

The following is the list of the questions that was included in the survey:

1. Where is your organisation located?
2. Do you operate an Environmental Management System?
3. Have you implemented the following?
  - ISO 14001
  - EMAS
  - Other
4. Do you have external certification/verification of your Environmental Management System?
  - Yes
  - No
  - Application made
  - Don't know
  - Other
5. Is the certification body accredited by one of the following?
  - INAB
  - UKAS
  - RvA
  - DAU
  - Don't know
  - Other
6. Which of the following sectors describe the activities of your organisation?
  - Manufacturing
  - Service
  - Waste
  - Transport
  - Other
7. In relation to independent certification/verification of your Environmental Management System can you rate the following statements  
(Strongly Disagree – Disagree – Neither – Agree – Strongly Agree)

- It gives confidence that we are meeting the requirements of the relevant standard
  - It gives confidence we are in compliance with legislation
  - It gives top management confidence in environmental performance
  - It satisfies the requirements of our customers
8. From your experience of implementing an Environmental Management System please answer the following questions  
(Strongly Disagree – Disagree – Neither – Agree – Strongly Agree)
- Implementing an EMS has a positive impact on environmental performance
  - It is easy to measure this impact
  - Impacts are communicated to senior management
  - This information is publically available in an environmental statement
  - Implementing an EMS improves compliance with legislation
9. Can you rate the following perceived benefits of reporting and communicating environmental performance  
(Not Important – Slightly Important – Important – Very Important – Essential)
- Help achieve environmental performance criteria
  - Increase awareness and dialogue
  - Demonstrate commitment and efforts to improve environmental performance
  - Provide a mechanism to respond to concerns and questions about environmental aspects
10. In evaluating your environmental performance have you used the following standard as a guide: ISO 14031:1999 Environmental management - Environmental performance evaluation – Guidelines?
- Yes
  - No
  - Don't know
  - Other

11. Indicators of environmental performance are a means of presenting quantitative or qualitative data or information in a more understandable and useful form. Please indicate which of the following characteristics do the indicators you use display (multiple choices allowed)

- Direct measures or calculations e.g. tonnes of contaminant emitted
- Relative measures or calculations e.g. tonne of contaminant emitted per tonne of product manufactured
- Indexed e.g. comparing with a baseline- expressed as percentage of emissions in baseline year
- Aggregated e.g. collating data from different sources into a combined value
- Weighting e.g. applying a factor relating to significance
- None of the above
- Other:

12. Which of the following do your indicators relate to (multiple answers allowed)?

- Raw materials
- Energy
- Services
- Design of equipment and facilities
- Installation of equipment and facilities
- Operation of equipment and facilities
- Maintenance of equipment
- Products
- Wastes (solid, liquid, hazardous, non-hazardous, recyclable, reusable)
- Emissions (to air, effluents to land or water, noise, vibration, heat, radiation, light)
- Life cycle analysis
- Other

13. Can you rate the following considerations for selecting indicators of environmental performance

(Strongly Disagree – Disagree – Neither – Agree – Strongly Agree)



- Consistent with the organisation's stated environmental policy
- Useful for measurement
- Relevant and understandable internally and externally
- Cost-effective and timely manner
- Type, quality and quantity of the data
- Representative of environmental performance
- Measurable in appropriate units
- Responsive and sensitive to changes
- Information on current or future trends

14. Can you rate the following statements concerning how environmental indicators are checked by your external auditors

(Strongly Disagree – Disagree – Neither – Agree – Strongly Agree)

- External auditors spend too much time on this area
- External auditors do not spend enough time on this area
- External auditors consider this area important
- External auditors make findings in this area

15. Please indicate if your organisation uses any of the following indicators of environmental performance

- Quantity of materials used per unit of production
- Quantity of water per unit of product
- Quantity of energy per year per unit of product
- Quantity of each type of energy used
- Average fuel consumption of vehicle fleet
- Rate of defective products
- Total waste for disposal
- Quantity of waste per unit of production
- Quantity of hazardous waste eliminated due to material substitution
- Quantity of specific emissions per year
- Quantity of specific emissions per unit of product

16. Please indicate if your organization uses external condition indicators which provide information about the local, regional, national or global condition of

the environment which can be used to identify relationships between your activities and the condition of some component of the environment?

Examples: Odour/dust/concentration of a contaminant at a specific distance from the site boundary/ Concentration of a specific contaminant in groundwater/ Concentration of a specific contaminant in surface soils at locations in the area surrounding the facility

- Yes
- No
- Don't know

17. If you would like to make any comment about this survey or about Environmental Management Systems and environmental indicators please do so in this section.

### 3.3.3 Research

The survey went live on the 20<sup>th</sup> February 2009 and remained open for 27 days. A total of 235 individuals were circulated with the questionnaire and the 73 responses were received which represents a 31% response rate.

Following closure of the survey the information has been summarised and analysed. Some respondents to the survey requested a summary of the responses received and this was indicated as a possibility in the email accompanying the survey.

Following the survey going live, responses indicated that one of the questions was not allowing the submission of the choices of the respondents as they intended them. An investigation was conducted and the problem was identified as being that the particular question was allowing the use of a choice such as "slightly agree" only once and the respondents were not allowed to use it again for the other choices. The problem was rectified immediately. It has been possible to identify the number of respondents (45) that had completed the survey before the problem was rectified and these responses have been discarded from the pool of responses for this question only, leaving a total of 38 respondents.

### 3.3.4 Results and Discussion

The results of the survey are summarised in Tables 3 – 15 which are included in the appendices. Pie charts or histograms have been utilised to give a visual presentation of the data and these can be seen in Figures 1-16.

Questions 1 - 6 were designed to gain some preliminary information about the respondents in terms of location, type of environmental management system operated and it also provided some useful information about knowledge of certification and accreditation processes.

The location of those surveyed was divided into four main categories: Ireland; United Kingdom; Netherlands and Germany (Figure 1). Respondents also had the opportunity to complete the "others" option and three respondents utilised this which gave the replies: Isle of Man; Japan and; Northern Ireland and Republic of Ireland. The breakdown of responses by country broadly reflected the breakdown of the total number of surveys circulated. This is noteworthy and indicates a similar interest in completing the survey amongst the different countries where these organisations were located.

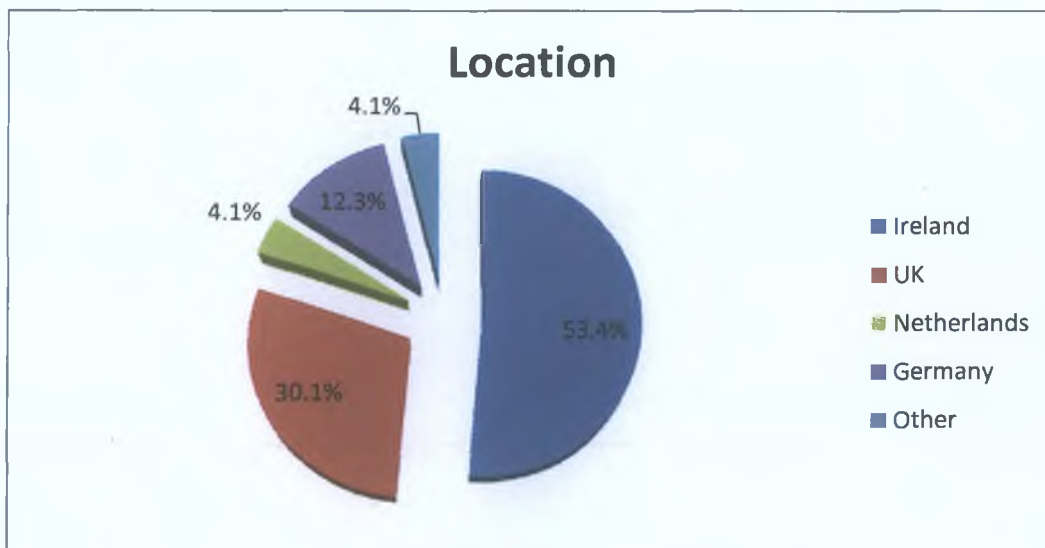


Figure 1 – Location of Organisation

Almost all respondents indicated that they are operating an environmental management system (Figure 2) which would be expected as this survey was targeted at this group and it is more surprising that two respondents replied that they are not operating an environmental management system. This is most likely to mean that they have not yet implemented an EMS as can be seen from some of the comments received e.g. comment 16 of question 17 (Appendix 1 – Table 15).

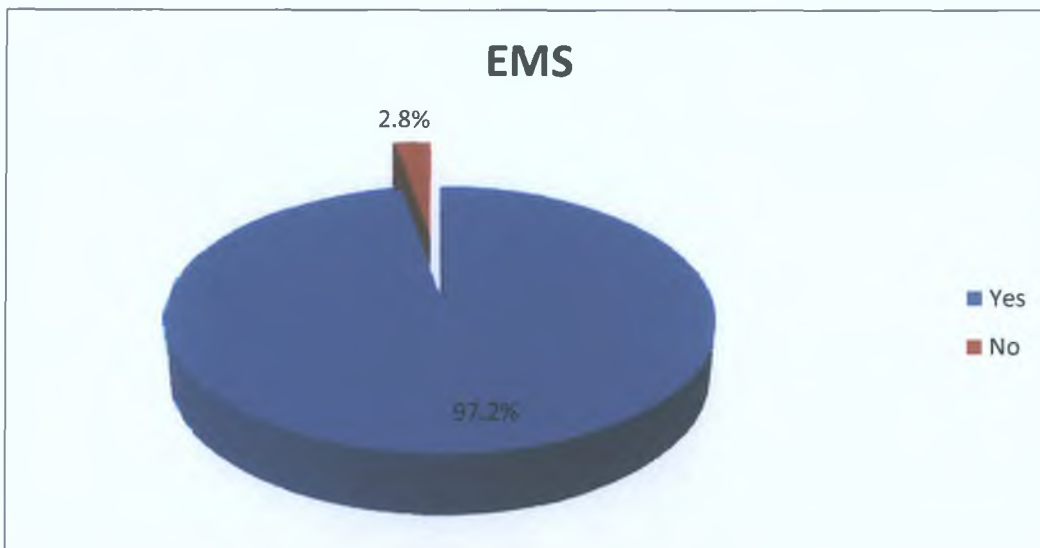


Figure 2 Operating an EMS

Question 3 enquired of those surveyed as to which type of system they implemented. 75.7% responded that they had implemented ISO 14001, 50.0 % had implemented EMAS with 21.4% indicating "others" (Figure 3). There is evidently some overlap between those who use ISO 14001 and EMAS which would account for the combined response for these two options accounting for 125.7% of the total. The others category indicated some are using their Integrated Pollution Prevention Control (IPPC) licence requirements as the model for an EMS, one is based on forestry standards (FSC & PEFC), a proportion are using their own or corporate versions of an EMS and one respondent indicated "9001" which suggests a lack of familiarity with environmental management systems. In this instance, the most appropriate person within the organisation did not complete the survey or those



responsible for the environmental aspects are not very familiar with management systems or their nomenclature.

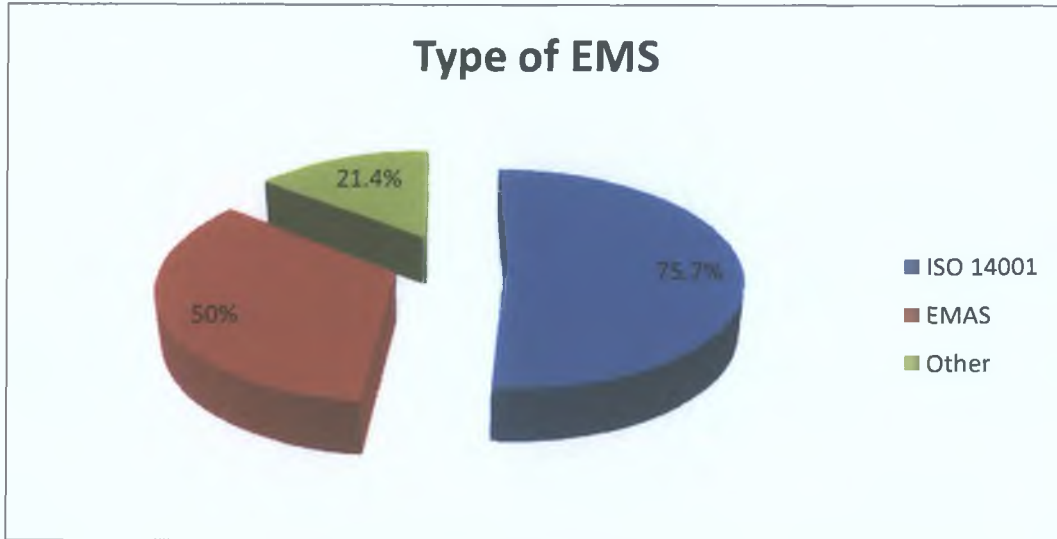


Figure 3 Type of EMS

A substantial proportion of respondents at 75.3% indicated in replying to question 4 that they had external certification/verification to their EMS (Figure 4). A sizeable proportion (13.7%) of organisations did not have external certification/verification, indicating that their EMS was an "internal scheme". The "others" category accounted for some of this cohort with two respondents indicating that they had an Integrated Pollution Prevention Control licence (which suggest the EPA were considered external auditors or those monitoring compliance) and three respondents indicating the use of an in-house system.

