



Murdoch
UNIVERSITY

MURDOCH RESEARCH REPOSITORY

<http://researchrepository.murdoch.edu.au/>

This is the author's final version of the work, as accepted for publication following peer review but without the publisher's layout or pagination.

**Annandale, D., Morrison-Saunders, A. and Hughes, M. (2007)
*Measuring the impact of voluntary environmental protection
instruments: Perceptual vs. archival techniques.* International
Journal of Environment, Workplace and Employment ,
3 (1). pp. 1-14.**

<http://researchrepository.murdoch.edu.au/1771/>

Copyright © 2007, Inderscience Publishers.
It is posted here for your personal use. No further distribution is permitted.

**Measuring the Impact of Voluntary Environmental Protection Instruments:
Perceptual versus Archival Techniques**

Dr David Annandale¹: Senior Lecturer in Environmental Assessment and Policy,
School of Environmental Science, Murdoch University, South St., Perth, Western
Australia. Telephone: +61 8 9 3606081. Fax: + 61 8 9 3606787. E-mail:
d.annandale@murdoch.edu.au)

Dr Michael Hughes: Tourism CRC Research Fellow, Curtin Sustainable Tourism
Centre, Curtin University of Technology, GPO Box U1987, Perth, WA, 6485 Australia.
Telephone: +61 8 9 266 2123. Fax: +61 8 9266 1100. E-mail:
Michael.Hughes@cbs.curtin.edu.au)

Dr Angus-Morrison Saunders: Senior Lecturer in Environmental Impact Assessment,
School of Environmental Science, Murdoch University, South St., Perth, Western
Australia. Telephone: +61 8 9 3606125. Fax: + 61 8 9 3606787. E-mail: [a.morrison-
saunders@murdoch.edu.au](mailto:a.morrison-saunders@murdoch.edu.au))

¹ Corresponding author

Measuring the Impact of Voluntary Environmental Protection Instruments: Perceptual versus Archival Techniques

Abstract

The use of voluntary environmental protection instruments is expanding significantly around the world. Although there is a large literature dealing with what drives companies to adopt voluntary instruments, there has been relatively little research on the impact that some of these tools have on the actual environmental performance of companies. The existing literature in this area presents contrasting results, perhaps because it tends to use perceptual measurement, which may not reflect *actual* outcomes. To investigate this issue, the primary research reported on in this article undertook a combination of perceptual measurement and “archival” (or objective) measurement on the same sample of firms. The research concluded that most firms saw some degree of positive response from the introduction of Environmental Management Systems. This was especially the case for “system” (or “process”) improvements, and to a lesser extent held true for direct environmental performance improvements. It was also clear that there was a very close correlation between the results of the perception-based research and the archival measurement research. . At least in the context of this kind of investigation, either research approach would appear to produce a valid outcome.

Keywords

Voluntarism, environmental performance, archival, perceptual

Introduction

Over the course of the last decade there has been increasing emphasis on the use of voluntary environmental protection instruments by both governments and firms. Tools such as Environmental Management Systems (EMSs), corporate environmental reports (CERs), life cycle analysis and environmental accounting have grown in response to concerns about whether traditional regulatory “command and control” approaches have actually led to real environmental improvements¹. Clearly, better environmental management performance is an important contribution for sustainable business.

While these so-called “new” voluntary environmental protection instruments have been elaborately described², and there is a sophisticated literature dealing with what drives companies to adopt voluntary instruments³, there has been relatively little research on the impact of these tools on the actual environmental performance of companies.

This article attempts to redress this perceived inadequacy by presenting the outcomes of empirical research undertaken with a sample of firms operating in Western Australia. Moreover, it attempts to shed light on the relative merits of “archival” (also known as “objective”) measurement, versus “perceptual” measurement.

The article begins with a brief review of the small literature relating to the impact of voluntary instruments on environmental performance. It then moves on to describe the research methods used, and the outcomes of the primary research. The final section presents some preliminary conclusions.

Impact of Voluntary Instruments on Environmental Performance

Possibly as a result of the fact that voluntary environmental instruments are still in the relatively early stages of development inside companies, there is very little reported research into the impacts of these instruments on actual environmental performance.

