
A National Materials Accounting Strategy

A path to competitive advantage
for Australian industry



*Authors: Paul Martin
Miriam Verbeek*

Title: National Materials Accounting Strategy: A path to competitive advantage for Australian industry

*Publisher: Profit Foundation Pty Limited
PO Box 744
SUTHERLAND NSW 1499*

December 1998

This document may be distributed free of charge. It is also available at the website address: www.profitfoundation.com.au

Information presented in this document may be copied for personal research or educational purposes provided the source of such information is fully acknowledged.

ISBN: 0-646-36648-3

Foreword

When a renowned strategist like Michael Porter (1997) says that environmental performance is the key to competitiveness, industry should listen. When Mercedes Benz, Volkswagen AG, Ford and Volvo signal that one key to competitiveness is environmental performance, Australia's automotive industry ought to take notice. So too should Australian industry listen to leading players in the electronics industry, the plastics, wood and paper pulp, packaging, building materials, metals, and a host of other industries of importance to Australia. The signals such industry leaders send are clear: The key to success is the minimisation of the "whole of life" environmental impacts of goods and services, production, consumption, and disposal of goods.

The future competitive position of Australian industry is being worked out today, right now. But not in Australia alone. How Australia stands relative to the rest of the world is being worked out by Australia's competitors and customers in the US, Japan, Korea, the EC, and elsewhere. It is being worked out by managers within competitor corporations, by the purchasing personnel in the businesses for which Australian industries are the upstream suppliers. It is being determined by the senior politicians and bureaucrats who are shaping the international trade rules. It is being shaped by the researchers who are developing the analytical tools that will allow their stakeholders to take the high ground in debates about the environmental credentials of competing corporations, products and economies.

Right now, today, Australian industry is handing to its competitors the means to become first ranking suppliers in the game in which Australia ought be a natural leader.

This report shows that Australian industry is slipping behind in what is likely to be "the biggest game in town", in terms of competitive advantage. It outlines what Australia's competitors are doing, what overseas governments are doing, and what some companies in Australia are trying to do. It outlines an approach to win back the potential advantage that industry is allowing to slip away. And it provides a number of steps forward to regain that advantage.

This report's call for action has the support of a significant group of Australian industry leaders. In two or three years, the opportunity to be a key player will disappear and the costs of maintaining and developing Australia's competitive stance will be far higher than it is today. This report offers industry, government, consumers, and others concerned with environmental issues the chance to shape a common agenda and make a concerted approach that will deliver significant benefits to all.

Executive Summary

The use and transformation of materials is a fundamental activity of industry. It is also a fundamental source of environmental challenge. Governments are everywhere exercising their responsibility to the community to improve environmental sustainability through increased understanding of materials flows, with particular emphasis on pollutants that limit the utility of other natural resources such as air, water, land, flora and fauna. In Australia these attempts are reflected in such initiatives as load based licensing of pollutants, trading of emission licenses, and state of the environment reporting. On the world stage, these attempts are being increasingly embodied in international standards such as ISO 14000, and in complex materials accounting methodologies.

The potential benefits of adopting such standards and methodologies are significant. The benefits accrue to industry, to governments and to the community in general. Benefits include:

- marketing advantage for products where valuable market segments are eco-sensitive;
- minimisation of waste and efficient and effective resource use within companies;
- an informed basis for sustainability debates and a basis for promulgation of policies, rules and regulation by government;
- a means for comparing products across industries, and capability for arguing and encouraging best practice.

In Europe, North America and Japan, government and industry adoption of ISO 14000 and materials accounting is well advanced. Some companies, urged by government legislation and preferred procurement practices, and by consumer demands, have been grappling with the implementation of materials accounting for over a decade. These companies are not only reaping the benefits of such implementation, they are now beginning to demand their suppliers adopt appropriate environmental standards, and conduct their own materials accounting analysis. Increasingly, Australian suppliers to these companies are affected by these demands.

Australian government and industry have been slower than other developed nations to reap the potential benefits of standards and methodologies for increasing environmental sustainability. In part this is because of the costs of adoption of these standards, and in part because of a lesser sense of urgency regarding environmental issues which pervades the Australian political and industrial scene.

Materials accounting methodologies require significant investment in data collection and analysis. While some larger, multinational firms operating out of Australia may be able to afford such an investment, most small and medium sized enterprises are at a significant disadvantage. We believe that, within a few years, even the larger firms in Australia will find themselves disadvantaged on the international stage and in community debates about environmental sustainability. The disadvantages arise because of the lack of coherent data sets and methodologies that reflect the Australian situation. Unless these are developed soon, Australian industry will, of necessity, need to adopt those already available in other countries. Such a move potentially erodes Australia's unique competitive capabilities.

This report details our analysis of the nature of the challenge to Australian industry and government of the international moves towards environmentally sustainable practices. Our particular concern is with Australia's preparedness to meet the challenge of adopting materials accounting in its government and industry decision-making processes. We conclude from our analysis that Australian governments and industry need to act quickly to ensure Australia remains a competitive international force, and operates in environmentally sustainable ways.

We recommend to meet the challenge, governments and industry coordinate their efforts through the establishment of an Institute for Materials Accounting and Sustainability (IMAS). In moving towards the establishment of the IMAS, we recommend:

- That a national approach with the federal government be established.
- That a coordinating entity be created.

In this report we outline the strategy, operating principles and general approach for such an entity. This

set of recommendations is based on detailed and extensive consultation with industry, government, and research, teaching and advisory organisations already involved in materials accounting.

Australia is well positioned, because of its size, isolation and physical disconnection from the rest of the world, to be ambitious in pursuing the establishment of a sound framework for the adoption of materials accounting and sustainable practices. Some of the groundwork for adopting these practices has already been set by leading Australian companies and by various government initiatives, often noted in this report. We strongly urge industry and government build upon these efforts and forge a positive path towards future competitiveness and sustainable development.

Contents

Foreword.....	3
Executive Summary	4
Table of Contents	6
Illustrations	8
Figures.....	8
Glossary of Terms and Abbreviations	9
I About this Report	10
II About the LCA Roundtable	10
III About the Consulting Team	11
IV Voluntary Support	11
Part 1: The Requirement for Materials Accounting	13
1.1 Introduction	14
1.2 Materials Accounting	14
1.3 Development of Materials Accounting Techniques	15
1.4 ISO 14000	16
1.5 The Benefits of ISO 14000	20
1.6 ISO 14000 and ISO 9000	20
1.7 Broader Applications of LCA	22
1.8 Conclusion	25
Part 2: Strategic Issues for Industry and Government	27
2.1 Introduction	28
2.2 LCA and ISO 14000 as a Trade Barrier	29
2.3 International Activity on ISO 14000 and Materials Accounting	31
2.3.1 Government	31
2.3.2 Industry	33
2.3.3 Other initiatives	34
2.3.4 Conclusion	34
2.4 Understanding Competitiveness Impacts for Industry	35
2.4.1 Cost barriers to adopting materials accounting	37
2.4.2 The particular issues for SME	38
2.5 Materials Accounting and Community ESD Demands	40
2.6 Government Motivations for Adoption	41
2.7 Conclusion	43
Part 3: Outlining a National Response by Industry and Government	45
3.1 Introduction	46
3.2 Assessing Australian Preparedness	46
3.3 Australia's Preparedness for the challenge	47
3.4 Five Critical Challenges for Australian Industry	49
3.5 Opportunities from Meeting the Challenges	52
3.5.1 Industrial outcomes	52
3.5.2 Community and environmental opportunities	53
3.5.3 Opportunities for government	53
3.6 What Australia Needs to Secure the Opportunity	54
3.6.1 A need for critical mass	54
3.6.2 A need for maintenance of technical standards	54
3.6.3 A need for specific Australian knowledge and data	55
3.6.4 A need for industry promotion	55
3.6.5 A need for education	55
3.6.6 A need for effective links with government, policy and trade bodies	55
3.7 A Model for a National Institute	56
3.8 Sensitivities Regarding IMAS	56

3.9 The Underpinning Need for IMAS and its Structure	58
3.9.1 The IMAS Mission	59
3.9.2 Services logic	59
3.9.3 The requirement for integrity	60
3.9.4 Financial support	61
3.9.5 Membership	61
3.10 Conclusion and Recommendations	62
3.10.1 Raise industry awareness:	62
3.10.2 Recommendation 1: Establish a national approach with the Federal Government	62
3.10.3 Recommendation 2: Create a coordinating entity	62
attachment 1 - Survey and Analysis	65
Section I: Participants in Discussions and Submissions	66
LCA Roundtable	66
Individual survey responses or meetings	67
Section II: Analysis of Results from Consultative Process	68
Industry	68
Government	69
Industry associations	69
Information providers	69
Confidentiality and the uses of data	70
Engaging with environmental and consumer interests	71
Awareness of materials accounting	71
Initiatives using materials accounting techniques	71
Problems in the adoption of materials accounting	72
The need for a national institute	73
Requirements to make IMAS a success	73
Possible models for IMAS	74
Possible funding for IMAS	75
Potential partners for IMAS	76
Summary	76
attachment 2 - A Description of Materials Accounting Techniques	77
Introduction	77
Materials accounting techniques	78
Material input per Service Unit	78
Materials flux analysis	79
Life cycle assessment	80
Other materials accounting techniques	81
Summary	81
attachment 3 - Summary of Activities Related to Materials Accounting and ISO 14000 in 25 Countries	85
attachment 4 - Life Cycle Assessment, methodology and issues	89
A Four Step process	89
Life Cycle Inventory Analysis	90
Systems and boundary definition	90
Data collection	91
Data calculation	91
Data quality	91
LCA data	91
Data source Issues	91
Life Cycle Impact Assessment	92
Issues and uncertainties	92
attachment 5: Life Cycle Conceptual Example	95
attachment 6: Euro Label Accredited Products	99
References	103

illustrations

1.1	International Case Study – ICI Paints and eco-labelling	14
1.2	International Case Study – Axel Springer Verlag AG, Heidelberg, Berlin, Germany	16
1.3	International Case Study – US competitiveness and ISO 14000	18
1.4	Australian Case Study – Whole of life design	21
1.5	International Case Study – Volvo (I)	25
2.1	Time lags and tendering costs for SMEs	28
2.2	The greening of public purchasing	32
2.3	Aluminium industry	34
2.4	Electronics industry	36
2.5	What impact might buyers' requirements have on Australian SMEs?	38
2.6	Green public purchasing	40
3.1	Australian LCA research	48
3.2	International Case Study – Volvo (II): Improving business systems performance	50
3.3	Australian Case Study – Improving agricultural competitiveness	53

Figures

1.1	The ISO 14000 Series	17
i1.5.1	The components of VEMS and the process for continual improvement	24
i2.1.1	Critical Gap – The Problem of unpreparedness: Estimated timings under current Australian conditions	29
2.2	LCA hotspots around the world	31
2.3	Industry characteristics and motivations to adopt materials accounting techniques	36
i2.5.1	Cash production impact of disruption to market access	39
i2.6.1	A summary of international approaches	41
3.1	The keys to the IMAS services role	59
3.2	A summary of services provision	61
a2.1	Flow of materials induced by anthropogenic activities and control strategies	77
a2.2	Scheme of the essential interactions between the anthrosphere in a regional economy .	79
a2.3	Summary Approach used by materials accounting tools	82
a4.1	The four steps in the methodology of LCA	89
a4.2	A systems approach to LCA	90
a5.1	Key elements in materials inventory	95

Glossary of Terms and Abbreviations

	Activities	Actions which enable metabolism in the anthroposphere, namely to nourish, clean, reside and work, transport and communicate.
	Anthroposphere	Open system consisting of materials, goods and processes, to satisfy human biological and cultural needs. The physical economy of a region.
CRC	Cooperative Research Centre	
	Ecological rucksack	The physical mass involved in the creation of a unit of service, (ie the tonnes of ores to be processed to obtain a kilogram of useable metal)
EMS	Environmental Management Systems	(ISO 14001) Management systems which commit companies to producing highest quality products with lowest possible environmental impacts.
ESD	Environmentally Sustainable Development	An economic state where the demands placed upon the environment by people and commerce can be met without reducing the capacity of the environment to provide for future generations
GATT	General Agreement on Tariffs and Trade	Formed in 1948 and replaced by the World Trade Organisation in 1994
	Goods	Materials or material mixtures with functions valued by humans.
IMAS	Institute for Materials Accounting and Sustainability	
	Index	A single aggregate derived from two or more indicators.
	Indicator	The product of specific manipulation of environmental data; the selection and presentation of statistics in order to represent defined variables or outcomes in a way that is meaningful, reliable, able to be measured over time and capable of disaggregation to the level of the relevant social unit (provided in Harding and Hendriks, 1996).
LCA	Life Cycle Assessment	Methods based on the principle of "cradle to grave" assessment. In these methods, the entire life cycle of a product, process or activity (encompassing extraction and processing of raw materials, manufacturing, transportation and distribution, use/reuse) is analysed.
	LCA Roundtable	The group comprising representatives from industry, government and research institutions who have supported the production of this report.
LCI	Life Cycle Inventory	List of elements which are used and/or effected by Materials accounting
	Materials	Chemical elements and their compounds.
MFA	Material Flux Analysis.	Methods that consider a single material across an entire system (usually a country or an economy) in the production of a good under review.
MIPS	Materials inputs per service unit	A way to determine or estimate for producing any well-defined service the kilograms or tonnes of materials that must be moved somewhere in the world
	Process	Transport, transformation and change in value or characteristics of materials and goods.
OECD	Organisation for Economic Cooperation and Development	
SME	Small and Medium Enterprise	
TMR	Total Material Requirement of a nation	
	Waste	A material or good that has negative economic value in its current location.
WTO	World Trade Organisation	Formed in 1994 as a result of the ' Uruguay Round' of discussions.

I About This Report

In this report we present data from around the world which shows the impact of materials accounting techniques on economies, industries and individual firms. We provide much of this information in the form of case studies and summary tables. We also provide relevant local case studies and examples, and interview and survey data from Australian industry. In the latter part of this report we specify the competitiveness issues which arise from our analysis and outline some of the essential requirements if Australia is to create a platform from which it can develop improved competitiveness through the use of materials accounting techniques.

The project leading to this report was contracted as a feasibility study under the *National Network Grants* scheme funded by the Department of Industry Science and Tourism. The study was proposed by the Cooperative Research Centre (CRC) for Waste Management and Pollution Control, on behalf of a large number of industry, government and research entities which constitute a voluntary Roundtable on Life Cycle issues. The Profit Foundation Pty Ltd conducted the project under contract to the CRC.

The aim of this report is to highlight the issues of competitiveness arising from the worldwide move towards materials accounting, and to outline for industry and government possible paths to respond to these moves. The analysis presented shows that a coordinated national response by industry and government is necessary. The report aims to trigger that response, and to engender commitment to creating an adequately resourced national coordinating mechanism that will help ensure Australia is able to capitalise on opportunities in trade, industrial cost reduction, environmental conflict management, and product marketing.

II About the LCA Roundtable

This project was supported by the LCA (life cycle analysis) Roundtable, a voluntary group of industry, government and research institution representatives. The roundtable was originally convened by the CRC for Waste Management and Pollution Control as a means for exchanging information between those with an active concern for life cycle issues.

The initial proposal was endorsed by a meeting consisting of the following members of the roundtable:

- Dimi Pesudovs, *PACIA*
- Brett Thomas, *Energetics Environmental*
- Deo Prasad, *CRC Renewables UNSW School of Architecture*
- Bill Lawson, *UNSW School of Architecture*
- John Pullen, *ALCOA Australia*
- Liz Quintan, *EPA NSW*
- James Petrie, *Sydney University Dept. of Chemical Engineering*
- Ron Wainberg, *CRC for Waste Mgt. & Pollution Control Ltd.*
- David Ho, *CSIRO*
- Andrew Doig, *Australian Industry Group*
- Gary Wood, *NSW Dept of Public Works & Services*
- Jamal Asian, *James Hardie Fibre Cement Technology*
- Karli L. James, *Victoria University Centre for Packaging, Transportation & Storage*
- Colin Arnold, *Pioneer International Ltd.*
- Peter Scaife, *BHP*
- Bob Richer, *Boral Building Products*
- Chris Ryan, *Centre for Design at RMIT*
- Val Brown, *University of Western Sydney.*

Reporting of the progress of this analysis, and discussions of issues, have taken place at two subsequent roundtable meetings.

III About the Consulting Team

The Profit Foundation Pty Limited has been in operation since 1982. It specialises in strategy development where the enterprise faces the risks associated with fast growth or rapid change. It is frequently involved in new technology commercialisation and the establishment of new enterprises. The Profit Foundation has conducted a large number of such projects for leading Australian and international corporations. In addition it has carried out feasibility studies and strategy development tasks for Australian governments and major corporates. The website address for the Profit Foundation is: www.profitfoundation.com

The leader of the consulting team is Paul Martin, a specialist in new enterprise strategies. In addition to his consulting activities, he is Visiting Fellow at the Australian Graduate School of Management, a member of the Pooled Development Funds Registration Board, and active in community affairs.

Dr Miriam Verbeek and Arthur Panos are the other members of the consulting team.

IV Voluntary Support

The project had the benefit of the active support of a number of voluntary participants. Particular mention needs to be made of the following, who provided substantial time and assistance:

- Leanne Philpott, formerly with the CRC for Waste Management and Pollution Control, who continued her involvement on a voluntary basis.
- Sven Lunde, Environmental Consultant, Germany.
- David Coutts, from the Australian Aluminium Council, who provided a great deal of facilitative support and access to information in Canberra.
- Peter Scaife, formerly of BHP, who provided active support for the project as well as valuable input.
- Kim Sweeny, from the Strategic Industry Research Foundation, who provided active support as well as access to information.
- Dimi Pesudovs, from the Plastics Industry Association, who provided guidance and support.
- Colin Arnold, from Pioneer International, who provided guidance and support.
- David Pinch and David Vernon, of Environment Australia, who provided advice and support.
- Michael Adams, of the Department of Foreign Affairs and Trade, who assisted with international assessments

A large number of other people gave freely of their time in developing our understanding of the issues.



