

A FRAMEWORK FOR SUSTAINABLE RECYCLING

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ABSTRACT

Under the current regimes of policy, planning and management, kerbside recycling in Australia cannot be considered sustainable and will not achieve optimum efficiency. Throughout the country there are many excellent programs, demonstrations, studies and financial support schemes working to keep kerbside recycling viable, but eventually all of these efforts will flounder unless we change our approach to policy, planning and management of the total recycling system. The fundamental flaw lies in the belief that a total free market approach will eventually deliver a market sustainable system. This inappropriate and simplistic view overlooks the immature nature of the recycling sector and the lessons we have learnt from the development of other essential services which are a part of the public/private interface of infrastructure and business. Before we see significant advancement towards sustainability, we need a radical re-think about the policy, planning and management systems needed to satisfy the community demand for on-going recycling.

INTRODUCTION

Recovery and recycling of used materials is an activity of strategic significance. Close to 20 per cent of the domestic waste stream in Australia is diverted to recycling and the proportion is increasing as community support gathers momentum. In the commercial sector, even higher rates of material recycling are being achieved through in-plant/in-process reuse and external recycling.

Recycling can not only conserve resources that would otherwise have been lost, but the practice can also reduce transport, energy and disposal costs. But the success of recycling also depends greatly on the comparative cost and supply certainty of the recycled product. Recycling ultimately needs to make sound economic sense, as well as environmental sense for long-run sustainability to be achieved.

Recycling is a commercial/community program with considerable state and national significance. It is widely recognised as important for achieving educational outcomes and changing practices with regard to consumption patterns. It has captured the imagination of the community and gained political support at all three levels of government.

At the national level there is active collaboration between government and non-government stakeholders in the efforts of ANZECC to develop the Packaging Covenant and NEPC to develop a national environmental protection measure.

These developments have been on-going for many months and appear to be nearing fruition.

Notwithstanding the beneficial outcomes anticipated from the national initiatives, it is still essential to have a state-by-state based framework for planning and management if a sustainable system is to operate. This paper discusses some of the issues that need to be considered in such a framework within which the national initiatives can be fully implemented.

THE CURRENT SITUATION

The market created for the main recyclable materials has proved unstable and highly fragmented. This is partly due to the lack of a formal market structure with logical rules and predictable behaviour by buyers and sellers. The vicious cycle of increasingly greater market instability has resulted in some major failures in recycling schemes, and forced some industry enterprises into making their own arrangements for supply of recycling materials. Such a move by companies to operate outside the traditional value chain provides them with greater certainty of quantity, quality and price and may well maximise their internal efficiency – but in the end, these moves further fragment the sector.

The imperative of sustainable recycling constitutes a mindset that is not present within the thinking horizons of many of the participants in the recycling value chain. The focus of most players is on their own part of what is a long and complex chain.

The recycling system infrastructure is not balanced to maximise overall efficiency. Rather, organisations operating at each activity in the chain have invested in systems and technology to improve their own efficiency. In other words, their focus has been on their own activity optimisation rather than total system optimisation.

The position is compounded by a proliferation of different collection, sorting and handling systems at each activity point, particularly post-consumption. This has led to a situation where protecting and upgrading established positions is a common, reasonable and logical pursuit; but one where a durable outcome, which ultimately requires the cooperation of participants in the interests of a higher-order goal, is unlikely to emerge.

The outcome to date is a sub optimal recycling system. It is excessively costly and open to participants to bypass the many steps in the chain.

THE RECYCLING VALUE CHAIN

The value chain model for kerbside recycling and the functions and roles of the main participants are discussed below in an attempt to highlight some of the strengths and weaknesses that exist, and the opportunities that are within our grasp, if we can organise and manage the system appropriately. The value chain model is widely used to describe industrial systems of sequential value-adding, and the approach here has been based on the work by Michael Porter¹.

The operations of an organisation or an industry can be viewed as a series of activities which culminate in a tangible product or service. A measure of value creation takes place at each activity point. Although each discrete value addition may be small, it contributes to establishing an outcome which meets the approval of buyers. The ultimate value is measured by the price buyers are willing to pay for the product or service.

Two groups of activities are relevant. Primary activities are those directly involved with operations – in essence manufacturing, logistics, marketing, and consumption. Support activities provide indirect, but driving inputs, such as – the people associated with the sector, and the market frameworks within which transactions take place.

