WASTE & RECYCLING CONVENTION
PERTH
September 1998

ECO-EFFICIENCY –
INDUSTRIALISTS POINT OF VIEW

By

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INTRODUCTION

Business today is besieged with a plethora of initiatives, programs, operating philosophies and agenda, that makes it nigh impossible for most companies to decide what to embark on, why, and where is it really leading the company. We are all familiar with quality programs, just in time manufacturing, cleaner production. And now we are confronted with eco-efficiency, ESD, sustainability and the triple bottom line. Where will it end?

In this paper I have been asked to reflect on eco-efficiency, the phase of corporate practice considered to be beyond cleaner production. My approach to this request has been to prepare an overview of the evolutionary changes that are confronting industry and highlight some of the drivers that are motivating that change. In the process I place in context cleaner production and then eco-efficiency.

However, I believe that beyond eco-efficiency there lies a larger goal - that of sustainability for organisations, communities and society as a whole - and I have constructed a macro context into which I feel many of the elements of good corporate governance fall.

It is my hope, that with a contextual framework, organisations embarking on any of the improvement initiatives can understand where that particular initiative fits, where it can lead them and what will logically follow.

PATHWAYS OF EVOLUTION

Industry and governments are both involved in a continuing process of evolution that sees the interaction between the two changing as each party changes. This evolution is quite natural and very understandable, therefore to a limited degree it is quite predictable. Through an understanding of the path of the evolutionary process it is possible to put into perspective what is happening today, why it is happening and what may lie ahead.

The area of environmental interaction between industry and governments presents a good model of the respective developments and outcomes for both parties, and the community at large. In this instance four stages of evolution are described and a model created into which can be fitted the concepts of cleaner production, eco-efficiency, and ESD. The four stages are discussed below, while Figure 1 – Pathways of Evolution, shows the four stages in diagrammatic form.
Stage 1 - Regulated

*Industry* operates with a strong single focus on financial profit. All measures of corporate performance are converted to dollars, and performance time frames are measured in months. Traditional economic theories dominate industry and governments alike. These theories assume that resources are inexhaustible, and if a resource does become depleted then the organisation switches to an alternative resource. Corporate mentality involves minimum tolerance of regulation, maximum opportunistic endeavours to outsmart regulators, and if cornered then a compliance approach is adopted with apologies to the bottom line.

Governments representing the whole community need industry to succeed as it is the companies that generate the wealth of the society, employ the people and pay taxes to permit governments to function. At the same time as being supportive of industry, governments also represent the interests of the community and thus must act to stem destruction of the environment and the fabric of society.

The regulatory framework is command and control based. Companies are regulated with permits and emission limits. There are broad ambient standards set, prescriptive licences are issued and there is very little room for flexibility.

Stage 2 - Negotiated

*Industry* becomes aware that it makes sense to work smarter. Working smarter generates more wealth, in the process the company reduces costs and increases efficiencies. Labour is reduced, multi-skilling is introduced, less product is rejected at the factory and by customers, in-process wastes are reduced.

*Government* is encouraged by this "enlightenment" of industry, and commences to introduce support programs that help industry to work smarter. Quality programs, just in time manufacturing, computer aided design, computer aided manufacturing, and cleaner production are all separately packaged and delivered by government in a genuine effort to help industry become more competitive in markets that are being besieged by ever bigger organisations.
The regulatory framework is very collaborative. Governments want to help industry help itself, and at the same time manage the environmental amenity of the immediate community. Agreements are negotiated and entered into on a voluntary basis by industry - knowing that all too often if they don't there will be a return to the regulated environment. Framework regulations and covenants are implemented and regulations are performance based - a clear step above the regulated prescriptive environment of the old days.

