



## Reuse and recycling: model development and incentive programs



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# Executive summary – Reuse and recycling: model development and incentive programs

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This report was initiated by a brief that required the delivery of a report which details the various recycling and reuse programs in operation, locally and internationally. The brief required positive suggestions for new programs, and strategies for the implementation of these, as well as performance measures. Targets for strategies were to be, particularly, around the plastics, timber and paper industries.

It was agreed that, given the time and budget commitment, it would not be realistic to deliver a fully detailed comprehensive assessment of the field. It was agreed that the study would concentrate on generic characteristics of the main local programs, and then select from other jurisdictions programs which appear to provide the greatest insights.

We anticipated that a problem in conducting the study would be that no overall framework for understanding the types of incentives programs required for best impact may exist. This proved to be the case. Through a review of the literature and through interviews, it is clear that there is no overall model for linking programs and analysing them.

To make sense of the plethora of programs available to encourage greater reuse and recycling in, especially, the Commercial and Industrial (C & I) sector, our first task was to develop a framework, a social systems model, for understanding the way people might be encouraged to increase materials recycling and reuse.

In the model we describe three interlinked groups: individuals, organisations and society. Each group responds to different types of incentives, yet belong to each of the other groups. At the basis of understanding how these groups operate, and therefore how their behaviour might be effected, we specify three types of factors – or flows: information flows, resource flows and cultural flows. Information is vital for decision-making and forms the basis for many values and beliefs held by individuals, organisations and society. Resources – whether financial, technological or material – enables activities to be carried out: the conversion of materials or data that is not in itself useful to society, to something that is useful. Finally, cultural flows give meaning to the activities of individuals, organisations and society. Culture is made up of the values, beliefs, “stories”, that people hold (and may vary from group to group). Culture in part defines “valuable” and directs where individuals, organisations and society expends effort.

This social system model is developed in Part 1. Using this model, it is possible to identify the sorts of programs that could be implemented to change the behaviour of people – depending whether the target behaviour is that being displayed by individuals, organisations, or society (see Box 1.2). What the model demonstrates is that the sorts of programs that could be implemented are legion. The model also demonstrates that it is important to know where the behavioural problem is located. Implementing programs without such knowledge is akin to trusting in “luck”.

Thein-depth information required to develop strategies for introducing and analysing industry (or materials-specific) recycling and reuse programs does not exist in Australia. Programs that are being implemented are relatively generic. This is useful

approach for initiating activity but unreliable for obtaining desired, and specific results. There is the added danger that unless such programs are constantly reassessed in the light of their ultimate objective – that is waste minimisation (or sustainable resource use), they will create a government-dependent recycling and reuse system.

For the target materials intended as a focus for this report, data is apparently being collected by the Clean Hunter Centre. With this data in hand, it should be possible to develop strategies, using the social systems model, which focus on creating an effective industry.

An integral part of that strategy formulation will be knowing what sorts of programs can be put in place – the incentives that are available – to achieve desired recycling and reuse behaviour. This information is provided in Part 2 of this report.

We have listed incentives under the headings of international, national government, state government and industry. There is a deal of slippage between these categories. The sectors cooperate with each other, recognising the need to conserve resources and introduce more sustainable practices. In discussing each of the incentives, we have noted which parts of the social system they are most likely to target. Coupled with industry (or materials specific) information, it should be possible hone programs to achieve desired behaviour.

We recommend that a next stage is to develop materials strategies, using the systems model and knowledge gained of the success parameters of incentive programs currently in place. With a systems framework as guide, and detailed knowledge of materials and programs, it will be possible to use system dynamics packages such as iThink or Vensim to guide strategy development and to set priorities within budgets and timelines.

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# Part 1

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## A Strategic Perspective on Recycling

The aim of this section is to describe a heuristic model for understanding the management of recycling and re-use. This model provides the foundation for analysis of incentive programs to be described in Part 2.

# 1.1 Introduction

We reviewed a significant portion of waste minimisation literature (including electronic sources) as well as interviewing those involved with waste minimisation efforts. Our aim was to identify and analyse the programs and strategies being implemented to encourage people to reuse and recycle. Our review revealed two significant gaps in the framework being used for increasing materials recycling and reuse in Australia: the absence of a well-structured paradigm and, as a consequence, the loss of opportunities to understand which strategies work.

There is a great deal of literature dealing with how to increase recycling and re-use of materials. Studies provide insights into price elasticities of waste services, alternative technologies, market responses to different programs, etc. The literature identifies a number of incentives: regulation, consumer education, management of physical flows, and economic incentives, to name a few. Studies variously provide "crossover" indications: economic studies suggest the relative effectiveness of economic incentives over regulation; some studies show different responses dependent on attitude and other attributes of the consumer; others show shifts in consumer attitudes in response to education, or preferences to different waste management regimes; and still other studies show the effects of extremes of manipulation of different incentives, such as illegal dumping in response to significant waste cost increases; or the relative weakness of education alone without other elements in place. In none of the studies, however, is there a theory of behaviour underpinning decisions about recycling or reuse strategies, nor a model for the management of that behaviour that draws on all of these elements and treats them as an integrated whole.

Most plans for increasing recycling and reuse follow episodic approaches to natural resource management, concepts are developed, researched and sometimes implemented. The problem with the approach is that the episodes are not linked in ways that accumulate learning. Feedback into the knowledge base is haphazard. Individuals and institutions are often doing good work, but there is no integrative framework that maximises the value of their work.

In order to meaningfully apply a continuous improvement approach to macro-level policy (rather than micro-level sub-tasks) it is essential to have a way or thinking – a model – of what is being managed. Without such conceptualisation it is not possible to discern where energy or resources are

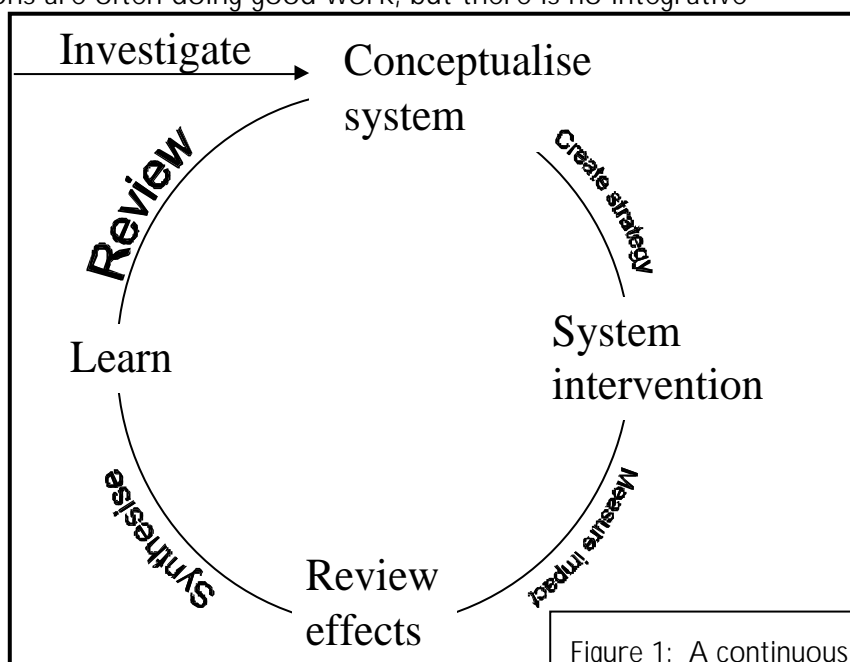


Figure 1: A continuous improvement paradigm

being wasted, or where redirection of resources might significantly alter outcomes. Institutions or individuals may have such a concept in their heads, or buried within working papers. Some initiatives reflect awareness of a wide range of elements that have to be managed, but express this understanding only in the range of interventions that are proposed. The conceptualisation behind the interventions is not overt. It is not shared across agencies that are pursuing (in the broadest sense) the same agenda. The result of this is barriers to learning and refinement. This is akin to not having a shared language – individuals may know a lot, but unless there is a basis for narrative they cannot collectively draw on that knowledge.

The second feature of this lack of specification is that opportunities to accelerate understanding of what strategies work, and particularly why they might work, are being lost. For example, when one program deals with economic incentives, another deals with improving materials flows, and a third is focused on regulatory enforcement, it is very easy to believe that they are focused on different aspects with tenuous links. Insights about the tradeoffs across program types, or potential synergies between them, are, therefore, difficult to specify. A model, using system thinking exploits the possibilities for synergies.

In this first part of the report we propose such a model. The framework we develop will form the basis for discussing the utility of programs listed in Part 2.

## 1.2 A conceptual framework

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Encouraging people to recycle and reuse is not an economic or an environmental problem. Encouraging people to recycle and re-use materials is a behavioural problem, requiring sets of decisions and actions by individuals which, as a consequence, either increase or decrease environmental health and economy (and social equity). The focus of waste management, therefore, should not be on material flows nor on flows of wealth. It should be on the creation of patterns of behaviour that result in more benign flows of materials.

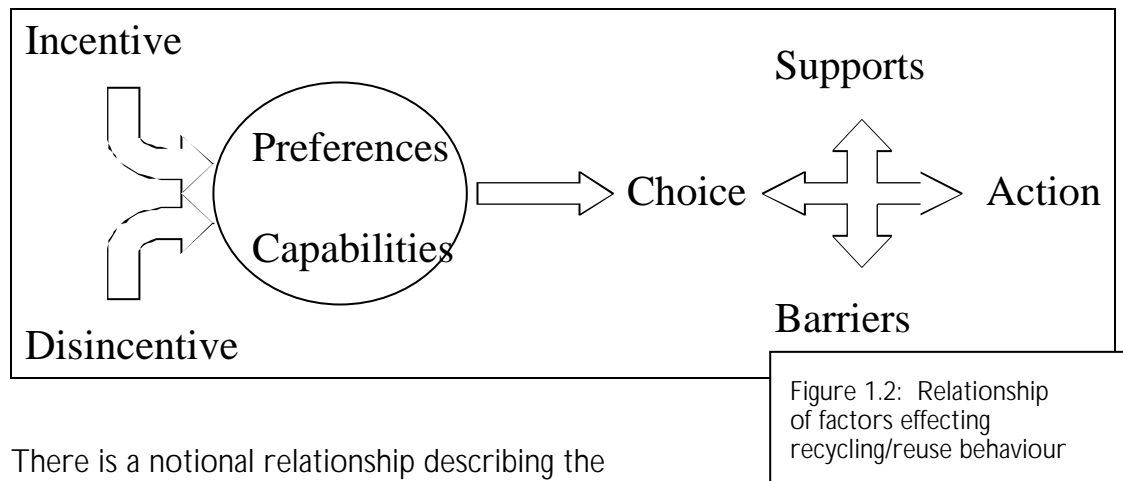
Recycling and re-use behaviour operates at two levels. The first is the choice made to recycle (or not). The elements in that choice are a mixture of incentives and disincentives, mediated by the decision making process of the individual (or the organisation). The decision making components are the preferences (values, beliefs etc.) of the decision maker, and their capabilities in making the decision (information, capacity to structure the information, etc.).