The model commences with the acquisition of raw materials by manufacturers and concludes with sale of recovered raw materials back to those same manufacturers, with the key stages being:

- raw materials manufacture,
- secondary manufacturing and conversion,
- distribution and sales of goods,
- product utilisation and consumption,
- collection and transport of recovered resources,
- processing and up-grading recovered resources in MRFs etc,
- sales and marketing of recovered resources,
- incorporation of recovered resources with virgin raw materials.

These primary activities in the recycling value chain are associated with creating products for consumers, followed by the logistics of collecting, sorting, consolidating and re-selling specific types of recovered materials. Value is created repeatedly and built up in performing each of these primary activities.

Support activities are less repetitive, and often less obviously sequential in nature; but none-the-less, they also contribute to value creation. Typical of the secondary activities are:

- the regulatory environment and market frameworks within which the system operates,
- the people within the system and their needs for training, skills development, resourcing, etc,
- the exchange protocols used to manage the transfer of ownership, responsibility and risk as commodities move along the value chain, and
- the technologies that are developed to facilitate each stage and produce operating efficiencies.

The value chain can be used in a number of ways, but here, two prime purposes are intended:

- to describe the **functions and roles** performed at each activity point through the product life cycle; and

- to highlight **strengths and weaknesses** of the system.

Functions and Roles - the focus here is to capture the essence of the functions that actually add value to the recycling system. These are outlined in Table 1 – Recycling Value Chain Functions & Roles.

TABLE 1: RECYCLING VALUE CHAIN FUNCTIONS & ROLES

ACTIVITY	FUNCTIONS & ROLES
Primary Activities:	
Raw Materials Manufacture	Manufacture and supply of virgin materials; reprocessing of recovered resources; integration of virgin and recovered resources.
Secondary Manufacture	Manufacture of consumer goods; manufacture of packaging.
Distribution and Sales	Wholesale and retail distribution; retail sales.
Product Utilisation	Consumption; source separation of wastes; preparation of recovered resources for collection; discard of residues to waste.
Collection and Transport	Collection; quality inspection for contamination; kerbside sort; consolidate and transport.
Processing	Stockpile; consolidate; sort and upgrade resources; quality inspection; store for shipping.
Sales of Recovered Resources	Market intelligence; arrange transport; consolidate; trade/broker sales; stockpile; develop markets; develop suppliers.
Support Activities:	
Market Frameworks	Environmental objectives; fair trading regime; government trading/tendering guidelines; OH&S controls.
People	Market research into consumer preferences; consumer education; training of participants; education of suppliers and buyers.
Exchange Protocols	Commodity quality/price guidelines for raw materials; market competition between resources; quality and contamination protocols; collection contracts; testing regimes.
Technology Development	Increase recycled content in products; integration of packaging with transport, storage and display; bins and containers for sorting and collection; automation of collection, handling and beneficiation; IT systems for trading; new products from recovered resources.

Key conclusions that can be drawn from this situation include:

- sorting takes place at four activity points, namely the point of consumption or use (home, supermarket, office, factory etc.); kerbside collection point; MRF or transfer station; and again at the raw materials processor's factory, (the protocol varying largely with the materials handling technologies used rather than the commodity type);
- the consolidation and sorting of recycled commodities is a major logistics activity which spans the whole value chain.
- a principal support activity and system driver is the development and provision of technology to facilitate recycling; and
- there is a notable lack of systems planning and/or coordination throughout the support activities.

System Strengths – The recycling system operating in Australia has some intrinsic strengths which play a critical role in the success of the scheme, these include:

- there is strong community support for and participation in the recycling program; households in fact create considerable value in the system by their willing participation in waste sorting at no cost to the recycling system; the majority of community members want to make an active contribution to resource conservation;
- the market for collection, sorting and MRF processing of recycled material, although fragmented, is highly competitive; this is likely to lead in the medium term to technology and system innovation;
- there is strong government support for the recycling program; this has been characterised by numerous initiatives including creation of waste boards; provision of supplementary funding for recycling, and the push for national measures relating to packaging;
- there is a demonstrated commitment from the packaging, manufacturing and newsprint sectors to use recycled resources;
- the newspaper publishers have taken a leading role in establishing a purchasing regime for recycled newspaper which minimises down-side risk to suppliers and shares benefits on the up-side of commodity prices;
- the supply capacity of the system is very strong;
- there are four principal points of value creation in the primary activities associated with the recycling section of the value chain –
 - the logistics process involving capturing used materials, transporting, consolidating, sorting to type and on-transporting to buyers' premises,
 - the (voluntary) participation of householders in the recycling program,
 - the selling/buying activity in which supply sources and demand sources trade,
 - the materials transformation process which allows recyclable materials to be used beneficially in order to reduce consumption of virgin resources; and
- value is also created for the recycling industry through the support activities in areas such as:
 - progressively declining input costs through technology developments,
 - improved streamlining of transactions through continuously improving protocols and increasing maturity of relationships, and
 - workforce competency through experience and training.