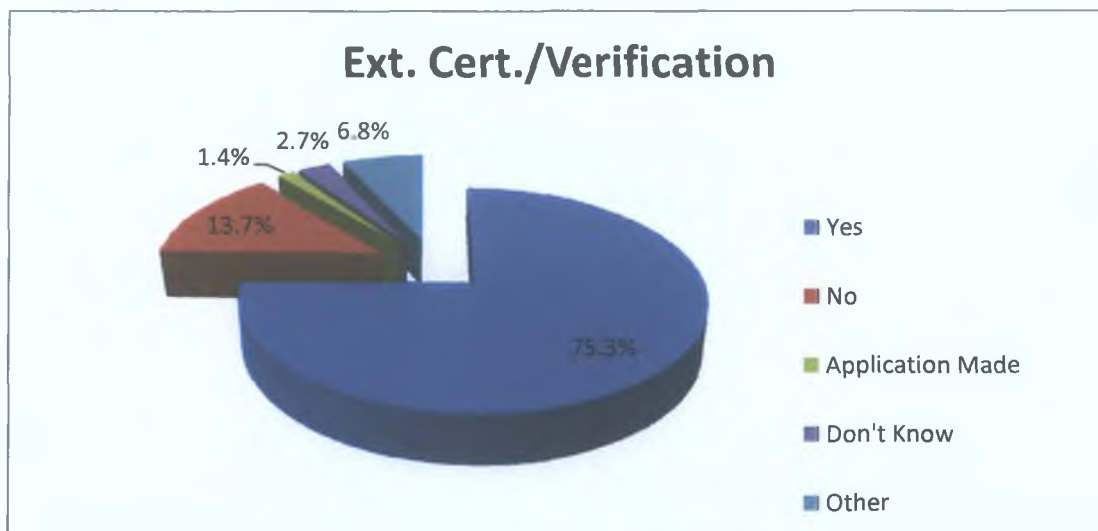


Figure 4 External Certification or Verification

Question 5 was designed to ascertain the extent of knowledge among those surveyed about accreditation as opposed to certification which was the subject of the previous question (Figure 5). The highest response percentage recorded here was for the United Kingdom Accreditation Service, UKAS, with 37.1% indicating that their certification body was accredited by that organisation. The abbreviations used i.e. INAB, UKAS, RvA and DAU presupposed that there was a level of awareness of each accreditation body in each country (Ireland, United Kingdom, Netherlands and Germany respectively). This may have been a factor in the responses received with 12.9% indicating that they did not know and 22.6% indicating the "other" options. Among the other options listed were some certification bodies, e.g. NSAI, which would indicate a lack of awareness of accreditation. Some of the respondents indicated the EPA which most likely means that these organisations are IPPC licensed and are not certified.

## Accreditation of Certifier

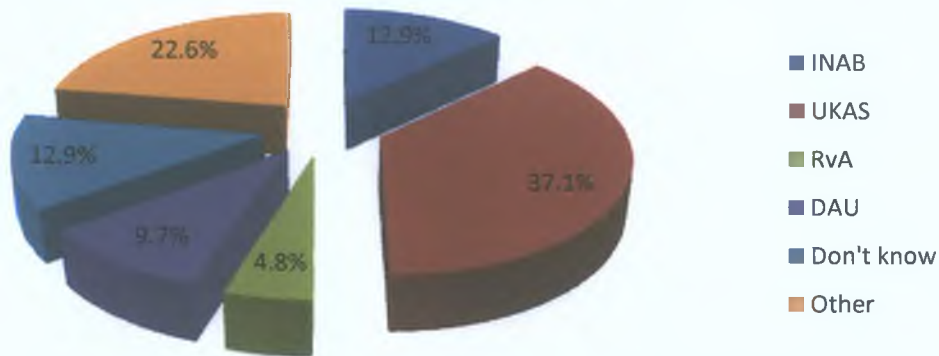


Figure 5 Accreditation of Certification Body

Question 6 enquired as to which sector best described the activities of the responding organisation. 69.9% indicated manufacturing, service 6.8%, waste 9.6%, transport 2.7% and "others" at 23.3% (Figure 6). Four of the other category indicated that they were part of local government which might reflect the fact that some of the EMAS registered sites in the UK are from this category and one in Ireland.

## Sector

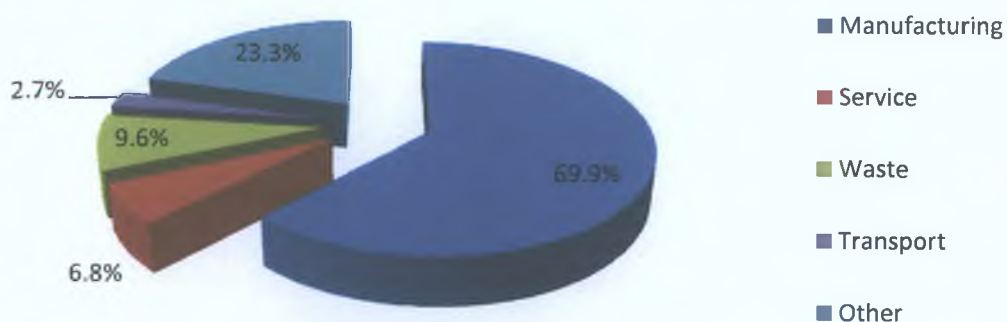


Figure 6 Breakdown of respondents by sector

Question 7 sought to find out the views of those surveyed regarding the independent certification/verification of their Environmental Management System (Figure 7). 95.7%

either agreed or strongly agreed that independent certification/verification of the EMS gives confidence that they are meeting the requirements of the relevant standard and a slightly lower but still large percentage at 88.5% either agreed or strongly agreed that it gives confidence that they were in compliance with legislation. The views expressed in the comments box for this question were interesting, with one respondent commenting that: "If audited against the standard then it gives confidence that the standard is met – but the rest does not automatically follow" and another responding that: "Legal – ISO 14001 provides little. Absolute requirement for EMAS." These views indicate that one can be in conformance with a standard but not necessarily in compliance with the relevant legislation. The other views expressed indicate that EMAS is more relevant when it comes to legislative requirements.

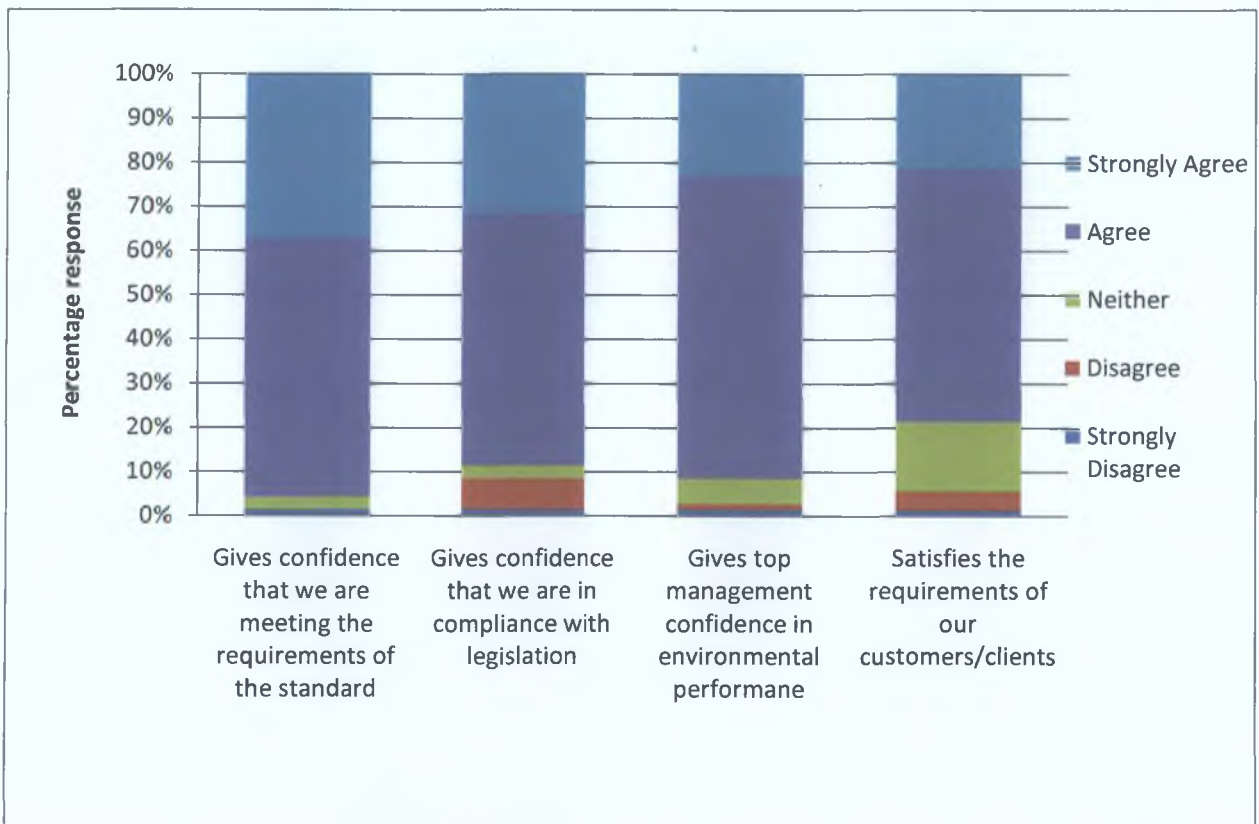


Figure 7 Effect of Certification/Verification of an EMS

A lower percentage at 78.5% agreed or strongly agreed that having the EMS externally verified/certified satisfied the requirements of their customers with 15.7% neither agreeing nor disagreeing and 5.7% disagreeing or strongly disagreeing. Views expressed here were that: "Our customers have not requested environmental performance information – more quality related" and that: "Customers are very broad – some interested, others couldn't care". The response rate and views expressed (albeit only two out of the 70 that answered the question) indicates that environmental issues are not foremost in customers minds.

The experiences of those implementing an EMS was probed in question 8 in terms of impact on performance, ease of measuring the impact, making information publically available and compliance with legislation. The number of respondents to this question has been filtered to eliminate those who answered before a problem with the programme was resolved which has resulted in 38 responses being analysed (Figure 8).

The vast majority of respondents at 97.4% either agreed or strongly agreed that implementing an EMS had a positive impact on environmental performance which indicates that, from the point of view of these organisations, implementing an EMS is a worthwhile exercise in improving the state of the environment. 84.3% either agreed or strongly agreed that the positive impact is easy to measure but 7.9% neither agreed nor disagreed and 7.9% either disagreed or strongly disagreed with this view. This suggests that measuring impacts of environmental performance may be difficult for a small but significant number of organisations.

94.7% of respondents agreed or strongly agreed that impacts are communicated to senior management which would be expected of a properly functioning EMS. ISO 14001:2004, clause 4.4.1 (b) requires organisations to have specific management representatives with responsibility in "reporting to top management on the performance of the environmental management system". Annex I of the EMAS Regulation (76/2001) also contains a similar clause (I-A.4.1 (b)).

81.5% of respondents agreed or strongly agreed that this information is publicly available in an environmental statement. Making information publicly available in relation to environmental impacts is not a requirement of ISO 14001 or an absolute requirement of



EMAS but it is encouraged in the latter as detailed in the following clause (14) of the regulation (761/2001):

“Organisations should be encouraged to produce and make publicly available periodic environmental statements providing the public and other interested parties with information on their environmental performance”.

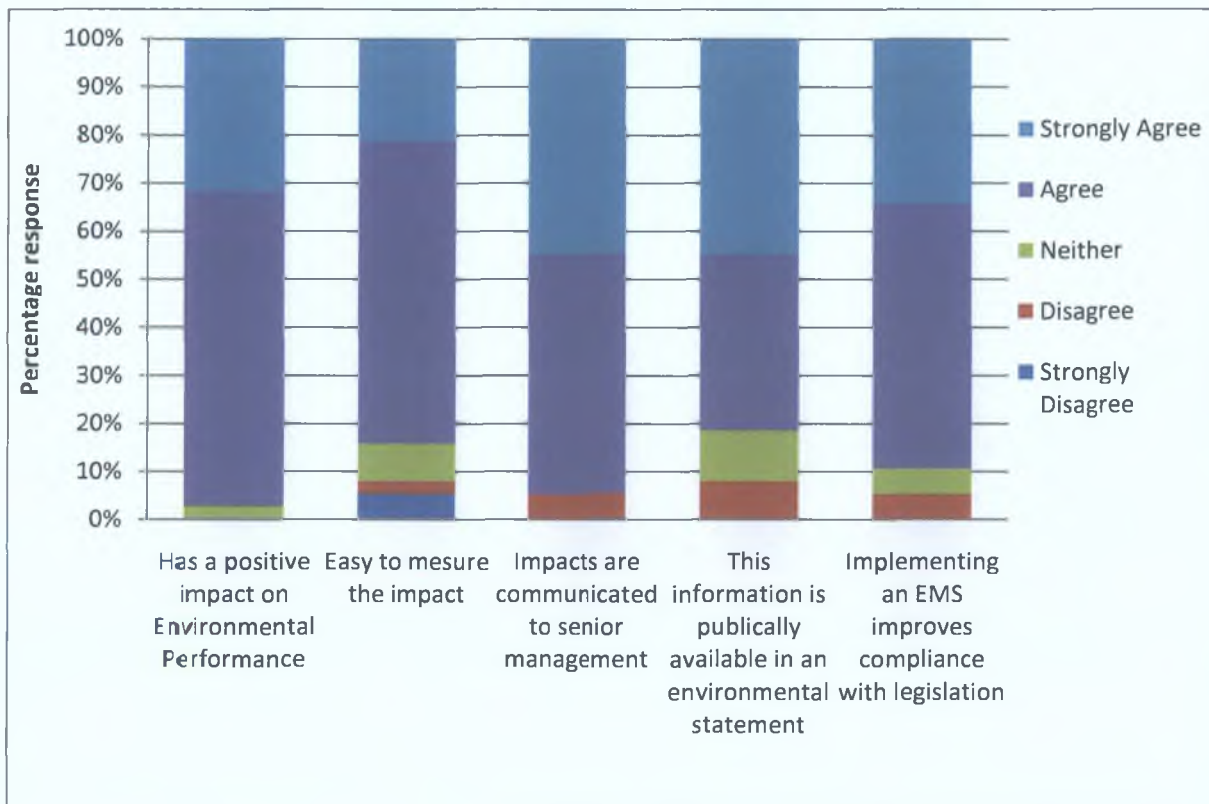


Figure 8 Implementation of an EMS

Finally, in response to the view that implementing an EMS improves compliance with legislation, 89.5% of respondents either agreed or strongly agreed. This figure is not significantly different to that obtained in response to a similar view in question 7 (At 95% confidence level,  $z = -0.178$ ).