It is clear that whilst a choice to recycle is necessary for recycling to occur, it is not sufficient. Supporting structures and information which enable choices to be carried out are also necessary. The relative strength of these will be a significant determinant of what recycling action occurs. Implementation matters such as the availability of recycling services, facilities design (allowing for separated storage of waste streams, for example), the “quality” of the waste and its amenity for easy recycling, and the like, are co-determinants of recycling action.

The effectiveness of recycling strategies is therefore a function of:

1. The relative incentive/disincentive for materials parsimony and recycling behaviour;
2. The choice-making structures, incorporating the preferences and capabilities of the decision makers; and
3. The strength of supports and barriers.

These are illustrated in Figure 1.2.



There is a notional relationship describing the effectiveness of recycling strategies which shows:

$$A = f(I - D, P \cdot C, S - B)$$

Where:

- A = action on recycling and reuse
- I = Incentives for the decision maker
- D = Disincentives for the decision maker
- P = Decision maker preferences
- C = Decision maker capabilities to make the decision
- S = Supports for recycling; and
- B = Barriers to recycling.

Embedded within these elements is a host of sub-elements, ranging from pricing models, cross elasticities, industry structure, physical flows, community values and the like. Within the materials flow system are intermediaries (as well as the original consumer) who are also operating within a not dissimilar choice/action model – producers, regulators, etc. Such flows and intermediaries are generic to every social system. Only their dimensions or characteristics change with the problem being analysed.

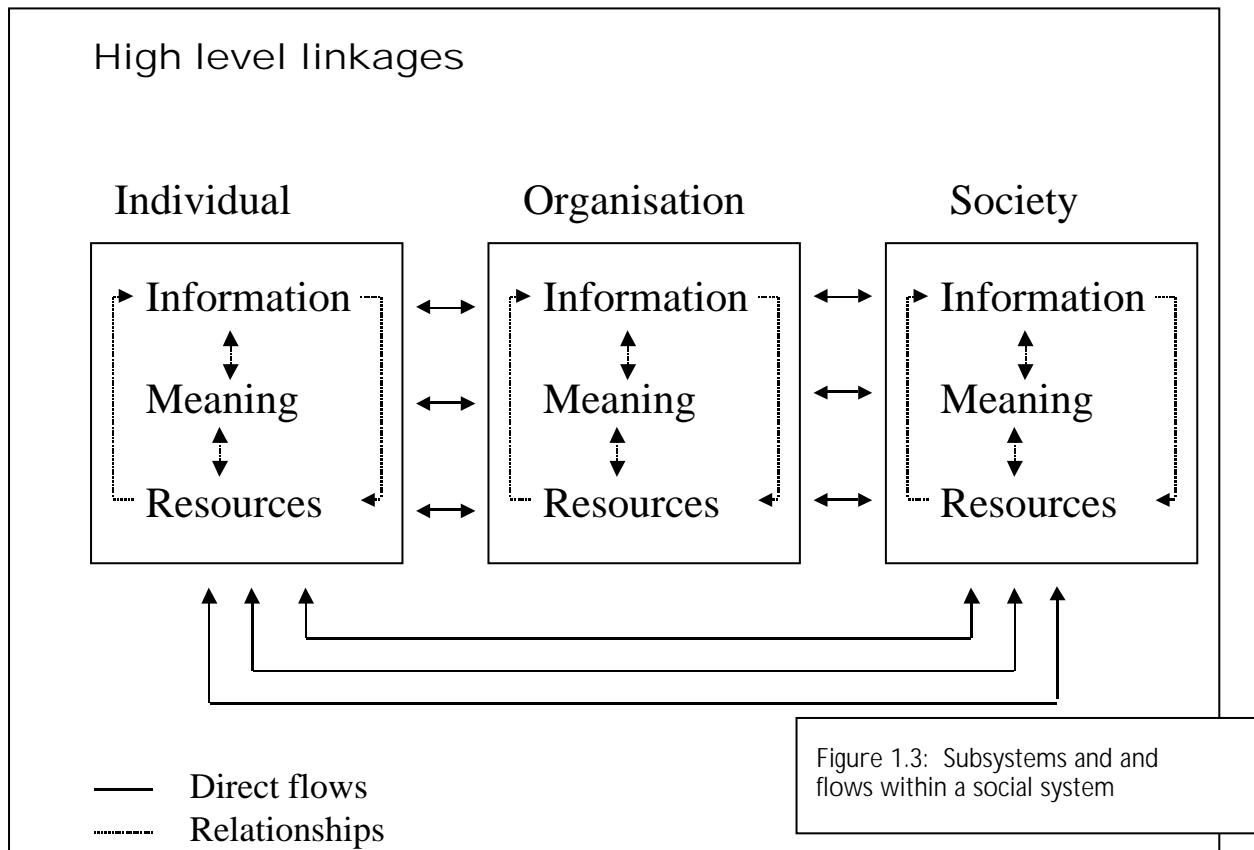
Those elements which describe the way materials and decisions flow can be placed into three categories: Resource flows; informational flows; and behavioural or

#### Box 1.1: Sets of flows within a social system

Three sets of flows or factors direct how social systems work. In order to change the system, incentives must be in place to change each of the factors:

- Resource factors – these are factors that enable the activity/process to be carried out. They include tangible factors, such as asset infrastructure, and intangible factors, such as financing and R&D. Structural factors are those that are concerned with supplies of materials into the system, the processing of those materials into goods and finally the markets accepting the goods. Figure 1 basically depicts a structural framework for production.
- Informational factors are embodied in the command and control functions, and in the way information about how tasks are to be done is disseminated and learnt. Advertising, education programs, standards setting (including government regulations) and all part of the information system.
- Behavioural factors are those that influence the way we understand we should live our lives and interact with others. Behavioural factors are generally summarised by the term “culture”. For example, we could say that the Waste Minimisation and Management Act wants to encourage a “culture” of waste minimisation. In other words, it wants to foster behaviours that will cause people to produce less waste.

cultural flows. A fuller description of these factors is provided in Box 1.1. Understanding the operation of these flows in relation to the target problem is fundamental to developing strategies for problem solution.



These flows effect the behaviour and decisions of those who operate within the social system.

On this basis, we can see that we are dealing with a decision-making system in which, two flows, information and resources, inform the development of cultures which in turn attach meaning to information and resources (the relationship, therefore, is iterative). These meanings (culture) include values and beliefs, alongside with the mechanisms that are used to structure the information to make decisions. This structuring approach is one aspect of knowledge (the other aspect being awareness of the data that is used in making the decision). We've represented this model in Figure 1.3<sup>1</sup>.

In an open system (such as the social system we describe), it is the pursuit of resources which conditions choices. It is information about the result of that pursuit which signals to the decision making entity (individuals, organisations, or society) whether it is following useful strategies. It is through this mechanism that learning takes place, and it is through this mechanism that the most significant changes in culture and values are achieved. This suggests that the most powerful strategies will go to the heart of resource access, and will potentiate signals which show that environmental performance will allow for access to resources on improved terms.

The operation of these elements together provides the repertoire of possible interventions which could alter the patterns of choices that are made with respect

<sup>1</sup> Attachment A gives a fuller discussion of the social systems model described here in brief.

to sustainable use of resources, and recycling behaviour in particular. We've noted some in Box 1.2.

### Box 1.2: Possibilities for shaping choices

Highlighting the range of possible points for intervention, to further environmental responsibility.

Subsystems and processes	INDIVIDUAL	ORGANISATION	SOCIETY
12 INTERVENTIONS IN INFORMATION (the feedstock of decisions)	1. Improve information about: - Potential impacts of waste management on other groups/individuals in society - consistency of choice with the individual's self standards about environmental integrity - Potential resource impacts (penalties and rewards) on the individual of different choices about waste management. 2. Improve task decision making skills so as to reduce adverse impacts of mistakes.	3. Increase awareness of consequences (to others, to the organisation and to the decision maker) of poor waste management 4. Improve decision making skills about poor waste management. 5. Reduce information filtration by individual choices and organisational culture regarding waste <sup>2</sup> . 6. Manage the outflow of information about the organisation and its environmental decisions (including marketing and corporate reports) 7. Improve internal availability of information about organisational waste management standards and external standards required of the organisation. 8. Ensure effective communication of decisions within the organisation.	9. Increase organisational and individual awareness of societal "rules", expectations, and sanctions regarding waste management. 10. Increased public reporting and increased media and stakeholder investigation (beyond the stories promulgated by the organisation) 11. Strengthen legal regulation of unacceptable activities, and policing. 12. Tightly link legal decision making and community standards.
12 INTERVENTIONS IN CULTURE (the shapers of choices)	1. Strengthen ethical/environmental sensitivity through education. 2. Stimulate debate on the waste management of organisational and personal choices/decisions 3. State environmental self-standards. 4. Encourage discussion of environmental self-standards in organisational decision making.	5. Formalise organisational environmental standards, including waste management. 6. Educate the organisation in societal standards and expectations (including legal standards). 7. Embrace responsibility, through conscious resource allocation and communication. 8. Debate waste managements, beliefs, culture and the environment performance of the organisation.	9. Strengthen the link between environmental responsibility and access to community resources. 10. Debate community environmental values and standards. 11. Strengthen institutional frameworks for environmental values development.
10 INTERVENTIONS IN RESOURCES (the subject of choices)	1. Use rewards and sanctions to shape attitudes to waste management. 2. Ensure that individuals have the resources they require to implement their waste management decisions. 3. Choose where to invest personal resources with conscious regard to the environmental performance of the organisation.	4. Select markets and sources of resources with concern for the pressures on environment that these choices may create. 5. Link staff and stakeholder rewards to demonstration of environmental competence, self-standards and organisational standards.. 6. Ensure that resources are adequate to implement pro-waste management decisions.	7. Provide direct resource allocation signals to individuals and organisations, about the acceptability of their waste management performance. 8. Transfer the costs of waste management to those with the power to ensure responsibility. 9. Make waste management responsibility criteria for debating public resource allocation. 10. Withdraw resources/patronage/market from organisations which do not demonstrate waste management responsibility.
LINKAGES	(a) Legitimate deliberations about environmental values, beliefs and organisational responsibility in all choice. (b) Shift attention from individual to systemic responsibility. (c) Entrench responsible action and responsible processes.		