SYSTEM WEAKNESSES – as with many new and evolving systems, the recycling scheme has a number of weaknesses yet to be overcome. The central issue revolves around the fact that recycling is not actually an "industry" or organised service. Rather it is a loosely organised process which culminates in materials to be used as input sources for various industries. Specific system weaknesses include:

- there is inadequate planning, organisation and system protocols associated with the recycling value chain beyond the stage of product utilisation; this is manifested in an absence of rules, order and regulatory regimes;
- for some manufacturers, inclusion of recycled materials in the production process appears to be a grudge purchase; this restricts demand for some recycled materials and artificially creates price barriers between competing resources;
- the recycling system infrastructure is not balanced to maximise overall efficiency; instead, organisations operating at each activity in the chain have invested in systems and technology to improve their own efficiency;
- the need for multi-stage sorting adds to the cost of the final product; with current technology, for products which are small in volume and sourced from multiple supply points, sequential sorting and concentration is essential;
- the support for utilisation of recovered resources in the packaging and raw materials manufacturing sectors, is not yet matched by a similar level of commitment from the fillers or manufacturers of product;
- the system is weakened by the proliferation of different collection, sorting and handling systems at each activity point post-consumption;
- participation in support activities in the recycling system is quite moderate reflecting the relative immaturity of the market, a high level of fragmentation, the government push coming from an environmental perspective, and the ineffectiveness of government efforts to intervene;
- the purchasing model developed by the newspaper publishers has not been widely adopted across other commodity streams; and
- risk management remains a major weakness, with no clear way forward to manage risks while maintaining market order; there is no uniform agreement as to which party should carry the risks of trading and commodity price fluctuations.

The recycling system as it is currently structured is excessively costly and open to abuse. There is a clear opportunity for development of an overall framework, and for service providers to fill obvious gaps. The ownership and price recovery risks could be accommodated in more efficient ways in order to achieve system optimisation gains. There is substantial scope for the market and the system to mature.

OPPORTUNITIES TO MOVE FORWARD

One step in moving the system forward is to review the various objectives of the stakeholders in the resource recovery value chain and to look for synergies that can yield sustainable solutions. In this regard a sustainable solution is one which satisfies the three bottom line objectives of social, environmental and economic stability. Table 2 – Schedule of Stakeholder Objectives summarises the challenges we face.

TABLE 2: SCHEDULE OF STAKEHOLDER OBJECTIVES

STAKEHOLDER	SOCIAL	ENVIRONMENTAL	ECONOMIC
Households	To be a part of the community in recycling, with minimum personal inconvenience.	To make a positive contribution to the state of the environment.	These views vary widely depending on the cost tolerance of the individuals.
Councils	Minimum neighbourhood disruption with collection; minimum rate payer dissatisfaction.	To make a positive contribution to reducing resource consumption and environmental impacts.	Achieve maximum cost off-sets with a minimum of risk exposure.
Collection Contractors	Minimum complaints from residents regarding collection services.	None generic.	Profitable collection operations with no commodity risks.
MRF Operators	None generic.	None generic.	Maximum throughput; minimum supply quality risk; significant trading margins.
Brokers/Traders	None generic.	None generic.	Significant trading volumes and margins to diversify price/demand risks.
Reprocessors	None generic.	To make a positive contribution to the health of the environment, consistent with corporate positioning.	Minimum total purchase cost for feed stocks, to achieve minimum long-run costs.
Manufacturers	None generic.	None generic.	Have products and their presentation in a manner and at a price which attracts customers.
Governments	Community participation in recycling.	Reduce consumption of resources.	Stable markets and trading arrangements.

There are a few, but significant, conflicting interests in the objectives outlined above – particularly with regard to the views that stakeholders have of the system and its sub-system elements. To be sustainable, the proposed system must incorporate ways of overcoming these issues in favour of total system operations. Four key conflicting areas are:

- MRF operators have a particular interest in maximising the amount of recyclables diverted to their facility for sorting to amortise their capital investment and achieve economies of scale. Thus they would favour a minimum of kerbside sorting. This may lead to a lower net recovery of saleable resources.