The comments recorded against question 8 focused on the issue of making environmental information publically available.

Question 9 examined the perceived benefits of reporting and communicating environmental performance (Figure 9). Combining categories important, very important and essential, 97.3%, 97.3% and 98.7% respectively were recorded for the following perceived benefits:

1. Help achieve environmental performance criteria
2. Increase awareness and dialogue
3. Demonstrate commitment and efforts to improve environmental performance

The response rate of 91.8% was recorded for

4. Providing a mechanism to respond to concerns and questions about environmental aspects

Point 4 above achieved a slightly lower percentage which might suggest less focus on external concerns.

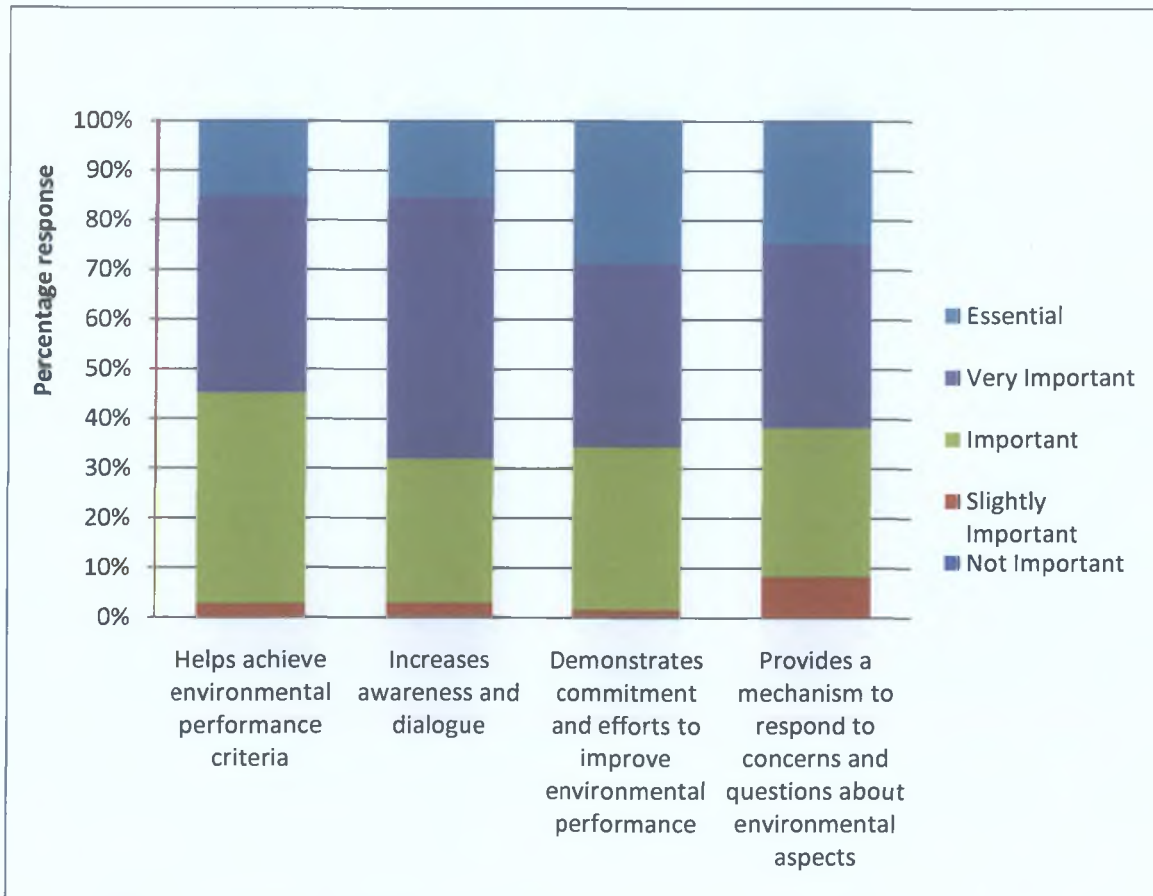


Figure 9 Perceived benefits of reporting and communicating environmental performance

In the course of the literature review for this dissertation there was some evidence to suggest that quantifying environmental impacts can be difficult and is not always consistent between organisations. Measuring these impacts can, if positive, lead to greater confidence in the use of Environmental Management Systems generally. Question 10 sought to find out the awareness levels of an international standard which is a guideline for evaluating environmental performance i.e. ISO 14031:1999 Environmental management – Environmental performance evaluation – Guidelines. The use of this standard is not a requirement of ISO 14001 or EMAS but it does provide information on evaluating impacts. 26.0% of respondents indicated they had used these guidelines, with 60.3% not having used them and 5.5% did not know and 8.2% were in the “other” category (Figure 10).

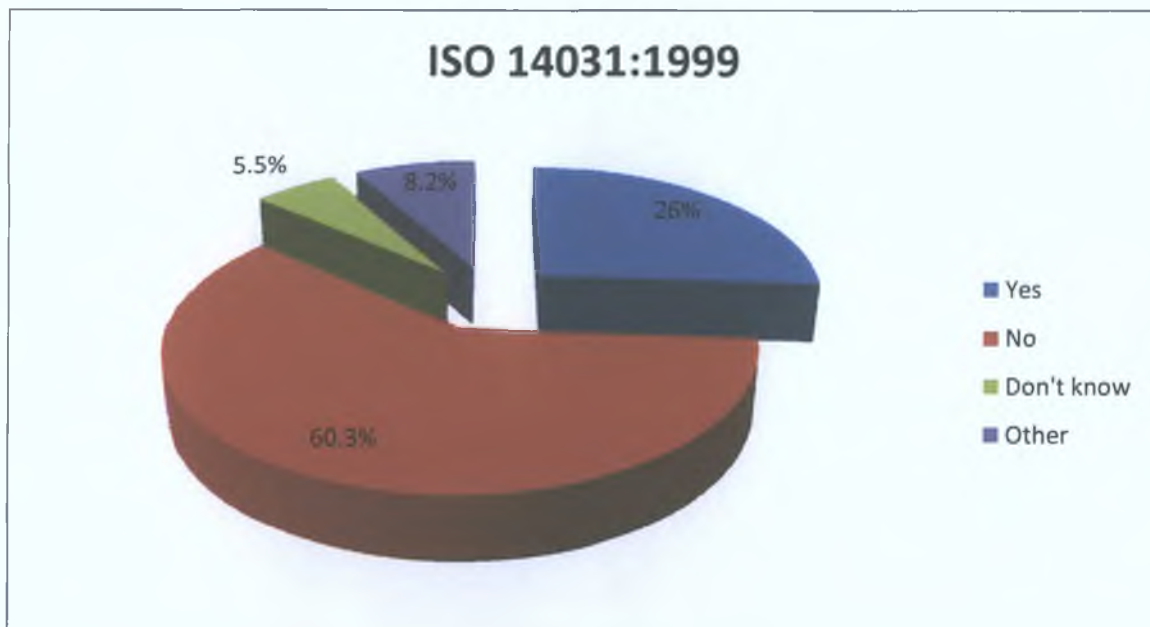


Figure 10 Use of ISO 14031:1999 Environmental management – Environmental performance evaluation - Guidelines

Question 11 sought information from those surveyed about the characteristics of the indicators they used (Figure 11). The highest score recorded here at 87.7% was for direct

measures e.g. tonnes of contaminant emitted. This is likely to be the easiest type of measurement to make. Next at 65.8% were relative measures e.g. tonne of contaminant emitted per tonne of product manufactured. This is likely to be a useful measure for internal purposes within a company by linking environmental impact to product manufactured. Indexing by comparing to a baseline recorded a level of 46.6% with aggregation (collating data from different sources into a combined value) at 23.3%, weighting (applying a factor relating to significance) at 20.5%, none of these at 0% and “others” at 4.1%. It would appear that the easiest measure to implement i.e. direct measures is used the most, whereas a more complex system of measurement such as weighting is used the least at 20.5%. This may be related to a requirement for more time and effort in using the latter measure, as some manipulation for data would be required and weighting factors would need to be applied.

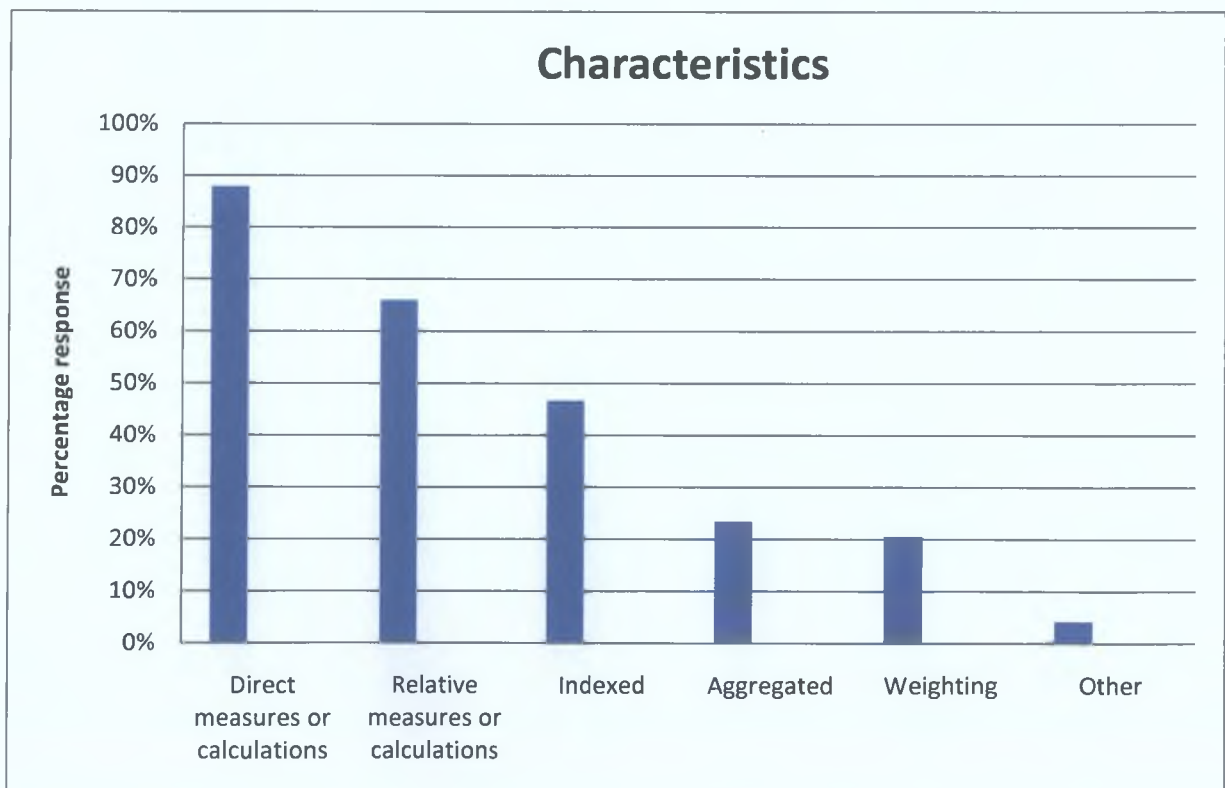


Figure 11 Indicator characteristics

Within question 12, a number of possibilities were suggested and respondents were asked to indicate to which of these did their indicators relate. This is graphically illustrated in Figure 12.