<sup>2</sup> Individuals and organisations "filter" information from the environment, acting on some information and discarding or not recognising other sets of information.

The 37 themes highlighted in Box 1.2 are neither exhaustive nor exclusive. For each there is a number of possible configurations, variations and permutations. There is a myriad of potential interventions, in all processes and across all elements and sub-systems, to create the desired outcome

The most effective outcomes will arise when the intervention are systemic in their effect, or when they go to some fundamental driver of the behaviour of the system. Interventions which change fundamental beliefs, the flow of information about environmental issues, or allocation signals to those who seek resources are the ones that are most likely to create behavioural change as an outcome. (Remembering that behavioural change is only possible if the capacity exists to successfully implement the decisions that are made.)

In this report we are concerned with the types of interventions – or incentives – that are being implemented or might be implemented – to promote better recycling and re-use behaviour. We turn now to a more detailed discussion of incentives (interventions) within the context of the social systems model just described.

#### Box 1.3: Promotional messages

Seminal work by Emery shows that positive response to promotional messages will arise when the message, the expectations of the recipients, and the actual benefits that are delivered by responding to the message, are consistent. Short of this alignment, the message becomes ineffective. This highlights an important characteristic of public good promotional messages: If the recipients are unable to move readily to achieve the benefits, they will rapidly learn to dismiss the message (even when consistently re-presented). If it is not possible to implement the first choice to recycle, it should be anticipated that future messages about recycling will be contaminated and ineffective.

## 1.3 Understanding incentives

The economic waste management literature generally describes incentives in financial or other economic terms, and sometimes encompassing regulation (or rather imputed costs arising from regulation, or the risk weighted cost of penalties). At times, incentives are also categorized as in box 1.4. These are useful for deriving lists, but, as we have already highlighted, there can be no answer to the question “do we have the right incentives in place?” without a comprehensive understanding of the range of decision makers who are involved, of each of the decision/action elements, and the ways in which these interlink. Incentives, or interventions must be carried out in the context of the social system – in this case the way we, as a society, manage waste (and our major focus in this

#### Box 1.4: A method of categorising incentive programs

- **Mandated** : Introduced through regulations. These can include mandated take-back requirements, or licensing or access controls that flow through into the pricing of resources.
- **Voluntary**: Generally introduced by an industry association or other organisation through codes of conduct. The penalties associated with breach can vary from advisory notification, through to exclusion from membership (which may deny the continuance of a business). International standards such as ISO 14000 are acquiring significant power by virtue of their wide acceptance by major purchasing corporations.
- **Monetary** : Monetary incentives are of two main types. The first are direct incentives, such as grants or investment funds. The second operate through the market, such as the pricing of different services or goods.
- **Promotional/educational** : Such programs seek to pass on information which will stimulate recipients to view their behaviour in a different way, providing them with different options for behaving and different ways of assessing that behaviour.



study, recycling/reuse).

Information flows People get the information they need to make decisions. That is, people

need information about the recycling options available to them, and the actions that they need to take to avail themselves of the recycling options. Related to this is the issue of whether people have the appropriate pre-conditioning information to make a proper decision about whether to recycle. They need to approach this transaction with a background knowledge about its implications for the environment, for community and for self. They also need to arrive at the point of decision with a well informed decision-making approach that allows them to properly take into account appropriate data. That is, they need to be educated to make the educated choice to recycle even if this involves some minor inconvenience.

Information is generated not only by decisions to communicate. Information is generated by any perceivable change in the salient features of a system's environment, including the fact of continuity of some aspect of that environment against a backdrop of other changes. The patterns of the flows of resources in themselves are rich and important information to the individual and the organisation that is resource seeking [17].

Information about effects of choices (both past and intending) is of particular importance in the application of standards people engage in. It is not accidental that much of the content of waste management programs is concerned with sensitising decision-makers to the effects of their choices on others (the promotional/educational messages). Information serves the purpose of highlighting that an issue exists, which may require consideration.

Box 1.5: Studies on incentives

In reviewing studies on incentives, we found they deal with different aspects of the social system, but do not deal with them as cross-linked and systemic. The challenge is to integrate these studies into a workable model, so that predictions can be made about the likely response to any intervention.

Studies of pricing, in particular, highlights the behavioural impact of moving from one waste removal pricing regime to another. The dominant lesson is to link pricing signals to the behaviour which is sought. Thus, a number of studies show the effectiveness of usage pricing (volume or weight) for rubbish removal as a cause of changes in rubbish generation behaviour, with flow-on effects into recycling and control-at-purchase.

Economic studies also indicate that: There are limits to the capacity to use pricing alone, with adverse behaviour like illegal dumping being a result of over-reliance on waste removal pricing;

Whilst regulation is found to be less effective than economic incentives, this is a potentially misleading outcome. Activity take place within a framework of regulations and legal rights, such as sanctions for dumping, and responsibility for site conditions, community and health.

Another set of studies deal with the preferences/competences dimension:

- Surveys highlight community values in relation to the environment. Typically these show a high level of abstract concern for environmental issues (around 65% plus), and a low level of practical action (around 10% involvement).
- There are indications that the community is typically unaware of the requirements for effective recycling, such as what materials are suitable for what kinds of recycling.
- There are studies showing the impacts of promotional activities on both attitude and knowledge. However, this dimension of the equation is relatively poorly understood in any heuristic sense. Most of the material is descriptive and post hoc, rather than dynamic and predictive.

Yet another set of studies deal with supports and barriers to waste management. Within this set, there is a body of work from within the recycling sector which highlights

- Practical aspects of the availability of services;
- Examination of the structural requirements;
- Considerations of the viability of the industry.

It may be quite consistent with the way in which these things work, that approximately 65% of individuals claim some form of environmental ethic, but only around 10% act on it. The gap may be the lack of choice information to close the link between a general positive environmental attitude and understanding of the environmental implications of actions.

A substantial number of information transactions underpin a recycling transaction. These include:

- The flow of information which shapes decision makers' values or beliefs, and sensitises them to the desirability of recycling and reuse;
- The means through which information (such as cost/benefit data) is processed and evaluated;
- Access to information about the incentives available to support the choice, or to overcome disincentives or barriers to consumating the transaction; and
- Information which adjusts perceptions about disincentives, or about regulatory issues.

Many essential flows can be identified which shape the behaviour of the decision maker, and which determine the efficiency with which incentives can be deployed. We have not, from any of the studies we have reviewed, found one that deals directly with the effectiveness of information flows. Much is assumed, but little systematically understood about this aspect of the system.

Resource flows Coupled with understanding information flows is understanding what the flows of resources are. This does not mean merely looking at the materials flows when studying recycling and reuse programs, but also the flow of those resources which motivate behaviour, notably economic resources.

Understanding these resource flows is significant at a number of levels:

- Wealth, or rather the pursuit of wealth, is a prime motivator for organisations to act. Perceptions that any strategy will result in the achievement of a flow of valuable resources is at the heart of shaping economic responses to recycling imperatives.
- The resource outcomes of past strategies will be significant shapers of the behaviour of both individuals and organisations.
- The flow of material resources themselves is the substance of recycling and reuse. The measure of the effectiveness of any recycling strategy is the impact it has on these flows.

The signals that are of most behavioural significance are not the one-off resourcing opportunities, such as grants or bonuses. Behaviour and culture change rarely occur in response to single incidents – they are the result of continued reinforcement, in a way that is meaningful. To be behaviourally effective, adjustments to resource flows should be of sufficient magnitude, pervasiveness, and persistence.

**Box 1.5: Changing resource flows by US EPA**

It was recently noted that the US EPA has added a further 18 recycled-content items to the US Federal Government's buy recycled program. Once a product is designated, procuring agencies are required to purchase it with the highest recovered material content level practicable. The new products are: carpet cushions, flowable fill (used for filler around pipes and in trenches), railroad grade crossing surfaces, park benches/picnic tables, playground equipment, food waste compost, plastic lumber landscaping timbers/posts, solid plastic binders, plastic clipboards, plastic file folders, plastic clip portfolios, plastic presentation folders, absorbents, industrial drums, award plaques, mats, signage and manual-grade strapping.

In Part 2 of this report, we will discuss the international development of public purchasing. Such programs, by either governments, or by multinationals, as part of their ISO 14000 strategies, are likely (on the principles described above) to be among the most powerful shapers of corporate behaviour and culture.

Preferred purchasing arrangements to support either local industry or environmental policy objectives have been unfavourably viewed by Australian governments, and there is little information about private initiatives in this regard. We have been unable to identify studies of the relative effectiveness of green purchasing compared to other incentive structures. It is worth noting that in the enterprise development literature there are studies which show that preferred purchasing arrangements are likely to be more effective in developing growth companies than are grants or other direct supports [18], [19-21]. This belief is also held by some of those interviewed for this study.

**Culture** The received wisdom about the shaping of beliefs is that the main mechanism is through education and promotion. The perspective we have taken on these issues suggests that whilst such education is potentially beneficial, there are many other ways of achieving changed beliefs. These include through the adjustment of resource flows, and alterations to the information flows.

The same perspective also suggests that personal commitment to environmental values, whilst desirable, is no guarantee of organisational outcomes that are consistent with those beliefs. Neither is the lack of this commitment a barrier to the achievement of sound environmental outcomes. The factors that mediate between individual beliefs and the patterns of outcomes from organisations include:

- the effects of resource flows and incentives;
- the nature of the information that is taken into account in making decisions;
- the effect of the collective culture and multi-person decision making;
- the impact of decision making and information structuring processes;
- the effects of competence (or lack thereof) and resource availability on the eventual outcomes of decisions, and
- the dynamic effects of changes in context.

These considerations bespeak the importance of systemic intervention rather than strategies directed at a small part of the total system.

## 1.4 Conclusion and summary

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Incentive programs encourage individuals, organisations or societies, to engage in preferred behaviour. To be effective, incentive programs must target the causes of the behaviour. The more precise the understanding of the behaviour, the more likely that effective programs can be designed. Effective strategies (or effective incentive programs), therefore, will be those that have their basis in an understanding of factors which act as the greatest barriers to desired behaviour.

### Box 1.6: Commercial and Industrial (C & I) waste

Commercial and Industrial (C & I) waste includes all inert, solid, industrial, and hazardous wastes generated by:

- Businesses and industries such as retailing, manufacturing and office premises;
- Institutions such as schools, hospitals, defence, and government administration;
- Finance and communication sectors; and
- Excludes construction and demolition waste and municipal waste

To carry out such an analysis requires a model for understanding the links between the various elements making up the social system in which individuals, organisations and societies operate. In Part 1 we have described such a system. In that system, we discussed the importance of three sets of factors which effect the behaviour of social stakeholders: the information individuals, organisations and society receives, the resources they have access to, and the beliefs and values (culture) they hold.