- Councils have an interest in minimising the cost and social inconvenience of kerbside collection. This can be achieved through increased mechanisation in kerbside collection systems, however it will result in greater mingling of recyclables, a need for increased MRF processing, increased overall costs and lower recovery of saleable resources.
- Reprocessors, are few in number in a system where there are many sources of supply. Therefore they hold a commanding market position from which they are able to demand strict quality adherence and control prices. This has instilled a tendency towards adversarial contract/trading arrangements rather than alliance partnerships.
- Manufacturers are intent on driving consumption by consumers on the basis that to do otherwise will reduce wealth creation and economic growth.

The absence of a market structure, plans and logical rules of behaviour will result in periods of market failure. The lack of overall planning stunts development and the absence of system management results in self-serving, ad hoc decision making. The way forward must be based on the idea that market mechanisms should be retained, but that agents/managers, on behalf of state governments, should play an influential role in creating cohesive, and viable market conditions. Such a role is important because recycling is in fact a complex economic system operating in a highly fragmented value chain.

Put simply, there is a leadership gap in the operation of the recycling system. While that gap remains unfilled system vulnerability will remain high. Free market advocates may argue to leave well alone and allow market mechanisms to move the system to equilibrium. But that logic does not hold up for an economic system in which so many non-market, community benefit factors apply. In such markets, some form of government intervention is usually necessary, at least in the short term, to establish and nurture viability. Governments, with overwhelming community support, have signalled their intention to support recycling. Government intervention possibilities range from overall market domination, through direction and control of planning, management and operations (as in the case of water supply and energy) to general management (as in the case of building construction).

The industry structure selected must maximise market mechanisms and freedom of choice for the public and private sector stakeholders. It must incorporate flexibility and competition within the context of light-handed overall control.

But the aim is to move from the current loosely organised system to one which matches the level of organisation existing in other industries, such as retail trading, banking and finance, telecommunications, commodity trading and motor vehicle trading. In such mature sectors, government policy provides an overarching framework, while stakeholder protocols provide the tools and rules for relationships and responsibilities. This approach will require greater ownership for recycling on

the part of the manufacturing industry through mechanisms such as the PNEB contract arrangements for quality, quantity and price that have been established for recycled newspaper.

With regard to the ownership of recyclables and management of risks through the recycling chain, the general management role proposed requires a measure of authority to secure collaborative moves towards recycling sustainability. Such authority could be achieved either through development of legislative controls or, preferably, by agreement between the stakeholders that the agent/manager on behalf of the government could be nominal owners of the recyclable commodities after transfer from Local Government. From a recyclables ownership position these agents/manager should be positioned to:

- undertake planning and development in collaboration with stakeholders (especially Local Councils and end markets), to improve recycling participation and efficiency;
- let contracts to specialists for MRF processing and negotiation of long term supply contracts with industry;
- manage the trading risks currently implicitly assumed by Local Government, but mitigate effectively these risks through long term sales contracts and engagement of specialists to undertake the negotiation of such contracts;
- ensure that material flows are directed along routes which maximise the value-added and minimise the costs added.

With regard to technology development, there are several opportunities for system enhancements. However, these will only be effective where total system approaches are taken. The advent of mixed plastics sorting MRFs is one such opportunity. Such facilities could significantly lower collection costs for all non-glass containers, could reduce total sorting costs, and increase both the quality and quantity of recovered resource yields. The proposed systems management role would work collaboratively with the relevant stakeholders to ensure that such systems are implemented where appropriate and that duplicate sorting, handling and processing systems are eliminated.

Key main features of such a management scheme include: a key role for governments in both planning and facilitating kerbside recycling; continuing and even increased participation by the private sector in the operations of recycling; a higher level of involvement from manufacturers; and much greater articulation of the quality requirements of reprocessors back through each activity in the value chain to household separation.

REFERENCES

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Previously he was General Manager the EIDN program, where he worked extensively across the environment management industry developing comprehensive networks and a deep understanding of the markets for the industry. This involved analysis of markets, the regulation and drivers for those markets and positioning strategies for companies seeking to increase their competitiveness.

Paul has over 25 years experience covering environment management, waste management and mining sectors, with operational roles from production engineer through to chief executive of a public company.