Stage 3 - Induced

Industry starts to see the benefits of working more effectively with the resources it uses. There are better profits and things appear to be going smoother. There are less strikes and production stoppages, products can be put into the export markets more competitively, and we can even defend our base in our home town markets from some of the bigger international players both by direct competition and joint initiatives. Simple cost cutting is no longer the first target to improve efficiency, as companies move to increase resource utilisation efficiency. Eco-efficiency is an approach that company executives can relate to, because they can measure it, and from which the company can derive value. This could be the proverbial "win-win" situation, and industry moves beyond a compliance mentality.

Governments respond by creating financial incentives. These cost the government less than support programs or command and control regulation policing. In addition these financial incentive measures leverage off industry and other private sector capital funds. There are financial "carrots" created to stimulate the high achievers, and a change process in management that involves broad based attitudinal changes within those companies. The governments achieve their environmental objectives off other people's money. The cost of compliance goes down, the level of compliance goes up, and the amount of pollution loading goes down.

The regulatory framework is structured so that astute performers can make more money by being even smarter and better environmental performers. Load based licensing is converted rapidly into a permit trading regime, smart tax offsets are introduced and green energy drives and finances a plethora of different agenda.

Stage 4 - Unconstrained

Industry recognises that it is really dealing with more than just financial capital. Human capital and ecological capital are recognised and valued. Companies begin to understand the power behind ecological sustainable development (ESD) thinking and behaviour. The leaders move beyond the regulatory frameworks of governments.
Truly global corporations emerge with powers greater than governments, their reach greater than governments and their responsibilities greater than governments. If they don't nurture the ecosystem they are out of business - most probably because they are quickly rejected by their customers. They see that competitive advantage can be gained by doing it right for society, the economy and the ecological environment. Not only that, but they see a future beyond the next quarter's financial result, beyond the next annual general meeting, and beyond the next chief executive. Sustainability for the business appears as a real possible future.

Governments become eclipsed. They step back so as not to impede the leaders, and encourage the small players to tag along with the front runners. Collaboration between governments and industry emerges as a means of achieving higher goals. This is really the "win-win-win" situation.

The regulatory framework backs off from the leaders as competitive market forces take over where external regulation once operated. The corporations have self-imposed regimes of operating codes and require their suppliers to conform. The regulatory systems are targeted at the laggards and the leaders become unfettered by political regulatory regimes.

What I have described is a process of co-evolution on the part of industry and governments that is happening today across the developed world. For the forward thinking, foreknowledge of this process of evolution can create a serious competitive edge. For the average player it will mean little.

BEYOND CLEANER PRODUCTION

The above story of co-evolution also highlights how, where and why various initiatives, programs and incentives come into vogue and then for no apparent reason disappear from the limelight - and cleaner production is one of those initiatives. Cleaner production is fading, not because it doesn't produce the results, but because it is being incorporated into other larger programs and ways of thinking and conducting business.

Cleaner production is essentially an internally focused program, and eventually companies have to be focused both internally and externally. On its own, cleaner production will not deliver the full benefits that companies of the future need. And the same can be said of quality programs, JIT and other advanced manufacturing programs. On their own they produce good, but limited results. Incorporated into total corporate systems they combine to deliver outstanding improvements in performance.

This is not intended to forecast the end of cleaner production and other similarly internally focused programs. There are many companies that are still in the grip
of a compliance mentality, they can't see the big picture. Single stream focus programs are the starting tools for moving these organisations along the path of corporate evolution. Through such programs they can learn and experience the benefits that are possible, and can get a taste for what the future can offer. But on their own such programs will never deliver the full and necessary reforms.

Driving us to move beyond cleaner production and such programs are the big ecological drivers that are motivating governments and the leading companies. Of these drivers, the single most significant issue and greatest threat that has been recognised across the globe by leading regulatory agencies is the escalating world population and the associated decimation of our natural resource base.

This is of course a driver for cleaner production, for in cleaner production we aim to reduce the in-process waste and minimise the pollutants released - both of which contribute to resource conservation. But there is a desperate need for more impact than cleaner production alone can deliver.