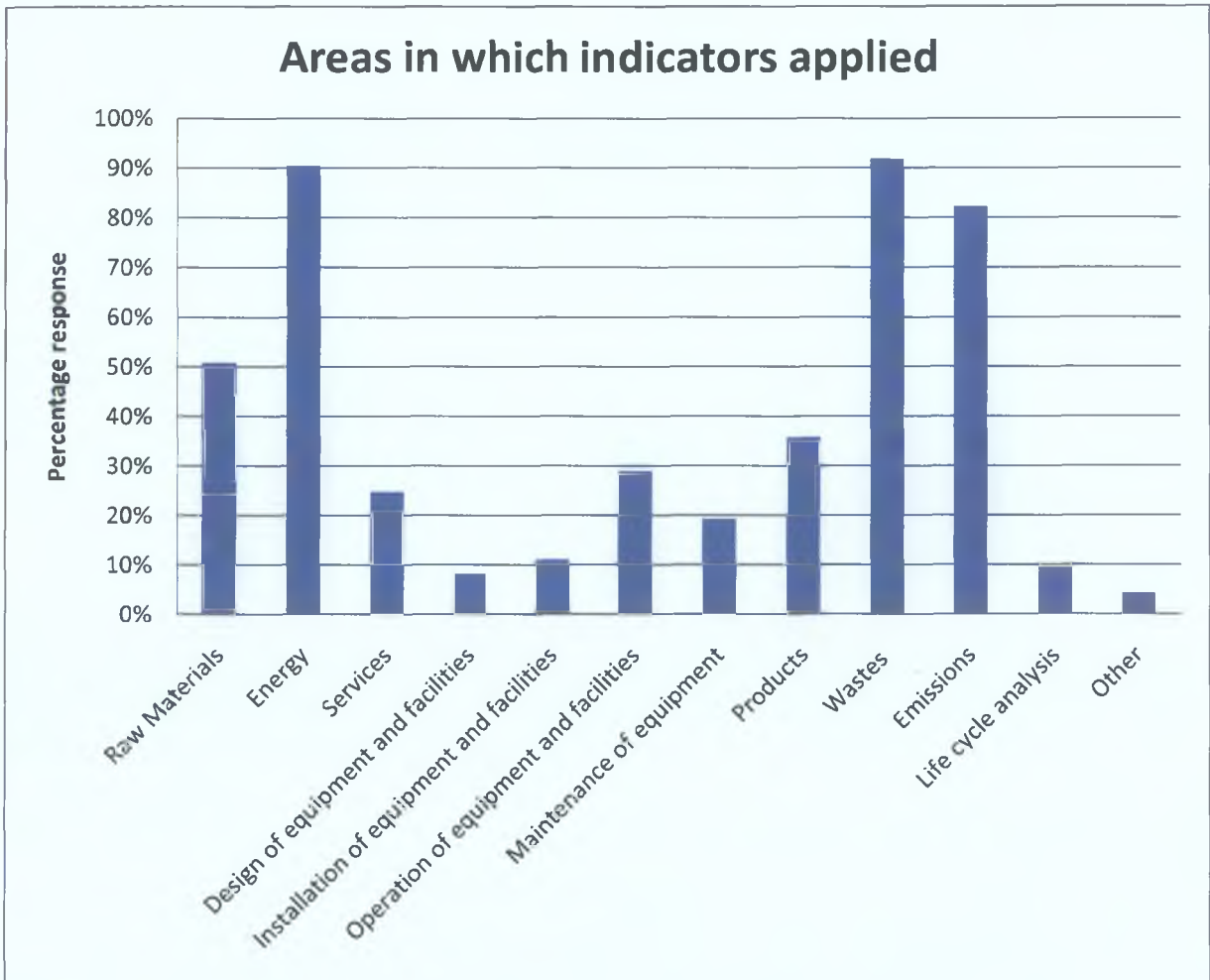


Figure 12 Application of indicators



On analysing the responses the indicators used can be ranked based on percentage response as follows:

|   |       |
|---|-------|
| 1. Wastes                                   | 91.8% |
| 2. Energy                                   | 90.4% |
| 3. Emissions                                | 82.2% |
| 4. Raw materials                            | 50.7% |
| 5. Products                                 | 35.6% |
| 6. Operation of equipment and facilities    | 28.8% |
| 7. Services                                 | 24.7% |
| 8. Maintenance of equipment                 | 19.2% |
| 9. Installation of equipment and facilities | 11.0% |
| 10. Life cycle analysis                     | 9.6%  |
| 11. Design of equipment and facilities      | 8.2%  |
| 12. Other                                   | 4.1%  |

It would appear from this response that any indicators of environmental performance would be likely to include wastes, energy and emissions as the most prominent measures.

Those surveyed were asked, in question 13, to evaluate a list of reasons that might be used for selecting indicators of environmental performance (Figure 13). Nine individual considerations (reasons) were listed and the highest percentage recorded for agreeing and strongly agreeing, against an individual consideration, was 77.9% and the lowest was 52.1%. The percentage of those disagreeing or strongly disagreeing ranged from 1.4% to 11.6% , for all the considerations listed, and the range for the neither agreeing or disagreeing category was from 19.7% to 40.6% with an average of 31.0%. The highest percentage 77.9% was recorded for "being representative of environmental performance" but it might have been expected that this figure would have been higher as this could be identified as an indispensable component of an indicator of environmental performance.

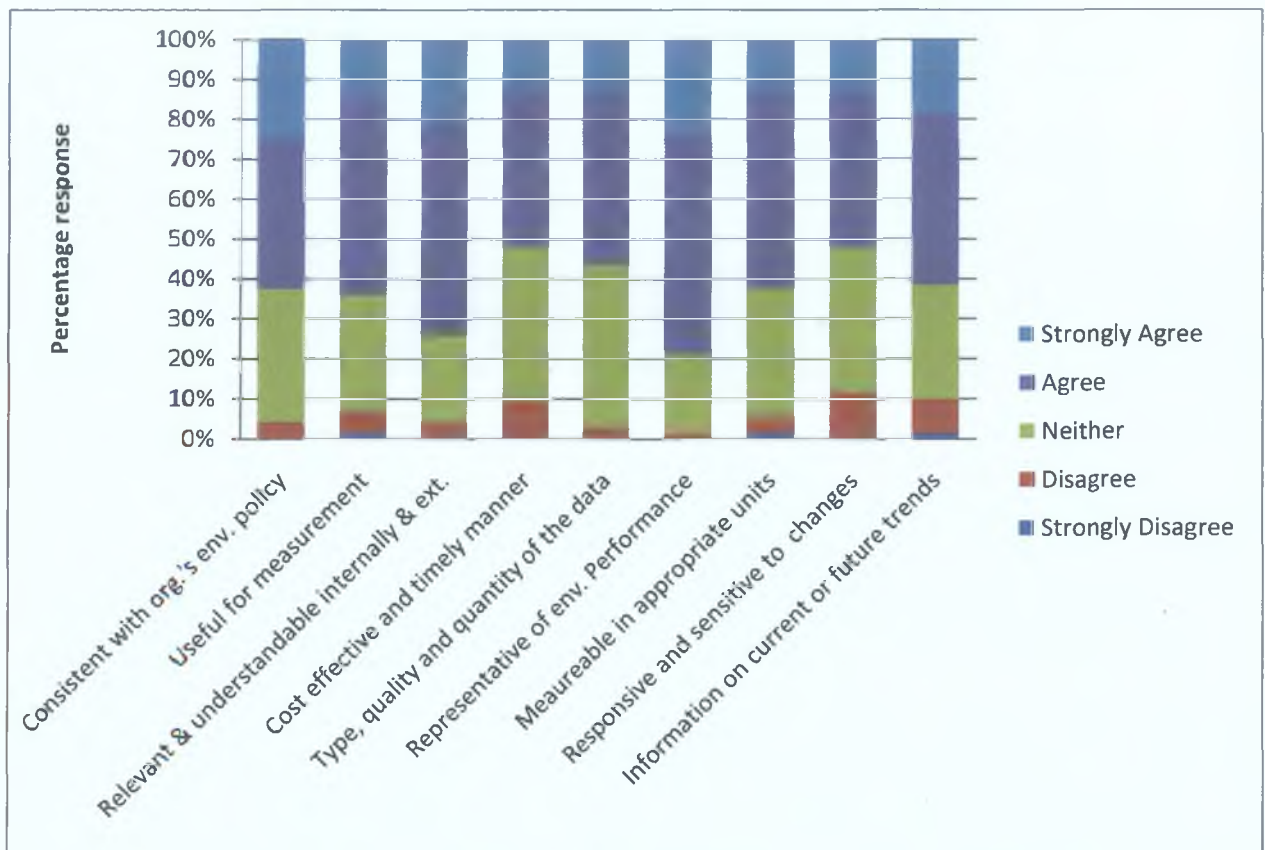


Figure 13 Considerations for selecting indicators

The number of respondents that replied neither in this category is higher than might have been expected within the range 19.7% to 40.6% which might suggest that the respondents have other considerations that were not on this list or had difficulty with the question.

Question 14 probed the perceived attitude of external auditors to the issue of environmental indicators (Figure 14). Opinions were not as polarised in this area as with some other questions with relatively high percentages neither agreeing nor disagreeing with the statements. 46.2% either disagree or strongly disagreed that auditors spent too much time on this area and 25.4 % agreed or strongly agreed that auditors did not spend enough time on this area. 70.7% agreed or strongly agreed that external auditors consider this area important and 55.4% agreed or strongly agreed that external auditors make findings in this area.

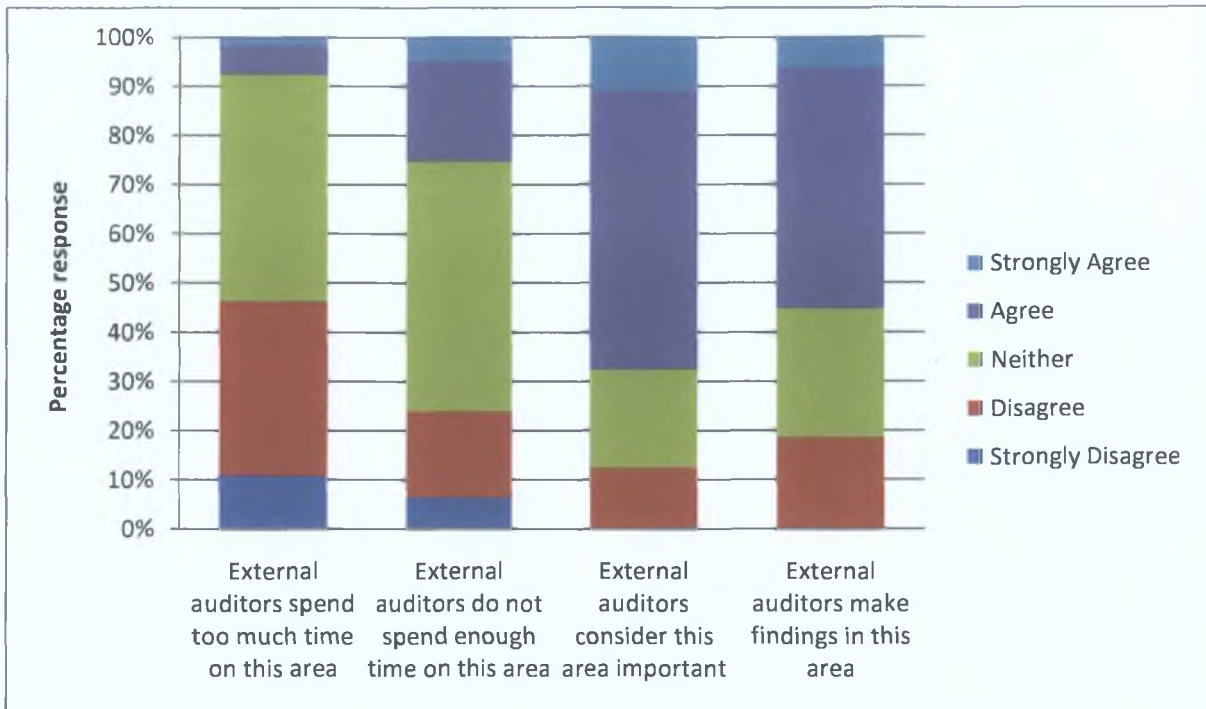


Figure 14 Environmental indicators and external auditors

Question 15 presented specific examples of indicators and asked if organisations used any of those listed. The highest percentages were recorded for waste, emissions and energy which mirrored the responses to question 12. The choices for this question included options that linked indicators with units of production and this was used to examine this particular aspect to help understand if this type of linkage was common place (Figure 15).