We have highlighted that a failure to consider these factors simultaneously is likely to diminish the effectiveness of any program. In fact, apparently well-functioning waste minimisation strategies we have reviewed show the characteristic of multiple simultaneous interventions in the system, each targeting a different set of behaviours [22-24].

In Part 2, our attention turns to listing programs that are being used in Australia and elsewhere to increase recycling and reuse behaviour. We analyse these benefit of these programs within the context of the model developed in Part 1. Since our focus in this report is also predominantly on the commercial and industrial sector, we have concentrated our discussion of programs targeted for that sector.



# Part 2

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## Reviewing recycling programs

This section discusses a number of programs used nationally and internationally to encourage greater recycling and reuse of materials. The discussion is carried out within the context of the model developed in Part 1 and within the context of the needs of the commercial and industrial sector.

## 2.1 Introduction

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Generally, analyses of programs for recycling and reuse focus on material flows – on the question of whether or not materials are being recycled and reused. The strategies that arise from such an analysis lead to the design of:

- Incentive programs for consumers to engage in recycling behaviour, which will make materials available for reuse and recycling;
- Incentive programs for manufacturers to use secondary goods, thus re-introducing materials into the consumption stream; and
- Incentives to industry to provide the services of collection, reprocessing and marketing of secondary materials.

Materials flow analysis approaches recognise that failure to adequately consider the contingencies operating either upstream (demand side) or downstream (supply side) in the recycling and re-use system, will not succeed.

Although materials flow analysis is useful in highlighting factors, the distinction between supply and demand side, and industry development, becomes more blurred the more issues are explored. Demand and supply are inextricably interlinked. Programs that make explicit their linked nature are more likely to succeed than those which target apparently unique materials flow problems. We have proposed, in Part 1, that a useful method of understanding recycling and reuse behaviour is through a social systems perspective, where we focus incentives to effect one or more of three factors: information flows, resource flows, and belief systems.

This does not mean that programs should not be targeted at solving particular materials flow problems (for example, research and development in technology to increase tolerance for contamination in recycled plastics). Rather it means that when we design strategies, we recognise those factors which will make the most impact in achieving the outcome we desire (ultimately waste minimisation – or even more broadly, sustainable resource use). For example, analysis may show that more emphasis should be placed on providing information to sort plastics at source. Such an emphasis, analysis may show, has not only the primary effect of reducing contamination in plastics collected for recycling, but helps to change the value systems of people to encourage them to engage in recycling of other materials, and even to reduce consumption of non-recyclable or reusable materials.

## 2.2 Material flows

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Having noted the integrated nature of recycling and re-use, it is nevertheless useful to discuss the findings of studies on materials flow. They reveal the significant barriers to increased recycling and re-use which, once having been identified, we can analyse using social systems thinking.

### 2.2.1 Supply side issues

A great deal of energy and money is being directed into managing Municipal Waste. Almost every waste board in NSW reports research and trials on the types of waste collection system that will maximise the amount of recyclables collected in the waste stream. Double bins are being trialed or have been implemented, different

collection periods are being trialed – whether to collect weekly or fortnightly, or other intervals; various charging systems have been trialed and implemented. The literature on solid waste management deals predominantly with this stream of waste – with relatively little emphasis on waste management from the Commercial and Industrial (C & I) sector.

The C & I sector (leaving out the Construction and Demolition (C & D) sector) produces between 20% and 40% of the total waste stream. The percentage of C&I waste varies between regions depending on the residential or commercial nature of the area. The composition of C & I waste also varies greatly. For example, the Inner City Waste Board reports that a third of their C & I waste stream comprises food/kitchen waste (20%), paper/cardboard (9%), wood/timber 8% and soil and concrete (16%), another 23% of the waste stream is categorised as “unknown” [25]. The Macarthur Waste Board, on the other hand, reports wood/timber comprising 15%, food/kitchen comprising 13%, paper/cardboard comprising 10%, and plastics comprising 10%, of their waste stream, with an 8% “unknown” component [26]. The Central Coast Waste Board report organic compostable materials make up 23% of the waste stream, wood waste 15%, plastic 18%, and paper 11%. Hunter Waste Planning and Management Board reports garden/vegetation waste make up 32% of the C & I waste stream, wood/timber 11%, paper/cardboard and food/kitchen waste 8%, with an “unknown” component of 11%<sup>3</sup>.

These variations reflect the industries operating within the region. The Inner Sydney region is the focal area for Government, commerce and industry. Entertainment, cultural and tourism activities are the largest contributors to waste, particularly hotels, cafes and restaurants. The largest industries on the Central Coast are involved in providing community services, finance and property business services. Major C & I waste generators in the region are the food and beverage industry (37%), followed by the timber and paper industry (10%) and food retailing (10%). The needs of industries are different. Region by region, strategies need to vary to ensure that the dominant components of the waste stream are targeted.

Additional factors add to the complexity of designing incentive programs for minimisation of waste in the C & I sector:

### 2.2.1.1 Organisational size

Businesses can be categorised as small (those employing less than ten people), medium (less than 100 employees), large (more than 100). Small and medium (SME) businesses tend to have fairly simple organisational structures, enabling ready access to decision-makers. However, SMEs are often cash constrained and have limited access to expertise and support for introducing innovation.

Large organisations generally have complex chains of command. Decisions about day-to-day operations are isolated from strategic decisions which control administrative structure, the types of goods purchased, and even the way the business should be laid out. Large organisations usually have a greater informational support and financial infrastructures to introduce changes.

### 2.2.1.2 Dependence on the supply chain

Waste disposed by the C & I sector is often from secondary sources, outside the control of the business operator. For example, waste may be generated by

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<sup>3</sup> The balance is made up of materials such as plastics, cloth, metals.



contractors and service providers, not within the direct management control of the organisation. Changes in waste streams may mean persuading suppliers to change their methods of operation. This in turn may require negotiated changes to terms of purchasing (such as price, volumes and the like) with consequent operational and economic impacts. Lack of control over the origins of waste is a significant factor in the resistance of the C & I sector to mandatory waste minimisation regulations.

### 2.2.1.3 Accommodation

The C & I sector is variously located in strip shopping centres, arcades, industrial parks, high-rise buildings, stand-alone centres and isolated areas. Each of these configurations involves different collection methods and different stakeholders. High-rise buildings and arcades, for example, generally have a central care taker/manager with whom waste program arrangements can be partially negotiated. Other sites may comprise many businesses which each make their own arrangements for waste management.

Regardless of the configuration of the accommodation, many businesses find that facilities or physical space to sort and store recyclable goods do not exist. This is especially significant when space is at a premium, or where profit performance is calculated on a \$ per sq metre basis.

### 2.2.1.4 Economic

The C & I sector is bottom-line profit focused. Changes in the way they carry out their business must not impose cost increases that will disadvantage them over competitors. The concept of “no regrets” reflects the fact that industry will in general only adopt those environmental initiatives that can result in improved cost structures. Many organisations view waste as a “normal” cost of business and may include such costs in “cleaning costs” or in the costs of building management. Information about the extent of waste may be hidden, and therefore management of such issues may not be triggered. Regulations mandating waste minimisation are, in this light, responded to as cost increase, and often resisted for this reason.

### 2.2.1.5 Informational

Many in organisations simply don't know what goods can be recycled, how they should be recycled, how they should be stored and who will pick them up. This is also the case with potentially re-useable materials. It is not always clear what goods can be re-used within the office or returned for re-use to the manufacturer or a second party. The pressures of change on the C&I system add to the difficulty of ensuring organisational capability to deal with recycling issues. Rapid change is occurring in technology, legislation, standards, consumption patterns and information flows. For many, especially SMEs, keeping up to this pace of change is a significant challenge. The desire to search out new information about new issues is, not unnaturally, low.

A means for reducing this pressure is collective learning and information exchange. However, organisations generally operate within an industry with a number of competitors. Sharing information may mean giving away a competitive advantage and is, therefore, reluctantly carried out. Without the benefit of information that demonstrates how waste minimisation programs lead to cost advantages, and how such programs should best be implemented, they enter the category of “feel good” possibilities, entirely discretionary and with low priority.

### 2.2.1.6 Comment

Underlying each of the supply side materials flows issues are factors which indicate the types of changes which need to be made to information and resource flows to alter behaviour patterns. A significant barrier to changing the nature of these information and resource flows is the belief system which defines potentially recyclable or reusable goods as “waste”. The definition of materials as “waste” means that decisions about its disposal are carried out by people who are not necessarily best equipped, either in an organisational hierarchy sense or in an informational sense, to deal with materials in an environmentally responsible way. A fundamental part of any strategy to increase recycling and reuse behaviour would require programs which change the belief system of decision makers – changing their definition of materials from “waste” to “resources”. Simultaneously, such decision makers would benefit from programs which showed them how information and resource flows could be changed to maximise their capacity to use such “resources”.

### 2.2.2 Demand side issues

Advances in technology and transport, and increased affluence have made natural resources increasingly accessible for the production of goods. Coupled with this has been minimal accounting for depletion of those resources, or the disposal of waste. When natural resources were relatively difficult to harness, a culture of reuse and recycle was a sensible response to resource signals.

Overlaid on these societal shifts towards attributing less value to environmental resources, are powerful signals, through the media and advertising, which consistently signal consumption as the means for self actualisation – for achieving a better/happier life. The resources directed towards creating this consumption culture are massive. The effectiveness of this in shaping the focus of the community on environmental resource use rather than environmental resource parsimony, is obvious. As a result of these fundamental changes in information and resource flows, concepts of re-use and recycle are not consistent with the mindset of many in the C & I sector and many householders.

It is not surprising that messages in support of recycling register weakly (in terms of triggering action) compared to messages in support of consumption. There are few rewards for companies to re-use products or use secondary goods in their products. Significant structural and cultural barriers discourage the re-use and use of secondary products [27]:

#### 2.2.2.1 Location and operating economics

Recycling and re-use are low margin businesses. They are also enterprises in which transport represents a significant cost component. In these characteristics they are analogous to ready-mix concrete suppliers. For such businesses, securing sites for their activities which are close to their centres of activity (both supply sources and markets) is of substantial economic significance. This means that they are often dependent on being able to find locations that are close to (or within) metropolitan centres. This has proven to be a major barrier for many recycling firms. “Recycling” does not exist in zoning definitions. It tends to be viewed as “the garbage business”, with consequent site access difficulties. These difficulties are compounded by ill-informed community biases against “garbage disposal” in their neighbourhoods.