Part 1

The Requirement for Materials Accounting

The aim of this first section is to explain what materials accounting is, its benefits to industry and its context within the wider implementation of ISO 14000 and the environmentally sustainable development (ESD) discussion

1.1 Introduction

Materials accounting methodologies are relatively new tools for analysing, from “cradle to grave” the use of materials in products and/or processes. They enable comparisons between different products and services, both across and within industries. Materials accounting has taken on international prominence because it has the potential to provide the data and the means to implement environmentally sound practices and resource use by industry, consumers and government. It has taken on international prominence because it is embedded in international standards (ISO 14000) which are becoming pivotal to industry operating standards, trade negotiations, preferred purchasing and eco-efficiency.

In this section of the report, we briefly explain what is materials accounting and how it relates to ISO 14000. The materials accounting methodology promoted by ISO 14000 is standardised by ISO 14040 (Life Cycle Assessment or LCA). We list a number of likely benefits that will accrue to companies through the implementation of ISO 14001 (the Environmental Management System standard). The benefits of ISO 14000 for companies parallel those benefits companies accrued from the implementation of ISO 9000. The substantial difference is that ISO 14000 has its focus on the environment (ISO 9000 had its focus on quality), and it incorporates LCA. The implementation of LCA methodology is, for some companies, a quantum shift.

1.2 Materials Accounting

Materials accounting techniques use a scientific methodology to objectively evaluate the physical resource effects of alternative courses of action. “Physical resources” are generally broken down into prime components, such as units of energy, water, land, carbon, oxygen, nitrogen, etc. They are also quantified, for the purposes of comparison. The particular resources counted, and the measures used, vary with different approaches.

Thus it is possible to compare “apples and oranges” by measuring quantities of prime components (materials) embedded in their creation and consumption. By placing relative values on the quantities of these prime components, it is possible to arrive at a relatively transparent comparative judgement about which is preferred (from the perspective of embedded materials). The way of assessing and measuring the bases of comparison also varies with the particular technique in use.

There are a number of major approaches to implementing materials accounting. These are described in attachment 2. There are, however, recurrent themes in the approaches (though the methods to address these themes vary markedly):

- “Cradle to grave” assessment: Objective materials accounting considers the entire cycle, from the original extraction of the physical resources, until the eventual return of physical resources to nature (whether in a beneficial or harmful form). All processes, including extraction, processing, consumption and return to nature, and all by-product activities, are encompassed.

Attachment
2

A Description
of Materials
Accounting
Techniques

ILLUSTRATION 1.1

International Case Study - ICI Paints and eco-labelling

It is not accidental that paint features substantially among those products that have sought ecolabelling as a means for product differentiation. Purchasing in the paint industry is particularly sensitive to environmental considerations, particularly in Europe (driven by both consumer preference and institutional preferred purchasing criteria) and the USA (where government-preferred purchasing arrangements frequently address the environmental “friendliness” of paints).

This has led some of the leading paint companies to embrace materials accounting techniques in conjunction with eco-labelling of their products. ICI paints has achieved the European Eco-label as part of its consumer marketing approach. The following quote from the company illustrates this commitment.

ICI Paints has been committed to reducing the environmental impact of its products for many years. Dulux quick drying Gloss is the first paint product in the UK to be awarded the EU Eco-label.

- Quantification of physical inputs and outputs: Selected inputs and outcomes of the various processes are converted to objective physical measures (viz litres of oxygen, nitrogen etc; hectares of land etc). This is the "inventory" of the materials.
- Scientific assessment of the interactions and outcomes: The interactions between these outcomes are calculated using algorithms which reflect processes in nature. Environmental processes, and the environmental consequences, vary from environment to environment. To be reliable for decision-making the algorithms should properly reflect the local context.
- Specification of values in impact assessment: The evaluation of impacts brings together the results of these algorithms, knowledge of the environment, and a stated set of values to create a preferences "weighting" for different outcomes.

An important aspect of materials accounting technology is that it has the dual aspects of directing the collection of data and providing a set of algorithms for the analysis of that data. The way the algorithms are structured is vital for answering questions of sustainability. Sustainability issues for Australia, Adelaide, Perth, Wagga Wagga, Taiwan, Singapore, Zurich, etc, are likely to differ markedly. An LCA applied without thought to the issue of regional diversity, or differential environmental pressures will provide inappropriate answers.

The challenge for materials accounting techniques, therefore, is not only in the collection and management of data, it is also in the *appropriate* analysis of that data. This challenge is one of the fundamental arguments for a coordinated response to the adoption of materials accounting techniques from Australian industry, government, consumers and the environmental movement.

1.3 Development of Materials Accounting Techniques

Materials accounting techniques have been developed in response to a worldwide move towards more environmentally sustainable development (ESD). They are an added tool in dealing with and assessing the environmental effects of industry.

The interest in ESD is reflected in international efforts to address environmental problems. These international efforts include: The Montreal Protocol; the environmental side agreements of the North American Free Trade Agreement; and the mandates resulting from the 1992 Earth Summit of the United National Conference on Environment and Development in Rio de Janeiro.

As well as these global efforts, national standards bodies have developed environmental management standards. These standards include: eco labelling; load-based licensing; recycling; pollution inventories; guide-books; and various materials accounting techniques. Materials accounting techniques often underpin other standards, enabling comparative analysis of materials. Many national governments have turned to materials accounting techniques to justify the requirements of environment legislation and procurement practices.¹

Dulux is introducing more environmentally responsible replacement products when they fully meet the performance standards expected by its customers.

In the meantime, Dulux offers water-based products that are near equivalent to each of its solvent-based products. Its objective is that by the end of the decade, traditional water-based paints will no longer be part of the Dulux product range. Dulux is also committed to reducing the waste from its factories — half the quantity of manufacturing waste by 2000.

Under the ISO 14003 standard, the sole basis for all eco-labelling will become Life Cycle Assessment under ISO 14040. The World Trade Organisation stresses international standards as the only legitimate basis for environmental preferred purchasing arrangements by governments (in the US and EC particularly). This means that eco-labelling under this standard will become increasingly important in competitiveness in the paint market.

¹ This will be discussed in greater detail below

For those involved in international trade, the proliferation of national environmental standards represented a potential impediment to free trade. There were challenges, under the General Agreement on Tariffs and Trade (GATT) that national environment standards were *de-facto* trade barriers.

There were calls from both government and industry for an international consensus approach on environmental standards. In August 1991, these calls resulted in the establishment by the International Standards Organisation (ISO) of a Strategic Advisory Group (SAGE). The task of SAGE was to assess the need for internal environmental management standards and to recommend an overall strategic plan for such standards. As a result of the assessment by SAGE, ISO formed Technical Committee #207 (TC-207) for environmental management standards. This committee produces the ISO 14000 series.

The role of International Standards as the technical foundation for the global market is recognised in the WTO Agreement on Technical Barriers to Trade (TBT). The TBT Agreement urges government to make the utmost use of international standards in order to prevent unnecessary trade barriers (Schwamm, 1997).

1.4 ISO 14000

The aim of ISO 14000 is to promote a common approach to environmental management, to enhance an organisation's ability to attain and measure environmental performance, and to facilitate trade and remove trade barriers. The TC-207, which promulgates these standards, comprises members from 47 countries and has an additional 13 countries as observers.

Figure 1.1 provides an overview of some of the categories of standards. The ISO 14001 standard is the key standard for an organisation to implement its environmental practices, while other ISO 14000 standards support this development and implementation by specifying tools, methods, techniques and guidelines for management system auditing, environmental performance evaluations, life cycle analysis, environmental aspects for product specifications and standards, environmental labelling, etc.

Briefly, the intent of the categories of the ISO 14000 series highlighted in Figure 1.1 are:

- Environmental Management Systems (EMS): There are two components to an EMS: A written program, which commits the company to producing the highest quality product with the lowest possible environmental impact and sets forth the procedures to be followed to achieve this goal; this program must incorporate relevant local and federal environmental regulations that apply to their specific facility; and an education and training program for employees to enable understanding and implementation of the written program.

ILLUSTRATION 1.2

International Case Study - Axel Springer Verlag AG, Heidelberg, Berlin, Germany (Lundi, 1998)

Springer Verlag is an international publishing company which employs approximately 12,500 people. In 1995, the company decided to improve its environmental credentials by introducing an Environmental Management System (EMS). The EMS contains the following guidelines:

- To put in place programs which would increase the sensitivity of readers, business partners and employees to environmental issues.
- To minimise the waste stream from Springer Verlag company and its suppliers' production processes and products.
- Use of eco-efficient technologies and substances in all company units.
- Avoid and decrease of environmental burdens by reducing energy and water consumption, emissions and waste.
- Publish an annual environmental report to record improvements and changes.

The company began implementation of its EMS by carrying out an LCA on its operation. Based on this analysis, a number of key areas were targeted for reform:

- Paper and ink: The most important raw material for the company is paper. The company

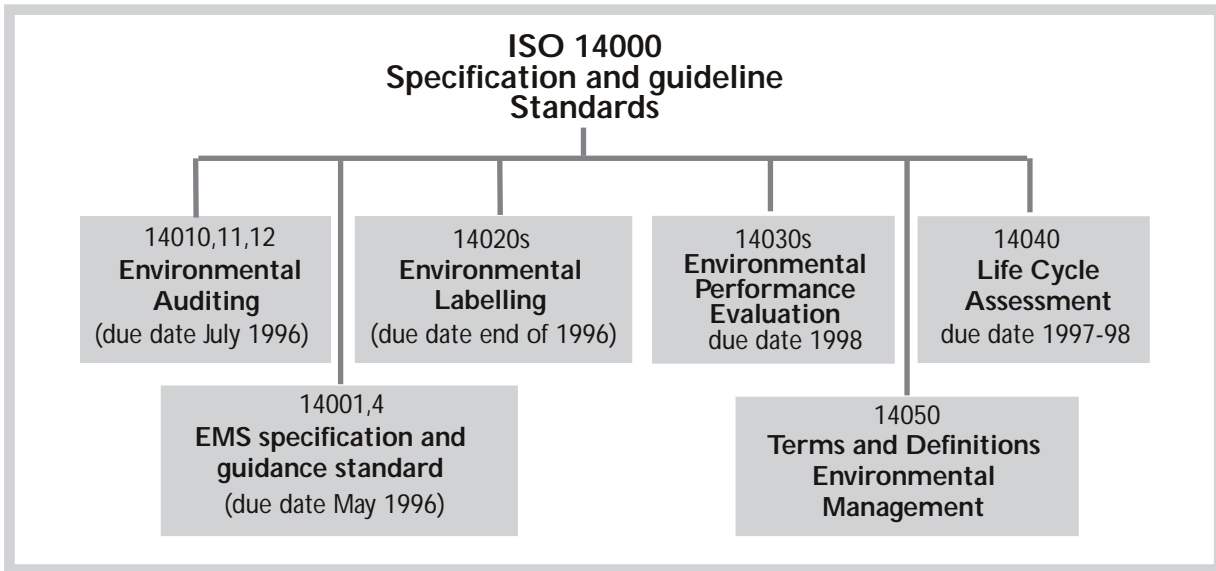


Figure 1.1: The ISO 14000 series

- **Environmental Auditing:** This commits the company to a routine evaluation of its environmental controls and must be conducted by an independent third party. It defines the inputs (raw materials, energy) and outputs (waste streams, emissions) for the system. Management must then set up a program for addressing inefficiencies within the system to be addressed.
- **Environmental Labelling:** This standard provides requirements for three types of labels: The “seal of approval” for products that meet specified requirements within a product class; single-claim labels for such things as recycled content, energy efficiency, etc.; and “environmental report card” labels that uses a life-cycle approach and permit comparison of the environmental effects of the manufacturing and use of products.

Environmental labelling is critically important in markets where environmental credentials are important to sales. Pulp and paper markets in Europe, USA and Japan are likely to feel the effects in the short to medium term. All products marketed to achieve added value as “clean and green” or environmentally friendly will be brought under this requirement. In Germany, for example, companies which want to sell copiers, fax machines, televisions and computers etc, need to pass the criteria for the German eco label, the Blue Angel Mark. Attachment 6 lists 190 Euro-label accredited products, taken from the European Eco-Label web site (<http://>

Attachment
6
Euro-label
accredited
products

introduced a “Forest Use Standard” for its suppliers, reduced the weight of paper and include approximately 66% recycled paper content. These actions save 1,400 tons of paper and 11 tons of aluminium per year.

Rather than disposing of coloured ink residues, the company uses the residues to make black or white ink, enabling approximately 13 tons of colour paint to be recycled, and, therefore, saving an equivalent to 65,000DM per year (an amortisation of the investment in about 1.4 years).

- **Water and waste water:** A new machine for waste water treatment reduced the amount of waste water by 80% (amortisation 4 years).
- **Energy use:** A new combined power-heat plant (1 MW electricity) which produced less emissions was installed in a Berlin factory. This plant reduced energy costs by approximately 850,000DM per year. The investment was approximately 5,000,000DM (amortisation of about six years).
- **Water treatment costs:** The cleaning of print machines was changed. Ultra-sound treatment is now used instead of detergent, reducing costs for purchase of detergent by 90%. In one plant in Hamburg, galvanic sludge is dried reducing the quantity of sludge by 50%. The investment was amortised over 2.4 years.

europa.eu.int/en/comm/dg11/ecolabel/index.htm), illustrating the sorts of product categories that are eco-labelled, and the types of international firms seeking this method of brand differentiation.

- Life Cycle Assessment: LCA is the chosen methodology for materials accounting within the ISO 14000 series. It defines the life cycle methodologies which are acceptable within the standard. In turn, these methodologies become the basis for any claim of compliance with the ISO 14000 standard in terms of trade, product environmental performance and comparative assessment or eco-labelling.

LCA reflects the common themes for materials accounting, but has some distinct elements:

- The Life Cycle Inventory (LCI) contains the source data on the materials inputs and outputs of the processes analysed. Typically this inventory is reflected as materials consumed (input) and produced (output) per relevant consumption unit (eg. land and energy, and carbon, oxygen, nitrogen etc. Per kilowatt in the case of electricity or per tonne in the case of metals). In an economy where there is a large number of organisations which have developed and refined materials inventory data, and where the exchange of information is facilitated, downstream processors in a supply chain can readily secure the data they need to conduct an LCA. In an economy where these conditions are not present, preparing an LCA can be a major fixed cost expenditure, falling disproportionately upon the SME sector.
- The output of the analysis is in the form of a LCI of the total materials inputs and outputs of the processes under investigation. The inventory itself is multi-factored and largely values free. The additional step, comparative evaluation, requires the imposition of weightings on these inventory data.
- Life Cycle Impact Assessment is the means whereby weightings (reflecting the values of the assessor) are applied to the data to provide a basis of comparison of the products or services in question.

ILLUSTRATION 1.3

International case study - US competitiveness and ISO 14000

Environmental regulatory costs have been estimated at between 3-8% of the US Gross National Product. It is widely believed in the US this places companies at a disadvantage as they compete against products from countries without such environmental regulatory burdens. ISO 14000 represents a way of ensuring US products are not required to compete with products of other countries, unless those competitors have incurred equivalent costs of similar high standards of environmental responsibility.

For many US corporates, the issue of ISO 14000 is significantly a trade issue, even more than an environmental concern. Australian industry has not focused on this potential impact on their international markets.

The expected impact

Health, environment and safety officials at 115 North American companies were surveyed by Arthur D. Little Inc. (Hofman, p38) about how ISO 14001 would affect them.

- 62% predicted ISO 14001 certification would be important to their business.
- 86% said it was important their environmental management systems be at least equivalent to the ISO 14001 standard.
- 61% said meeting the standard could offer a potential competitive advantage.
- 70% said ISO 14001 could be important in letting them demonstrate environmental, health and safety due diligence.
- 8% said not meeting the standard could possibly mean a non-tariff trade barrier.
- 35% said that meeting the standard could possibly improve the quality of environmental performance or reduce environmental management costs.



A fuller description of the approach is contained in Attachments 4 and 5.

- Terms and Definitions: These standards serve to define the environmental terms to promote understanding and interpretation.

The ISO 14000 standards are designed to apply to all businesses and industries, large and small, including service industry. Businesses serving an international market, either directly or indirectly, will be the first to be affected by the international adoption of ISO 14000, most notably with the adoption of ISO 14040 and the related eco-labelling.

The number of companies registering to the ISO 14001 Environmental Management System (EMS) Standard continues to grow, particularly in the electronics, semiconductor, and chemical supplier industries. Asian and European companies continue to take the lead on registering to ISO 14001. US companies with customers in Europe, Asia, and the UK are seeing increased customer and competitive pressures to register to the ISO 14001 standard. Examples of companies which are now requiring suppliers to implement EMS are¹:

- AEG Hayshaltsgerate GmbH, Nurnberg
- Axel Springer Verlag, Heidelberg
- Deutsche Lufthansa AG, Hamburg
- Deutsche Telekom, Darmstadt
- Mitsubishi Semiconductor Europe, Alsdorf
- Siemens AG, Munchen
- Sony Europe, Fellbach
- Toshiba Europe, Neuss
- AT&T, New York
- IBM
- 3M
- Toyota Motor Corp., Toyota City
- Georgia-Pacific Corp., Atlanta
- Motorola Inc., Schaumburg
- Volvo Inc., Gothenburg
- Texas Instruments Inc., Dallas.

Legislators, particularly in the UK and USA, are assessing the value of certification in improving the effectiveness in monitoring industries (Goodman, 1998). In the conduct of this study it became clear an increasing number of powerful international firms have decided the type of cultural realignment brought about by the implementation of ISO 14000 is fundamental to their success. We have featured some of these companies in this report.

As well as major international companies, standards organisations in several countries adopted the draft ISO 14001 standard as their national standard. The BS 7750 standard was published in 1992, and is considered the blueprint for the ISO 14001. Some 17 certification bodies are registering companies to BS 7750 in the UK, Japan, the Netherlands, Korea, and Brazil.

The growing demand for accreditation is a reflection of the expectation of industry that such accreditation will assist them to compete in their targeted markets, and give them a bargaining advantage over uncertified competitors.