There is considerable literature reporting on the pros and cons of voluntarism, but this tends not to be based on empirical work. On the “pro” side, Sugiyama and Imura⁴ claim that voluntary pollution control agreements implemented in Japan over the last 30 years have benefited local governments and companies. However, despite the fact that the title of their article includes the word “proven”, these authors have only evaluated Japanese voluntary agreements from a “process” perspective. Numerous other commentators focus on the perceived process improvements provided by the development of voluntary instruments, without testing the impact of the instruments on actual environmental outcomes⁵.

One recent piece of World Bank empirical research that comes down on the “pro” side has shed light on the relationship between EMSs and regulatory compliance rates. A survey of 236 factories in heavily polluting industrial sectors showed that there is a direct correlation between adopting ISO 14001 and compliance. This Mexican work showed that the closer a firm is to certification, the more environmental benefit it obtains. For example, 86% of plants with high EMS adoption scores were complying with environmental regulations, while only 24% of plants with low scores were⁶.

There is also contrary literature that questions the claimed benefits of voluntary environmental instruments. A large survey of 1,510 US firms published in 2000 found

that overall, the systems were not seen in a positive light. Managers surveyed saw them as having a negative impact on the major strategic dimensions of performance (lead time, costs, and quality)⁷. Similar conclusions were reached by Welch et al⁸. From a large survey of Japanese and US firms, these authors concluded that the expected benefits of EMS adoption were lower than the reported realization.

The literature, therefore, appears to provide contrasting evidence. It is possible that the reason for this relates to the use of “perceptual” measurement, where empirical evidence is collected through surveying the perceptions of managers. While this is an accepted social science research technique, it is possible that managerial perceptions may not properly represent the *actual* impact of voluntary instruments on environmental performance. To investigate this issue, the primary research reported on below undertook a combination of perceptual measurement and “archival” (or objective) measurement on the same sample of firms. The hope was that this would provide a more rigorous answer to the research question (i.e. “what impact do voluntary environmental instruments have on actual environmental performance?”).

Research Approach and Outcomes: How to Measure the Impact of Voluntary Environmental Instruments on Corporate Environmental Performance

Positivist research is steeped in the idea that there is something “inferior” about measuring perceptions, and that “real/accurate” research must either use objective or “archival” measurement, or some mixed perceptual/objective technique to prove accuracy⁹. Recent literature that examines the relative value of perceptual and archival measurement makes it clear that there is uncertainty about the correlation between the two approaches¹⁰. Some studies have reported negative correlations¹¹, while others have

reported moderate¹² to strong¹³ positive correlations. One of the aims of this research was to add to this debate by undertaking combined research within the same set of firms.

Empirical Research Using Perceptual Measurement

An earlier article presented the results of the research based on perceptual measurement¹⁴. In summary, we interviewed managers from 40 Western Australian firms taken from the primary resources sector (18 firms), construction, engineering and services (7 firms), storage, processing and distribution (6 firms), manufacturing (6 firms), energy (2 firms) and waste management (1 firm). Through use of interviews, we examined:

- the influence of EMSs and/or CERs on environmental management performance (here we initially asked managers whether or not the voluntary instruments had influenced their company's performance);
- the type of influence (if the first question was answered in the affirmative, we then asked manager to identify the main areas of impact and to provide specific examples); and
- the significance of the impact.

Of the 40 companies interviewed, 37 had EMSs similar to the ISO 14001 standard, and 23 undertook annual corporate environmental reporting. With regard to EMSs, 90% of interviewed managers said that this tool had positively influenced the company's environmental performance, and nearly 70% indicated that this influence was "moderate-to-large". The influence of CERs was considered to be smaller, with 70% stating that it

had a positive influence on environmental performance, and only 43% stating that it had a moderate-to-large impact.

Further questioning helped to clarify the nature of these claimed benefits. Firstly, with regard to EMSs, 61% of respondents claimed that it:

- provided a systematic framework for tracking issues;
- provided focus and discipline; and
- provided better documentation and an overall “driver” for change.

In addition, 35% of respondents claimed a positive relationship between EMSs and improved environmental awareness.