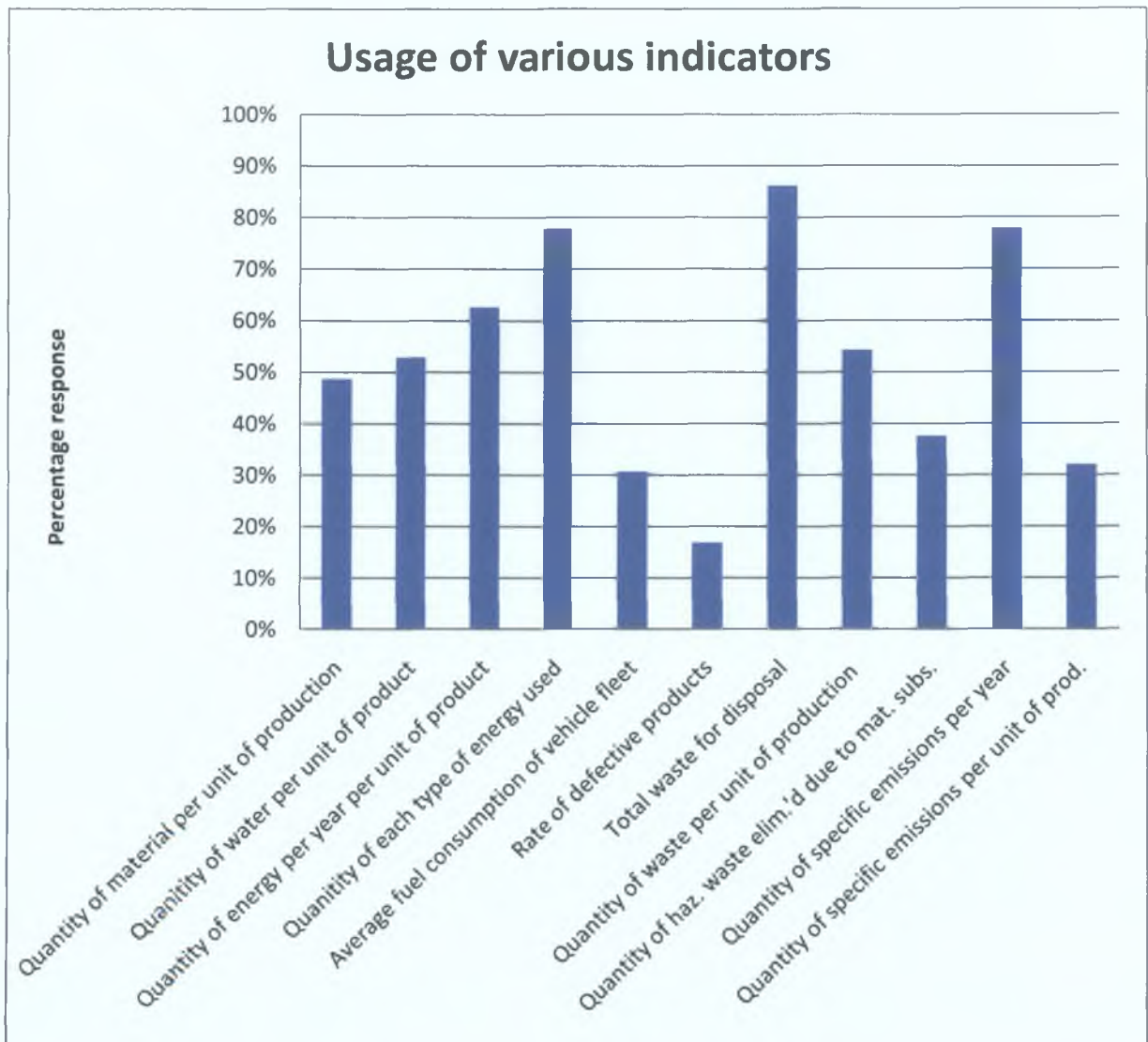


Figure 15 Usage of various indicators

The following table gives a summary of comparisons of energy, waste and emissions on their own and when linked to production or product:

Table 1 – Linking indicators for energy, waste and emissions with production

| Indicators of Environmental Performance            | Response | Difference between use of indicator on its own and when linked with production |
|--|----------|--|
| Quantity of each type of energy used               | 77.8%    |  |
| Quantity of energy per year per unit of product    | 62.5%    | Energy: -15.3%   |
| Total waste for disposal                           | 86.1%    |  |
| Quantity of waster per unit of production          | 54.2%    | Waste: -31.9%  |
| Quantity of specific emissions per year            | 77.8%    |  |
| Quantity of specific emissions per unit of product | 31.9%    | Emissions: -45.9%  |

Linking indicators to units of production is more relevant in a manufacturing area. When a filter is applied to the survey results to confine the answers to those from a manufacturing background a total of 51 responses remain. The responses for this question in relation to energy waste and emissions are as follows:



Table 2 · Linking indicators for energy, waste and emissions with production (excluding non-manufacturing organisations)

| Indicators of Environmental Performance            | Response | Difference between use of indicator on its own and when linked with production |
|--|----------|--|
| Quantity of each type of energy used               | 80.4%    | Energy: -5.9%  |
| Quantity of energy per year per unit of product    | 74.5%    |  |
| Total waste for disposal                           | 90.2%    | Waste: -31.4%  |
| Quantity of waster per unit of production          | 58.8%    |  |
| Quantity of specific emissions per year            | 80.4%    | Emissions: -43.1%  |
| Quantity of specific emissions per unit of product | 37.3%    |  |

It would appear from this analysis that there is scope for organisations to link their indicators more closely with production but this is more likely to be of use internally and may have implications in term of the efficiency of processes.. The difference between the usage of indicators for quantity of energy and quantity of energy per unit of product is closest at 5.9% and this may indicate that this indicator is relatively easy to measure and also easy to link with units of product. The differences for waste and emissions were much larger at 31.4% and 43.1% respectively, indicating perhaps that these have more diffuse sources and are also more difficult to link to the output of production. In addition to making those outside the organisation aware of environmental performance, it may be possible to use linkages between environmental performance and production as a means of “selling” the effectiveness of an EMS to top management.

Question 16 focused on external environmental condition indicators to examine if organisations looked beyond their own walls (Figure 16).



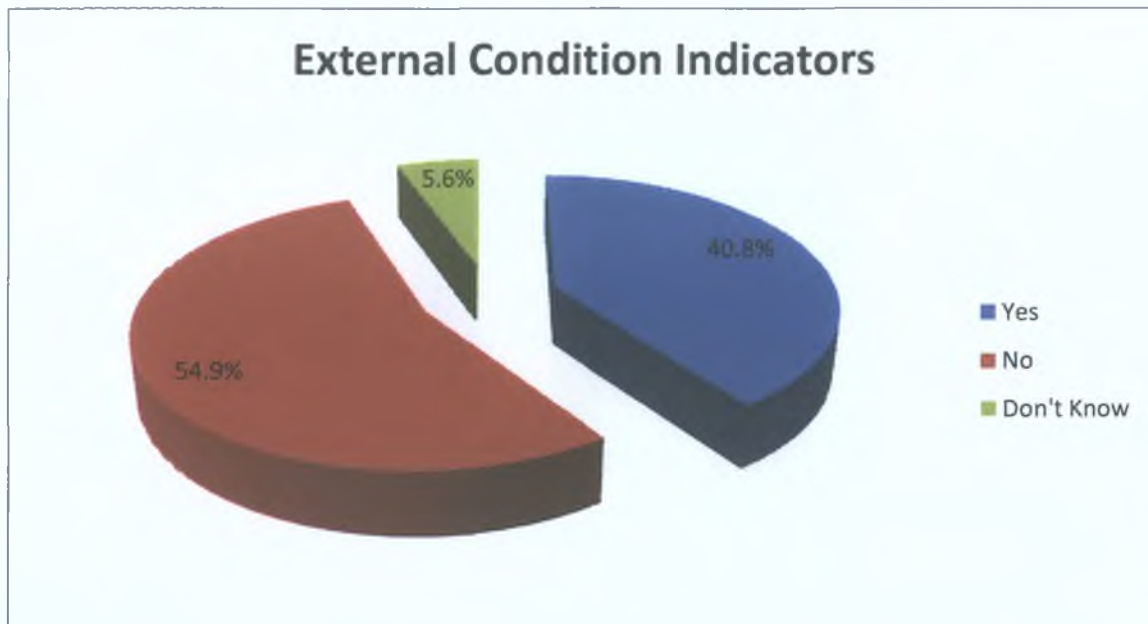


Figure 16 Use of external condition indicators

Responses were divided in response to this question with the majority not using this type of indicator at 54.9% compared to 40.8% who do and 5.6% in the don't know category.

Utilising external environmental indicators may sometimes be imposed on organisations as part of license conditions and perhaps those not required to do so confine themselves to their site boundaries. External condition indicators may provide valuable information of the actual impact of activities on the environment.

Question 17 presented an opportunity for further feedback on the survey and environmental indicators (Appendix 1, Table 15). One respondent commented that:

“Most of our impacts are indirect and therefore we do not have the same performance data as say manufacturing industries. Improvements in environmental impacts is very difficult for us to measure as we mainly enforce environmental legislation on others”

This person is likely to represent a local authority and highlights the difficulty of measuring indirect impacts.

Another respondent highlighted the complexity of their indicators:

“Our indicators can be complex to measure as we have many functions (authority for guidance, regulations and also provision of waste management facilities landfill sites, waste transfer station and bring sites) multi site EMS and dependent on external factors.”

One respondent emphasised the importance of other aspects that are relevant to the effective working of environmental management systems:

“Environmental indicators are very important in an EMS to allow the company to set objectives and make year on year improvements. They are however, only part of the EMS and there is a lot more to consider and involve. It is important for a company to first define what their most significant environmental impacts are (across every area of the company). The indicators they measure and the targets they set should be around these most significant impacts, that way the company can make the biggest improvement. Top management commitment is essential to make an effective EMS. It is clear to an external auditor if this is just being run by one person keeping up the paper work”

Finally, a negative view of environmental management systems was presented by a respondent who emphasised the importance of licence conditions:

“Environmental management systems are simply an aid. The IPPC licence requirements are the real driver behind performance. There is too much paperwork attached to EMS. If I were assessing a company’s performance I would be checking against the IPPC licence conditions. ISO14001 would be not be considered important”

### 3.3.4 Summary

The research conducted for this section of the dissertation and its analysis has been useful in gaining an overall impression of environmental management systems as experienced by organisations which operate them. It has also been useful in attempting to gain some information about attitudes and experiences of using environmental performance indicators as it has been identified during the literature review that there are differing views as to usefulness of EMSs and their real benefit in environmental terms.

It has not been possible to apply statistical analysis in any depth to the results obtained due to the multi-variant nature of the questions and the fact that the same sample was responding to all the questions, thus negating their independence in statistical terms.

Therefore it has not been possible to test the significance of responses received beyond a subjective appraisal of percentages recorded for the various options posed. The comments field that was included for the majority of questions proved to be a source of useful information that provided a background to some of the responses received.

From an analysis of the responses to the first six questions, it is possible to say that those who responded to the survey were:

- mainly located in Ireland and the UK
- operated an EMS
- which was either ISO 14001 or EMAS or both
- had external certification
- from an external accredited certification body
- and the majority of which were involved in manufacturing.

The majority were positive in their opinions that external certification gives:

- Confidence in meeting standard requirements and complying with legislation and to top management and satisfies the requirements of their customers.

The majority of respondents were positive in their opinions that implementing an EMS had:

- a positive impact that was easy to measure and was communicated to senior management
- and that the information was publicly available in a statement and implementing an EMS improved compliance with legislation.

Most agreed that there were benefits in reporting and communicating environmental performance in terms of:

- Achieving environmental performance criteria, increasing awareness, demonstrating commitment and providing a mechanism to respond to concerns and questions.

These first series of questions as illustrated above demonstrate that those operating an EMS have a largely positive view of EMSs and can see real benefits in environmental performance from implementing one. It needs to be considered that those responding to this survey were often likely to be environmental professionals, so it could be assumed that they would have a naturally positive inclination in matters relating to the environment and indeed their employment status may depend on the maintenance of an EMS.

Following the first nine questions which sought to establish general attitudes to environmental management systems, the next seven questions focused on the environmental performance evaluation in the form of indicators used. This had been identified in the literature review as a deficiency in EMSs, as organisations struggled to both identify and quantify benefits of implementation and also struggling to communicate this information internally, to regulators and to the public as was seen in some negative perceptions that have arisen concerning EMSs.

There is a dedicated standard that provides guidelines to organisations i.e. ISO 14031:1999 Environmental management – Environmental performance evaluation – Guidelines. During the course of the literature review for this dissertation, reference was made to this guideline (Henri & Journeault, 2008) and one of the questions included in the survey was one to establish the level of knowledge about this standard. A little over a quarter of those who responded had used the guidelines, which was a smaller proportion than might have been expected.

The characteristics of the indicators used, the areas in which they are applied and the considerations for using them can be summarised for the majority as:

- direct measures or calculations that are applied to energy, wastes and emissions and are relevant and understandable internally and externally and are representative of environmental performance

Regarding external auditors, the majority agree that they consider the area of indicators important but opinion is almost evenly split on whether or not they make findings in this area.

Those using indicators linked to energy, waste and emissions were more likely to report the figures in isolation rather than link the figures to units of production and the majority do not use external condition indicators.

From this series of seven questions, the profile of the most common indicators used that emerges is:

- ***A direct measure relating to energy, wastes or emissions reported in isolation from production and confined to internal conditions. The indicator is relevant, understandable internally and is representative of environmental performance.***

## **3.4 Review of environmental statements of companies that are EMAS registered**

### **3.4.1 Introduction**

European Regulation 761/2001 encourages, in clause 14, the production of a publicly available environmental statement which would provide the public and other interested parties with information on their environmental performance.

Not all EMAS register sites make their environmental statements publicly available on their company website but it is possible that they are made available on request.

In this section of the dissertation, three environmental statements of EMAS sites were examined to establish their content and also what they used as indicators.

### **3.4.2 Methodology**

Three sites were selected using an internet search engine and these were:

1. AHP Manufacturing B.V. T/A Wyeth Medica, Newbridge, Ireland
2. TT2 Ltd (Tyne Tunnel), Wallsend, Tyne & Wear, UK
3. Newcastle City Council, Newcastle, UK

The statements were downloaded and the content analysed.



### 3.4.3 Results

#### **AHP Manufacturing B.V. T/A Wyeth Medica**

One of the EMAS sites in Ireland makes its environmental statement available on its website and this organisation is AHP Manufacturing B.V. T/A Wyeth Medica. The site's registration number as an EMAS site is IE-011 and the most recent available environmental statement is that from 2007. This has been verified by the verification body which in this case was SGS United Kingdom Ltd.

This statement follows the format:

1. Introduction
2. Management of the activity
3. Environmental monitoring data
4. Concluding remarks

The introduction contains an overview, site details and an update on site activities. In the overview section, the organisation states that the Environmental Statement includes all aspects of the site's environmental performance for the given period (January – December 2006) and that the performance is reported in terms of progress on delivery of environmental objects and targets and compliance of emissions from the facility with the site Integrated Pollution Prevention Control (IPPC) licence.