Attachment
4

Life Cycle
Assessment,
methodology
and issues

Attachment
5

Life Cycle
conceptual
example

¹ BVQI, a company carrying out environmental management systems registrations, have registered more than 500 companies worldwide to ISO 14000.

1.5 The Benefits of ISO 14000

There are a number of benefits to organisations for adopting ISO 14000. These include (Goodman, 1998):

- Environmental Liability: the standard can be the foundation of an internal risk control programme. Stricter environmental legislation, coupled with heightened awareness about environmental liabilities, is increased interest in legal, financial and commercial risks associated with environmental performance¹.
- Reduced Costs/Increased Profit: A properly designed EMS can trigger changes that reduce the total cost of a product or improve its value. Such improvements allow companies to use inputs more productively – from raw materials, to energy, to labour – offsetting the costs of reducing environmental impact².
- Management of Change in Supply: Implementation of an EMS encourages checking whether suppliers will be able to supply products in the long-term that meet changes brought about by consumer and regulatory ESD pressures. As well, it causes them to focus on their materials use improvement.
- Improved Image: With increasing awareness of environmental issues, it is becoming more likely that environmental credentials will play a part in customer loyalty. Environmental aspects are now commonly being incorporated in labelling and packaging.
- Employee Motivation: The implementation of an EMS in an organisation is symbolic of caring for the environment and can lead to improved employee morale and motivation, with its flow-on economic benefits.

Joseph Cascio, chair of the US Technical Advisory Group (TAG) working on the ISO 14000 standards stated (Hemenway & Hale, p28):

People don't understand that the ISO 14000 standards are a revolutionary thing. You have to bring all your employees into the picture and get them all trained and educated on environmental consequences and you have to get them to think in terms of environmental impacts.

1.6 ISO 14000 and ISO 9000

The early elements in the ISO 14000 series, (14001-14003) share characteristics with the ISO 9000 series. In the main the systems to be used by individual enterprises are self developed, and self administered, under the umbrella of process guidelines and audit requirements. However, the ISO 14000 series takes on significantly different characteristics with the later elements focused on comparative assessment of environmental impacts. This is most notable in relation to ISO 14040 (LCA) and the related eco-labelling standards.

Implicit in ISO 14040 is the recognition that comparative assessment across products and processes requires common methodologies and comparative data across organisations. It also calls on detailed data. Comparative methodology and reliable detailed data requirements have a flow-on effect that is materially different to the ISO 9000 series:

- The objective technical comparison characteristic creates an inevitable shift from self developed and self administered processes, to externally specified methodologies, with obligatory compliance.
- A shift in the orientation of ISO standards from a company by company, process management

¹ *At the Climate Change Conference in Geneva, at the 1997 conference in the UK devoted to Environmental Insurance, and at the 1997 Kyoto Climate Change Conference, insurers were present in large numbers to encourage actions to reduce the effects of global warming. Limited numbers of insurers offer "environmental impairment" policies and there tend to be exclusions and conditions attached. With a good EMS in place, many potential environmental incidents or accidents (which may not be covered by insurance) can be avoided.*

² *Porter and van der Linde (1997) studied major process changes at 10 manufacturers of printed circuit boards. They found that environmental personnel initiated 13 of 33 major changes. Of the 13 changes, 12 resulted in cost reductions, eight in quality improvements and five in extension of production capabilities.*

focus, to company to company comparisons, and country to country negotiations about the processes and procedures in applying sustainability-focused trade discrimination rules.

- As methodology and data reliability become more significant in competition between enterprises and in trade negotiations, there will be a significant increase in technical disputation over data and methodologies, with major impacts for individual enterprises following. The contestability of data and methodology has the potential to become a self sustaining driver of improvement in the quality of that data and those methodologies.
- Meeting the data requirements for a credible LCA requires cooperation vertically in industry supply chains (it is essential to obtain detailed, often confidential information from input suppliers for a downstream input user to prepare their materials inventory); and horizontally across an industry (to allow identification of the typical, rather than firm specific or idiosyncratic materials characteristics of inputs). Without high levels of trust and cooperation within industries, the capacity to properly harness ISO 14000 for competitive advantage will be seriously hampered.
- The collection of the required data, and the development of the algorithms and models for the application of LCA, have significant fixed cost characteristics. The flow-on effects on smaller organisations will be disproportionate. The flow-on effects will also be disproportionate in those economies where there are weak coordinating mechanisms within industries and enterprises.
- The use of objectively comparable data and methodologies to assess environmental consequences will further engage environmental and consumer interests in better informed debates with enterprises and government. The quality of the information will become of increasing importance as a result.
- The use of LCA data and methodologies in contests between enterprises and between countries on trade barriers, and in environmental or consumer debates, will have flow-on effects. As LCA becomes a field for environmental and resource use contests, there will be a strong incentive for organisations which feel they may be disadvantaged by having inaccurate data about their products and processes to strive to improve the quality and credibility of their data.

ILLUSTRATION 1.4

Australian Case study - Whole of life design

MEC-Kambook (Axis Kettle), Schiavello Commercial Interiors (HOTdesk™), Southcorp Whitegoods (Dishlex Global Dishwasher), Blackmores (Waste Conscious Packaging), Imaging Technologies (SwapShop™) and NIDA Group (EcoVend), Email, and Caroma have all been participants in the Australian EcoReDesign™ Program, jointly funded by the Australian Department of the Environment and the Australian Research Council. The focus was to build the capacity of the Australian manufacturing sector to secure a position in the emerging market for ecologically well designed products.

The National Centre for Design at RMIT led the development of this approach, in collaboration with Australian manufacturers which agreed to commit to a major redesign of existing products, and to reduce total life-cycle environmental impact. The corporate investment exceeded \$15 million.

The program reflected the realisation of consumer concern for new standards for environmental performance and environmental management. In the more ecologically focused countries (notably in Northern Europe) environment policies are emerging as an important design factor. Such policies include resource taxes and other means to ensure manufacturers take responsibility for the ultimate disposal of their products.

Eco design involves a shift from stopping waste leaving the system, to designing systems which do not produce waste. A materials lifecycle perspective includes the entire system from extraction and processing through to the disposal phase, the aim being to minimise all adverse environmental effects.

A phase two new program which began in 1997, has the support of the Energy Research and Development Corporation, the Australian Industry Group, the Packaging Council of Australia and the Australian Electrical and Electronic Manufacturers Association.

- LCA may become a basis for separating values from materials data, in the evaluation of products, projects and processes. The benefits from using a scientific process, with reliable industry – supplied and controlled data, married with a methodology that unbundles judgement values from technical data, could be substantial in legal environment contests and impact assessments, comparative purchasing, and a host of other areas not directly targeted by ISO 14000.

1.7 Broader applications of LCA

LCA is potentially critical to Australian trade. For enterprises comprising part of an international supply chain, ISO accreditation may be vital to securing sales. However, it offers much more than this defensive advantage.

For the major international firms which have adopted LCA, the key to its adoption is the opportunity to secure economic advantage over competitors through pursuing four significant benefits.

ILLUSTRATION 1.5

International Case Study - Volvo (I)¹

Volvo's environmental policy states in part:

Industrial activities and transportation not only require capital investment, raw materials and labour – they also consume environmental resources...Volvo's activities in the transport sector are such that its production processes, as well as its products, demand environmental resources.. Effective environmental programmes... provide a basis for long-term profitability and satisfactory economic growth.

Volvo's environmental policy represents one of Volvo's three core values (Safety, Quality and Environment):

Volvo pledges to minimise the environmental impact of its operations by:

- adopting a holistic approach to the environmental impacts of its products
- developing and marketing products which possess the most favourable environmental properties and which meet the highest possible efficiency standards
- adopting production processes which are as environmentally sound as possible
- specifying environmentally sound, recyclable materials in the development and manufacture of its products
- working to develop efficient transport systems having minimum environmental impact
- seeking to ensure that its production processes and products comply with comparable environmental standards, wherever in the world the company operates
- seeking to ensure that a similar degree of environmental concern is exercised by its working partners
- pursuing and participating in research and development activities in the environmental field
- providing information on the environmental impact of its operations in an open and factual way

Volvo's environmental management system (Figure i1.5.1) exceeds environmental standards that may be applied in any of the countries in which it operates.

All majority-owned production plants have undergone environmental audits and all major units have environmental coordinators. Environmental coordinators direct and evaluate environmental programmes at the local level. Volvo set specific environmental goals each year and reviews its performance in a comprehensive annual environmental report, widely available to employees, suppliers and the public.

The use of materials accounting by Volvo

Life-cycle assessment (LCA) is used to determine where environmental impact is greatest and the

1. "Rational contestability" between alternatives

- A common basis for comparisons
- Transparency of embedded values, data and calculation
- Amenability to independent verification of process quality

This could be reflected in more scientifically rigorous dealings with alternatives by industry, the courts and government. The greater objectivity in the measures, and the separation of values from tangible impacts, will aid in distinguishing the politics from the science.

2. Value engineering tools

- Exposing materials and energy consumption
- Highlighting major opportunities for rationalisation
- Potential for maximising reuse, or just minimising resource use by industry co-location

corrective measures which should receive priority. The technique is also used to evaluate production processes and recycling.

The method Volvo has utilised most widely to date is EPS (Environmental Priority Strategies in product design).

This method is the result of collaboration with the Swedish Environmental Research Institute and the Federation of Swedish Industries. It enables the total life cycle impact of a product, from raw materials extraction, through manufacture and use, to waste disposal, to be calculated. Results are expressed in terms of an ELU (Environmental Load Unit) determined by the manner in which the following five areas are affected: Health (as per WHO standards); biological diversity; biological production (foods, forests, etc.); natural resources (land use, as well as metals, oil, coal etc., valued according to their availability/scarcity); aesthetic values.

Following are examples of the type of data EPS has provided.

Examples of data provided by EPS

The Motor Car: Analysis performed with the aid of EPS indicate that everyday use of cars accounts for by far the highest proportion (80 to 96% of the ELUs) of the environmental impact. The proportion changes dramatically when fossil fuels are replaced by renewable alternatives. For example when biogas is substituted for diesel oil, ELUs of everyday use changes from approximately 80% to 40%.

- **Tyres:** Is it preferable to retread worn tyres or burn them? Tyres account for just over 5% of the total environmental loading of a car with a life equivalent of 250,000 kilometres. Retreading is a better alternative, reducing the environmental loading of tyres on ELU of cars by 10%.
- **Glass:** EPS analysis shows a major part of the ELU on a car is accounted for by the glass it contains. EPS analysis further shows the use of tungsten instead of silver for heating wires would cut ELU during production to just a tenth, while the use of recycled glass could cut CO₂ emissions from glass manufacture by approximately 35%. Volvo is seeking patents for a car windscreen recovery system developed by the company as a result of this work.
- **ECT and ECB design:** The EPS method was used in the development of Volvo's high profile projects to develop an Environmental Concept Truck and an Environmental Concept Bus to meet the needs of cities.

Integrating life-cycle assessment in Volvo's product and process development activities has not been easy. The resources required for training and information programmes have proved to be greater than envisaged. Nevertheless, Volvo has persisted. Volvo aims to integrate LCA into 10 major product development projects by the end of 1998. Already the use of LCA has significantly effected the direction of funding priorities within the company.

¹ The information used to compile this case study derives from Volvo's environmental reports (1995 and 1996), Volvo ECT 1995, Volvo ECB 1995, information on Volvo Group's web site on 6/7/98, and direct enquiry.

This could be reflected in increased profits, and enhanced consumer benefits.

3. Trade benefits

- Either in a positive or a defensive mode, the capacity to deal effectively with ISO 14000
- A mechanism for credible environmental labelling
- A mechanism for consumer education

Used effectively, LCA could provide Australian industry with a tool to increase its market share in overseas and domestic markets, and with industrial purchasers which adopt an ISO 14000 approach, and in sectors where marketing claims of ecological responsibility are significant.

4. Community resource management

- Increased objectivity and transparency in environmental debates
- Improved state of environment reporting
- Facilitation of integrated data collection and analysis

Governments rely on the collection and analysis of information from industry, in order to make policy decisions about environment and industry. LCA has the potential to provide a sound basis for the formulation of regulation. Such information is also significant in community education and reporting, and in country to country and other international negotiations. The existence of a well developed LCA database could alleviate collection and analysis requirements. It would also reduce the compliance complexity for industry if a common framework useful for management decisions and marketing positioning could be simultaneously used for government reporting.

Not only the quality of the individual decisions, but also the quality of community education and involvement, can be enhanced by the proper use of this technique.

ILLUSTRATION 1.5 (cont'd)

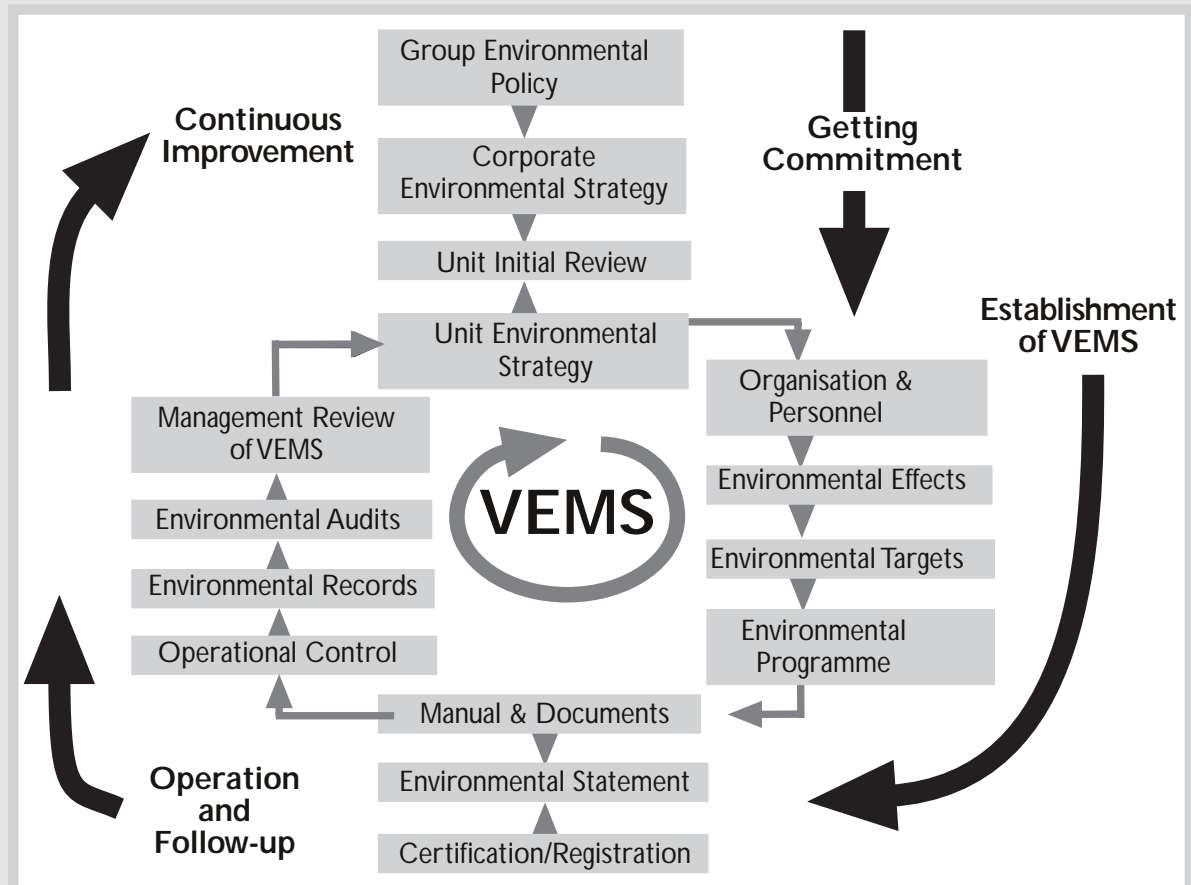


Figure il.5.1: The components of VEMS and the process for continual improvement

1.8 Conclusion

Materials accounting techniques are proving to be a significant tool for industry, government, and the environmental movement. They have the potential to improve debate on sustainable resource use. Many companies have begun to implement materials accounting techniques to understand and analyse their own resource use – to reap the benefits of more efficient and effective resource use. Governments are using materials accounting techniques to justify procurement and legislative decisions. The environmental debate has galvanised international organisations such as WTO and ISO into grappling with issues of sustainable use. Their adoption of LCA has given further prominence to the methodology.

Part two of this report elaborates on the strategic issues for Australian industry and government noted in part one. It argues the case for a coordinated response for the adoption of materials accounting methodologies by Australian industry. It also discusses how other countries have responded to the materials accounting challenge and the lessons Australian industry and government might learn.



Part 2

Strategic Issues for

Industry and Government

The aim of this second section is to highlight what is happening in the international and local arena, and the implications of this for Australian industry and government. A number of case studies are used to illustrate the issues for Australia.

2.1 Introduction

The fundamental question in determining what, if anything, ought be done by Australian industry and government to improve Australia's materials accounting capabilities, is whether doing so will materially impact on the competitiveness of Australian industry, particularly small and medium enterprise (SME). This section of the report is intended to provides the framework for answering that question.

This report highlights three reasons why Australian industry and government should take action:

1. Current international moves towards the adoption of ISO 14000 and, in particularly, materials accounting which might act as trade barriers for Australian goods;
2. The need to respond to community demands for environmentally sustainable development and;
3. The likely costs to Australian industry and government of responding too late.

We have discussed these issues under separate headings, but they are all related.

ILLUSTRATION 2.1

Time lags and tendering costs for SMEs

What happens if a major contract comes up in the many US or European jurisdictions with a materials accounting linked preferred purchasing program? or if a significant multinational like the many cited in this report prescribes such information as a purchasing prerequisite? What will happen when a small Australian supplier is suddenly faced with a requirement to provide materials accounting data, or provide an ISO 14040 certification?

Unpreparedness is not just a simple data and analysis difficulty. The strategic issues include competitive positioning, response timing and contract negotiation. The following diagram (Figure: Critical Gap) sketches the scenario for a SME faced with an unexpected requirement for data which complies with ISO 14040, or other similar materials accounting techniques.