### 2.2.2.2 Vicious cycles of markets

Recyclable materials are traded as commodities on international markets. Their relative supply and demand is effected strongly by economic conditions, business cycles, changing purchasing preferences and fluctuating prices. High prices result in an increase in materials collected. This leads to an oversupply of materials, and a consequent drop in prices. As such it is important to develop strategies that are effective over the long term and not directly tied to short term market fluctuations.

Secondary materials substitute for virgin feedstocks, because while they are of lower quality they are also of lower price. However, secondary materials do not benefit from public subsidies embedded in pricing for virgin materials. Prices paid for secondary materials are strongly affected by the changing prices of their virgin counterparts, which have commodity market fluctuations themselves. As a result, secondary substitutes are often sold on spot markets where their prices are established by the availability of virgin materials, but with intrinsic cost disadvantages. Federal and State governments in Australia have traditionally supported the production of virgin materials through tax laws, transportation regulations, energy subsidies, and below-market pricing of certain materials. Transportation costs represent a major economic barrier for marketing recyclables because of their inherent low value, their relative low density, and their frequent need to be transported to distant processors or end-users. Few programs, apart from subsidies for collection of recycled goods, exist which redress the balance of public subsidies for resource extraction.

#### Box 2.1: Environmental subsidies

Environment Australia estimate that total financial and environmental subsidies to the use of natural resources in Australia are to the order of \$13.7-14.8 billion (3.2 to 3.5% of GDP). \$6 billion is direct financial subsidies and \$7 billion is in the form of environmental subsidies. These subsidies are built into the infrastructure of the economy and lifestyles. They include: non-recovery of public management costs, favourable tax treatment, direct contributions and lower than normal rates of return, and non-payment of environmental disruption costs by the entities causing the disruptions.

A hidden advantage of virgin feedstock is the built infrastructure, informational and behavioural factors that favour the use of such feedstock. Technology, buying specifications and use knowledge are built around the use of virgin feedstock. Education and promotion campaigns, as well as significant expenditures on technology (see later) are intended to redress this structural imbalance, but substantial time lags must be anticipated.

There are demands for financial and environmental subsidies to be reduced through increased charges for services and environmental damages, and through reduction of treatment control expenditures by governments. Programs which enhance sustainability are being subsidised through grants programs, and through the establishment of organisations such as the Waste Boards. These operate to facilitate infrastructure and information flows, and disburse grants to the waste management industry.

However, as highlighted in Part 1, behaviour will follow resource signals, particular fundamental economic signals.

### 2.2.2.3 Timing and technology investment

The technology for reprocessing/manufacturing secondary materials is well-developed. There are many successful operations both overseas and in Australia. In Australia where the emphasis on recycling is relatively recent compared to parts of Europe and the USA, the infrastructure, investment, and coordination with other production factors to increase the recycling industry's capacity to meet supply capability has lagged.

Low and unreliable supply of secondary materials greatly increases the operating risks for firms in the recycling industry, especially re-manufacturers and end-users with high capital infrastructures. It has traditionally been difficult for processors and manufacturers to minimize contamination, adhere to product specifications, and meet buyer expectations. This problem is compounded by many new collectors and processors that produce recyclable materials in small quantities, and of variable quality.

## 2.3 Incentive programs.

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A plethora of programs operate to encourage better waste management. These programs operate through economic measures and through regulation. They effect, in varying measure, the fundamentals for changing social systems: information flows, resource flows and social belief systems.

We have categorised programs into macro-level programs, likely to effect broad sectors of industry and society; and into micro-level programs, better suited for targeting specific issues in the recycling and reuse agenda. In discussing these programs, we highlight their systems effects – the factors or flows in the social system which the program is most likely to effect.

The most overarching of these programs are those put into place by the international community.

Often these programs provide the basis for those adopted by the Australian Commonwealth Government, and by State Governments. State Government programs, however, are those most likely to target micro-level issues within industry and society. Under our category of State Government Programs we list many initiatives taken by local governments, government departments and boards.

### Box 2.2: The ITA program for cleaner production

The Portuguese Institute for Environmental Technology (ITA) has implemented a program for cleaner production, targeting small and medium-sized enterprises (SMEs). In one glass company the program resulted in an investment of 89 million Escudos which tripled output while improving by-product use and reducing production of waste, sludge, and CO<sub>2</sub>. The company has saved 200 million Escudos.

ITA has identified several keys to improving eco-efficiency:

- 1 Education of workforces;
- 2 Helping SMEs to identify areas for technology development;
- 3 Creative co-operation between the ITA team and company representatives;
- 4 Social and financial incentives to stimulate consumer preferences and reward companies for environmentally improved products and services;
- 5 Addressing multiple eco-efficiency objectives, such as energy and material efficiency, together.

Effected by both international and government programs, but also responding to international trends, industry also implements programs to effect waste minimisation behaviour. Industry programs form the final category of initiatives we discuss in this part of the report.

### 2.3.1 International programs

Australian businesses export and import products, services and technology. International standards and modes of operation are important for many Australian businesses. What happens internationally provides a powerful context and incentive to adapt Australian practices to suit. Essentially, the motivation to change is derived from a recognition that failure to do so will increasingly limit the nation's, or

organisations' capacities to access resources (in terms of materials, technology and/or markets) and therefore maintain and increase profitability.

Two international programs which are becoming increasingly prominent in setting overarching principles for waste minimisation, are under the banners of Eco-efficiency and the ISO 14000 series. These programs are not targeted specifically at waste minimisation, but they provide the rationale, the context, for concern about waste minimisation, and are, therefore, important as initiators of cultural change – as well as promoting a number of valuable tools for making changes.

### 2.3.1.1 Eco-efficiency

Eco-efficiency was adopted by the World Business Council for Sustainable Development (WBSCSD) in 1992.

The Organisation for Economic Co-Operation and Development (OECD) has identified eco-efficiency as one of the most useful of a range of new concepts linked to sustainable development. The WBSCSD has developed strategies for improving eco-efficiency through publications and workshops with a focus predominantly at the individual firm level. The Council also provides

numerous examples of where gains in economic efficiency can be made through better waste and production techniques [28].

#### Box 2.3: Eco-efficiency

Eco-efficiency is reached by:

- The delivery of competitively-priced goods and services;
- That satisfy human needs and bring quality of life;
- While progressively reducing ecological impacts and resource intensity throughout the life cycle;
- To a level at least in line with the earth's estimated carrying capacity.

### 2.3.1.2 ISO 14000

ISO 14000 aims to bring about industrial practices which are consistent with ecological sustainability. Materials accounting techniques are encouraged by ISO 14000 (especially ISO 14040). These provide objective means for assessing the comparative environmental performance

of different companies, products or processes. Implementing the requirements of ISO 14000 is becoming increasingly important for businesses which trade in Western Europe or North America. International companies, and public purchasing bodies are increasingly requiring that suppliers become ISO 14000 accredited, and use the comparative environmental assessments as part of their purchasing deliberations. ISO 14000 may become a key tool in world trade negotiations, creating a significant incentive for organisations to implement waste reduction and resource efficiencies [7], to improve their comparative environmental performance, and thereby market access.

#### Box 2.4: The aim of 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.

### 2.3.1.3 Impacts

As already noted, these programs potentially provide strong incentive for those who supply to the international market to put in place waste minimisation regimes.

The effectiveness of such incentives depends on the awareness by those who should respond to the existence of the programs. Information flows (consistent with the meaning frameworks of the recipients) is fundamental to their effectiveness.

Publications, conferences and standards promoted by these programs provide information about the need for efficient resource utilisation, the tools for achieving sound resource utilisation (including “soft” tools such as life cycle analysis (ISO 14040) and environmental auditing (ISO 14010,11,12)), and the cost advantages of resource parsimony. These programs are intended to overcome information gaps and promote a culture of sustainable management.

Large companies are taking these programs seriously. Companies such as Dow Chemicals, Xerox, Volvo, Southcorp, Blackmores, Body Shop, MEC-Kambrook, and IKEA are integrating eco-efficiency and ISO 14000 concepts into their organisational structures and cultures. The impact of their doing so is increasingly down the supply chain as they require stricter standards from their suppliers. Volvo, for example, not only publishes standards it expects its suppliers to abide by, it has an active program to help suppliers achieve the standards. And Volvo rejects suppliers who consistently do not meet environmental standards in their own operations [29-31].

The slow flow through from major international companies to smaller local firms is a reflection of economic realities. Larger organisations have the information receptors, analytical capabilities and scale of resources required to respond to these initiatives. Many of these initiatives have a substantial fixed cost component [7], and the economics of their adoption is favourable to larger scale enterprise. There will, nevertheless, be secondary effects in the SME sector as learning and diffusion takes place.

## 2.3.2 Commonwealth Government Programs

The Australian Commonwealth Government, through Environment Australia, has introduced the Cleaner Production program. This recognises that waste management is not only a matter of recycling. It also requires technologies and practices to prevent waste production, or to enable reuse and recycling to occur. As with Eco-efficiency and ISO 14000, Cleaner Production recognises the integrated nature of waste management, as a combination of production processes and disposal issues. The program provides funding for grants, seeks to build a series of public and private partnerships with government, industry and professional associations, unions, community groups and individual businesses to assist Australian Companies to recognise and reduce the environmental impacts of their businesses. The initiatives of the Federal Government provide a coordinating mechanism for the waste reduction efforts of state and local government, NGOs and industry [32] and implement the Australian Government’s Ecologically Sustainable Development (ESD) Strategy on waste Minimisation and Management [33]. Many initiatives provide funding for programs at the state, local, NGO and business level. A significant outcome of the strategy, however, is the coordination of industries across Australia in cooperative programs.

Examples of such programs include:

- The Commonwealth Government approached five major Australian companies involved in the construction and demolition industries to pioneer best practice waste reduction in the industry across Australia in an initiative called “Wastewise Construction Program”. Together these companies have established a range of best practice solutions [34].

- Agreements with the Association of Liquidpaperboard Carton Manufacturers, HDPE, Steel Can, Paper Packaging and Newsprint industries to:
- Remove 500 million milk and juice cartons from the waste stream each year;
- Remove 270 million plastic milk bottles from the waste stream every year;
- Collect 200,000 tonnes of newspapers each year;
- Manufacture over half of all paper packaging from recycled papers; and
- Recycle over 40,000 tonnes of steel cans each year.