This Environmental Statement appears to be largely aimed at addressing the requirements of its IPPC licence. The principal environmental aspects were identified as:

- Emissions to sewer (waste water)
- Storm water emissions(surface water)
- Groundwater
- Emissions to atmosphere (air)
- Noise emissions
- Waste Management (hazardous and non-hazardous waste)
- Resource Use & Energy Efficiency (energy and water consumption)

Data for emissions to the sewer was presented in tabular form and accompanied by a narrative to explain the figures. The data given in the table covered both the reporting period of 2006 and also gave data for the preceding four years which allowed for trend analysis. Values that exceeded limit values were summarised in a table that contained the cause and the corrective action taken. Similar data was produced for the other aspects identified above.

Environmental performance indicators (EPIs) have been identified by Wyeth as a means of further enabling Wyeth Newbridge to determine objectively environmental impacts and what is having a positive or negative influence in this regard. For this purpose, Wyeth engaged environmental consultants. Phase I involved the identification of environmental and social indicators and phase II involved selecting indicators that are compatible with existing data as being relevant to business and operational objectives. The company has reported that it is experiencing difficulty in selecting key EPIs that are representative of activities at its site in Newbridge. Operational efficiencies have been maximised so the means of implementing future improved environmental performance is limited so the EPIs may fulfil a role in tracking performance rather than using it to aim for improvement.

## TT2 Ltd (Tyne Tunnel)

TT2 Ltd is a registered EMAS site (UK-000132).

The environmental statement is an interim statement and covers the period 2007-2008. An update is provided on environmental aspects as follows:

- Waste
- Purchasing
- Electricity and Water
- Transport
- Natural Environment and Biodiversity
- Education and Awareness
- Vehicle Tunnel Air Quality Update
- Complaints/compliments

The performance indicator used for waste is kg of waste recycled and is compared with previous year's figures. The statement contains the comment that "we do not have a specific objective for waste". Regarding purchasing, the objective was that the company would carry out second party audits of their key suppliers and one was carried out within the period covered by the statement. Electricity and water consumption figures showed a decrease for electricity and increases for water which was explained as being due to increased staff levels. The performance indicator used for transport was fleet mileage and personnel mileage claims both of which decreased. For natural environment and biodiversity, no indicators are given and the graph has been removed as "no additional trees or shrubs have been planted". The performance indicator used for education and awareness was stakeholder visits to the site which had decreased due to business and operational requirements and the availability of staff. Air quality was examined with performance indicators for opacity, NO<sub>2</sub>, CO and NO. These were presented in the form of graphs and included a level indicated as X parameter allowed and expressed as parts per million. In the accompanying text, reference is made to a legal limit and it must be assumed

that these are the same levels. Complaints and compliments were also illustrated graphically and a comparison with previous years provided.

## Newcastle City Council

Newcastle City Council (Neighbourhood Services) is a registered EMAS site (UK000120).

The statement is a 38 page document and has been verified by an independent verification body. A number of different performance indicators are illustrated by using histograms.

The following aspects were highlighted and each had an associated performance indicator, the majority of which had the data presented in a histogram:

- Office waste
- Energy and water
- Transport
- Natural environment and biodiversity
- Purchasing
- Parks, countryside and training
- Civic services
- Ancillary services
- City Build
- Highways and traffic signals
- Grounds maintenance
- Cleansing services
- Bereavement services
- Environmental stores
- City transport
- City engineering services
- City design
- Newcastle leisure
- Area based facility services

The statement also contained information on whether or not the environmental objectives had been met in the previous year and a success rate of 57% had been recorded.

The number of performance indicators used by Newcastle City is large in comparison to the other two environmental statements reviewed. It may be too broad as it tends to dilute the impact of the performance indicators when they are spread over such a disparate group.

The aspects and hence the indicators are provided per section of Neighbourhood Services rather than by environmental compartment e.g. emissions to air, water, waste, energy usage. This approach allows for each sector of the organisation to be analysed discreetly but it may be more difficult to discern the actual trend for each parameter in total. For instance waste/recycling is dealt with under several headings i.e.: office waste; parks, countryside and training; civic services; city build; highways and traffic signals; grounds maintenance; cleansing services; environmental stores and city transport. It is not immediately apparent as to the overall trend regarding waste and recycling for Newcastle City Council. Fewer objectives/indicators in this case might lead to a clearer assessment of environmental performance.

#### **3.4.4 Summary**

The three environmental statements examined for this section of the dissertation were of variable quality and content. It appears that all three use the statement, in part, for promotional purposes and so it is not solely intended as a report on environmental performance for the period in question and may form part of the public relations effort of these organisations. (This is indicated as a possible benefit of EMAS participation in clause 9 of regulation 761/2001 when it mentions gaining added value in terms of public image).

The size and content of each statement may also be a reflection of each organisation's size, financial strength and the importance it attaches to external communication. Henri and Journeault (2008) have suggested that large firms may devote more attention to the measurement of indicators to help manage environmental issues and that as well as monitoring, decision-making and external reporting, one of the uses of indicators by



organisation is for attention-focusing and signalling. Therefore, the publication of an environmental statement may have other designs outside of reporting to the public and other interested parties.

One of the organisations is a manufacturing site (Wyeth Medica), one is involved in the service industry (TT2 Ltd) and one is a local authority (Newcastle City Council). The data included by Wyeth Medica in their statement was the most comprehensive and included data in tabular format in addition to graphs as opposed to TT2 Ltd. and Newcastle City Council who presented their data in the format of graphs.

Wyeth Medica and TT2 Ltd include seven and nine environmental aspects respectively and then included corresponding indicators which illustrated what had happened with respect to the aspects during the reporting period. Newcastle included 19 environmental aspects and corresponding indicators and as mentioned already, some of the indicators covered the same parameter albeit for different environmental aspects. It would seem to diminish the effectiveness of the environmental statement somewhat when so many environmental aspects are included and especially in this case when the same indicator (waste/recycling) was used for 10 of the aspects. It might be more beneficial to confine the statement to the most prominent indicators with fewer aspects as there seems to be no weighting attached to the significance of each environmental aspect identified in the Newcastle City Council statement. The EMAS regulation (Annex III, Clause 3.2 (c)) requires that the environmental statement shall include a description of all the significant direct and indirect environmental aspects but the inclusion of 19 environmental aspects in the Newcastle City Council statement may indicate that the organisation has not fully appraised its significance in each case.

The Wyeth Medica statement included what appeared to be entries in a children's art competition and a photograph of a sponsored garden project at a local school. This would indicate that the environmental statement, as well as fulfilling requirements to report environmental performance, was also aimed at the local community as part of a public relations initiative.

The TT2 Ltd environmental statement was the smallest in terms of content but this may be indicative of the size of the organisation and its operations.

All three statements contained the three most often used indicators that were identified from the research conducted via a survey for this dissertation i.e. energy, wastes and emissions. Energy is often coupled with resource usage (including water) and this category would seem to be an important consideration for organisations when reporting their environmental performance. These categories are identified in clause 3.2 (e) of the EMAS regulation 761/2001 as areas that may be included in the summary of the data available on the performance of the organisation against its environmental objectives and targets:

“The summary may include figures on pollutant emissions, waste generation, consumption of raw material, energy and water, noise....”

All three environmental statements were verified by the same organisation (SGS United Kingdom Ltd) which should help ensure consistency from the verification body reviewing the statement. One of the functions of environmental verifiers is to check the reliability, credibility and correctness of the data and information in the environmental statement (Regulation 761/2001, Annex V, Clause 5.4.1 (b))

In conclusion, the three environmental statements reviewed all followed the format as identified in the EMAS regulation but were of varying length and quality which could be related to the size and resources of each organisation. They all contain the most prominent aspects as identified in the regulation and have indicators to illustrate how these are being achieved. One of the statements (Wyeth Medica) contained more information in tabular format whereas the others used graphical illustrations in the main.

## 4 Conclusions

The objectives of this dissertation were to conduct a literature review to examine attitudes to environmental management systems and broadly answer the question do they improve environmental performance. This was achieved by examining them in practice by interview, survey and review and the information gathered was evaluated to establish how they could be improved in terms of indicators and how these are communicated.

The literature review revealed divergent opinion regarding environmental management systems. A number of surveys have been conducted that have examined attitudes to, and the effectiveness of, environmental management systems. In some cases these surveys have presented evidence to support the effectiveness of environmental management systems and in other cases, they have highlighted problems and difficulties. It was apparent that the reaction of the respondents often depended on the population that they represent e.g. regulators, certifiers and users of EMSs recording different responses in surveys.

The evidence from literature reviewed, emanating from sources such as journal articles, was balanced and presented what might be termed a fair assessment of environmental management systems. The ENDS reports that were used proved a useful source of information for surveys conducted but also gave voice to those who had negative comments to make about EMSs. Some of what might be considered damning evidence often related to compliance issues with examples of how those operating an EMS successfully in terms of verification or certification might not be in compliance with legislation.

These incidences could be isolated and no evidence emerged of a substantial or widespread problem of this nature amongst those operating an EMS. It is the nature of such opinion or comment that it will attract a disproportionate level of attention than the harder to sell 'good news stories'.

The interview with an environmental manager pointed out the merits of a system based approach versus a suggested project based approach. One of the key findings from this interview was the value attached to figures that were independently audited and verified which indicated the merits of being part of the Integrated Pollution Prevention Control

licensing system and also the EMAS scheme. In this interview, it became apparent that EMAS was considered to have advantages over ISO 14001 and the most important of these was that figures were verified by a third party which gave confidence to the organisation itself and by extension to the wider public.

On the other hand, the measurement of the outcome from participation in EMAS is through verification whereas an ISO 14001 audit may produce a slightly different approach on the part of the verifier and the auditor. An EMAS verifier's primary focus is in verifying the environmental statement of the organisation whereas the ISO 14001 auditor will not be focused on an environmental statement allowing more time to examine internal auditing etc., for instance. In many cases, EMAS verifiers may also be ISO 14001 auditors so the approach taken to each EMS will most likely be very similar.

The survey was the primary tool utilised in the project to gather information about environmental management systems from the point of view of those organisations that operated such systems. The survey was targeted at those operating systems so this must be entered as a caveat in any consideration of the survey results. The picture of EMSs that emerged from this process was that they were a positive way of addressing environmental issues within organisations and 97% of respondents agreed that an EMS had a positive impact on environmental performance.

A sizeable proportion had their systems externally certified and a sizeable proportion of the certified bodies were accredited, though there was less certainty about the role of accreditation among respondents. The percentage of respondents who had an opinion that external certification gives confidence that they were meeting the requirements of the relevant standard was very high at 96%.

In addition to gathering information on attitudes to and perceptions of EMSs the survey also examined the area of measuring environmental impacts. Use of a specific guideline (ISO 14031:1999) was low at 26%, indicating perhaps that less thought and structure is devoted to this aspect of EMSs.

A synthesis of the responses to questions regarding impacts gave the following statement of what an environmental indicator was likely to be:

***A direct measure relating to energy, wastes or emissions reported in isolation from production and confined to internal conditions. The indicator is relevant, understandable internally and is representative of environmental performance.***

This survey has shown that this statement describes the most commonly used indicators by organisations. The EMAS regulation is currently under revision (Voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) \*\*\*I [Online] (Updated 6 April 2009)) and in addition to attempting to make EMAS more accessible to all organisations with a particular emphasis on smaller organisations (“..notably small organisations should be encouraged to participate in EMAS”) the new regulation has placed greater emphasis on the use of and a methodology for environmental indicators. The regulation states that organisations should be encouraged to participate and will see benefits provided that “they are able to demonstrate an improvement of their environmental performance”. It is clear from the regulation that the use of environmental indicators will be the primary means of demonstrating this improvement.

This new regulation is a provisional edition which has been adopted at the sitting of the European Parliament on the 2 April 2009. The next step is that the regulation proceeds to the Commission and the Council of Ministers.

Section C of Annex IV of the new EMAS regulation as adopted on the 2 April 2009 deals with core indicators and other relevant existing environmental performance indicators and the cores indicators are listed as:

- Energy
- Material Efficiency
- Water
- Waste
- Biodiversity and
- Emissions



This regulation also gives information on what each core indicator is composed of:

- A - a total figure indicating total annual impact in the given field
- B – the overall annual output of the organisation
- R – a ratio of A/B

The three indicators that have emerged as the most likely to be used from the survey conducted for this dissertation are related to energy, waste and emissions and these are joined by material efficiency, water and biodiversity in the core impacts highlighted in the new EMAS regulation. The indicators are not linked to units of production in the new regulation and it might be considered commercially sensitive to include that level of data in an environmental statement. This type of linkage with production may be more appropriate for internal reporting and may be of interest to top management in controlling environmental impacts in a cost effective manner.

This EMAS regulation is going further than before in specifying the core impacts and how these should be reported when compared with the current EMAS regulation or ISO 14001:2004 which mentions “key characteristics of its operations that can have a significant environmental impact”.

This should help to ensure the inclusion of a minimum number of measures to indicate environmental performance in environmental statements and there is scope for them to become the template for use in all environmental management systems.

The review of a small sample of environmental statements issued by EMAS registered sites showed them to be of variable composition and quality. It was apparent in the course of the research for this dissertation that environmental statements issued by EMAS registered organisations are not always readily available and indeed the current regulation (761/2001) states that “organisations should be encouraged” to make them publicly available even though this is given more emphasis in the annex where the more prescriptive “shall” is used.

Again, in the revised EMAS regulation, the clause relating to this aspect (17) states that organisations “should produce and make publicly available” environmental statements. The word “encouraged” has been removed so the case for making the environmental statement available is stronger but is still not a definitive requirement. It is regrettable that making the

environmental statement publicly available is not a mandatory requirement of the revised EMAS but it would appear that a compromise has been arrived at on this point. In the annex to the revised regulation, it states that organisations “shall be able to demonstrate to the environmental verifier that anybody interested in the organisation’s environmental performance can easily and freely be given access to the information...” Conformity with this requirement should ensure the data is made available to interested parties.