None of the above relates *directly* to improved environmental performance, although these process reforms were implied preconditions. However, 43% of interviewed company managers did provide evidence of how implementation of EMSs has led to specific environmental improvements. A long list of positive initiatives was provided, varying depending on industry sector, but commonly focusing on pollution control, production efficiency improvements, and increasing resource input efficiencies for energy and water.

Although the influence of CERs on company environmental performance was considered by respondents to be smaller than for EMSs, three main areas of positive impact were highlighted by the survey:

- 35% of respondents stated that CERs improved monitoring and data collection, and led to a more organized approach to environmental reporting through the use of key performance indicators or other reporting tools;
- 35% claimed that CERs provided a good internal management tool and, as a consequence, improved management of environmental performance;
- 35% claimed that public reporting enabled a focus on critical environmental issues through public accountability and transparency.

Notably, no respondents claimed that CERs led to direct, physical, environmental improvements.

The outcomes of this empirical research lend some support to the claim that voluntary environmental instruments may positively impact on environmental performance.

However, to further verify this conclusion, we decided to return and re-interview the same sample of firms approximately 18 months after the first effort.

Empirical Research Using Archival Measurement

Of the 40 companies involved in the original, perceptual measurement research, 13 did not participate in the follow-up archival research. Of these non-participants, most indicated that they were either too busy to respond, or that their corporate structure had changed so significantly that re-interview did not make sense.

Of the 27 that were re-interviewed, 12 were in the primary resources sector, 6 in construction, engineering and services, 3 in storage, processing and distribution, 4 in manufacturing, 2 in energy, and 1 in waste management.

The follow-up research consisted of face-to-face interviews where the purpose was to directly verify statements made in the original research about the impact of EMSs and/or CER on environmental performance. Interviewees were reminded of statements made in the original interview, and then asked for verification. Usually this was in the form of documentation.

The first outcome of note was that the impact of CERs was often difficult to isolate from that of EMSs. All 27 firms had EMSs in place, and also produced CERs. However, in the follow-up research, no interviewees could produce documented evidence to link CERs with improved environmental performance. This was somewhat striking, given that 70% of firms interviewed in the first survey had stated that CERs had positively influenced performance. Because of the difficulty surrounding isolating CER influence from EMS, the remaining research focused only on EMSs.

Table 1 presents the outcomes of the follow-up, archival research.

INSERT TABLE 1 AROUND HERE

Environmental performance improvements were conceived by managers as relating to either process (or “system”), or actual direct outcomes (further defined as either improving existing actions or introducing new actions).

System improvements were defined as changes to corporate culture, boosted environmental awareness, better focus and discipline, and more systematic frameworks for tracking issues. While these initiatives do not relate directly to improved environmental performance, interviewees considered that they were a necessary precondition for better physical outcomes. Process improvements were difficult to

directly verify, but could be inferred by the presence of documented systems. Supporting documentation therefore tended to be aspects and impacts registers; objectives and targets registers; audit timetables; staff regulatory responsibility matrices; incident reports; training manuals; and internal reports.

Table 2 shows that supporting documentation was found for 24 of the 27 companies that indicated a perceived positive impact on system performance from introducing EMSs.

INSERT TABLE 2 AROUND HERE

As was the case with the initial, perception-based research, fewer companies claimed direct environmental performance improvements as a result of instituting EMSs. Table 2 shows that of the 14 companies claiming that EMS improved existing actions, 10 could support these claims with documented evidence. Better outcomes were achieved in waste management, energy efficiency, recycling, pollution control, and contractor tendering. The most significant source of verification documentation was internal monitoring data, usually based on reporting against key performance indicators.

Seven companies indicated that EMS had led to the introduction of new actions. These included initiatives such as waste segregation, recycling, and pollution control. All 7 companies were able to verify these perceived improvements, using combinations of internal reports, targets and objectives registers, contract requirements and implementation registers. In addition, most of these new actions could be physically viewed.

Conclusions

The research reported on in this article set out to shed light on the relative merits of “archival” (also known as “objective”) measurement versus “perceptual” measurement, in relation to the impact of voluntary environmental protection instruments on actual environmental performance.