A major impact on the waste stream and recyclability of packaging in Australia should arise from the recently negotiated National Packaging Covenant. The Covenant was the packaging industry's alternative to mandatory product stewardship<sup>4</sup>. In negotiating the Covenant, the Packaging Industry Association argued that legislation is an inadequate policy tool, focusing on, often arbitrarily set, bans and targets and fails to recognise changing circumstances and responsibilities of a range of stakeholders for programs to work.

The Packaging Covenant is an umbrella document. Its major features are:

- 1 Self-regulatory - companies are not obliged to sign the Covenant;
- 2 Non-prescriptive – it does not tell companies how to make their packaging or what type of packaging they should use.
- 3 No targets are set.
- 4 Product stewardship – a shared responsibility among all relevant parties for the environmental management of packaging and paper products, including their recovery and utilisation.
- 5 Has a five year life span, providing a degree of certainty, stability and continuity.
- 6 Focused on consumer packaging and household paper.
- 7 Has a regulatory safety net (NEPM) which will set mandatory restriction on those who do not sign the Covenant and on imported production.

#### Box 2.5: The National Packaging Covenant

- The National Packaging Covenant is based on the principles of product stewardship and shared responsibility. Product stewardship imposes an obligation on all those who benefit from production to assume a share of responsibility for a product over its lifecycle. The Covenant covers consumer packaging and household paper.
- Industry signatories to the Covenant must make commitments to practice product stewardship, including:
  - 1 Continuous improvement in recovery and reprocessing of used packaging materials; and
  - 2 Support for kerbside recycling collection or other recovery systems.
- Local Government signatories to the Covenant have made commitments in relation to best practice in the delivery of kerbside recycling collection systems.
- The Commonwealth State and Territory governments have made commitments to:
  - facilitating product stewardship through legislation by developing a NEPM on used packaging materials; market development;
  - applying product stewardship to their own operations;
  - community education; and
  - supporting kerbside recycling collection services.
- As the Covenant includes a voluntary system of industry self regulation, the intent of Council is to ensure that industry signatories do not suffer any competitive disadvantage as a result of fulfilling their commitments under the Covenant.
- The National Environment Protection Goal Measure aims to reduce environmental degradation arising from the disposal of used packaging and conserve virgin materials through the encouragement of re-use and recycling of used packaging materials by supporting and complementing the voluntary strategies in the National Packaging Covenant.
- The scope of the Measure is limited to the recovery, re-use and recycling of used consumer packaging materials and will focus on:
  - Materials used for packaging products consumed on domestic premises;
  - Materials used for packaging food and beverages intended for consumption in public places or in

<sup>4</sup> Partly reflecting the German "Green Dot" implementation process.

- 8 Will involve signatories: Commonwealth and State Governments (ANZECC), local government, and packaging supply chain companies (and relevant industry associations) in significant commitments towards cleaner production and stakeholder support.
- 9 Has a number of schedules which detail the undertakings specific to different groups:
- 10 Federal, state and territory governments accept undertakings on obtaining and managing data and ensuring that any future agreements and policies are consistent with the Covenant, and support market development initiatives;
- 11 Local governments accept best practice kerbside collection principles and practices, apply transparency within their budgets and rates so that householders will be able to see the financial costs associated with providing waste disposal and kerbside collection services; and
- 12 The packaging supply chain will: design packaging and implement practices which will reduce the amount of materials used in packaging, encourage the greater reuse and recycling of used packaging, provide co-operation with governments, financial support for kerbside and other recycling systems.
- 13 Existing national Industry Waste Reduction Agreements will become Schedules to the Covenant [35].

In addition to Environment Australia programs, the Commonwealth Department of Industry Science and Resources, through its Cooperative Research Centres (CRCs) bring together researchers, private industry and other users of research with an emphasis on developing internationally competitive industry sectors. The CRC for Waste Management and Pollution Control is coordinating several industry and research sectors to bring to market waste minimisation technologies and processes. The cooperative nature of Commonwealth waste minimisation programs is fairly standard for national governments internationally, though some have opted for more mandatory measures.

As with international programs, the central importance of Commonwealth programs is their contextual nature. Over and above specific activities, the Commonwealth initiatives signal the importance of waste minimisation to the C & I sector, but depend on extending the effect to other incentives, such as tax incentives for recycling/reuse, resource procurement, reduced subsidisation of virgin materials (see Box 2.1), increased requirement for public purchasing of recycled content and reuse products. Through its waste minimisation efforts, the Commonwealth Government has the potential to effect resource flows necessary for recycling and reuse, and to effect the nation's waste management culture.

### 2.3.3 State Government Programs

The most significant initiative for recycling and reuse in NSW is the State Government's Waste Minimisation and Management Act 1995, now incorporated within the Protection of the Environment Operations Act 1997. The Act sets the goals, legislative infrastructure and financial basis for a comprehensive program to reduce waste in NSW by 60% by 2000, recently revised to achieving the 60% goal by 2005. The initiatives related to the Act include:

- A set of Waste Boards, to guide the implementation of waste management strategies throughout metropolitan areas of NSW;

#### Box 2.6: Waste minimisation versus recycling

It is worthwhile to note that whilst reduction of waste is an important element in enhancing sustainability, a number of international studies have shown that this is often at the cost to decreased viability for recycling enterprises. The reduction in the scale of such activities increases the cost per unit of waste recycled. The diminished waste stream can also force recyclers to tap into more complex or difficult-to-capture waste streams (with resultant loss of economic efficiency).



- Methods of collecting information about the waste stream to provide benchmark data, enable strategic decision making and establish success rates of various programs; and
- A legislative framework for levying waste charges and policing waste offences.

The Act parallels similar initiatives in other states of Australia and internationally. The incentive to produce such legislation is provided by the international Agenda 21 program, and through the Commonwealth Government's own strategy for waste minimisation.

The mandates of legislation have the effect of decreasing the amount of waste for disposal, and increasing the amount of material to be re-used and recycled. For example, the NSW Government's proposed ban on green waste to landfill galvanised development of green waste recycling initiatives – such as the Greenwaste Technology Unit (GTU) at the University of NSW. Regulations in many states of North America have banned the burning of agricultural residues, resulting in new recycled products and natural fibres appearing in a growing marketplace [36].

In the context of the Act, and through the various departments and boards set up by or implementing the Act, the State Government has launched a number of categories of programs to encourage greater recycling and reuse.

### 2.3.3.1 Industry Programs

These programs are analogous to those implemented at a national level. The Southern Sydney Waste Board, under its C & I cross regional program, has developed industry working groups to discuss waste issues with key stakeholders, to develop a waste agenda for their Sector and identify industry specific solutions. Industry-based programs enable recognition of the complexity of the issues facing an industry and put the onus on the industry to seek solutions. They potentially provide a single voice to deal with required changes to supply and demand for the industry; and agreements created by the industry potentially create solutions which enhance the competitive capabilities of players in the industry.

A frequent stumbling block of industry programs is their voluntary nature. This is desired by industry, allowing them the flexibility of participating or not, depending on their circumstances. However, voluntarism increases the possibility of free riders. In waste minimisation there are opportunities for companies not adhering to waste minimisation agreements to make gains over their competitors. It only takes a few free riders to discredit the whole program. Local and international experience suggests that such programs work best when there is a background mandatory level of compliance – such as is provided by the NEPM to the Packaging Covenant.

Initiatives to implement waste reduction in government agencies through purchasing of "green products" have been under successful in Northern Europe and America. In 1984 the South Australian Government introduced a purchasing policy which gives priority to products made from recycled materials in 1984. NSW has not yet followed this lead and there is some policy resistance to any forms of preferred purchasing programs in NSW. Government departments appear willing enough to implement token programs such as purchasing recycled content paper, but not to implement more decisive policies underscored by such tools as Life Cycle Analysis – the basis for green purchasing programs in USA and Europe.

### 2.3.3.2 Financial mechanisms

Financial incentives are a feature of all government and most industry-based programs. They come in the form of levies, loans, grants and rebates. Financial incentives can be used to build resources, both physical and informational, in businesses, enabling them to carry out recycling and re-use activities. Often, however, funds provided through financial incentives are also used in changing the values and beliefs of society which underscore waste management efforts – a necessary use of funds at early stages of introducing new methods of thinking about management issues.

- Waste levies have been extensively used throughout the world and have had a significant impact on the waste disposal behaviour of the C & I sector – and on waste collectors to the sector. The only levy imposed by legislation in NSW is the waste levy, imposed on disposal of waste to landfill. In NSW, income from the levy goes to Waste Services NSW to run their operations. In other states, revenue from waste levies are targeted towards waste minimisation programmes. For example, in SA, part of the levy income funds an Environment Officer who works with the EPA and the South Australian Employer's Chamber develop projects to encourage waste minimisation [12].

- Loans are also an incentive. In South Australia, under the Cleaner Industries Demonstration Scheme (CIDS) – now the Pollution Prevention Fund (PPF), interest free loans to a maximum of \$50,000 (but not exceeding 50% of the total project cost) are provided for the purchase of new technology and equipment. Since its inception in 1994, over 50 businesses have received almost \$1.5 million dollars in funding. The estimated benefit from this investment is at least \$2 million per annum [12]. In San Francisco Bay Area, the capacity for recycling organisations to obtain loans has been credited with a significant increase in local recycling enterprises [9].

#### Box 2.7: Revolving loan fund

In the San Francisco Bay Area...the Alameda County Source Reduction and Recycling Board decided to fund the design and implementation of a Revolving Loan fund for local recycling enterprises. This three year old loan fund, which provides low interest loans for a variety of purposes, has shown the following results for the local economy: Loaned out \$1.6 million, and leveraged an additional \$4 million in financing for 14 different enterprises; Created and/or retained over 500 jobs in the local area; and Created local markets and or diversion for over 6,000 tons/month.

- Rebates or tax reduction, and subsidies can stimulate market behaviour, signalling changes favoured by government and channelling resources into areas government would like to grow. In Australia, only the Commonwealth Government has the capacity to set taxes. At present, it has no structure in place to provide rebates or tax concessions for recycling or reuse incentives, although rebate proposals are being drafted by Environment Australia for consideration by the Minister [37]. State Governments can put in place subsidies, such as that in SA. There councils are allocated subsidies, not on the volumes of recyclable materials collected, but on amounts actually sold to industry, providing an incentive to source markets for this material.

Developing industry capacity is critical to the success of programs to encourage recycling. One barrier to growing capacity is access to capital. A recent survey of Australian environment industry firms highlighted that over 40% were capital constrained. The reuse and recycling industry is relatively new, with a number of economic characteristics (small scale, volatile volumes and pricing) that make investment difficult to attract. An effective method of helping

companies is for a government-sponsored organisations (such as one of the Centres or Wasteboards) to work cooperatively with a recycling or reuse organisation. Often the association itself tips the balance for investment by the financial community [38].