## 5 Recommendations

Environmental statements are in widespread use throughout the world and have gained the respect of users, regulators and the public as a means of managing environmental performance.

Their effectiveness and value could be enhanced by improving the indicators used for measuring environmental performance and in turn, making a statement of environmental performance publicly available.

Consideration of the following points could go some way to achieving this aim:

- Organisations operating an EMS to use the core indicators as specified in the revised EMAS regulation
- Encouragement of the inclusion of these indicators in any revision of ISO 14001
- Encouragement of the inclusion of a mandatory requirement to make environmental statements publicly available in future revisions of EMAS
- Engagement with national standards organisation to argue for the inclusion of a stronger requirement for environmental reporting in ISO 14001

## 6 References

Arimura, T.H.; Hibiki, A.; H., Katayama. (2008). Is a voluntary approach an effective environmental policy instrument? A case for environmental management systems. *Journal of Environmental Economics and Management* 55 , 281-295.

Clapp, J. (2001). "ISO Environmental Standards: Industry's Gift to a Polluted Globe or the Developed World's Competition-Killing Strategy?", in Olav Schram Stokke and Oystein B. Thommessen (eds.), *Yearbook of International Co-operation on Environment and Development 2001/02*. London: Earthscan Publication.

Clark, D. (1999). What drives companies to seek ISO 14000 certification? *Pollution Engineering International Summer* , 14-15.

Council Directive(EC) No 761/2001 of the European parliament and of the council of 19 March 2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS)

DEFRA. (April 2008). *Defra position statement on Environmental Management Systems*. Department of Environment Food and Rural Affairs.

ENDS. (September 2000). *ENDS Report 308*. Haymarket Business Media. London.

ENDS. (March 2003). *ENDS Report 338*. Haymarket Business Media. London.

ENDS. (May 2003). *ENDS Report 340*. Haymarket Business Media. London.

ENDS. (November 2006). *ENDS Report 382*. Haymarket Business Media. London.

ENDS. (June 2007). *ENDS Report 389*. Haymarket Business Media. London.

ENDS. (August 2007). *ENDS Report 391*. Haymarket Business Media. London.

ENDS. (December 2007). *ENDS Report 395*. Haymarket Business Media. London.

Henri, J.-F., & Journeault, M. (2008). Environmental performance indicators: An empirical study of Canadian manufacturing firms. *Journal of Environmental Management* , 87 Pages 165-176.

ISO (1999). ISO 14031 – Environmental Management – Environmental Performance Evaluation – Guidelines. Geneva.

ISO (2004). ISO 14001 - Environmental Management Systems - Specification with guidance for use. Geneva .

ISO (2004). ISO 17011 – Conformity Assessment – General Requirements for Accreditation Bodies Accrediting Conformity Assessment Bodies. Geneva

ISO (2006). ISO 17021 – Conformity Assessment – Requirements for Bodies Providing Audit and Certification of Management Systems. Geneva.

ISO History and Definitions [Online]. *Questlaser*. Available from [http://www.questlaser.com/PDF\\_Files/ISO\\_Notes.pdf](http://www.questlaser.com/PDF_Files/ISO_Notes.pdf) [Accessed 10 October 2008]

Johnstone, N., & Labonne, J. (2009). Why do manufacturing facilities introduce environmental management systems? Improving and/or signaling performance. *Ecological Economics* , 68 p.719-730.

Nawrocka, D., & Parker, T. (2009). Finding the connection: environmental management systems and environmental performance. *Journal of Cleaner Production* , 17 pages 601-607.

Newcastle City Council Neighbourhood Services – Environmental Statement 2004-2005 [Online] Available at [http://www.newcastle.gov.uk/wwwfileroot/ns/emas/NS\\_Emas\\_Statement\\_0405.pdf](http://www.newcastle.gov.uk/wwwfileroot/ns/emas/NS_Emas_Statement_0405.pdf) [Accessed 4 May 2009]

Priego, M., & Palacios, C. (2008). Analysis of environmental statements issued by EMAS-certified Spanish hotels. *Cornell Hospitality Quarterly* , 49(4) Pages 463-465.

REMAS Findings Final Report (2007) [Online] Available at <http://remas.iema.net/content/presentations.htm> [Accessed 1 October 2008]

Rondinelli and Vastag. (1996). International environmental management standards and corporate policies: An integrated framework. *California Management Review* 39(1) , 106-122. Rondinelli and Vastag . (2000). Panacea, Common Sense, or Just a Label? The value of ISO 14001 EMS. *European Management Journal* Vol. 18, No. 5 , 499-500.

SEI. (2006). *I.S. 393:2005 Technical Guideline*. Sustainable Energy Ireland.

SEI. (2008). *Ireland's Largest Business Energy Users Make Energy Efficiency Gains*. Sustainable Energy Ireland.

SEI. (Year unknown). *The New Irish Energy Management Standard - The Aughinish Alumina Experience*. Sustainable Energy Ireland.

Steiger, U. (2000). Environmental Management Systems: Empirical Evidence and Further Perspectives. *European Management Journal* Vol.18, No. 1 , 23-37.

Systems Thinking for Service Organisations - A Brief History of ISO 9000 [Online]. Available at <http://www.systemsthinking.co.uk/3-1-article.asp> [Accessed 25 October 2008] .

Tyne Tunnels Interim Environmental Statement 2007-2008 [Online] Available at <http://www.tt2.co.uk/upload-files/EMAS%20Statement%20.pdf> [Accessed 4 May 2009]

Voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) \*\*\* [Online] (Updated 6 April 2009). Available at: <http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2009-0210+0+DOC+XML+V0//EN> [Accessed 25 May 2009] .

Wyeth Newbridge Environmental Statement 2007 [Online]. Available at <http://www.wyeth.ie/Portals/0/EMAS%20Statement2007.pdf> [Accessed 4 May 2009]



# 7 Appendices

## Appendix 1

Table 3

| Question 1   | Response Percent | Response Count |
|--|------------------|----------------|
| <b>Where is your organisation located?</b>   |                  |                |
| Ireland  | 53.4%            | 39             |
| UK   | 30.1%            | 22             |
| Netherlands  | 4.1%             | 3              |
| Germany  | 12.3%            | 9              |
| Other:   | 4.1%             | 3              |
| 1. Isle of Man<br>2. Japan<br>3. Northern Ireland and Republic of Ireland<br>Skipped Question: 1   |                  |                |
| Question 2   | Response Percent | Response Count |
| <b>Do you operate an Environmental Management System?</b>  |                  |                |
| Yes  | 97.2%            | 70             |
| No   | 2.8%             | 2              |
| Skipped Question: 1  |                  |                |
| Question 3   | Response Percent | Response Count |
| <b>Have you implemented the following?</b>   |                  |                |
| ISO 14001  | 75.7%            | 53             |
| EMAS   | 50.0%            | 35             |
| Other:   | 21.4%            | 15             |
| 1. EMS as per requirements of IPPC licence; 2. Based on our IPPC licence; 3. FSC & PEFC; 4. Not accredited system; 5. IPPC licence; 6. Corporate Program; 7. 9001; 8. IPPC Licence; 9. Internal Management model; 10. IPPC Licence; 11. Our own EMS; 12. Corporate environment management system similar to ISO 14001; 13. In-house; 14. Plan is to be ISO 14000 certified in 2010; 15. In the process of being accredited to ISO 14001 OSHAS 18001<br>Skipped Question: 3 |                  |                |

Table 4

| Question 4<br>Do you have external certification/verification of your Environmental Management System?  | Response Percent | Response Count |
|---|------------------|----------------|
| Yes   | 75.3%            | 55             |
| No  | 13.7%            | 10             |
| Application made  | 1.4%             | 1              |
| Don't know  | 2.7%             | 2              |
| Other:  | 6.8%             | 5              |
| <p>1. EPA verify; 2. Subject to audit by EPA; 3. The group wide EMS is not certified by a certification body, some of individual division EMS' have been externally certified; 5. Accredited in house at corporate level subject to 2 yearly audits; 6. Plan is for initially internal certification.</p> <p>Skipped Question: 0</p>                                    |                  |                |
| Question 5<br>Is the certification body accredited by one of the following?   | Response Percent | Response Count |
| INAB  | 12.9%            | 8              |
| UKAS  | 37.1%            | 23             |
| RvA   | 4.8%             | 3              |
| DAU   | 9.7%             | 6              |
| Don't Know  | 12.9%            | 8              |
| Other:  | 22.6%            | 14             |
| <p>1. NSAI; 2. We use BSI who are accredited by UKAS, RvA, JAB, CNAB &amp; ANAB; 3. TUV Rheinland; 4. EPA; 5. German DAR; 6. BSI; 7. Also INAB (EMAS); 8. ANAB; 9. Our certification body is the EPA - I am unsure of their accreditation; 10. Not accredited; 11. Corporate verification; 12. NSAI; 13. No; 14. Internal certification</p> <p>Skipped Question: 11</p> |                  |                |

Table 5

| Question 6   | Response Percent | Response Count |
|--|------------------|----------------|
| <b>Which of the following sectors describe the activities of your organisation?</b>  |                  |                |
| Manufacturing  | 69.9%            | 51             |
| Service  | 6.8%             | 5              |
| Waste  | 9.6%             | 7              |
| Transport  | 2.7%             | 2              |
| Other:   | 23.3%            | 17             |
| 1. Energy Industry; 2. Physical Regeneration; 3. NAC E Code 91.1 Business, employers and professional organisations (more closely civil service than above); 4. Local authority; 5. Public funded; 6. Mineral Processing; 7. Ecological land use planning; 8. Local Authority; 9. Hospitality /Financial services/Property also with the Group; 10 Food and Drink; 11. Local government; 12. Local government; 13. Mineral Extraction; 14. Design and installation of solar energy solutions (not manufacturing); 15. Power generation; 16. Civil Engineering; 17. Food processing Skipped Question: 1 |                  |                |

Table 6

| <b>Question 7</b>  |                          |                 |                |              |                       |                       |
|--|--------------------------|-----------------|----------------|--------------|-----------------------|-----------------------|
| <b>In relation to independent certification/verification of your Environmental Management System can you rate the following statements:</b>  |                          |                 |                |              |                       |                       |
|  | <b>Strongly Disagree</b> | <b>Disagree</b> | <b>Neither</b> | <b>Agree</b> | <b>Strongly Agree</b> | <b>Response Count</b> |
| It gives confidence that we are meeting the requirements of the relevant standard  | 1.4% (1)                 | 0%(0)           | 2.9%(2)        | 58.6%(41)    | 37.1%(26)             | 70                    |
| It gives confidence we are in compliance with legislation  | 1.4%(1)                  | 7.1%(5)         | 2.9%(2)        | 57.1%(40)    | 31.4%(22)             | 70                    |
| It gives top mgt. confidence in env'l performance  | 1.4%(1)                  | 1.4%(1)         | 5.7%(4)        | 68.6%(48)    | 22.9%(16)             | 70                    |
| It satisfies the requirements of our customers   | 1.4%(1)                  | 4.3%(3)         | 15.7%(11)      | 57.1%(40)    | 21.4%(15)             | 70                    |
| Comments: 1. Our customers have not requested environmental performance information – more quality related; 2. If audited against the standard then it gives confidence that the standard is met – but the rest does not automatically follow; 3. Legal – ISO 14001 provides little. Absolute requirement for EMAS. Customers are very broad – some are interested, others couldn't care.<br>Skipped Question: 3 |                          |                 |                |              |                       |                       |

Table 7

| <b>Question 8</b>   |                          |                 |                |              |                       |                       |
|---|--------------------------|-----------------|----------------|--------------|-----------------------|-----------------------|
| <b>From your experience of implementing an Environmental Management System please answer the following questions:</b>   |                          |                 |                |              |                       |                       |
|   | <b>Strongly Disagree</b> | <b>Disagree</b> | <b>Neither</b> | <b>Agree</b> | <b>Strongly Agree</b> | <b>Response Count</b> |
| Implementing an EMS has a positive impact on env'l performance  | 0.0%(0)                  | 0.0%(0)         | 2.6%(1)        | 65.8%(25)    | 31.6%(12)             | 38                    |
| It is easy to measure this impact   | 5.3%(2)                  | 2.6%(1)         | 7.9%(3)        | 63.2%(24)    | 21.1%(8)              | 38                    |
| Impacts are communicated to senior management   | 0.0%(0)                  | 5.3%(2)         | 0.0%(0)        | 50.0%(19)    | 44.7%(17)             | 38                    |
| This information is publically available in an env'l statement  | 0.0%(0)                  | 7.9%(3)         | 10.5%(4)       | 36.8%(14)    | 44.7%(17)             | 38                    |
| Implementing an EMS improves compliance with legislation  | 0.0%(0)                  | 5.3%(2)         | 5.3%(2)        | 55.3%(21)    | 34.2%(13)             | 38                    |
| Comments: 1. Information is only publically available in an environmental statement by implementing EMAS – no requirement with ISO 14001; 2. Info for the public on our business section is diluted in the corporate figures; 3. Measuring impact can be difficult as EMS is not throughout the whole organisation; 4. Some elements easier to measure than others. Few companies produce environmental reports for the public<br>Skipped Question: 0 |                          |                 |                |              |                       |                       |