The following very graphic example has been taken from a reference that discusses an initiative called Factor IV (2) and is shown in Figures 2.1 to 2.3. It draws on work by the US National Academy of Engineering and uses data that has been compiled for the USA economy in 1989. I have heard that this may be an optimistic picture in comparison with the figures for 1997, but that data is not available to me at present.

Figure 2.1 represents the notional economy of the USA in 1989, with inputs - energy and raw materials, and outputs - saleable products plus emissions and wastes. The Academy looked at the two output classes and assessed the relative proportions of each for the economy as a whole.

Figure 2.2 shows that these are respectively - saleable products 7% and emissions and wastes at 93%. But another factor they took into account was the disposal of saleable products to waste within 6 months of purchase.
This is 80% of all saleable products, leaving only 1.4% saleable products and 98.6% of wastes and emissions.

It has been suggested that the relative amount of saleable products to the inputs is a measure of the efficiency of an economy - and this is often used in business. Well, in the case of the USA economy in 1989, the efficiency of resource conversion in the economy was only 1.4%, which compares with around 2.2% to 2.4% for some Scandinavian countries at that time. While this is almost twice the efficiency of the US, it still does not appear to be particularly efficient.

Is there any wonder that there is global concern about over utilisation of resources?

When these arguments relating to resource utilisation are put to economists their typical reaction is that resource consumption is linked to wealth creation and the gross domestic product (GDP) of the economy, and if you cut consumption you cut wealth creation and cut GDP. This threat is sufficient to stop most politicians dead in their tracks. And regrettably the environmental lobby groups have not been able to get around the economists’ simplistic view of the economy.

This is where waste managers come in. After all it is the waste management industry that manages the emissions and wastes of society.

The challenge is to improve the efficiency of the economy without reducing GDP. Figure 2.3 shows how by converting some of the emissions and wastes into saleable products we can achieve a significant boost in system efficiency with little impact on the inputs. In the example shown, just 10% of the emissions and wastes are converted, and even allowing for the 80% fallout of saleable products to waste after 6 months, it boosts the efficiency from 1.4% to 3.2%.

One well-known example of this approach to resource efficiency improvement is at steel mills where copious amounts of slag are produced as part of the emissions and wastes. Not only did these go to waste, but the heat energy in the molten slag was lost and more resources were consumed breaking up the solidified slag so that it could be landfilled.

It is now common practice for service companies to take slags from the steel maker, still molten and in the ladle, and convert it into sand and cement additives.
which can be sold. In this scenario the slag is used, the energy of its molten state is used, the landfill space is conserved, and the cost of breaking the slag is saved. The steel company is rid of a waste, the service company makes a tidy profit, the product replaces virgin sand and cement materials, and the environment is better off.

The whole process leverages off wastes and creates more wealth, more jobs, significantly reduces the impact on the environment, and conserves resources - increasing efficiency and growing the GDP.

This is beyond cleaner production. And this is where the opportunities lie for companies that want to get above simple waste disposal and into resource recovery and efficiency improvements. This is where eco-efficiency comes into play, and creates business opportunities for manufacturers and service providers alike.

**WHAT IS ECO-EFFICIENCY?**

Eco-efficiency has been promoted extensively by the World Business Council for Sustainable Development (3), a global organisation that has been established to encourage the pursuit of sustainable development and to develop policy and best practice for corporations, including the concepts of eco-efficiency.

Eco-efficiency is defined as - "the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing the ecological impacts and resource intensity throughout the life cycle, to a level at least in line with the earth’s estimated carrying capacity".

Eco-efficiency is clearly at the intersection between the environment and the economy. And as corporations move from simple financial measures of performance, so they will pick up environmental performance criteria, and as these become definable in numerical terms, so the concept will be picked up widely across industry.