An innovative, and even more proactive method of helping overcome the capital requirement problem was adopted by the South Carolina Department of Commerce and Northeast Recycling Council. These organisations hold a recycling investment forum. At these forums, financiers meet representatives of pre-screened sustainability-promoting businesses. Since 1995, 90 companies have been featured. The initiative has created new networks, developed a better understanding among recycling companies of how to market their business plans to investors, and polished their public presentation. Ten of the presenting companies have received a total of \$14,999,000 in equity financing, and four companies have been acquired [39].

- Waste Reduction Grants : Individuals and organisations in NSW can apply for grants up to \$100,000 for projects that develop innovative and proactive approaches to waste reduction. The projects likely to be considered for funding focus on avoiding or reducing waste. These grants have been available since 1997 and have funded projects such as:
  - A computer take back scheme;
  - A waste education/promotion Internet site;
  - The distribution of food waste to charities;
  - A radio waste program – Talking Absolute Rubbish;
  - The use of recycled waste materials in concrete.

Box 2.8: NSW EPA Waste Reduction Grants

This year's waste reduction grants of up to \$100,000 will be available for projects that avoid or re-use waste paper, food and/or plastic in small to medium sized NSW businesses.

to the tune of \$5.5million [40].

EcoRecycle Victoria provide grants for product and market development projects designed to increase use of recycled materials – up to 30% of project costs. Recipients of EcoRecycle grants comment that the availability of the grants has two major secondary benefits. It stimulates projects that might otherwise not have been undertaken; and the involvement of EcoRecycle Victoria enables information sharing and partnerships that might otherwise be difficult in competitive industries [41-43].

- Rates . Local government has the capacity to utilise variable rates to charge for collection of household waste. In Contra Costa, California, the Solid Waste Authority solicited proposals from competing garbage and recycling companies for eight-year garbage, recycling and yard debris services contracts. The successful contractors collect municipal waste and householders are provided with a variable garbage rate structure. This plan has been extended to the commercial section, which also has a variable garbage rate structure, providing commercial customers with a financial incentive to reduce garbage volume. Using a smaller garbage bin helps create space in their enclosures for recycling containers. To help customers reduce their garbage service and rates, businesses have their choice of 13 permitted commercial recycling collectors. Businesses choose the best combination of recycling service and rates that fit their needs [44].

- Container Deposit programs. An incentive for consumers to return packaging containers (in the past this was mostly glass bottles) used to be the norm in Australia. The only Australian State now with container deposit legislation is South Australia. Such regulations are strongly resisted by the packaging industry. CDL has served South Australia well and has been lauded as a successful litter reduction strategy with secondary benefits: 35 recycling depots in Adelaide, 130 recycling depots throughout the State and 4 major supercollectors with an estimated 600 direct jobs in the industry [45]. This infrastructure provides a valuable established platform as recycling in general becomes more popular, and the deposit program helps subsidise the cost of collections [46].

### 2.3.3.3 Information programs

Information programs, as we have highlighted, are essential in changing waste management culture, as well as telling how waste management can be carried out.

- Provision of literature that enables businesses to conduct their own waste audits. The Waste Boards have been active in producing booklets and methodologies. These range from small, easy-to-follow ideas to more substantial audit guides. For example, the Central Coast Waste Board produces booklets aimed at the accommodation and restaurant industry. These provide easy to understand information on the need to reduce waste, the nature of waste in the industry, and alternatives to managing waste, but rely on personal motivation rather than hard economic data. A more substantial document is the Waste Makes No Cents manual developed to help SMEs in the C & I sector look at ways to reduce waste generated, without affecting the level of services or quality of products produced.

- Advice to those in the C & I sector on waste management strategies

The Southern Sydney Waste Board, for example, provides an information service that includes a site visit and recommendations report. Surveys of those who have used such services have been encouraging. A significant percentage (approximately 70%) report that such advice enable them to solve waste related problems [11].

As the recycling and reuse industry matures, the role of advising to industry will be increasingly taken up by the private sector. Specialists in this

field are well-established in other countries where consultants work with companies to lower their disposal costs [47].

- Case studies show the benefit of waste reduction to the organisation's bottom line and provide information about methods of implementing recycling and reuse. Case studies are a popular medium for disseminating information, being produced by almost every organisation concerned with waste minimisation. Environment Australia's website ([www.environment.gov.au](http://www.environment.gov.au)) provides a number of case studies. In addition, case studies are published in booklets such as Profiting from Environmental Improvement in Business [48].

#### Box 2.9: Advisory service

Site visits are arranged with interested businesses to review current waste management practices, provide resources, assess commitment to making changes and identify waste management options. Each business visited is provided with report outlining suggested improvements...

Some businesses want to improve their systems and are encouraged by potential cost savings and waste reductions that can be made. In cases where businesses are committed to improving their waste management practices, the Board will offer a partnership to develop a Waste Minimisation Program for the company.

Typically, case studies provide a thumb-nail sketch of the procedures used to achieve waste minimisation, and the benefits in terms of waste diverted. Sometimes economic advantages to the business are spelt out. Case studies are important in helping to change the behaviour of those in the C & I sector who look to trends in the industry and who need evidence of financial gains to change their behaviour.

- Information about options for recycling and re-use. Several media are used for disseminating information about recycling and re-use options - hard-copy directories, telephone advisory service and websites. These directories and websites are produced by EPAs around Australia, and by private organisations.

Box 2.10: Reverse garbage website

A private website ([www.reversegarbage.org.au](http://www.reversegarbage.org.au)) containing information about reuse options for a huge range of objects such as materials and offcuts including adhesive foams, corflute, glass, leather, bubble wrap, particleboard, rubber, buttons and old theatre sets, was launched by the Environment Minister Bob Debus in January of this year.

An innovation is the trading online service provided by the Waste Board, ARRnetwork, which allows people and businesses to list items they need as well as items they want to dispose of for which others may have a use ([www.arrnetwork.com.au](http://www.arrnetwork.com.au)).

Also important are purchasing guides such as that produced by Southern Sydney Waste Board: Buy Recycled Office Product Guide, available on their website ([www.sswb.nsw.gov.au/publications/BuyRecycDir.html](http://www.sswb.nsw.gov.au/publications/BuyRecycDir.html)). This parallels EcoRecycle Victoria's Guide for Purchasing Officers in Government and Industry.

- Training programs on waste minimisation. These programs are often conducted in conjunction with industry associations and use seminars or workshops. In South Australia, the Small Business Pollution Prevention Project (SBPP) targets small to medium businesses on a neighbourhood basis, with assistance from local government and water catchment management board officers. The businesses are provided with workshops and advice. Follow-up surveys of attendees show that businesses have gained significant cost and environmental benefits through these workshops.

Box 2.11: Small Business Pollution Prevention Project

The South Australian Small Business Pollution Prevention Project begins with selection of a suitable suburb. Businesses are advised of the project by letter, door knocking and local press. A one-hour information session is held in the nominated suburb to build interest in the project and demonstrate the economic and environmental benefits to be gained. Interested businesses attend a series of three, two-hour workshops and are led through a simple life cycle model with which they can measure their own operations. All sessions are free. Numbers attending workshops are limited to 15 to ensure all participants have the chance to discuss their own situations.

Feedback is sought six to eight weeks later to measure pollution prevention initiatives implemented as a result of the workshops.

The workshops have the extra benefits of networking adjacent businesses to reduce environmental impact, while improving the relationship between the EPA, local government and industry participants.

Two officers from the EPA began the project in 1996 as a part time operation conducted after hours. The program proved very popular with local industry, participating councils and catchment officers. Demand was so great that in July 1998 two people were appointed full time to conduct the project for a minimum period of two years.

The Gould League in Victoria has targeted programs (Waste Wise Schools Program – see ([www.gould.edu.au/wastewise/index.html](http://www.gould.edu.au/wastewise/index.html)) for schools,

and couples these with awards for schools which show excellence in achieving waste minimisation and initiatives.

In Victoria is the Centre for Education and Research in Environmental Strategies (CERES – [www.ceres.vic.edu.au/intro.htm](http://www.ceres.vic.edu.au/intro.htm)) which offers services for schools, Council and Regions including:

- Performances for schools and community festivals
- Consultancies for schools (staff and students) on waste audits and whole school organic and kerbside recycling
- School and community workshops on worms and composting

EcoRecycle's Waste Wise programs are used in over 400 schools [49]. CERES stimulates over 40,000 students to participate in the cultural and ecological programs it hosts [50].

Courses in waste minimisation are increasingly being offered at tertiary institutions, or are being integrated into established programs.

- Newsletters and magazines which provide up-to-date information to stakeholders about innovations. The Waste Boards provide such newsletters for general public consumption and for special sectors, such as the Wasteboards' C & D sector newsletter. Such newsletters provide information to people about methods by which they can reduce waste. The information is likely to be useful to those who have made the decision to reduce waste. Getting the message through to those who are not yet aware is more difficult.

A useful synthesis of market data and trends is given by the Market Report produced by EcoRecycle Victoria [51]. Industry Association newsletters, while encompassing a broader range of issues than recycling and re-use, are also important sources of information. For example, the December issue of Packaging, carried articles on recyclable stone fruit trays and extols their virtues [52].

North America, where there is a more mature and substantial waste management and recycling sector, offers magazines dedicated to recycling and re-use. They advertise equipment for recycling, such as balers and sorters, tire cutters and crushers, pulverizers and conveyors, collection containers and compost turners, etc. They provide analyses of various recycling and re-use issues and solutions, and provide case studies of businesses which have developed innovative techniques for supplying recyclables, or using recyclables.

- Publication of guides on how to set up recycling and re-use centres, such as that produced by Reverse Garbage, titled Reusing Wheels not Inventing Them [40].
- Benchmarking information: This involves collecting data about waste, not only for strategy formulation, but also for benchmarking the success of strategies. The Waste Minimisation Act notes the importance of this task. It is an integral part of Waste Boards' and EPA's activities. The National Packaging Covenant has also made data gathering an important part of its agenda.

Box 2.12: Advertisement

BIOCORP, It's BIODEGRADABLE!