Such a situation may arise by virtue of a number of external factors including:

- an industrial customer calling supply tenders with ISO 14040 compliance (or at least inventory data provision) as a prerequisite;
- the demand by a distributor for such information, for the purposes of eco-labelling or comparative evaluation;
- a mainstream purchaser such as an international government department requiring such information as part of a tender process;
- the emergence of an environmental contest in international trade.

The competitiveness issue is time – the gap between minimum response time with industry preparedness and readily accessible LCA resources, and the minimum response time when these resources are not in place. The critical gap is defined by the difference between three months (given national preparedness) and 18 months (given no preparedness). If a SME were facing such a demand today, the 18-month scenario is virtually inevitable in Australia. Should Australia have in place an effective national program this would fall to approximately three months or less.

The "risk loop" in the diagram represents the risk that the SME's first attempt to comply with such a demand will not produce an acceptable result, and they will be forced to repeat some or all of the data capture and analysis processes and to undergo fresh accreditation processes. This would add many months to the time line.

The major potential sources of this risk are:

- the possibility, particularly in relation to bilateral trade agreements and international ISO 14040 certification, that the first used approach will not satisfy certification standards;
- the possibility that algorithms imported from other jurisdictions (with different environmental issue and characteristics) will create a disadvantageous comparison for the Australian supplier;

2.2 LCA and ISO 14000 as a Trade Barrier

The impact on trade of efforts to occasion environmentally sustainable development (ESD) has thus far been indirect rather than direct. Consumers and government agencies are striving to build into their consumption patterns an awareness of environmental issues. There is also a general push for encouraging environmentally friendly products and services. Those organisations able demonstrably to meet these aspirations are likely to have a competitive edge. That, at least, is the perception of a growing number of major international corporations.

Whilst ISO 14000 is ostensibly a voluntary code, for the less advanced economies, it could act as a trade barrier. Lack of ISO accreditation may significantly reduce the capacity of these economies to sell into Japan, the USA and Europe. Our research shows that many believe that time bilateral trade arrangements between the USA, the EEC and emerging Asian economies will require those Asian economies to enforce the ISO 14000 standards.

- the potential that a non-accredited and inexperienced service provider will fail to deliver to the required level; or
- that the required materials inventory data will be unavailable when required (adding further delay).

Bargaining issues compound these risks of unpreparedness. Should the SME take a defensive stance in relation to Life Cycle Assessment requirement, this has the potential to impact on the bargaining relationship between the supplier and the purchaser. It opens up the possibility of being excluded from the opportunity, or having to make price and terms concessions in order to overcome this initial hurdle.

The net result of all of these impacts of national unpreparedness is serious competitive disadvantage.

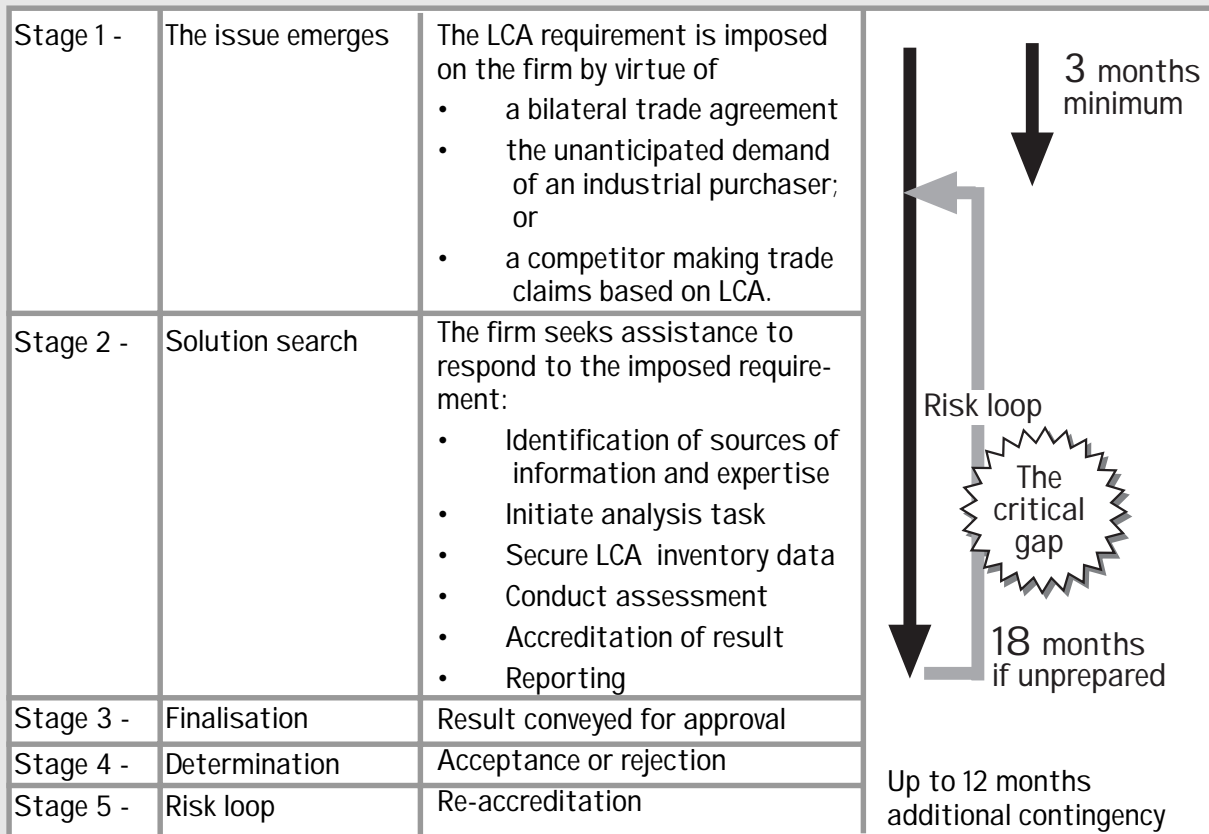


Figure i 2.1.1: Critical Gap – The Problem of unpreparedness: Estimated timings under current Australian conditions

The potential barriers to free-flow of world trade, therefore, come from two sources: Corporations which have adopted EMS; and countries, or blocks of countries, which have introduced purchasing preferences akin to ISO 14000 principles. EU eco-labelling and other eco-labelling schemes have been cited (particularly by some developing countries) as restricting trade. Our interpretation of the World Trade Organisation dialogue on this issue is that provided purchasing and trade preferences are imposed on the basis of credible international standards (notably ISO 14000), they are likely to be acceptable. Those trade or purchasing barriers that are idiosyncratic are more likely to be seen as infringing WTO free trade arrangements.

Many countries are gearing up to meet the challenge posed by environmentally linked trade requirements. China, for instance, is attempting to protect its increasing foreign trade revenue by directing Chinese industries to become ISO 14000 certified. It is also increasing its understanding and enforcement of environmental regulations. Europe's Eastern Block countries, acknowledging both the trend for increasing environmental responsibility but, especially, forced by the requirements of the EU standards for production and services, are similarly taking action to increase their knowledge and application of technologies for meeting the challenges of producing sustainable products.

In an effort to forestall detrimental trade effects of environmentally sustainable criteria on nations ill equipped to implement such criteria, forums are debating such issues before they become major stumbling blocks. These include the OECD (Organisation for Economic Cooperation and Development), UNCTAD (United Nations Conference on Trade and Development), the UNEP (the United Nations Environment Programme), and the WTO (World Trade Organisation). Discussions in these forums try to balance the pressure for increased environmental controls with the objective of decreasing trade barriers between countries.

The outcome from the 1997 Regional Meeting of Experts on the Interrelationship between Trade and Environment held in Bangkok provides an example of the typical outcomes from trade and environment forums. Recommendations centred on co-operation for the adoption of environmentally friendly technologies, sustainable utilisation of ecosystems, transparency in eco-labelling schemes, and coordination of efforts to build environmental management systems in the region. There appears to be general acceptance of the need for greater environmental safeguards, but at the same time, a call for substantial help to find and collate the data and introduce the technologies that will enable adherence to stricter environmental safeguards.

These forums, however, can only partially address the threats to trade for countries where industry is not seriously addressing the need for environmentally sustainable practices. Multinational companies can draw to some extent on their multinational experience to keep them in the forefront of developments. However, even multinationals will be unable to exploit the full potential for engaging in foreign trade if they do not have a pool of regional data from which to make appropriate materials accounting assessments. SME, which do not have depth of international exposure and "deep pockets", are likely to feel the greatest impact for international requirements. Coordinated industry and research organisation efforts, facilitated by government, is essential. This has been the realisation in the Nordic countries, Germany, Britain, Japan, the US, and China. It is a realisation which is dawning on some of the Asian countries and some of the Central European countries as they develop the trade strategies that will be necessary for them to maintain significant trade revenues from the developed economies that are already committed to this path.

Australia argued in relation to Greenhouse gases at Kyoto in 1997, that its situation is not directly comparable to that in the northern developed economies. Our resource structures, and our natural environment, are quite different. However appealing such an argument may be to our national self interest, it is one that will fall into discredit if the materials accounting inventories and algorithms used in Europe, Japan and America are the ones that are embedded in the LCAs Australian industries have to apply. If the 'objective' tools of comparative assessment reflect a fundamentally different set of ecological values to those that are important in our environment, then the results of the application of these tools must provide misleading conclusions on environmental impacts. Unless Australia is able to develop the inventories, the algorithms and models, and the impact assessment techniques, appropriate to its unique environment, it will be forced into an increasingly defensive stance.

Australia has a choice now between being placed with the unprepared or with the prepared world economies. Australia's capacity to harness Life Cycle Assessment and other materials accounting techniques is the heart of whether it will win or lose through the adoption of ISO 14000 as an international standard.

2.3 International Activity on ISO 14000 and Materials Accounting

In preparing this report, we collated data from a number of sources regarding the international scene¹. A country by country analysis shows a wide variance in the response of countries to ISO 14000 and materials accounting. We provide a summary of activities in 25 countries in Attachment 3. What follows below is a discussion of those findings.

While recognising overlaps in effort, we separately discuss the efforts of the different stakeholders in relation to materials accounting and ISO 14000. These stakeholders are government, industry, and a catchall "other initiatives".

2.3.1 Government

A question we began with was whether any governments had taken the step of enforcing compliance with ISO 14000 or LCA. Such a move would potentially pose the most direct threat to the flow of Australian goods not adequately safeguarded by compliance. We found that no government has passed legislation to force use of LCA, or mandated the use of ISO 14000. The exception to this is the growing practice of embedding ISO 14000 or similar compliance in government purchasing requirements. This now is being widely seen as within World Trade Organisation (WTO) guidelines on acceptable discriminations in trade.

The more usual role for governments is to establish or participate in programs to encourage the use of materials accounting techniques, or "environmentally friendly" production methods, of which materials accounting techniques (including LCA) are a part. This is the case in the Nordic countries and in Japan (where an industry program, apparently with mandatory participation, is in operation). This is also the case in the US where the move to develop means for assessing "cradle to grave" impacts of products and services, was initiated in the early 1990's. A major motivation in the US was to control the proliferation of local and national environmental standards. In Germany, the government was obliged to justify

Attachment
3

Summary of
Activities
related to
Materials
Accounting
and ISO 14000
in 25 countries



Figure 2.2: LCA hotspots around the world.

¹ References used for collating this material are: Hanssen (1998), DFAT (1998), OECD 1998, IMAS project questionnaire results, Hand (1997), and provided interview data.

preferences for certain recycling processes and did so with the aid of LCA. While Germany does not directly include punitive measures based solely on LCA, there are many disadvantages for producing goods and services which do not adhere to standards that derive from LCA methodology.

Concurrent with a general interest in LCA is the increasing interest within the OECD in encouraging "green" public purchasing. Public sector purchasing accounts for between 5-15% of GDP in OECD countries. Given the environmental effects of government operations are being increasingly scrutinised, public authorities are seeking ways of improving their "environmentally friendly" credentials. A number of authorities are already using ISO 14001 certification as a criteria for screening products and services and using LCA data to inform that purchasing.

Governments have been proactive by setting in train longer-term initiatives. In the US, several federal agencies have set up units to advance development of LCA tools and knowledge throughout industry. Local and state governments provide incentives for industries to adopt materials and energy accounting. Canada has started to develop databases to provide life cycle inventory of inputs and outputs. The database is focused on the five major materials sectors of the economy: Aluminium; glass; steel; plastics and dimensional lumber. Contribution to the database is voluntary. The hope is to have the database completed by 1999. In Denmark, LCAs are a key part of the Government's environmental policies. The Government cooperates with industry to develop LCA tools, provides grants for companies to conduct their own LCAs and provides a computer model to conduct the LCA. DFG (German Research Association) is funding a long-term research project on "resource-oriented overall analysis of material flows for metallic raw materials" and works through its environment ministries and relevant companies to develop standards based on ISO.

For many governments in South East Asia and the Eastern Block countries, LCA and ISO 14000 in general has not been a significant issue, given difficult social and economic climates. That is not to say that LCA and ISO 14000 have been ignored totally in the regions. Where governments have attended to the

ILLUSTRATION 2.2

The greening of public purchasing

The joint session of Trade and Environment Experts of the OECD in May 1998 discussed the use of government purchasing mechanisms to enhance the ecological performance of government, and to encourage the development of environmental responsibility in industry. That session highlighted some of the many approaches that are being implemented internationally.

Local government in France has established a network to exchange information and to develop greener purchasing initiatives (the "Eco Maires" initiative).

In Switzerland, a number of ad-hoc groups have been established to a similar end. Since 1981 a group chaired by the Swiss Federal Buildings Office has been providing greener purchasing information to all federal departments. Eco-efficiency issues have been canvassed for products and processes including paints, thermal insulation materials, green roofs, ecological assessment approaches and environment management practices.

The Danish government has in place a national program for sustainable public procurement, which covers all public purchasing, with particular emphasis on office plant and furniture, paper, cleaning agents, paint, lighting, organically grown foods, transportation equipment and cabling.

In June 1995 the Japanese government adopted an Action Plan on Greening Government Operations, which sets reduction targets to be achieved across all of government, in virgin pulp and paper, energy, water, waste volume, air and water pollutants, and construction waste. These targets are transformed into specific management programs for such things as recycling, energy and water conservation, pollution prevention and treatment and the like.

In the US a number of programs exist at all levels of government. For example:

- The EPA under the 1976 "Buy Recycled" program requires affirmative purchasing policies to be implemented by government departments in areas as diverse as paper, engine coolants, retread tyres, traffic cones, compost, toner cartridges, and plastic bags.

issue, they have worked with research organisations and industry bodies, to enhance understanding of LCA in government and industry. In some cases, such as Taiwan and Korea, they are working towards developing tools that would be helpful to industry such as the development of an inventory data bank.

2.3.2 Industry

Industry initiatives and industry awareness varies widely from country to country. For many companies using LCA in the US, in Japan, Denmark, Sweden and Norway, the major motivation is to increase internal production and environmental efficiencies, and in developing new products and services. In the US, Denmark, Sweden and Japan, industry awareness is high amongst the larger companies which have been the major leaders in promoting the LCA tool. There have been more than 300 relatively comprehensive LCA studies carried out in the Nordic region during the last 3-5 years. There is also a deal of activity by industry associations which, together with research organisations, help collate data and disseminate information.

Large, multinational companies appear to be poised to reap the major benefits from LCA and ISO 14000 generally, strengthening their competitive edge and political bargaining strength through a technology that most SMEs find too complex and expensive to implement (see for example the Aluminium Industry Case Study). This is less likely to be the case where government, industry associations and research/education organisations have had a long-term exposure to the issues leading to effective dissemination of information and training among the SMEs. From countries where LCA and ISO 14000 issues have not been focused upon, there are concerns about its possible impact on trade as a non-tariff trade barrier, of its implementation costs, and its complexity as a management technology. Data from these countries also indicate that those organisations which are engaged in using materials accounting are the multinationals and the most powerful industries, potentially increasing their already dominant position on world trade and domestic commerce.

- Under a Presidential Executive Order, an "Environmentally Preferable Purchasing Program" has been initiated. This looks at purchasing from a life cycle perspective. Supplies which have been evaluated to date include cleaning products, construction materials, latex wall paints and computers. Many states are reported to have adopted the Presidential Executive Order for their purchasing.
- An example of a state program is the "Environmentally Preferable Products Program" of Massachusetts. This program has both a responsible purchasing, and an industry development, rationale. State wide preferred purchaser arrangements are put in place. Suppliers are listed as environmentally preferable after evaluation of the environmental credentials of their products. Buying departments are able to buy off this preferred list without going to open tender, saving substantial administrative effort. Departments may require materials inventory and life cycle impact assessment data as part of the tendering process, even if such issues are not part of the current specification. This allows the creation of life cycle data for future reference.

Life Cycle analyses have been incorporated into the government purchasing structures of Switzerland and Denmark. In the UK the focus has been on whole of life economic costing (but with an approach incorporating materials accounting).

A number of jurisdictions have sponsored the development of eco-labels to provide meaningful materials accounting information to government purchasers, as well as to consumers. These countries include Austria, Canada, Czech Republic, France, Germany, Korea, the Netherlands, Sweden, Norway, Finland, and Japan. Other programs are under development.

The World Trade negotiations on preferred purchasing programs and trade barriers are still underway. The observable pattern of development is towards legitimising those preferred purchasing programs based on the compliance with objective environmental standards such as the ISO 14000 series. This will make the application of LCA under ISO 14040 mandatory for many enterprises seeking to supply to governments that operate preferred purchasing arrangements.

2.3.3 Other initiatives

The effect of organisations such as environmental groups, roundtables with participants from a range of sectors, specialists standards groups, and the like is also significant on a world-wide scale. The best known of these is probably SETAC (Society of Environmental Toxicology and Chemistry), which operates out of the US, has affiliates in Canada, Europe and Australia and has an advisory group dedicated to advance LCA knowledge. ASTM (The American Society for Testing and Materials) is another active North-American NGO developing LCA standards in conjunction with CSA (The Canadian Standards Association). In Canada, a roundtable is developing eco-efficiency indicators intended to quantify and document how the private sector could track efficiencies. In Japan, JCLA (the Life Cycle Assessment Society of Japan) has an ongoing role in recommending and reporting to government and industry on the application and advancement of LCA. In Denmark the government has collaborated with public and private organisations to develop UMIP (a tool for conducting LCAs in Denmark).