Indeed, the accounting profession in a number of developed economies is actively involved in positioning itself as the logical player to report on eco-efficiency – after all their task is collection, collation and reporting of data. So what if it relates to eco-efficiency rather than their traditional ground of straight economic data?

The World Business Council for Sustainable Development is collaborating with a number of other national and international organisations to develop a uniform set of metrics - measures - for eco-efficiency. Their aim is to establish recognised standards against which companies can report and be compared.
Part of the drive for these standards lies in the finance sector. Here there is an ever-increasing desire to differentiate between investment alternatives. There is a general belief in the finance sector that companies which fully embrace eco-efficiency principles will be better performers in both the medium and long term, hence better investment options. Already there are two major international investment funds that invest only in companies that pass their eco-efficiency criteria. And there are reports that both funds are outperforming other funds which have invested in equivalent companies, but which do not meet the eco-efficiency goals of the first two funds.

The eco-efficiency metrics and guidelines that are being developed revolve around the following measurable aspects of companies' businesses - materials intensity, service intensity, toxic dispersion, recyclability, resources, durability, and energy. Table 1 – Checklist of Issues for Eco-Efficiency, covers a brief list of questions that can be used to test for eco-efficiency in each of these areas.

In the process of developing measures of eco-efficiency, various groups are starting to compile a list of benefits that they perceive corporations will generate if they pursue an eco-efficiency course in their business. Some of these are quite obvious, however, some of the less obvious provide some interesting insights into why the leading corporations believe they can achieve a competitive advantage through the principles of eco-efficiency. A partial list of benefits includes:

- improved economic performance,
- improved environmental performance,
- reduced cost of poor environmental performance,
- improved or protected market opportunities,
- improved public image,
- attracting a higher calibre of staff,
- retaining staff longer,
- enhanced management capabilities,
- reduced costs of environmental compliance,
- improved risk management,
- increased market share,
- reduced cost of capital.

**Eco-Efficiency and ESD**

ESD is one of those terms that has been unfortunately incorporated into political-speak to such an extent that it has lost a great deal of its meaning and value. Indeed, many have the attitude that ESD is a contradiction in terms and that it is not possible to have development which is ecologically sustainable. I challenge this latter view and I am disappointed in the loss of impact that ESD has as a result of its frequent and insincere use.

Let me outline for you the underlying principles of ESD, to highlight what I believe to be the elegance of the concept and its applicability to eco-efficiency. Simply stated, the principles of ESD are:
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<th>Material Intensity</th>
<th>Service Intensity</th>
<th>Toxic Dispersion</th>
<th>Recyclability</th>
<th>Resources</th>
<th>Durability</th>
<th>Energy</th>
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<tr>
<td>Can the product be redesigned to make less use of material inputs?</td>
<td>What service is the product delivering and can this be provided more effectively?</td>
<td>Can toxic dispersion be reduced by using alternative raw materials?</td>
<td>Can wastes from raw materials production be reused or recycled?</td>
<td>Can renewable or abundant materials be substituted for scarce or non-renewable ones?</td>
<td>Can materials or processes be altered to improve longevity?</td>
<td>Would substitute materials or components reduce overall energy intensity?</td>
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<td>Are there less material-intensive raw materials?</td>
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<td>Can existing raw materials be produced in less materially intensive ways?</td>
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<td>Would higher quality materials create less waste in later stages?</td>
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<td>Can wastes be utilised?</td>
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| | Can the product be integrated with others for multifunctionality? | Can harmful substances be eliminated from the production process? | Can products be designed to facilitate customer reuse or revalorisation? | Can more use be made of renewable energy? | Can durability-limiting aspects be designed-out? | Can processes be integrated to create energy savings? |
| | Can customer disposal problems be eliminated by providing a take-back service? | Can harmful substances generated in use be eliminated? | Can products be designed for easy disassembly? | | | |
| | Can products be redesigned to reduce logistics? | Can energy be recovered from end-of-life products? | Can new buildings maximising the use of passive heating and cooling? | | | |
| | | Can products be designed to utilise abundant materials in use? | Can maintenance of the product be improved? | | | |
| | | Can customers be educated on increasing product durability? | Can the energy efficiency of products in use be improved? | | | |
| Can products be made biodegradable so that less energy is required for disposal? | | | | | |
• decision making processes should effectively integrate both long and short term economic, environmental and social equity considerations;
• where there are threats of serious or irreversible environmental damage, the lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (the precautionary principle);
• the global dimension of environmental impacts of actions and policies should be recognised and considered;
• the need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised;
• the need to enhance and maintain international competitiveness in an environmentally sound manner should be recognised;
• cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms;
• decisions and actions should provide for broad community involvement on issues which affect them.