Three main conclusions can be drawn from this empirical research. First, while not universal across all interviewed companies, the voluntary instruments investigated did have a positive impact on environmental performance. All of the companies surveyed indicated some degree of positive response. The most consistent outcome was improved processes or systems, but 52% of interviewed firms could point to direct improvements to existing actions, and an additional 26% had introduced new initiatives as a result of EMS establishment.

A second conclusion that reinforces one of the outcomes of our earlier research, is that of the two voluntary instruments investigated, EMSs have a much more obvious impact on both process and direct environmental outcomes than do CERs. There appear to be two main reasons for this. The first is that CERs are often intimately linked to EMSs.

Managers indicated that CERs were a required outcome of EMSs, and so the main influence on environmental outcomes was the originating EMS not the consequent CER. The second reason is that EMSs are increasingly being viewed by firms as an international “quasi-standard” requirement for doing business. As more and more multi-nationals establish EMSs, many following the International Organisation for Standardisation (ISO) approach, so they are demanding that suppliers also develop

similar systems. This supply chain impact of EMS is beginning to show itself in recent research¹⁵.

Thirdly, it is clear that there is a close correlation between the results of the original, perceptual measurement research, and the follow-up archival research. For example, 89% of the companies indicating that EMSs resulted in system improvements could support these perceptions with documentation. In addition, 71% of companies that indicated a positive direct outcome on existing actions were able to verify these assertions, and 100% of those who claimed that EMSs had led to the introduction of new actions could prove these perceptions with documentation. These results would appear to support the literature mentioned earlier (see footnotes 12 and 13) that posits a positive correlation between perceptual measurement research and archival/objective research. At least in the context of this kind of investigation, either research approach would appear to produce a valid outcome.

In this research, we set out to ascertain whether voluntary environmental protection instruments were having a measurable impact on environmental performance. Our intention was to report the outcomes of empirical research, rather than to comment on the public policy implications of an increased take-up of voluntarism. However, it is clear that significant questions remain about the relative merits of voluntarism over command and control regulation, and many of these uncertainties could be addressed by further research. For example, our work focused entirely on whether or not environmental performance had improved as a result of the take-up of voluntary tools. In all likelihood, companies will only continue to use voluntary tools if they result in improved economic performance, or if they are required to do so by government regulation. New research

could therefore focus on the relationship between voluntary tools and commercial performance. Questions could be asked about whether positive environmental performance correlates with positive commercial performance. This would allow more careful conclusions to be drawn about what real drives the use of voluntary instruments.

Table 1: Outcomes of Archival Measurement Research

Company	Stated Improvements Resulting from EMS					
	Process (System) Improvements		Direct Environmental Performance Improvements			
	Perceived Improvement	Supporting Documentation	Perceived Improved Existing Actions	Supporting Documentation	Perceived Introduced New Actions	Supporting Documentation
1.	Better focus and discipline	Aspects and impacts register; targets and objectives register	None given			
2.	More systematic framework for tracking issues	No reply	Reduced water consumption; reduced CO ₂ emissions	None given		
3.	Environment is a higher priority	Aspects and impacts register	None given			
4.	Better focus and discipline; better documentation; more awareness	Training presentations; legal responsibility matrix; internal audit reports	None given			
5.	Better focus and discipline; more awareness	Site risk assessment forms; incident reporting; internal reports; meeting agendas	Contract short-listing more likely	Tender feedback	Waste Segregation	Documented site procedures/protocols
6.	Better focus and discipline; more awareness; improved image	Annual audits; awareness training programme	Energy Efficiency – air-conditioning, reduction in fossil fuel usage	None given		
7.	More awareness	Aspects and impacts register; contract requirements; legislative requirements; incident reporting	Reduce waste to landfill; minimise tyre usage ;reduce hydrocarbon spills	Internal reports – KPI monitoring data		
8.	More awareness	Aspects and impacts register;	More contracts	None given	Battery recycling; a system	Objectives and targets