2.3.4 Conclusion

Major players in the implementation of ISO 14000 are multinational companies, governments and NGOs in the more developed world, particularly in northern Europe and America. Governments and industry in these countries are embracing ISO 14000 as a means for addressing environmental concerns and increasing their competitive advantage. The view of ISO 14000 in less developed countries is less positive. ISO 14000 is often seen as a costly imposition by the more developed world and one that will disadvantage trade products and services from these countries.

France, Italy and Australia line up with countries in South East Asia and the Eastern Block as being potentially ill-prepared for a time when the more insidious effects of ISO 14000 effects will be felt. These effects are less likely to come as a result of direct regulations or trade bans on products and services. The effects are likely to emerge through the greater expertise and experience possessed by certain countries and companies to address environmental concerns that are becoming an increasing concern of the international community.

ILLUSTRATION 2.3

Aluminium industry

Over the past five years, the aluminium industry worldwide has been feeling increasing pressure from developments in the environmental movement. The movement emphasises that economic development at the expense of the environment is not acceptable. Governments have increasingly enacted regulations, economic instruments and environmental taxes to encourage industries to take environmental sustainability issues seriously.

Industries operating globally are feeling the impact of un-coordinated national efforts and are calling for uniformity of environmental regulations. This is being pursued through mechanisms such as the World Trade Organisation. Like most metals industries, the aluminium industry is under pressure to reduce emissions of greenhouse gases, as well as respond to other "sustainability" concerns. The concerns arise throughout the life cycle of the product:

- Bauxite mining generally involves open cut mining, causing disturbance to land and vegetation, and involving tailings storage which can pose serious environmental threats.
- Alumina refining leaves behind a highly alkaline sludge that poses storage and ecological problems.
- Dust, carbon dioxide, perfluorinated carbons and fluoride are emitted in the aluminium smelting process.
- Cathode residues from the smelting process containing toxic materials pose disposal problems.
- Aluminium dross and salt slag is produced in the primary and secondary aluminium industry which is processed but can also pose disposal problems.
- Significant amounts of energy are used in the semifabrication process.
- Dioxins can be produced in the aluminium remelt facilities.

2.4 Understanding Competitiveness Impacts for Industry

Industry competitiveness issues reflect two dimensions in how materials accounting can be linked to value generation for industry. These dimensions are:

- The fundamental motivation driving the adoption of these techniques; and
- The nature of the industry in which the use of materials accounting is being developed.

We have already discussed, in section 1.5, 1.6 and 1.7, the advantages to industry of adopting materials accounting. These advantages centre on seeking marketing advantage, compliance with purchasing preconditions, minimising waste and increasing efficient materials and energy use, and environmental compliance reporting. Not to be under-estimated is the significance that materials accounting information has to financial market analysts. All the reasons that we argue are advantageous to industry for the adoption of materials accounting are transparent to investors as well. When looking for sound investments, analysts will increasingly look towards those industries that employ best ESD practices. Recent announcements of mandatory environmental compliance reporting for listed Australian companies reflect this awareness.

This mixture of industry characteristics and motivations to adopt materials accounting techniques is summarised in Figure 2.3.

Though the argument might be strong for adopting materials accounting techniques, there are, nevertheless, significant cost and 'know how' barriers. This is the case for all companies, but especially for SME.

Offset against these disbenefits is the potential for multiple reuse through recycling, and whole of life savings from recycling, corrosion resistance and maintenance. For the aluminium industry, the logic of their claim to ecological responsibility rests heavily in the whole of life logic of recycling and reuse, coupled with a responsible approach to the challenges listed above¹.

The International Primary Aluminium Institute (IPAI), at their meeting in New York on 4 November, 1997, established a Board Task Group with a mission to:

...develop as complete an understanding as possible of the positive contributions that aluminium makes to the environmental and economic well-being of the world's population; of any negative economic or environmental impacts that its production may cause; and of the balance between these positive and negatives during the entire "life cycle" of the material.

One of the immediate uses for the data collected by the Task Force is for the Kyoto Protocol Implementation Conference in Buenos Aires in November 1998. A longer term benefit of the task force's efforts will be to put the industry in a position to forge its own future in environmental sustainability matters. The alternative is a simply reactive compliance to government regulations that are sometimes poorly considered from a lifecycle perspective.

Life cycle assessment will also be central in providing the data for benchmarking progress on environmental standards, meeting anticipated requests from agencies for industry wide information on progress in environmental performance, and for ISO compliance. The Task Force estimates it will require an annual expenditure of \$150,000 for a period of two years, apart from the investments of individual firms in different countries.

The aluminium industry supports the life cycle approach to assessing and responding to environment issues. The industry in Australia is moving towards provision of high quality life cycle data and actively supports initiatives to encourage wider use and better quality data and information from Australian industry as a whole. It recognises that without a widespread understanding of environmental management tools, the ultimate goals of sustainable development and good environmental management cannot be reached.

¹ Global Environment Awards have been given to the Reafforestation Program in WA for example.

	Observed rationale for adoption of materials accounting							
	Eco-sensitive buyers		Precondition for market access		Tool for cost competitiveness		Legal & Administrative benefits	
Industry characteristic	Eco-branding	ISO system compliance	Trade agreement*	Purchasing Condition	Economic optimisation	Industry Regulation	Contest Management	Data requirement
Materials and energy as cost drivers					◆	◆		
Ecological contests vital to accessing resources			◆			◆	◆	◆
Supplier against ISO 14000 specifications		◆	◆	◆			◆	◆
Ecological image relevant to market share	◆	◆					◆	
Complex materials and ecology data management			◆			◆	◆	

Figure 2.3: Industry characteristics and motivations to adopt materials accounting techniques.

* The trade agreements motivation is not as pronounced among the early adopters, but does receive some trade press coverage. As the relevant trade agreements come into being, it is anticipated that this rationale will become more pronounced among the later adopters.

ILLUSTRATION 2.4

Electronics industry

Production in the electronics industry is subject to three major pressures: waste minimisation; controlling hazardous materials; and intense competition. Political pressures, buyer preference in developed economies for “green” product, the importance of environmental public relations for major computer companies, and risk management requirements, all mean higher standards in one part of the world tend to influence production standards elsewhere.

Materials accounting techniques enable companies to benchmark the success of their production in meeting increasingly stringent standards, and to argue for rational approaches to regulation.

Waste and Hazardous Products Minimisation

An estimated 10-18 million tons of electronic and electrical equipment is disposed of annually. Much of this finds its way into increasingly scarce landfill sites. Waste includes Cathode Ray Tubes and batteries.

Germany leads the way in passing legislation for companies to be responsible for their own waste. Partly because of Germany's prominent position in the European Union, and partly because of the growing concern over the environment, other European countries are formulating and implementing standards that will meet the twin aims of maintaining the competitiveness of their industries and meeting environmental concerns.

Political efforts have been substantial, involving industry bodies, and government representatives, and world trade forums. Significant among these are the discussions through the World Trade Organisation Committee on Trade and Environment. Efforts have also been substantial on the research and development front, from reconfiguring products to increase their recyclability, to replacing components with high toxicity or waste potential.

Several projects (such as the Norad project, a project initiated by 22 Nordic companies, Fraunhofer Institute project in Germany, and various Eureka Projects) have been established on the premise that lead in electronic goods must be phased out, and to examine alternative adhesive technologies. Other projects, such as the Vision 2000 Eureka project, coordinate efforts of companies to:

- ensure a high quality of recycling,
- support markets for recycled materials and products,
- guarantee a system for equipment recovery and disassembly, and
- set take-back prices.

2.4.1 Cost barriers to adopting materials accounting

LCAs are expensive to produce. An often quoted ballpark figure for doing an LCA is \$100,000. As an indication, the recently completed an inventory of 32 steel plants cost \$US1million. Quotes for LCAs generally start at about \$10,000 for an original assessment for a fairly small system. A more comprehensive study may cost around \$30,000 and could rapidly accelerate to \$100,000 for more in-depth studies (Verbeek, 1998). There are reports of far higher costs, depending on scope, depth, methodology and ease of access to data.

The high initial cost of adopting materials accounting is driven by the nature of the techniques themselves and their data intensity. The fixed-cost nature of the original data collection and analysis means that substantial efficiencies are available through coordination. The Japanese approach to this has been to recognise the significance of scale and specialisation in reducing those costs, and to create a single, government-sponsored data clearing house. The responses in most other jurisdictions have been to facilitate data capture and exchange, and to provide mechanisms that preserve firm confidential data, but make industry-wide information accessible at low cost. The issues of economies of scale in information collection and transfer, firm confidentiality, and data integrity, are at the heart of why government-supported initiatives in other countries have secured significant industry support.

Related to this is the risk of substandard implementation of materials accounting technique, particularly LCA. The methodologies and standards are independently prescribed. The results of these have the potential to be contested, with the outcomes of the contests being material to the economic perform-

Other Eureka projects aim to design a completely recyclable television. NEC in Japan established its Eco-Action Plan 21 addressing environmental performance. It plans to reduce nitrogen oxide emissions generated by the company's transport fleet and reducing waste output. Matsushita, Fujitsu and Toshiba have similar plans. Governments support these projects through tax incentives (Japan), legislative requirements (widely used in Europe and North America), procurement preferences, and funding.

Reactive or proactive stance?

Pressures to account for materials and to address environmental health meet with varying reaction from electronics companies. Some struggle against the imposition of the stringent requirements. Others embrace government requirements, and seek to use superior environmental performance as a point to leverage superior economic performance, achieving this either through efficiency improvement, or by marketing advantages.

A majority of electronic companies in Germany see legislated environmental sustainability requirements as creating a solid framework, forcing companies to establish environmental procedures ahead of foreign competitors. They meet this challenge by using tools for measuring environmental performance of their products. Siemens, for example, has had programs in place since 1988 to develop environmentally sound materials for electrical products. The company has established teams to guide the development of environment-compatible products and create a standard for recycling, including rules for material preferences and marking.

As a bi-product of stricter company environmental standards, some companies find business advantages resulting from anticipated markets for environmental technology. Estimates published by the OECD put the worldwide environmental technology industry at \$200 billion a year, and expect the amount to reach \$300-600 billion by 2000.

Two lessons emerge from an examination of trends in the electronics industry.

The first is that stricter environmental controls will be progressively imposed. The movement is driven as much from consumer/public demand as from the economic imperatives (such as scarcity of landfill space, expense of pollution cleanup, and environmental disasters¹).

The second is that some businesses will profit from increasing environmental accountability, and use it to lead the achievement of enhanced competitiveness.

¹ The insurance industry has challenged industries to reduce environmental effects, predicting a crisis in the insurance industry by the year 2000 if natural disasters continue at current rates (Myers, 1998).

ance of the enterprise relying on them. In addition, government to government negotiations and firm versus firm contests are likely to call into question the credibility of individual firm and country materials accounting results and methods. All of these factors suggest that reliability of methods and data, and indisputable compliance with international standards, will be of great significance in terms of the outcomes from adoption of these techniques.

This in turn brings into focus the question of the capabilities available within the country to deliver the coordination, and to ensure the quality of the materials accounting techniques in use. In Australia the current status of coordination, and the availability of the resources for industry to credibly implement materials accounting techniques, are well short of what will be required.

2.4.2 The particular issues for SME

International markets are highly competitive. Apparently minor disadvantages, such as unavailability of supplies, or weak response to emerging consumer preferences, can be translated into permanent losses of competitive position. Materials accounting is directly relevant to SME competitiveness where:

- eco-labelling is significant for marketing of the product of Australian enterprise;
- bilateral or multilateral trade agreements incorporate LCA concepts and mandatory certification;
- an Australian company supplies to a purchaser which requires materials accounting compliance (including governments which adopt LCA as an integral element in their purchasing programs); or
- where optimisation of materials and energy input/output is significant for price competitiveness.

These situations are pervasive of our developing export activities, most notably in the sectors where there is high added value. These include:

- export products marketed on an ecological appeal basis. These span cosmetics (such as Red Earth cosmetics) through furniture (sustainably produced hardwood) to food products marketed

ILLUSTRATION 2.5

What impact might buyers' requirements have on Australian SMEs?

In an earlier example we considered the time impact on a SME faced with a need to provide materials accounting data or certification as a prerequisite to securing a market contract. In this illustration we discuss the longer term potential impacts of such issues on competitiveness.

It takes a great deal of cost and effort to create, and little to disrupt, SME market access relationships. Typically for a SME to secure a distributorship, or a major long term client, requires years of work and often hundreds of thousands of dollars in development. Such relationships are difficult to restart if they are disturbed. Re-bargaining can require the SME make costly trade-offs to secure the relationship.

The capacity of a supplier to readily demonstrate LCA preparedness represents for the purchaser a reduction of risk. Such risks include the risks of prejudicing their own environmental credentials. This adjustment in risk for the buyer opens up an industrial selling advantage for the prepared competitor. Preparedness represents risk reduction for the purchaser.

Risk in buying from an unprepared supplier can be a trigger for compensatory concessions from the seller to the buyer, or in extreme circumstances can lead to a loss of market access. Competitors will, if aware of the problem, seek to engender a sense of uncertainty in an attempt to disrupt the market relationship of the less prepared supplier.

The viability impacts on the adversely impacted SME of delays, re-bargaining and loss of competitive advantage can be readily represented using the Boston Consulting Group portfolio matrix (see Figure I 2.5.1).

A temporary disruption to market access, or disturbance of sales, is translated into:

- a persistent loss of relative competitive advantage and relative market share, cutting cash flow for the unprepared supplier.
- the shift in relative market shares, and therefore relative cash production, results in the requirement for a disproportionate investment on the part of the unprepared supplier to resume their

as sustainably produced (“Clean and Green”).

- politically sensitive international commodities, notably where the trade is linked to issues of greenhouse gases and worldwide sustainability. Timber, and energy intensive metals, fall into this category.
- product sold as intermediate in industrial processes of large scale multinationals, which in turn adopt LCA as an element in their mandatory environmental management policies. This practice of adopting LCA either as a separate requirement, or (increasingly) as part of an integrated ISO 14000 compliance program, is evident among some of the largest of Australia’s corporate trade partners. Downstream suppliers to the premium automotive manufacturers, for example, are likely to increasingly face LCA issues as the major automotive firms move to full implementation of these standards through their purchasing policies.

A lack of preparedness to meet these requirements has the potential to have a pervasive impact on many of Australia’s SME exporters. Alternatively, a readiness to comply with materials accounting requirements opens up the opportunity for non-price competitiveness at the premium end of a number of valuable markets.

Adverse impacts will be more pronounced for the less financially strong SME firm. Their capability to undertake LCA without a readily accessible source of expertise and support will be lower than their larger competitor’s, due to limitations of scale. Their finances will be more vulnerable to the cash flow impacts of any re-bargaining of price or terms, or exclusion (temporary or permanent) from any customer. The most likely impact for such firms is permanent harm, with a potential of being precluded from growth markets because of the persistent cash flow impacts of a disruption to their capacity to access markets where LCA becomes mandatory or desirable for purchasers.

LCA preparedness is about the capacity of Australian firms to avoid such permanent disadvantages. It is about minimising risk, by simply assuring the limited LCA resources available are ready, accessible and coordinated to meet such eventualities as have been outlined above.

‘natural’ market position. Re-bargaining is required to maintain market relationships in the face of uncertainties, or to resume market access after disruption. Re-bargaining will generally result in a wealth transfer from the supplier to the buyer. This will persist long after the trigger for the re-bargaining has gone.

- relationship damage and loss of supplier confidence, can accompany such re-bargaining and uncertainty.

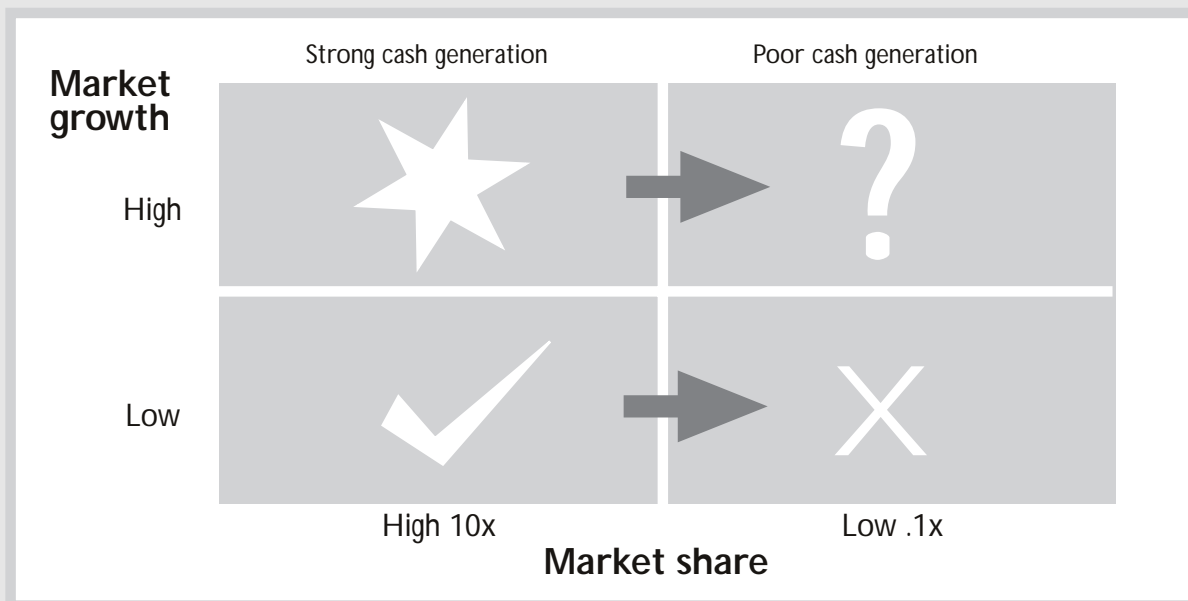


Figure i2.5.1: Cash production impact of disruption to market access: A shift from strong cash generation position, to a poor cash generation position.