ESD is about balancing social, environmental and economic considerations.

To highlight the relevance of these principles to our activities in the waste management sector, let me use some of the issues that we normally consider when planning and implementing a new waste facility - and demonstrate how what we do already fits into an ESD framework. The following list includes some of the typical factors considered:

- local amenity
- local employment
- capital investment
- post closure use
- energy recovery
- monitoring
- gate fees
- environmental levies
- host fees
- media management
- transport systems
- reuse of materials
- community consultation
- environmental management systems

By no means a full list, but representative of the breadth of issues. Now if we re-order these issues and overlay them on a three segment chart representing an ESD framework, it is not difficult to see that there is some interesting order and logic to a lot of what we already do - and it relates to the principles of ESD. This is shown in Figure 3.
So, where is eco-efficiency? Eco-efficiency is the interface between environment and the economy, and in this instance three issues fall squarely in that domain - environmental levies, reuse of materials, and energy recovery.

From this simplistic example it is easy to see that we have been playing with parts of the equation as a natural course of our business, but we haven’t as yet drawn the full picture together. We are very familiar with addressing each of the three discrete areas - environment, society, and economy, but rarely the interfaces and hardly ever the full spectrum. Eco-efficiency is one attempt to look at one of the three interfaces. Similarly cleaner production falls across the environment-economy interface, while quality systems could be considered as falling across the economy-society interface.

**WHERE TO NEXT?**

A number of major corporations have now commenced embracing what has become known as the "triple bottom line". This concept was developed in the UK and written about by John Elkington, Chairman of the company SustainAbility, in his recent book - Cannibals With Forks (4). In triple bottom line philosophy, companies address all three areas of the ESD framework - society, economy, and environment - and commit to report on and be answerable for their performance in all three areas. In so doing they not only pick up the three prime areas, but also the three interface areas - of which eco-efficiency is but one. This approach is being discussed as a true attempt to achieve sustainability within corporations.

In June of this year Placer Pacific, now Placer Dome, a major gold mining organisation with substantial operations in Australia and the region, publicly announced that they proposed to pursue a triple bottom line approach to their resources business. To my knowledge, this is the first such organisation with significant operations in Australia to commit to the triple bottom line.

Not all companies can embrace the triple bottom line principles instantaneously. It takes commitment, resources, determination, and very persuasive internal and external selling capability in the face of current short term thinking boards, financial analysts and investors. However, the humble cleaner production, which

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<th>Figure 3 - ESD in Waste Management Planning</th>
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**Figure:**

ESD in Waste Management Planning

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forms a part of eco-efficiency, which in itself forms a part of the triple bottom line is a good starting point.

My concern in the past has been that the various initiatives, of which I spoke earlier, are too often embarked upon as an end in themselves, without a bigger picture context or framework. As a result, good initiatives become discredited and fall by the wayside as the next apparent fad comes along.

In reality, most form a part of the framework of sustainability and the triple bottom line. Most have a place of relevance in our planning and operations. But to get the maximum benefit from each initiative, it really helps to first understand the perspective of where the big picture is heading, and where the particular initiative we are considering sits within that big picture of sustainability.

REFERENCES