Table 8

| <b>Question 9</b>  |                      |                           |                  |                       |                  |                       |
|--|----------------------|---------------------------|------------------|-----------------------|------------------|-----------------------|
| <b>Can you rate the following perceived benefits of reporting and communicating environmental performance:</b> |                      |                           |                  |                       |                  |                       |
|  | <b>Not Important</b> | <b>Slightly Important</b> | <b>Important</b> | <b>Very Important</b> | <b>Essential</b> | <b>Response Count</b> |
| Help achieve env'l perf. Criteria  | % 0.0(0)             | 2.7%(2)                   | 42.5%(31)        | 39.7%(29)             | 15.1%(11)        | 73                    |
| Increase awareness and dialogue  | 0.0%(0)              | 2.8%(2)                   | 29.2%(21)        | 52.8%(38)             | 15.3%(11)        | 72                    |
| Demonstrate commitment and efforts to improve env'l perf.  | 0.0%(0)              | 1.4%(1)                   | 32.9%(24)        | 37.0%(27)             | 28.8%(21)        | 73                    |
| Provide a mechanism to respond to concerns and questions about env'l aspects                                   | 0.0%(0)              | 8.2%(6)                   | 30.1%(22)        | 37.0%(27)             | 24.7%(18)        | 73                    |
| Skipped Question: 0<br>Comments: 0   |                      |                           |                  |                       |                  |                       |

Table 9

| <b>Question 10</b><br><b>In evaluating your environmental performance have you used the following standard as a guide: ISO 14031:1999 Environmental management - Environmental performance evaluation - Guidelines</b>   | <b>Response Percent</b>        | <b>Response Count</b> |
|--|--------------------------------|-----------------------|
| Yes<br>No<br>Don't know<br>Other:  | 26.0%<br>60.3%<br>5.5%<br>8.2% | 19<br>44<br>4<br>6    |
| 1. Hadn't come across this; 2. EMAS; 3. Corporate guidelines; 4. Very vaguely; 5. No; 6. Not implemented yet<br>Skipped Question: 0  |                                |                       |
| <b>Question 11</b><br><b>Indicators of environmental performance are a means of presenting quantitative or qualitative data or information in a more understandable and useful form. Please indicate which of the following characteristics do the indicators you use display (multiple choices allowed):</b>    | <b>Response Percent</b>        | <b>Response Count</b> |
| Direct measures or calculations e.g. tonnes of contaminant emitted   | 87.7%                          | 64                    |
| Relative measures or calculations e.g. tonne of contaminant emitted per tonne of product manufactured  | 65.8%                          | 48                    |
| Indexed e.g. comparing with a baseline- expressed as percentage of emissions in baseline year  | 46.6%                          | 34                    |
| Aggregated e.g. collating data from different sources into a combined value  | 23.3%                          | 17                    |
| Weighting e.g. applying a factor relating to significance  | 20.5%                          | 15                    |
| None of the above  | 0.0%                           | 0                     |
| Other:   | 4.1%                           | 3                     |
| 1. Different criteria; Water consumption; Electricity usage; Waste production; Gas usage;<br>2. Indexing on units manufactured handicapped by diversity of product portfolio, so indexing to headcount tried;<br>3. Zst values used for critical parameters e.g. waste licence parameters<br>Skipped Question: 0 |                                |                       |



Table 10

| <b>Question 12</b>  | <b>Response</b> | <b>Response</b> |
|---|-----------------|-----------------|
| <b>Which of the following do your indicators relate to?</b>                         | <b>Percent</b>  | <b>Count</b>    |
| Raw materials   | 50.7%           | 37              |
| Energy  | 90.4%           | 66              |
| Services  | 24.7%           | 18              |
| Design of equipment and facilities  | 8.2%            | 6               |
| Installation of equipment and facilities  | 11.0%           | 8               |
| Operation of equipment and facilities   | 28.8%           | 21              |
| Maintenance of equipment  | 19.2%           | 14              |
| Products  | 35.6%           | 26              |
| Wastes(solid, liquid, hazardous, non-hazardous, recyclable, reusable)               | 91.8%           | 67              |
| Emissions (to air, effluents to land or water, noise, vib., heat, radiation, light) | 82.2%           | 60              |
| Life cycle analysis   | 9.6%            | 7               |
| Other:  | 4.1%            | 3               |

1. Water, CO<sub>2</sub>; 2. Only sewer emissions relevant for mfg, fleet car emissions for service; 3. Incident frequency, complaints.  
Skipped Question: 0

Table 11

| <b>Question 13</b>   |                          |                 |                |              |                       |                       |
|--|--------------------------|-----------------|----------------|--------------|-----------------------|-----------------------|
| <b>Can you rate the following considerations for selecting indicators of environmental performance</b> |                          |                 |                |              |                       |                       |
|  | <b>Strongly Disagree</b> | <b>Disagree</b> | <b>Neither</b> | <b>Agree</b> | <b>Strongly Agree</b> | <b>Response Count</b> |
| Consistent with the organisation's stated environmental policy   | 0.0%(0)                  | 4.2%(3)         | 33.3%(24)      | 37.5%(27)    | 25.0%(18)             | 72                    |
| Useful for measurement   | 1.4%(1)                  | 5.6%(4)         | 29.2%(21)      | 48.6%(35)    | 15.3%(11)             | 72                    |
| Relevant and understandable internally and externally  | 0.0%(0)                  | 4.1%(3)         | 21.9%(16)      | 53.4%(39)    | 20.5%(15)             | 73                    |
| Cost-effective and timely manner   | 0.0%(0)                  | 9.9%(7)         | 38.0%(27)      | 39.4%(28)    | 12.7%(9)              | 71                    |
| Type, quality & quantity of the data   | 0.0%(0)                  | 2.9%(2)         | 40.6%(28)      | 43.5%(30)    | 13.0%(9)              | 69                    |
| Representative of env'l performance  | 0.0%(0)                  | 1.4%(1)         | 19.7%(14)      | 54.9%(39)    | 23.9%(17)             | 71                    |
| Measurable in appropriate units  | 1.4%(1)                  | 4.3%(3)         | 31.9%(22)      | 49.3%(34)    | 13.0%(9)              | 69                    |
| Responsive & sensitive to changes  | 0.0%(0)                  | 11.6%(8)        | 36.2%(25)      | 39.1%(27)    | 13.0%(9)              | 69                    |
| Information on current or future trends  | 1.4%(1)                  | 8.6%(6)         | 28.6%(20)      | 42.9%(30)    | 18.6%(13)             | 70                    |
| Skipped Question: 0 Comments: 0  |                          |                 |                |              |                       |                       |

Table 12

| <b>Question 14</b>   |                          |                 |                |              |                       |                       |
|--|--------------------------|-----------------|----------------|--------------|-----------------------|-----------------------|
| <b>Can you rate the following statements concerning how environmental indicators are checked by your external auditors</b>   |                          |                 |                |              |                       |                       |
|  | <b>Strongly Disagree</b> | <b>Disagree</b> | <b>Neither</b> | <b>Agree</b> | <b>Strongly Agree</b> | <b>Response Count</b> |
| External auditors spend too much time on this area   | 10.8% (7)                | 35.4%(23)       | 46.2%(30)      | 6.2%(4)      | 1.5%(1)               | 65                    |
| External auditors do not spend enough time on this area  | 6.3%(4)                  | 17.5%(11)       | 50.8%(32)      | 20.6%(13)    | 4.8%(3)               | 63                    |
| External auditors consider this area important   | 0.0% ( )                 | 12.3%(8)        | 20.0%(13)      | 56.9%(37)    | 10.8%(7)              | 65                    |
| External auditors make findings in this area   | 0.0%(0)                  | 18.5%(12)       | 26.2%(17)      | 49.2%(32)    | 6.2%(4)               | 65                    |
| Comments:  |                          |                 |                |              |                       |                       |
| 1. Especially EMAS for which calculations are actually checked; 2. Depends on the auditor; 3. No 3rd party accreditation just IPPC license requirements; 4. Answers applicable to EMAS audit which is different from ISO 14001 audit; 5. No external auditor; 6. Not applicable as we will be internally certified Skipped Question: 7 |                          |                 |                |              |                       |                       |

Table 13

| <b>Question 15</b>   | <b>Response Percent</b> | <b>Response Count</b> |
|--|-------------------------|-----------------------|
| <b>Please indicate if your organisation uses any of the following indicators of environmental performance</b>  |                         |                       |
| Quantity of materials used per unit of production  | 48.6%                   | 35                    |
| Quantity of water per unit of product  | 52.8%                   | 38                    |
| Quantity of energy per year per unit of product  | 62.5%                   | 45                    |
| Quantity of each type of energy used   | 77.8%                   | 56                    |
| Average fuel consumption of vehicle fleet  | 30.6%                   | 22                    |
| Rate of defective products   | 16.7%                   | 12                    |
| Total waste for disposal   | 86.1%                   | 62                    |
| Quantity of waste per unit of production   | 54.2%                   | 39                    |
| Quantity of hazardous waste eliminated due to material substitution  | 37.5%                   | 27                    |
| Quantity of specific emissions per year  | 77.8%                   | 56                    |
| Quantity of specific emissions per unit of product   | 31.9%                   | 23                    |
| Comments: 1. Also measure our regulatory and enforcement activities; 2. Most of these are not applicable in our industry - variable short-term sites Skipped Question: 1 |                         |                       |

Table 14

| <b>Question 16</b>  |                         |                       |
|---|-------------------------|-----------------------|
| <p>Please indicate if your organization uses external condition indicators which provide information about the local, regional, national or global condition of the environment which can be used to identify relationships between your activities and the condition of some component of the environment? Examples: Odour/dust/concentration of a contaminant at a specific distance from the site boundary/ Concentration of a specific contaminant in groundwater/ Concentration of a specific contaminant in surface soils at locations in the area surrounding the facility</p>   |                         |                       |
|   | <b>Response Percent</b> | <b>Response Count</b> |
| Yes   | 40.8%                   | 29                    |
| No  | 54.9%                   | 39                    |
| Don't know  | 5.6%                    | 4                     |
| <p>Comments:</p> <p>1. Concentration of a specific contaminant in groundwater; 2. Groundwater quality; 3. Odour Dust Noise; 4. Baseline data for surface water quality; 5. Smell of the waste water treatment installation; 6. Groundwater surveys and river survey of local river that storm water is added to; 7. Dust deposit gauges located outside the factory site boundary; 8. Groundwater at the boundary, noise measurement at one nearest sensitive receptor (as per IPPC); 9. Different Qualities of Water (rain, ground, process,...) as benchmark; 10. Contaminants in surface waters, local noise impacts measured at neighbouring receptors; 11. Gas migration, groundwater &amp; surface water quality near Landfill site, Surface water quality in our functional area as part of Water framework directive; 12. Ambient air quality off site - change in water chemistry downstream of discharge; 13. We test groundwater biannually for a range of contaminants e.g. NH3; 14. Biological surveys of receiving waters (up/down stream of discharge point), off-site monitoring of dust &amp; SO2 emissions; 15. Very site specific - if working on an abstraction zone or SSSI may have testing for pH or oil/fuel fractions; 16. We do send water samples annually for testing as one site is on the river although we are not required to have a consent to discharge; 17. Dust deposition gauges; 18. Noise, fugitive VOC emissions</p> <p>Skipped Question: 2</p> |                         |                       |

Table 15

**17. If you would like to make any comment about this survey or about Environmental Management Systems and environmental indicators please do so in this section.**

1. none, good luck with your investigation
2. Well done!
3. Confidential treatment is highly approved
4. Most of our impacts are indirect and therefore we do not have the same performance data as say manufacturing industries. Improvements in environmental impacts is very difficult for us to measure as we mainly enforce environmental legislation on others
5. We have already implemented many elements of an Env Mgmt System without being driven by customer demands and will complete implementation with "internal" certification by Corporate auditors
6. our indicators can be complex to measure as we have many functions (authority for guidance, regulations and also provision of waste management facilities landfill sites, waste transfer station and bring sites) multi site EMS and dependent on external factors.
7. We note that you have committed yourself to collecting the information submitted anonymously and that our IP address will not be stored with the survey results. We hereby request that you adhere to that commitment. Thank you.
8. Environmental indicators are very important in an EMS to allow the company to set objectives and make year on year improvements. They are however, only part of the EMS and there is a lot more to consider and involve. It is important for a company to first define what their most significant environmental impacts are (across every area of the company). The indicators they measure and the targets they set should be around these most significant impacts, that way the company can make the biggest improvement. Top management commitment is essential to make an effective EMS. It is clear to an external auditor if this is just being run by one person keeping up the paper work. Anyway, I shouldn't ramble- Good Luck!
9. This survey does not allow me to answer question 8 properly, but I strongly agree with all
10. Environmental management systems are simply an aid. The IPPC licence requirements are the real driver behind performance. There is too much paperwork attached to EMS. If I were assessing a company's performance I would be checking against the IPPC license conditions. ISO14001 would be not be considered important
11. Good survey - well presented, questions asked in coherent way. I complete lots of these. Most are awful.
12. this plant work to legislative requirements but
13. Well prepared survey. Good luck with your studies.
14. Had problems with question 8, would not allow we to tick boxes I wanted. Last 2 questions: Neither and lastly strongly agree.
15. WE are implementing ISO14000 over next 18 months so the survey is a bit premature for the site. I have implemented ISO14k at other sites so can answer some questions from experience in any event.
16. We are in the process of getting accreditation so any answers given are our perceived thoughts rather than what we know to be the truth in practice

Skipped Question: 57