2.5 Materials Accounting and Community ESD Demands

Truly sustainable development solutions should be acceptable to an informed community and involve the participation of interested and affected community members. LCA can assist by making explicit the total impacts associated with a process and hence provide a sound, objective platform from which negotiations between parties can proceed. The LCA decision-making process provides transparency to the material and energy flows of each unit process under consideration to enhance understanding, trust and establish common ground between parties. LCA provides a strategic framework where individuals from government agencies, the community and industry may develop informed management strategies

(Cooperative Research Centre for Waste Management and Pollution Control, 1997).

Many industrial activities in Australia have come under fire from the environmental movements. It is difficult to respond to these arguments in the absence of any credible means for communicating the impacts of alternatives to the community. It is difficult to engage in constructive debate when the arguments themselves move seamlessly (but opaquely) across comparisons of “apples” and “oranges”, interspersed with debates about philosophical values, challenges to the scientific credibility of competing experts, and disputation about what technical data is required as a basis of the discourse.

Materials accounting methodologies separate the elements of technical data, project data, algorithms and modelling interactions, environmental effects, and community preferences and values. Making these elements transparent will not reduce the contests. It will, however, clarify where the disagreements are, and invite more transparent contestation. If the elements of the contest can be made less confused, then the credibility of the system, and the players within the system, can be improved.

ILLUSTRATION 2.6

Green public purchasing¹

Consumption by public authorities in OECD countries accounts for between 5-15% of GDP. It involves an extremely diverse range of products and services. Public authorities are also a means for governments to implement their electorate's aims for a safer and sustainable environment.

In the US, Japan, Nordic countries, Germany, Canada and a number of other jurisdictions, legislation specifies factors which public authorities must take into account in their purchasing. Directives are variously aimed at reducing waste, energy, water use, chemical use, emissions, and dangerous substances. The effect is a focus by suppliers and purchasers on issues beyond price and narrow definitions of quality. A secondary effect arising out of the contests between alternatives these programs have brought about, is increased awareness that targeting single issues (such as waste, or energy, or water use, etc.) may not be the optimal means of achieving a safer and sustainable environment.

Approaches to greener purchasing

One of the challenges facing purchasers is how to identify “greener” products. Currently there exists four generic approaches. In many cases, the approaches overlap and are used concurrently:

“Single issue” approaches: These use a single criteria like energy efficiency or recycled content to guide purchasing decisions. These are increasingly seen as potentially distortive of overall sustainability.

Life cycle approach: “Life cycle assessments” provide a more comprehensive view of a product's environmental effects, across all stages from initial materials extraction to ultimate disposal.

Eco-labelling: This typically draws on multiple-criteria approaches to the selection of greener products. LCA-based approaches are gaining importance.

Guidebooks: This approach aims to assist public procuring agencies to identify environmentally preferable products by providing information on product characteristics and their impact on the environment, as well as recommendations regarding the formulation of public tenders.

¹ The information for this note is taken from OECD (1998).

2.6 Government Motivations for Adoption

The rationale for governments to adopt, and to encourage adoption by industry, of materials accounting, are related to both industry incentives and to community demands. Our research on the international support of governments to the adoption of materials accounting found the following rationales:

- An environmental policy rationale. By moving industry towards material accounting, it becomes possible to create a more rational basis for industry development and ESD policies. It creates conditions under which reasonably transparent (industry sourced rather than government sourced) data becomes the basis for debates about policy alternatives. This rationale seems to be present in the Canadian approach, and to a lesser degree within the US. Materials accounting represents one of the (perhaps few) areas where both industry competitiveness and environmental responsibility can be combined, and where the costs to government are relatively small compared to the significance of the possible ecological and industrial benefits. Properly implemented, materials accounting practices can stem the proliferation of environmental legislation, producing overarching legislation, such as eco-labelling and EMS compliance.
- Justification for action/inaction. Providing a justification for the choices government makes about whether and where to intervene is difficult. So too is the creation of an objective basis for seeking industry support and public purchasing policies. An effective materials accounting system in industry has the potential to provide not only improved public choices, but also an objective basis for justification of the choices made. This rationale is evident in the preferred purchasing arrangements that are already in evidence in the US and in northern Europe.

Country	Approach	Description
Austria	Single issue: Energy 2000 Eco-labelling	Identifies electrical appliances with low energy consumption and sets maximum energy consumption criteria which are updated annually
Canada	Eco-labelling Guidebook	Guidelines focus on waste reduction in categories such as cleaning products, compost, construction and demolition materials, energy efficient lighting products, lubricants, paint, paper, plastics and rubber
Czech Republic	Eco-labelling	
Denmark	Single issue: Energy 2000 Life cycle assessment Eco-labelling	Similar objectives to Switzerland Environmental recommendations on different product groups based on life cycle approach
Finland	Eco-labelling	
France	Eco-labelling	
Germany	Eco-labelling Guidebooks: handbook	Covers areas such as office supplies and equipment, vehicles, construction and infrastructure materials, cleaning products, catering and waste

Figure i2.6.1: A summary of international approaches (continued over page)

- Environmental and industry reporting. State of the Environment reporting is an important mechanism for community and industry education. It does, however, suffer from two major problems. The first is that much of the data is prepared only for reporting purposes, and therefore may be perceived as an overburden on productive activity in industry and government. Second, the information mixes many complex elements, which ideally ought to be separated to ensure reliable comparison across periods, across regions and across industry. Reliable materials accounting data, being used by industry for its productive purposes, provides an opportunity for more reliable and less burdensome environment reporting.
- Cost reduction and cost transfer. As international trade negotiations tend more to reflect materials accounting, it can be anticipated that the costs burden on government in attempting to bridge the gap of data inadequacy for trade and environmental negotiation purposes will increase. The availability of reliable materials accounting data within industry in part replaces the need for government to assemble its own data, sometimes in the face of industry opposition, and to defend that data where others contest its reliability or the validity of the conclusions reached.
- Supporting industry competitiveness. As outlined in this report, industry competitiveness is linked in a number of ways to effective materials management, and to a capability to argue and defend the effectiveness of that management. It is evident particularly in Japan but also to a lesser degree in the northern economies, that government intervention is in large part focused on increasing industry capability to respond to these emerging issues.

Australian governments currently grapple with these issues using a variety of forums and legislation. Environment Australia, for example, is currently working with state governments to set mandatory targets for electricity retailers, and with the automotive industry to secure fuel efficiency improvements as a result of the Kyoto protocol. Environment Australia is also asking Australian industry to report the amount of hazardous substances that it emits to the environment each with the aim of developing a National Pollutant Inventory. The NPI is designed to satisfy community desire for access to information about the amount of pollution entering the environment (EPG News, 1998). In addition, Load Based Licensing is being introduced, recycling practices are being encouraged, as is company environment reporting.

ILLUSTRATION 2.6 (cont'd)

Country	Approach	Description
Italy	Eco-labelling	
Japan	Eco-labelling	
Korea	Eco-labelling	
Norway	Eco-labelling Guidebooks	Designed to help purchasers integrate eco-efficiency into every stage of the purchasing process by focusing on life cycle costs and specification of performance in order to achieve a higher value added and less environmental damage through less pollution, waste and consumption of raw materials and energy.
Sweden	Single issue: Energy 2000 Eco-labelling	Similar objectives to Switzerland
Switzerland	Single issue: E2000 LCA:	Identifies electrical appliances with low energy consumption and sets maximum energy consumption criteria which are updated annually Used as a mechanism to integrate both qualitative and quantitative criteria into purchasing decisions

Figure i2.6.1: A summation of international approaches (continued from previous page)

2.7 Conclusion

There are international moves towards the use of standards, methodologies and technologies that respond to the need for environmentally sustainable development. These are telescoping into the adoption of ISO 14001 and ISO 14040 and related standards. For governments, adoption of materials accounting techniques provides the potential for more informed procurement choices and policy formulation.

Adoption of ISO standards, however, pose significant and costly shifts to the operations and management of ill prepared enterprises. In particular, adoption of ISO 14040, or materials accounting methodologies, pose the greatest need for investment by industry and government. To minimise such costs, neither government nor industry should be slow to adopt materials accounting methodologies. In five to six years, the cost of meeting the need to become familiar and incorporate the methodologies will be far greater, and they will be more immediate, giving less time to adopt the most suitable inventories and algorithms.

In the following section, we outline Australia's preparedness to meet the challenge posed by materials accounting. We then go on to provide a strategy to better prepare government and industry.

Country	Approach	Description
The Netherlands	Single issue: E2000	Similar objectives to Switzerland
	Eco-labelling	
United Kingdom	Life cycle assessment: Green Guide	Identifies six 'whole life cost' elements which comprise value for money" and which buyers need to incorporate into their specifications for goods and services requirements and standards.
	Eco-labelling	
United States	Single issue: Energy Star Buy recycled programme	Aims at providing federal agencies with guidance as regards the development pollution prevention strategies for their facilities.
	Life cycle assessment: Commercial Cleaning Supplies Catalogue	A matrix lists information on seven environmental attributes for products derived from environmental impacts arising in the context of the products' lifecycle.



Part 3

Outlining a National Response by Industry and Government

This section aims to put forward a framework for a national response. The intent is to facilitate discussion by industry and government, leading to the creation of a national materials accounting institute, supported by industry and government, to coordinate a national response to the competitiveness challenge of materials accounting. are used to illustrate the issues for Australia.

3.1 Introduction

Previous sections have discussed materials accounting within the context of the implementation of international industry and trade standards. The report has also identified the benefits and costs of implementing materials accounting techniques, and the international response by industry and governments to the challenges posed by materials accounting.

This last section focuses on the Australian response to the challenges. It discusses Australia's preparedness to meet the challenges and opportunities that will accrue to Australian industry and to the Australian community.

Our analysis shows Australia is not well-equipped to adopt materials accounting methodologies. We believe that the costs to Australian industry of not acting now to redress this shortfall will escalate markedly within a few years.

In the final part of this report we propose that Australian government and industry develop a national response through an institute which will integrate materials accounting efforts in Australia. We propose a structure and a strategy for that institute and finish the report with recommendations to advance action on the adoption of materials accounting by Australian enterprises in both the public and private sectors.

3.2 Assessing Australian Preparedness

Australia has responded on a number of fronts to industrial issues of environmental deterioration. Chief among these are regulations and research into pollution control and waste minimisation. The need for an holistic programme, and the need for significant investment in setting up the structures for an holistic programme to pursue environmentally sustainable solutions, has not yet attracted sufficient government or industry attention (as the survey forming part of this study reveals). There are, however, some signs of change. On the 4th September 1998, the Minister for the Environment, Senator Robert Hill, announced:

One of the key tools to assist us (to utilise our resources in a responsible and sustainable way) is "Life Cycle Assessment"; and one of the key industries that uses many of our resources is the building industry...The government will (allocate) \$125,000 towards developing data to determine environment impacts of building materials in order to reduce adverse impacts and improve efficient use of resources.

His statement marks a recognition of the role of LCA in informing efforts to create more environmentally sustainable industries. But it is a very small start along a very long path, and minute in comparison to the challenge posed by the march of materials accounting on the world front.

However it would be unfair to place responsibility for this lack of sufficient effort at the foot of government. It is industry that is facing the competitive challenge, and it is from industry that the impetus for action by government ought to come.

To ascertain industry's perceived need and support for a national institute to address these issues, the Profit Foundation undertook a small sample survey of potential users and of supporters. The approach was a mix of questionnaires and in-depth interviews. The total (30 responses) were divided into four categories for analysis purposes: Government - three respondents; Industry Associations - five respondents; Consultants/researchers/education institutions - six respondents; Industry - 16 respondents.

The Profit Foundation also conducted in-depth discussions with members of the LCA roundtable, was represented at two LCA Roundtable conferences where issues were raised by the consultants, and discussed a number of the issues with industry, government and academic stakeholders. We also made contact with a number of major multinationals in the automotive and electronics industries, to obtain perspectives on their experiences.

The bulk of the consultations were focused around testing responses to a "straw man" entity, an institute, the role of which would be to coordinate and support a national response by industry to materials

accounting issues. This institute was notionally entitled "The Institute for Materials Accounting and Sustainability" or IMAS. This initial conceptual model has been substantially redesigned on the basis of this feedback.

In summary, the survey showed that the need for some national response to the issues raised in this report is largely unquestioned by industry, government and information provision respondents. All recognise that materials accounting represents a significant strategic challenge to which Australia must respond.

The concept of a national institute to focus this strategy was well received. Some of the characteristics of such an entity were generally agreed. These include:

- The importance of independence (both the reality and the perception);
- The need for a national clearing house or other structure to gather, collate and disseminate information in a way that protects the commercial interests of the information providers;
- The need for such an institution to be industry led, but government supported;
- The desirability of involvement of environmental and consumer interest groups, within a professional framework that encourages industry engagement;
- The desirability of a mechanism for accreditation or standards maintenance, particularly in relation to ISO 14040 life cycle techniques;
- The desirability of an international intelligence and data gathering and dissemination function;
- The need to secure high levels of industry support and involvement in the institute, and with materials accounting techniques, with the institute having a significant role in securing this involvement and support.

A number of issues regarding IMAS are more problematic. Some of these are implementation issues such as appropriate naming for such an institute, details of the forms of participation which different groups might have, putative governance structures and mechanisms for data collection and preservation of confidentiality. But some are more strategic in nature. These include:

- The extent to which such an institute might be involved in service delivery to industry;
- The ownership of information;
- The extent to which the institute may serve as a coordinating or funding centre for research;
- The degree to which the institute may take a controlling role in the accreditation of consultants, methodologies or projects;
- Links with established programs and organisations.

3.3 Australia's Preparedness for the Challenge

The draft international standard for LCA (ISO DIS 14040) is at an advanced stage of development and is likely to be adopted within the next 12 months. Development of the LCA standard has required the active participation and financial support by industry and government from more than 40 countries.

As highlighted in Part 2, Australian industry is lagging behind many OECD nations in the application of materials accounting. For example, in Japan, the government established JLCA - an organisation to develop LCA - in October 1995. JLCA is responsible for facilitating collaboration amongst its membership, which includes 261 companies and a total of 415 members, to meet LCA data needs. In the UK, Canada, Germany, Austria, France, Japan, the Netherlands and New Zealand, Life Cycle Assessment data supports eco-labelling programs. In addition, procurement and product policies are based on materials accounting data in the US, Japan, the Netherlands and Sweden. In most of these countries regulatory and waste management policies are based on materials accounting data. In the US, the EPA and Department of Energy have produced extensive inventory data reports from more than 10 LCA research

projects. Numerous high quality publications have been released. The European Commission is supporting an effort to network the many materials accounting research endeavours in Europe including Germany, the Netherlands and France. LCANET, as the program is called, is aiming to make materials accounting more accessible to SMEs and is addressing the research needs in an integrated and coordinated manner.

Technology matures rapidly when:

- There is a strong strategic imperative for its adoption;
- There is substantial competition among researchers to deliver outcomes to industry;
- The technology is able to benefit from research in related areas of science;
- There is a strong political imperative - the powerful players are keen to see it implemented.

These conditions exist internationally for materials accounting, particularly life cycle techniques, driven by ISO 14000.

Our forecast based on investigation outlined in this report is that:

- Within five years, Life Cycle Assessment will be widely in use amongst the industrial leaders in the US, Japan and Europe;
- Bilateral trade agreements are likely to be under development or in place in sensitive areas, such as timber, pulp and paper, between these countries and selected exporters;
- Eco-labelling on the basis of Life Cycle Assessment will be evident in the developed economies, and will be having a demonstrable impact on institutional purchases and some classes of consumer purchases.

As materials accounting draws on highly specialised knowledge and data not readily available within industry, nor from the consulting or academic communities, there is a concern that Australian industry (with the possible exceptions of companies like BHP and CSR) will be disadvantaged in the global market due to a lack of preparedness. There is an urgent requirement for a coordinated national effort to ensure the required competencies, systems and data are available to meet this trade and competitiveness challenge.

ILLUSTRATION 3.1

Australian LCA research

With growing awareness about the importance of LCA, there is also increasing recognition of the limitations to use of the LCA tool. Despite the rapid pace of developments in methodologies and data for LCA, limited publicly accessible work has been done in Australia. The use of overseas models introduces the potential for significant error when applied locally. For example, these models rely on different fuel data composition including nuclear sources and may use waste emissions that conform to a stricter regulatory regime. Potential sources of error are not limited to the nature of energy or material sources and different pollution control measure. Environmental impacts are influenced by local factors such as the quality and nature of the receiving environment. The significance of impacts will be relative to the local socio-political climate.

The Cooperative Research Centre for Waste Management and Pollution Control Limited launched a research project in LCA, in December 1995. The initial project partners were the New South Wales Environment Protection Authority, the Centre for Water and Waste Technology UNSW, BHP Research, the Department of Public Works and Service, and the Centre for Safety and Environment Management. Soon after the project's commencement, collaborative partnerships were established with leading research organisations working in LCA. These were the Cooperative Research Centre for International Food Manufacturing and Packaging Science, and the National Centre for Design at RMIT.

The Life Cycle Assessment Project is intended to provide industry decision-makers with rigorous tools to optimise the management of materials, and hence to encourage ecologically sustainable

3.4 Five Critical Challenges for Australian Industry

International debates about Australia's greenhouse standards are only a foretaste of what Australian industry can anticipate, and for which Australian industry must be prepared if it is to maintain competitiveness. Contests about the environmental credentials of industry and industry policy are increasingly important. The stage is set for this to become more so in the next decade. There are five critical challenges for which Australian industry is insufficiently prepared. These challenges arise out of the benefits of the adoption of materials accounting techniques already enumerated above:

Challenge 1. *Competitiveness* in the face of increasing international competition and the increasing cost of resources.

Quality improvement through design and process engineering have become of critical importance in achieving both price competitiveness and market access. The techniques developed in the 1960s and 1970s are now embedded in "best practice" engineering in Australia. New techniques which are more directly focused on the underlying efficiency of the use of natural resources are making significant improvements in cost competitiveness in Europe, Japan and the US. The widespread and effective adoption of these advanced techniques by Australian industry will be of strategic importance in maintaining competitiveness.