		staff suggestions/input			for tank pressure testing; water treatment plant	register
9.	Better focus/discipline; better framework for tracking issues; more awareness	Aspects and impacts register; objectives and targets register; departmental business plan	None given-			
10.	Better focus and discipline; more awareness	Incident reporting; annual training courses provided externally	None given			
11.	More systematic framework for tracking issues	Sophisticated interactive EMS database	Reduced environmental risks identified by EMS; quarantine procedures	Risk register; trend graphs; documented protocols; training programmes	Sheep waste recycled; environmental awareness team created	Documented procedures and protocols
12.	More systematic framework for tracking issues	Aspects and impacts register; incident reporting	Nitrogen Oxide stream disturbance	Contract requirements; induction forms		
13.	More systematic framework for tracking issues	None given	None given			
14.	Better focus/discipline; more systematic framework for tracking issues	None given	Ensures compliance with legislation	None given		
15.	Better focus/discipline; more systematic framework for tracking issues; more awareness	Incident reporting; aspects and impacts register; documented procedures;	More likely to be short listed when tendering	Tender feedback		
16.	Increased awareness; better focus/discipline; more systematic framework for tracking issues	Incident reporting; aspects and impacts register; documented procedures; contractor criteria	None given			
17.	Better focus/discipline; more systematic framework for tracking issues; more awareness	Aspects and impacts register; documented procedures; internal reporting; incident reporting	More comprehensive training/inductions	Longer manual covering broader range of issues		

18.	More awareness; better focus/discipline	Aspects and impacts register; targets and objectives register; internal monitoring; external audits	None Given			
19.	More awareness; higher priority	Hazards, targets and objectives matrix; environmental risk ranking; Quality Diagnostic Improvement staff survey	Office power reduction; office paper use reduction	Internal monitoring data and trend graphs	Paper recycling ; saline water management; hydrocarbon spill management	Recycling bins and contracts; saline water and hydrocarbon spillage documentation
20.	More awareness; higher priority	Environmental training record; aspects and control procedures; objectives and targets register; training manuals/kits; updated copy of regulatory requirements	Power reduction	Power monitoring data	Budget for environmental management	Implementation register; environmental improvement plan
21.	Better focus/discipline	Regular internal reports; monthly reviews of progress; incident reporting; documented procedures	None given			
22.	More awareness; higher priority; better focus/discipline	Regulatory compliance index; monitoring schedule; documented operating procedures	Air emissions reduced; waste disposal minimized; energy consumption reduced	Implementation register; internal monitoring data (air emissions on track, waste and energy minimization yet to be implemented).		
23.	More awareness	Aspects and impacts register; incident reporting			Recycling of office paper and warehouse packaging	Recycle bins; waste disposal contracts/memos
24.	More awareness; more systematic framework for tracking issues	Regulatory requirements; documented procedures; employee survey results; incident reporting; internal reports	Improved dust emissions; noise reduction	Internal performance report; monthly trend graphs		

25.	More awareness; better focus/discipline; more systematic framework for tracking issues	Aspects and impacts register; objectives and targets register; documented procedures; internal monitoring reports; external audits	None Given			
26.	More focus/discipline; more systematic framework for tracking issues	Aspects and impacts register; documented procedures; incident reporting; objectives and targets register			Developed training Video about wetland conservation	“Save the frogs” video
27.	More systematic framework for tracking issues	Aspects and impacts register; targets and objectives register; annual business plan	None given			

Table 2: Summary of Outcomes: Perceptual versus Archival Measurement

Stated Improvements Resulting from EMS					
Process (System) Improvements		Direct Environmental Performance Improvements			
Positive response	Supporting Documentation Provided	Perceived Improved Existing Actions	Supporting Documentation	Perceived Introduced New Actions	Supporting Documentation
27 companies	24 companies	14 companies	10 companies	7 companies	7 companies
100% of total sample	89% of companies providing a positive response	52% of total sample	71% of companies providing a positive response	26% of total sample	100% of companies providing a positive response

Biographies

Dr David Annandale

When this research was undertaken, Dr Annandale was a Senior Lecturer in Environmental Assessment and Policy, and Head of the School of Environmental Science at Murdoch University in Perth, Western Australia. He is now Senior Technical Advisor to the National Environment Commission, Royal Government of Bhutan.

Dr Michael Hughes

Dr Hughes is a postgraduate Research Fellow in the Curtin Sustainable Tourism Centre at Curtin University of Technology in Perth, Western Australia. When this research was undertaken he was a Graduate Research Assistant in the School of Environmental Science at Murdoch University (Western Australia).