The benefits achieved by BHP in Australia using LCA are a microcosm of the performance improvements being achieved by world competitive international firms. For example:

- 3M has saved \$US1 billion through an environmental management system approach since 1975 (Hemenway & Hale).
- IBM realised energy savings of \$US32 million in 1990-91 (Hemenway & Hale).
- Sealtest Ice Cream Co. saved \$US3 million by focusing on environmental management in 1994 (Hemenway & Hale).
- Gillette achieved a 96% water use saving between 1972-93 by focusing on materials efficiency

development and prosperity for the Australian community. It aims to address limitations to the use of LCA in Australia. These include the lack of availability of locally relevant data for both inventory analysis and impact assessment; lack of consistency in approaches to Impact Assessment methodology; and insufficient awareness about the benefits and uses and limitations to the use of LCA.

The project commenced with an education and awareness-raising phase. It was intended to proceed with the development of life-cycle inventory data during mid-1996. Despite close links with industry stakeholders, the strong research capabilities of the partnership cluster, and growing demand for inventory data, resourcing constraints and the difficulties associated with collecting the source data meant that this aspect was deferred. Instead, the LCA project has proceeded with the impact-assessment phase of development. The Department of Land and Water Conservation in NSW recently joined the project team, with support from the Centre for Natural Resources.

The project is developing an approach of Life Cycle Inventory Assessment that is valid for Australia. This will involve establishing consensus on categories of environmental impacts of specific stressors such as Australian timber harvesting, bauxite extraction, release of sulphur dioxide and mercury. Impact categories might include global warming potential, acidification and river flow. An Australian system for evaluating these impacts will be developed. This will ensure that decision makers have access to the best available methods when making value-based environmental assessments.

Recently the project recruited an internationally experienced project leader, to ensure the outcome is fully informed by best international practice.

issues (von Weizsacker, et al, 1997).

- Hallmark has reduced its emissions of volatile organic compounds by over 80% since 1980 (von Weizsacker, et al., 1997), and is targeting significant saving in solid waste generation and energy use.

As governments (in response to local pressures and international conventions) move towards full environmental costing of natural resources, industry will inevitably find itself in a situation where measured accounting costs and (currently unmeasured) environmental costs become more closely aligned. The economic benefits from early adoption of materials optimisation measures will become increasingly evident under such circumstances.

Challenge 2. *Sustainability* in the face of emerging concerns about air and water quality, and the resource impacts of some industrial activities.

Trading in water pollution rights and carbon credits are a response to a widespread community concern about the resource impacts of industrial processes, and the impacts of pollution. Public contests about the relative impacts of industrial activities are commonplace. Identifying which of a range of alternatives is in fact the most sustainable, and what are the actual impacts of these alternatives, are matters of strategic importance in industrial, political and environmental terms.

Environmental contestation of resource use by industry must be anticipated to increase, as the demands on natural resources and the impacts of industrial waste become more evident within the community.

A challenge for industry wishing to secure access to the resources is to be able to demonstrate that it is optimising its use of those resources, and that it is reducing to the minimum the adverse environmental consequences that derive from its use of these.

Challenge 3. *Marketing opportunity* through securing a favourable image in the mind of the consumer.

The success of the "clean, green" promotional banner for Australian primary product is representative of the power of environmental and health concerns in the world market. The burgeoning health food markets, middle class "alternative life style" products, and consumer boycotts of polluting firms, all show the power of environmentally friendly credentials. As concepts of sustainability and environmental

ILLUSTRATION 3.2

International Case Study - Volvo (II): Improving business systems performance

Volvo, like many contemporary corporations, runs an organisation which closely integrates its own activities and the activities of its suppliers in a total business system. Volvo believes that it is the performance of the system, rather than the stand-alone performance of Volvo, that is the key to competitiveness.

Using materials accounting techniques, and assisting their suppliers in enhancing materials utilisation and environmental responsibility, has paid off throughout the system.

Suppliers

The products and services of suppliers to Volvo account for over half of the organisation's added value. Volvo require that all suppliers and contractors be familiar with the Volvo Group's environmental policy. A number of programs are in place to assist suppliers in becoming environmentally and commercially effective.

- Major and strategically important suppliers must implement ISO 14001, EMAS or BS 7750.
- All suppliers must be able to report on their environmental work, including organisation, fulfilment of legal demands and environmental results.
- Suppliers must develop and implement plans for the reduction of environmental impact.
- Suppliers commit to follow-up environmental care within their industry, and maintain an open dialogue with Volvo concerning achievements and trends.

impacts become more sophisticated, being able to access this credential will become both more economically important, and more constrained by the requirements of objective proof of environmental performance.

Coupled with this is the increasing prevalence of preferred purchasing schemes in the developed economies, under which those producers which are able to achieve an environmental accreditation will achieve marketing advantage.

Challenge 4. *Overcoming international trade barriers, particularly those created by our first world international competitors.*

The effects of tariff and non-tariff barriers erected by, or on behalf of the US, Canada and Japan, on Australia's primary and secondary producers, have in the past been pronounced. The next generation of non-tariff barriers are likely to be constructed around the environmental credentials of the suppliers. We can anticipate that this generation of barriers will have a particularly adverse impact on the added value manufacturing sectors of the Australian economy, unless we are prepared to counter them.

ISO 14000 is being perceived by some US corporations as a pivotal trade tool which will allow them to require competitor corporations to comply with these standards if they are to trade in the US, and Europe, and increasingly through bilateral arrangements in Asia.

Challenge 5. *Community support.*

Battles between the general community, and firms seeking to continue to expand industrial activities, are carried out on the streets and in the courts of Australia every day. The intensity of these contests is substantial, but the mechanisms for assessing environmental impacts relative to community values are flimsy and lack objective credibility. The decisions often involve measuring the relative significance of non-comparable quantities of different impacts, against the background of poorly specified community values. The result is a highly politicised, expensive and unreliable process of contestation.

A strategically important opportunity exists to simultaneously deliver to the Australian community and Australian industry, improved industrial competitiveness, more sustainable industrial activity, marketing advantage both locally and for export markets, preparedness for the next round of trade barriers, and a more rational and effective framework for environmental contests.

- Suppliers must provide data on environmental effects from production and products to enable life cycle assessments.
- Suppliers are bound by Volvo's policy for phasing out noxious chemical use.
- Suppliers must minimise packing materials and handling of excess rejected materials.
- Volvo considers recyclability and the use of recycled materials when selecting materials and design solutions.

To help suppliers and contractors achieve these requirements, Volvo conducts training sessions and conferences, and works closely with suppliers to improve the environmental sustainability of their products.

In 1996, Volvo surveyed 500 component suppliers to evaluate the progress of their environmental programmes. The results indicate that Volvo's environmental requirements have had a major impact and that most suppliers are working actively to alleviate the effects of their operations on the environment. German suppliers are particularly well advanced in this respect.

The net effect is to enhance not only their performance as suppliers, but also to improve their competitiveness as stand alone enterprises.

Has it paid off?

Volvo estimate it takes approximately six months for the company to recoup investments in ESD environmental initiatives. The economic benefits are only part of the advantage being achieved by its embrace of materials accounting and materials optimisation.

3.5 Opportunities from Meeting the Challenges

Should Australian industry and government take a strong position in materials accounting, the following are possible results:

3.5.1 Industrial outcomes

- Industry will be able to properly benefit from the industrial product and process design opportunities. The benefits to industry will be economic and strategic, and will in part be reflected in an improved capacity to afford improved environmental management, and the full environmental costing of resources.
- Eco-labelling and marketing on the environmental credentials of Australian industry and the environmental advantages of our country will be possible only with LCA certification under the ISO 14000 series. Competitors without objective measurements to aid them will not be able to claim these advantages. The benefit will be reflected in market image and market share.
- Effectively adopting materials accounting will increase the capacity of Australian industry to apply ISO 14000. This will be reflected in opportunities to secure international market access, commencing in Europe, and spreading progressively through the US, Japan and into other parts of Asia. The costs will be to international competitiveness and trade income.
- Adopting materials accounting techniques represents an opportunity to overcome many limits to environmental impact evaluation. Increasing the objectivity, credibility and transparency of such evaluations offers the potential for improved sustainability, increased certainty, and community credibility.
- As is highlighted by many of the industry cases we have studied, the adoption of materials accounting techniques imposes a discipline on an enterprise, that (with the commitment of management) can be translated into a corporate culture of equal commitment to environmental and economic performance. For many of the corporations we have considered, embedding this culture has opened up unexpected opportunities for improved financial performance.

The beneficiaries of the opportunities offered by the adoption of materials accounting, if seized, will cross political boundaries in the Australian community – industry, environmental groups, consumer bodies, labour organisations and the general public.

ILLUSTRATION 3.2 (cont'd)

- On 3 March 1998, Volvo announced the Volvo S40 1.8i and V40. The 1.8i is Volvo's first big step towards the 25% reduction in the total fuel consumption of Volvo cars, targeted for achievement by 2005.
- On 28 May 1998, Volvo announced the Volvo S80 2.9, the world's first car with environmental specification.
- The World Wildlife Foundation has recognised the efforts of Volvo by awarding it the Carl Mannerfelt Prize, to promote initiatives and activities combining natural and environmental protection with technological and economic development.
- Invoiced sales of Volvo cars in 1997 amounted to 386,400 units, an increase of 5% compared to 1996. Sales trends were positive, particularly in Europe and North America. Demand for the Volvo S40 and V40 exceeded expectations and production was stepped up in order to meet orders.
- The Volvo S70, Volvo V70 AWD (All Wheel Drive) and Volvo V70 XC (Cross Country) met with a swift and positive reception, particularly in North America.

3.5.2 Community and environmental opportunities

- A perceived lack of objectivity and transparency in environmental impact contests results in both less effective decision making, and in lowering of the credibility of the decision processes. Investing in improved methods of environmental contestation offers not only the possibility of better decisions, but also an enhancement of social capital through improved transparency and objectivity.
- The range and complexity of factors involved in sustainability is enormous. The interactions between these factors make the unaided prediction of environmental consequences an impossible task. Materials accounting offers a decision support tool that increases the likelihood that the policy decisions made in the interests of sustainability will be the right ones.

3.5.3 Opportunities for government

- Materials accounting techniques have been demonstrated in northern Europe and increasingly in the US to be effective tools for policy formulation and debate, and for bringing together the often irreconcilable claims of both interest groups into an integrated strategy.
- Improved environmental reporting is possible with a widespread adoption of materials accounting techniques and access to materials inventory data. It becomes more cost-effective when the techniques in use in industry, and the data required by government, are in harmony. Modern materials accounting techniques promote this commonality of interests.
- Government has the prime responsibility for international trade negotiations. In this role, as environmental issues become more significant to trade, having access to reliable materials accounting information, case studies of improved resource management, and effective comparative impact assessment, are all likely to be of increasing importance.

The challenge is great, but the opportunities are equally great. In the long term, Australian government and industry will be forced, by international and community pressure, to take up the challenges. The costs of a reactive response in the long term will be far higher than the costs of grappling with the issues today.

ILLUSTRATION 3.3

Australian Case Study - Improving agricultural competitiveness

The Australian dairy industry has adopted materials accounting as one key to improving its international competitiveness.

The dairy industry is the third largest Australian rural industry. Around 49% of milk production is exported in manufactured form. Over 80% of this is sales destined for Asia and the Middle East.

The Australian Dairy Industry Life Cycle Impact Assessment Project is an initiative of the Dairy Research and Development Corporation's (DRDC) Environmental Management Program. The scope of the project is to perform a LCA of the entire Australian dairy processing industry from "farm gate to factory warehouse".

The aims of the project

The benefits of undertaking LCA in the dairy processing industry are significant and expected outcomes are:

- To assist the dairy industry to identify opportunities to improve the environmental performance of products and processes in a cost-effective manner by providing data to target processes with the greatest impact and create the most waste;
- To benchmark waste emissions and energy and water use across dairy processing units;
- To form a basis for full product life cycle assessment studies as increasingly required as part of eco-labelling programs around the world and provide a sound basis for "green" marketing;

3.6 What Australia Needs to Secure the Opportunity

Within five years, Australia should be in a position where its industry is able to demonstrate a basic capacity to deal with LCA both as an industrial and trade tool. If Australia cannot achieve this goal, it is likely that a number of the adverse impacts outlined above will begin to emerge. It will take at least five years for Australia to be able to coordinate and implement the strategies that need to be in place to meet the challenges and secure the opportunities.

Securing the opportunities means that Australia will need to have a number of elements in place. These elements are critical to the widespread adoption and coordination of effort required by the complex methodologies such as materials accounting. They require the coordinated efforts of governments, industry, educational and research organisations to support the concept, to disseminate the information, to teach the methodology, to refine and develop the methodology, to collate and hold the data, and to ensure that it remains relevant to ever developing community values and needs. In summary, the elements that will need to be in place in Australia in order to benefit from materials accounting are:

3.6.1 A need for critical mass

To achieve accelerated development, isolated and under-resourced initiatives need to be brought together to create a critical mass in the areas of:

- communications and community awareness
- data and information management
- exchange of ideas and inspiration
- funding.

3.6.2 A need for maintenance of technical standards

A frequent experience in the implementation of new managerial concepts is that competition for market positioning among education institutions, consultants and technical staff can cause individuals and organisations to overreach their capabilities. Overselling results in the clients bearing the costs of the learning of the service provider. It also carries the potential of the loss of credibility for both the “brand” and the legitimate providers of expertise.

To minimise these risks, a method for maintaining the integrity of the technical standards is required.

ILLUSTRATION 3.3 (cont'd)

- Provide insights for regulatory discussion and enable the industry to clearly understand its strengths and weaknesses and hence provide valuable data to influence government policy making;
- To be used for evaluation of the effects of resource management options designed to create sustainable systems.

The project has now compiled published mass and energy flow data for all process operations for the manufacture of dairy products and the industry as a whole. The recent project review highlighted the need for more detailed information of material and energy use at a factory level.

Managing confidentiality

A Dairy Manufacturer's Environmental Forum held in May 1998 provided a framework for discussing with dairy industry representatives the thorny problem of securing detailed data, whilst preserving commercial confidentiality.

3.6.3 A need for specific Australian knowledge and data

The particular conditions in Australia require the development of country specific data. The use of data and models developed in the US and Europe has the potential of invalid conclusions, which may disadvantage both the environment and industry.

The development of specific data and knowledge for Australia is essential to the reliable use of materials accounting, and the proper application of ISO 14000.

3.6.4 A need for industry promotion

The communication of the challenge and the opportunity outlined within this document is a prerequisite for industry response, and for the implementation of materials accounting and ISO 14000. This task requires a dedicated effort, closely linked to the sources of real expertise and experience.

3.6.5 A need for Education

To develop the number of skilled engineers and technicians, at the depth required to achieve leadership in the region, will call on the combined resources of all the identified sources. This will have to be converted into forms appropriate for cost and time effective education. Sufficient educators will be required to deliver the educational product to the potential users. All these elements require high levels of coordination, and a concentration of the limited specialised resources.

3.6.6 A need for effective links with government, policy and trade bodies

Unless these elements can be aligned with effective government and industry policy, the coordination required to cost effectively address materials accounting and to meet the challenge of ISO 14000 will not be delivered.

These six needs cannot be met without significant effort, and they cannot be met within the span of a single year. To be ready in five years, Australian government and industry needs to act now. It will take a number of years for Australian industry and government to accrue the benefits from implementation and experience that comes with that implementation¹.

We propose a national strategy, to be implemented through a national coordinating institute as the mechanism for meeting the complex challenges posed by the adoption of materials accounting for Australian governments and industries.

An option supported by the forum was for the project team to confidentially manage operational data supplied by competing manufacturing firms, and release only selected averaged/aggregated operational information (e.g. amount of energy used for the manufacture of one ton of skim milk powder) back to participating firms. This would enable companies to assess their process efficiency relative to other firms, and benchmark their performance.

It is anticipated the dairy manufacturing database will be updated every 2-3 years to also provide a basis for assessing the level of process efficiency improvement with on-going commitment to environmental management strategies.

The dairy LCA project places this important export industry in a proactive position to satisfy growing international demands for environmental information, and counter emerging environmental barriers to trade.

¹ Such accrual of benefits as are highlighted by Porter (1980) in his discussion of "experience curve" effects.

3.7 A Model for a National Institute

The nature of the challenge for Australian industry and government is such that a national institution, charged with leading the implementation of a national strategy is required:

- a) A significant part of the challenge involves the securing, recording and disseminating of confidential data in a way that protects commercial interests;
- b) A driver of the need for a national response is to be able to achieve economies of scale and specialisation, which are not likely to derive from a fragmented approach across the country;
- c) many of the trade issues are “country to country” in nature and securing a national capability to respond to these is significant.

A notional “Institute for Materials Accounting and Sustainability” (IMAS) was put forward during this study as a model of a possible national response. It was designed to elicit responses and form a concrete basis for discussions during the course of this study. The survey responses and the in-depth discussions have led to refinements of this conceptual model. The refined model is discussed below.

3.8 Sensitivities Regarding IMAS

A number of sensitivities were highlighted during the consultative processes. The model we propose in this report responds to these sensitivities, as well as to the challenges that have been already highlighted.

- Confidentiality: A recurrent concern is industry confidentiality. Data that would be required for the purposes of preparing materials inventories has the potential to support competitive insights, such as inferences about cost structures, process efficiencies and the management of inputs and outputs from industrial processes. In many Australian industries there are only a small number of participants, in some instances with only one participant representing the lion's share of activity. Under such conditions, even disclosing information on an industry average basis has the substantial potential of disclosing commercially sensitive information quite specific to that individual firm.

There is also the concern the disclosure of data for materials accounting purposes does not engender its use for political purposes which may be counter to the interests of the firms who make the disclosure. Whilst this issue was a concern, all industry participants interviewed expressed a preference for open debate informed by data, with the belief this would create positive pressures for improved environmental and economic management, improve transparency and reduce distortions in the arguments about relative environmental performance.

- Relationship with the environment & consumer lobby: The confidentiality and political distortion concerns are related to the question of the form of the engagement with environmental and consumer interest groups. There are times when the relationship between these lobby groups and industry (or particular firms) is less than positive. The overwhelming attitude of industry is in favour of full engagement with these stakeholders, with the acknowledgment that even though this may not always be comfortable, it is essential to the improvement of economic and environmental competitiveness. The underpinning priority is to avoid compromising the achievement of improvement by industry and therefore to avoid compromising the performance of a national institute.

The boundaries to this engagement were most often expressed as being:

- There ought be no confusion about the purpose of a national institute, which is to improve the capability of industry to achieve materials efficiencies. Whilst this is underpinned by a sustainability rationale, an institute which is seen as imposing other agendas is not likely to be as effective as one where industry sees it as providing assistance. This is because of the inherent relationship difficulties with a dual role of offering to assist industry whilst simultaneously being a harsh critic of its environmental or consumer performance.

- It was recognised most environmental and consumer bodies suffer under severe resource constraints. It would be desirable if environmental and consumer representation could be on a professional basis.
- It was recognised representation would need to be on a basis that preserves the confidentiality of companies but does not place the environmental or consumer representatives in a position of actual or perceived conflict of loyalties.
- Government leadership and regulation: It is clear from the international development of materials accounting, that government has a central role in providing leadership, support and a climate for adoption. The level and nature of this leadership in different countries spans the following alternatives:
 - mandated government purchasing standards and compulsory reporting by industry (notably in the US and Europe);
 - sponsoring a national program with strong incentives for industry participation (Japan);
 - sponsoring and coordinating research and development efforts in materials accounting (US, Europe)
 - sponsoring voluntary programs by industry (Canada, UK).

From our interviews with industry, it was clear they expect tangible leadership from government, in matters such as:

- aligning government environmental reporting with materials accounting data that will be available from any national industry initiatives (thereby reducing duplication in information gathering and reporting);
- using objective materials accounting data and techniques in preference to subjective rationales, in the formulation of industry environmental policies;
- providing significant financial support for the establishment of a national strategy and the institutions that are needed to ensure industry is able to fully utilise these approaches;
- linking this set of initiatives with other industry development, trade competitiveness and environmental programs, to provide a sufficiently certain and well-developed program to allow industry to fully respond.

On the issue of mandatory requirements for materials accounting analyses and reporting the common response of industry is this ought not be the preferred approach. However, it was simultaneously recognised that if government reporting requirements, purchasing policies, industry support programs and environmental regulations did reflect an integrated approach to materials accounting, and draw on such data, then this will be a significant stimulus to industry adoption. It would also (potentially) reduce reporting and data gathering overlays on industry.

- Potential competitive sensitivities: The conduct of this study highlighted 'territorial' sensitivities among various proponents of different techniques, and across institutions. This is probably a natural result of the intense competition for resources that exists within the government and research sectors, and also market competition among commercial consultants and advisers. It is to be anticipated that this competition will be reflected in the process of development of a national strategy and a national institute.

The approach taken in this proposal is to concentrate on the legitimate interests of users of these techniques, and to assume that once these are established, it will be easier to shape the demands of the supply side of the equation. Our other approach is to focus the IMAS on functions that are complementary to and beyond the capabilities of the existing research and service provision bodies involved in materials accounting.

Related to this issue are the interests of other existing organisations such as The Australian Quality Council and Standards Australia. The approach to this issue has been to focus the IMAS on those activities which are specialised and beyond the role of these existing entities, so the role of IMAS is

likely to facilitate their fulfilling their missions rather than create a competitive entity.

- Naming: The interim name, the Institute for Materials Accounting for Sustainability, (or “IMAS”) was used for working purposes. A few comments were made (particularly by technical experts and advisers) that questioned whether this was the ideal name for such an institute. However, no other clear preferred name emerged. Each alternative proposed seemed to give rise to its own complications. It is proposed that the eventual name should emerge from the consultations with industry, as the institute moves towards implementation.

3.9 The underpinning need for IMAS and its structure

Achieving a state of knowledge and awareness of materials accounting techniques sufficient to the strategic requirements of industry, in terms of ISO 14000 alone, will require a critical mass and a concentration of resources.

Coupled with this, ensuring that such techniques are used skilfully will require a training and education effort beyond the capability of any identifiable institution.

To ensure the materials accounting “labels” (including ISO 14040 Life Cycle Assessment) are not mishandled to the detriment of legitimate users and to the credibility of Australian industry, a mechanism of quality assurance and accreditation is required.

Finally, to develop a framework within which government, industry and environmental and consumer interests can working together to further the national interest in relation to materials accounting, will require substantial effort and capability.

It is the bringing together of the skills and resources to provide the education, techniques, communication, negotiation and policy development, and quality assurance that is the driving need behind the proposed institute.

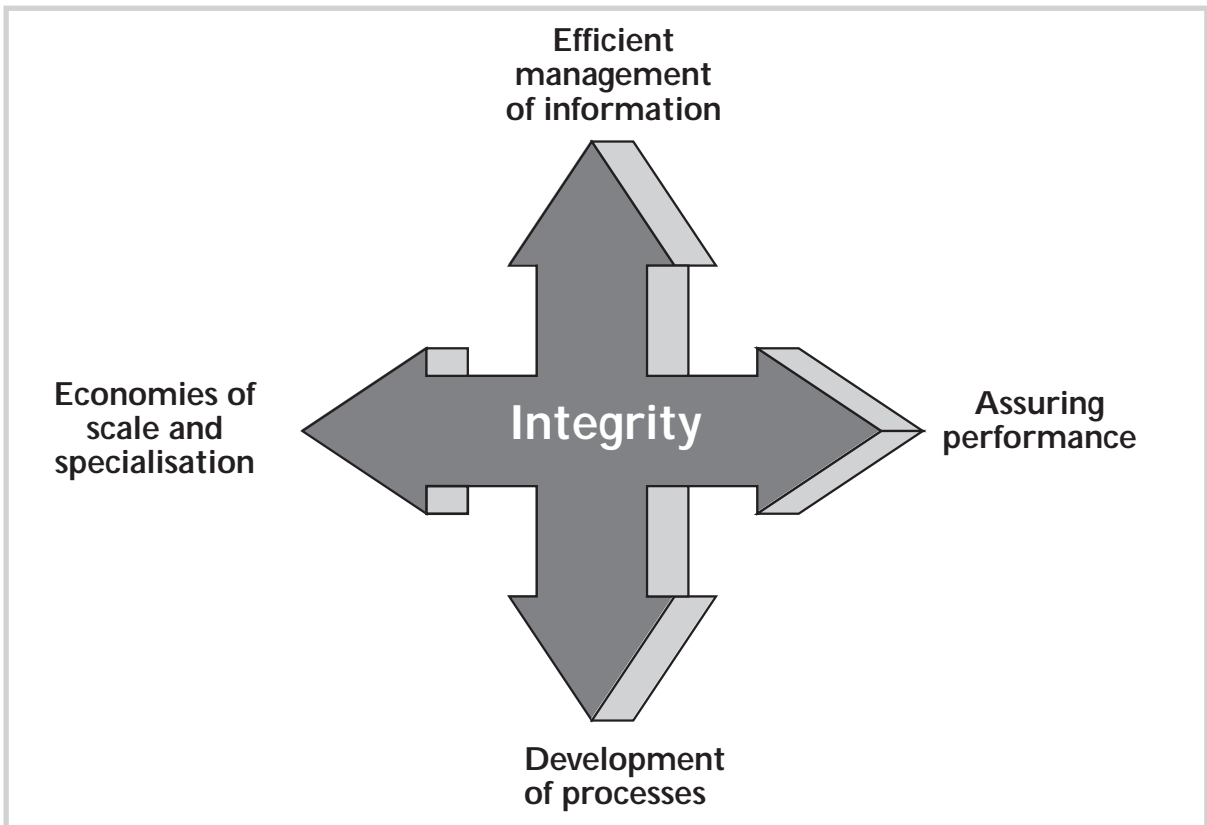


Figure 3.1: The keys to the IMAS services role.

3.9.1 The IMAS Mission

The mission of the proposed IMAS is to enhance the competitiveness of Australian industry, and to improve its materials efficiency, by facilitating its use of contemporary materials accounting techniques, through:

- promotion of the uses of such techniques to assist industry competitiveness;
- providing a secure and reliable materials inventory data collection, management and dissemination mechanism;
- maintaining the integrity of the materials accounting processes available to industry through accreditation and quality management approaches;
- working collaboratively with government, academia, research institutions, community and environment groups to further these ends.

3.9.2 Services logic

The IMAS is fundamentally conceived as a service to industry and government. There are four “keys” to this service role. These address the issues inherent in the adoption of materials accounting already discussed:

- Economies from scale and specialisation: With materials accounting, there are substantial scale economies in the collection and management of information. This is because the collection of inventory and impact information has a substantial ‘fixed cost’ element. This fixed cost is high when incurred by a single enterprise (particularly a smaller scale enterprise). However, when incurred across an industry or an economy, and amortised across a number of organisations, the cost per unit of materials accounting services delivered will decline markedly.

Further, the techniques of materials accounting are highly specialised. The choice of which particular technique, the methodology to be used, and the particular analytical tools, can have a significant impact on the utility of the outcome. For industry to be able to secure the best possible outcomes, a source of specialised and independent advice is likely to be of significant value.

The IMAS is intended to provide industry with this critical mass in both the collection and management of data, and in providing access to independent, skilled, specialist advice.

- Efficiencies in the use and management of information: Confidentiality and the avoidance of misuse of confidential information are significant concerns for industry. Overlaid on this are the complexities of collecting, ordering and storing the data in forms that allow not only for immediate requirements, but are also compatible with new demands as they emerge.

The task of information management is likely to be ongoing, as industry adjusts its activities to different resource sources and new technologies and market demands. Data redundancy is likely to be an ever-present consideration, requiring constant updating of the data.

- Assuring performance quality in materials accounting techniques: International Standards Association (ISO) standards for industry have traditionally allowed a substantial degree of latitude to tailor the processes used within a business, focusing more on the existence of, and compliance with, internal processes.

ISO 14040 will depart from this flexibility. Certification of compliance requires the enterprise has used LCA techniques that comply with the prescribed approach, using data to the prescribed standard. If the specifications of the standard are not followed, this has potentially significant drawbacks for industry in terms of eco-labelling, approved purchase arrangements and selling to downstream purchasers who have an ISO 14040 certification requirement themselves.

Coupled with this is the fact that materials accounting techniques used within industry for materials optimisation purposes will be central to many strategic decisions with substantial economic and environmental implications. Mis-application of techniques could lead to less than optimal outcomes for industry. This also implies suboptimal implications for sustainable resource management.

The range of possible approaches to this task includes:

- accreditation of experts and methodologies for particular forms of materials;

- sponsoring or conducting initial and continuing training for professionals involved in materials accounting techniques;
 - providing a peer review service where there is a concern about methodologies or standards used for particular tasks;
 - facilitating access by industry to professionals who are appropriately qualified and using appropriate methodologies, through a combination of a professional register and the use of a professional credential.
- Sponsoring the development of suitable materials accounting processes: The conditions in Australia – the nature of our economy and environment, and the operational characteristics of our industry – are unique. To maximise the benefit to Australia of the adoption of materials accounting techniques suitable materials accounting processes will be required.

This need is compounded by the likelihood that negotiations between industry and environment groups will increasingly draw on various materials accounting approaches. It is to be expected that the choice of techniques will reflect the political and economic concerns of the countries participating in such negotiations, as well as the substantive environmental and materials efficiency considerations.

The IMAS will focus on sponsoring and coordinating the development of materials accounting processes that are most suitable to Australian needs.

It is not anticipated that the IMAS will itself be a major researcher. The proposed method of operation will be through coordination of industry and research activities, lobbying for funds, and assisting in the direction of funds and research tasks.

3.9.3 The requirement for integrity

Embedded in all of these roles is a substantial need for trustful relations between the IMAS and stakeholder and user groups. The potential for engendering distrust and role conflict is substantial for such an organisation. For this reason, the reality and the appearance of absolute integrity is strategically central.

This reality and appearance will be addressed through a number of measures, which will need to be developed as the proposal is refined through further consultation with stakeholders. The areas requiring consideration include:

- the corporate structure, which must provide a high degree of independence from particular interests;
- funding frameworks, which must make it possible for the IMAS to chart an independent route for itself, whilst still having a clear service responsibility to industry and government;
- selection and control of the board and management of IMAS, to ensure the integrity and independence of IMAS;
- avoidance of service delivery or research roles that would place IMAS in economic competition with research, teaching and consulting organisations;
- the rigorous use of 'Chinese walls' and sophisticated data management to protect the confidentiality of information;
- the establishment of consultative processes that allow environment and consumer groups a full involvement in the development of policy and the furtherance of the drive for sustainability, but without prejudicing the trust of industry and government.

A proposed early stage in the development of the IMAS is the appointment of an independent and strongly minded group charged with ensuring that the strategy and the implementation of the IMAS is carried out with the requirement for demonstrable integrity as a central consideration.

3.9.4 Financial support

After the initial establishment period we propose the IMAS become self sufficient through service fees. Service fees should be structured at three levels. The first level is fees paid on a collective basis by industry or government, to secure the services of the IMAS in fostering the use of materials accounting within industry or particular industry sectors, or to allow the IMAS to assist in developing more synergistic data provision and reporting from industry to government (and vice versa) using materials accounting techniques.

The second level are services fees, levied on membership for either access to data (in forms that preserve confidentiality), or as part of an accreditation system for professionals involved in materials accounting service delivery to industry.

The third is for 'one off' professional services such as the conduct of professional reviews, or other services consistent with the independent role of the IMAS and its fundamental purposes.

This logic is closely linked to the rationale for the institute, as reflected in Table 3.2.

Service logic	Services configuration	Economic logic
Economies from scale and specialisation	National inventory data collection (see below) Materials accounting case studies collection Materials accounting technique reviews Advisory services on appropriate techniques and sources	Low cost per unit of service, by virtue of economies that are not available to individual firms.
Efficiencies in the use and management of information	Confidential collection of industry data Data collation and management to maximise utility and preserve confidentiality Secure data repository Efficient data recovery Audit of data integrity	Low cost per unit of service, by virtue of economies that are not available to individual firms.
Assuring performance quality in materials accounting techniques	Research "best international practice" Sponsor conferences and study tours of materials accounting best practice Sponsor and promote materials accounting education Conduct peer reviews of existing practices and particular studies Certify professional standards Create and manage forums for professional interchange	Contracted industry development service to government and industry
Sponsoring the development of suitable materials accounting processes	Collection of international intelligence on materials accounting and materials optimisation Negotiate between government and industry for synergistic development and use of techniques and reporting requirements Provide industry reports and seminars to highlight suitable practices and case examples. Develop industry by industry materials accounting strategies	Contracted industry development service to government and industry

Figure 3.2: A summary of services provision

3.9.5 Membership

It is proposed a professional membership structure be used to form the framework of the IMAS, and to ensure a "services" orientation is maintained. The membership of the Institute is anticipated to reflect the broad range of stakeholder groups. These stakeholders can be divided into three categories:

- Category 1 - policy stakeholders: These include industry bodies, and government, where the concern is the effective coordination of the activities of industry and government. Membership will deliver access to state-of-the-art intelligence and expertise, and the knowledge fundamental resources required for beneficial adoption are under development, or in place, as required.

- Category 2 - developers, educators and researchers: These include system developers, academic researchers, and industrial organisations who are developing various tools and data for their own use. The institute will provide efficient mechanisms for collaboration and access to world's best expertise. It will also provide supports for the dissemination of information and the education of future users of Life Cycle Assessment and related issues.
- Category 3 - professional users: This category will include consultants, trainers and employed personnel who are concerned with the application of these techniques in industry. Membership will deliver credibility (through accreditation) and technical support including education, and intelligence about advances in the field. The quality assurance element in the operation of the Life Cycle Institute will enhance the credibility and protect the mutual reputation of accredited members of the Institute.

It is contemplated that all levels of membership will be allowed access to data, and to various publications and other supports.

3.10 Conclusion and Recommendations

A strategy for arriving at the required competitive position will draw on the support of two main groups – government and industry. The proposed approach takes this as the keystone and builds on this support.

3.10.1 Raise industry awareness:

The program for doing this begins with this report. *We recommend that this report be circulated to promote discussion at the level of the various industry associations, governments and other stakeholders.*

Elements in this awareness raising program include:

- availability of the authors and supporters of this report, to present at industry seminars;
- free availability of this report, particularly for download from a number of industry web sites;
- public relations and limited advertising in the business press of the availability of this information.

The intent with the awareness raising is to secure from a small number of industry groups an in-principle commitment to support the creation of a national response to these issues.

3.10.2 Recommendation 1: Establish a national approach with the federal government

Building on the dialogue that has been commenced during the preparation of this report, we will seek to establish communication between the various potentially involved departments and peak industry bodies. The aim of this will be to agree a framework for a national response.

With this framework in place, we will then seek state by state involvement.

3.10.3 Recommendation 2: Create a coordinating entity

Whether at the outset of this approach (as the mechanism for implementing these other elements) or later in the process, a coordinating entity needs to be established. The key characteristics follow the IMAS model but modified in the following ways:

- The focus will be on developing and implementing an industry led national framework in collaboration with government.
- The key long term role is intended to facilitate the achievement of a cost effective means for

securing and accessing the required materials inventory data, across the whole economy, to ensure that SMEs are able to fully participate in the benefits of effective materials accounting.

- The second key role is to promote the effective use of materials accounting to enhance industry competitiveness and environmental sustainability.
- The third role will be as a source and clearing house for international data and intelligence to industry and government.
- The institute will seek a close relationship with accrediting bodies to jointly undertake a program of accreditation and standards maintenance for the deliverers of materials accounting services.

It is anticipated the institute will become self funding. However it is accepted that the timing and extent of achievement of this step will in large part depend on the timing and extent of industry response. Should government take the types of steps that have been effective in other developed economies, such as developing preferred purchaser arrangements or mandating minimal standards, this will be accelerated. Should such steps not be considered feasible then we envisage a longer period of economic dependence on government.