Dr Angus Morrison-Saunders

Dr Morrison-Saunders is a Senior Lecturer in Environmental Assessment and Program Chair of the School of Environmental Science at Murdoch University in Perth, Western Australia.

¹ Annandale, D., J. Altham, P. Dingle, J. Phillimore, and A. Morkel, "Developments in the environmental regulation of firms", *International Journal of Management*, vol. 17, issue 1, (2000), pp.35-44.

² Welford, R., *Corporate Environmental Management*, Earthscan, London, 1996. Braithwaite, J., and P. Drahos, *Global Business Regulation*, Cambridge University Press, Cambridge, 2000.

³ See, for example, recent work by Aseem Prakash and colleagues, such as: Prakash, A., "Why do firms adopt 'beyond-compliance' environmental policies?", *Business Strategy and the Environment*, vol. 10 (2001), pp.286-299. Eric Welch and colleagues have also published on this topic, especially in relation to Japan. An example is: Welch, E., Y. Mori, and M. Aoyagi-Usui, "Voluntary adoption of ISO 14001 in Japan: Mechanisms, stages and effects", *Business Strategy and the Environment*, vol.11, (2002), pp.43-62.

⁴ Sugiyama, R., and H. Imura, "Voluntary approaches in Japan: Proven record of pollution control agreements and new industrial initiatives for the protection of the global environment", *Eco-Management and Auditing*, vol. 6, (1999), pp.128-134.

⁵ Robinson, D., and A. Clegg, "Environmental leadership and competitive advantage through environmental management system standards", *Eco-Management and Auditing*, vol. 5 (1998), pp.6-14. Herremens, I. C. Welch, D. Kane, and R. Bott, "How and environmental report can help a company learn about its own environmental performance", *Eco-Management and Auditing*, vol. 6 (1999), pp.158-169.

Klaver, J., and J. Jonker, "Changing corporate environmental management: Development of new management systems", *Eco-Management and Auditing*, vol. 7, (2000), pp.91-97.

⁶ Dasgupta, S., H. Hettige, and D. Wheeler, "What improves environmental performance? Evidence from Mexican industry", *Journal of Environmental Economics and Management*, (2000), vol. 39, pp.39-66.

⁷ Montabon, F., S. Melnyk, R. Sroufe, and R. Calantone, "ISO 14001: Assessing its perceived impact on corporate performance", *Journal of Supply Chain Management*, vol. 36, issue 2 (2000), pp.4-16.

⁸ Welch, E., A. Rana, and Y. Mori, "The promises and pitfalls of ISO 14001 for competitiveness and sustainability: A comparison of Japan and the United States", vol. 44, (2003), pp.1-15.

⁹ Starbuck, W., and J. Mezas, "Opening Pandora's box: Studying the accuracy of managers' perceptions", *Journal of Organisational Behaviour*, vol.17 (1996), pp.99-117.

¹⁰ Boyd, B., G. Dess, and A. Rasheed, "Divergence between archival and perceptual measures of the environment: Causes and consequences", *Academy of Management Review*, vol. 18, issue 2, (1993), pp.204-226.

¹¹ See Starbuck and Mezas, note 10.

¹² Keats, B. and Hitt, M, “A causal model of linkages among environmental dimensions, macro-organisational characteristics, and performance”, *Academy of Management Journal*, vol.31, (1988), pp.570-598.

¹³ Snyder, N., and W. Glueck, “Can environmental objectivity be measured objectively?”, *Academy of Management Journal*, vol.25, (1982), pp.185-192.

¹⁴ Annandale, D., A. Morrison-Saunders, and G. Bouma, “The impact of voluntary environmental protection instruments on company environmental performance”, *Business Strategy and the Environment*, vol.13, (2004), pp.1-12.

¹⁵ Annandale, D., A. Fry, W. Hallal, P. King, D. McCauley, and R. Salazar, *Making Profits, Protecting our Planet: Corporate Responsibility for Environmental Performance in Asia and the Pacific*, Asian Development Bank, Manila, 2005. Potoski, M., and A. Prakash, “Regulatory convergence in nongovernmental regimes: Cross-national adoption of ISO 14001 certifications”, *Journal of Politics*, vol. 66, issue 3, (2004), pp.885-905.