The Answers: Because BIOCORP reSourceBags™ are:

1. Truly compostable bags, NO polyethylene!
2. Biodegradable in 35 days, better than paper bags!
3. Transparent to avoid contaminants!
4. Resistant to water: rain, snow & we waste!
5. Compact, easy to store

### 2.3.3.4 Promotional Programs

Promotional programs have the potential to begin a process of changing cultural norms – in the case of waste, the cultural norm of “throw away”, to at least re-use and recycle. Promotional programs cannot be expected to alter deeply embedded patterns of choice. They have the potential to provide people with the incentive to look for more information, or perhaps to stimulate minor changes to behaviour which may commence a pattern of rethinking. Several types of promotional programs currently operate:

- Programmed annual events such as National Recycling Week organised by Planet Ark, are designed to focus attention on how people across Australia can help reduce waste by recycling [53].
- Targeted programs to stimulate interest in waste minimisation for a particular category of waste or within a particular sector. For example, the Southern Sydney Waste Board target certain industry sectors, telling those within the industry about the Board’s services and inviting them to contact the Board to work out waste minimisation strategies.
- Seminars and conferences: These events serve a dual purpose. They provide information, and enable showcasing of success stories. As with case studies, showcasing provides an avenue for stimulating rethinking of the benefits of improved waste management. They are often conducted as joint sessions between a government authority (Waste Board, EPA, Environment Australia, etc.) and business associations.

Endorsement of products by government is an effective means of overcoming barriers to the purchase of reused or recycled goods. The success of green purchasing programs in Europe and in North America is in part attributable to the fact that products placed on the “green” list are endorsed by a creditable authority.

### 2.3.3.5 Research and Development (R & D)

Research and development programs target solutions to infrastructure and informational barriers to recycling.

Several centres have been set up around Australia, supported by Federal and State Government funds, to help companies implement waste management programs.

These centres include Australia Centre for Cleaner Production, the South Australian Cleaner Production Program and the Clean Hunter Centre.

Often R & D programs are tied to grant programs. R & D can be targeted towards a specific problem – such as how to sort barrier PET bottles from non-barrier PET in the

waste stream [43]. R & D programs also include those that seek to solve waste minimisation problems in particular sectors. For example, the Southern Sydney Waste Board offers a partnering program in which an organisation agrees to establish waste minimisation protocols (an intensive activity), then allows itself to be used as an “example” in further promotion to the industry sector [11].

R & D programs are generally time consuming and expensive, but are important in breaking new ground. The best use of R & D programs is in the context of a wider strategy for addressing the waste problem. The city of Berkeley, California, for

Box 2.13: R & D into paper collection from C & I sector

The Central Coast Waste Board is working with a recycling company who collects waste from the C & I sector to improve their paper collection system. The Board is engaging a consultant to help with trial of equipment and sorting methods, and is promoting the collection program.

example, has an aggressive strategy for becoming a leader in the environmental movement. It lends assistance to businesses in their start up phase with PR, obtaining permits, gives references and even buys products for public projects [54]. The Recycling Business Assistance Centre in Minnesota builds on existing programs providing help such as improved access to materials, R & D of new products and processes, improved efficiency and capital that nobody else would provide [38].

### 2.3.3.6 Infrastructure development

Stimulating people and organisations to choose to recycle will only cause frustration and future resistance if adequate infrastructure is not in place to enable behaviour change. Adequate infrastructure enables the capability to recycle and reuse.

Both state and federal governments support the establishment of resource recovery centres. The Federal Government, in its Federal Budget (1999-2000) dedicated \$2 million to set up resource recovery centres across Australia. The aim is to provide information and expertise to promote recycling and re-use of materials by business, and to develop diverse and sustainable markets for recycled materials [55]. These resource recovery centres are written into the plans of the waste boards, and are a cross regional project to enable maximum coordination of effort.

From infrastructure development projects, it is clear that a key to success is integration of programs along the whole re-cycle, re-use chain, coupled with integration with other programs to provide support, advice and consistent R & D [23, 56].

An approach which is reported as successful is tying re-use and recycling infrastructure development to community development. For example, in 1994, the Midwest Research Institute (MRI) began a project for the US Economic Development Administration (EDA) to identify economic development strategies that would not only increase local prosperity for businesses,

government and households, but also would protect the environment and conserve natural resources. According to Margaret Thomas, senior resource planner with MRI, this is one of the easiest sustainable economic development strategies for cities and towns. It creates new businesses while also reducing waste management costs [57].

#### Box 2.14: Drive-through recycle-reuse centre

A recent significant development in infrastructure development is the drive-through recycling centre for Western Sydney for residents and businesses to deposit unwanted materials to be reused and recycled. The centre will be open seven days a week accepting most materials for free. The range of materials accepted are computers, electrical goods, batteries, household hazardous substances (like unused paints and chemicals), furniture, clothing, carpets, mattresses and garden clipping.. A second hand shop on site will sell recycled items.

### 2.3.3.7 Awards and competitions

Recognition is one way of motivating action towards sustainable management. Awards and competitions are means to provide this recognition. Federal, state and local governments, and industry associations all support various types of awards for efforts to minimise waste. For example:

- The Furnishing Industry Association of Australia presents environmental awards for furniture and kitchen manufacturers [53].
- Warringah Council presents an Environmental Achievement award.



- Inner Sydney Waste Board presents a C & I waste minimisation award. The inaugural award achieved front page coverage in local press on two occasions and over 700 local business representatives attended the presentation evening.

## 2.3.4 Non-government Programs

The incentive programs discussed so far have been those initiated or heavily supported by the public sector under the umbrella of enabling legislation and public sector budgets. Sprinkled throughout the descriptions of these initiatives are examples of how non-government organisations sponsor or cooperate with government programs. Many companies, however, also initiate their own programs, having realised the benefits of waste minimisation strategies<sup>5</sup>

### Box 2.15 Dow's WRAP

Dow encourages staff to identify opportunities for waste reduction and pollution prevention. Each manufacturing division is responsible for development and implementation of the "Waste Reduction always Pays Program" (WRAP).

WRAP initiatives have achieved substantial reductions in emissions and inputs, e.g. 50% reduction in spills at a polyurethane plant; 80% reduction in consumption of a reactant in an agricultural products plant; 93% reduction in air emissions and 48% increase in production at a latex plant.

Wrap projects also save money, and are expected to continue yielding 30-40% returns on capital for the foreseeable future.

One common approach is a head office directive that action needs to be taken to achieve waste minimisation. Generally such programs are supported by promotional programs or slogans within the company – as for example the Dow WRAP program [28].

Companies which are serious about re-use and recycle initiatives for their products back these up with design of products to enable re-use and recycle, and provide the infrastructure to enable collection and return. This is, in essence, an acceptance of the Extended and Shared Producer Responsibility concept. Xerox, for example, has implemented a program which includes a well-developed infrastructure to return used photocopiers to the factory, close relationships with customers, and robust design of its products [28]. In 1999, Phillips Electronics required all business units to produce at least one "eco-designed" product for completion by 2001.

The recycling and reuse industry itself is also becoming more organised as it matures. In the US in 1995 a re-use industry association called ReDo was established to meet this need. This association supports growth in re-use through a quarterly newsletter providing in-depth articles on how reuse centers and programs have started up and are operating, along with other news important to the reuse industry; a reuse forum (on-line networking tool allowing questions to

### Box 2.16: ReDo

Recyclers have not understood the reuse speciality very well. The two industries use different methods of receiving, handling, storing, and marketing their wares. While recyclers work with bulk commodities, reusers handle a wide range of individual objects.

So far, no recycling organization has developed an effective effort to educate the public about advantages of re-use. Some recyclers have suggested that reuse competes for part of the supply of discards. Re-users agree this is true but claim a higher public policy priority.

<sup>5</sup> Arguably, the WBCSD program on Eco-efficiency, discussed under international incentives may be discussed under this heading. The focus, here, however, are programs that individual companies have put in place to change the culture, information flows and structures of their organisation.

be posted and potential responses from ReDo's other 115 members ([www.redo.org](http://www.redo.org)). The Australian organisation Reverse Garbage is affiliated with ReDo [58].

The networking needs of the recycling and reuse industry should not be underestimated. In primary resource-based industries, the networks – to obtain resources, advice, technology information, etc. – are well-established. This is not the case in the recycling and reuse industry. Initiatives such as ReDo and the NEBC (Northwest Environmental Business Council), a regional trade association representing more than 1,000 environmental industry association [59], provides opportunities to advance their case in social resource deployment.

Others in the recycling industry seek out opportunities and make the investments necessary to grow their business. For example Cogle's Recycling Inc. in USA collects plastics. It found that the amount of unmarketable plastic in its collection was as large as the marketable. To avoid losing revenues and pay disposal fees, the company purchased plastic lumber manufacturing equipment to create its own market for residual plastic [60].

## Summary and recommendation

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In Part 2 of this report, we have discussed a number of programs operating nationally and internationally to encourage individuals, organisations and society to increase their materials reuse and recycling. Our focus in selecting the programs to discuss has been on those targeted towards the C & I sector.

We described each program, noting the organisations implementing them, and the variants to the program. We have discussed how each program, or sets of programs, is likely to cause the desired change of behaviour. We have used the social systems model outlined in Part 1 to structure these conclusions.

While it is possible to talk in general terms about the likely effects of programs, it is not possible to recommend which programs should be adopted within in NSW or to derive strategies for such adoption.

To do so requires a more systematic and comprehensive structuring of the underlying issues than is currently available. Our major recommendation is that the Waste Boards collaborate to agree such a structure, and analyse where the myriad of initiatives in place, or under development, might fit. With this analysis in place it would be possible to develop meaningful strategies which integrate regulation, pricing, incentives and communication into a planned behaviour modification program.



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# Attachments

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Attachment A: Social systems

Attachment B : Literature review





# Attachment A: Social systems – a brief overview<sup>6</sup>

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A "system" is a set of interactive elements each of which is related directly or indirectly to every other element. For a something to be defined as a system it must be composed of at least two related elements, and all elements must be connected. One of the characteristics of a system is that it is not possible to decompose its elements into unrelated subsystems [62]. When we describe a system we identify its elements and the interactions of elements. Generally we try to contrive the description of elements in ways that allow us to study and manipulate them.

Another characteristic of a system is its operation is more than the sum of its parts. This means that even if we understand the detail of every element in a system, we would not necessarily understand the system. For example, understanding how neurones fire, blood flows, function of grey matter, white matter, glands, frontal lobes, left hemisphere and right hemisphere and the like can not fully explain thought. Thought is an integration of all these elements (and many others). We can only understand such systems by looking at the whole and understanding the interactions between the elements that make up the whole.

Systems conceptualisation are used in many disciplines of science. They are used extensively in the physical sciences. For example biological sciences use systems modelling to explain the operation of living things. Similarly, the field of ecology utilises systems concepts to explain the relationships between the organisms and their environment. Increasingly, we are also using systems theory in the social sciences. Adopting the theory's' propositions and terms to identify and describe the phenomenon we are interested in. We've listed and explained some of the terms from systems theory in Box A.1.

One of the reasons systems theory is flexible enough to provide a framework for study for both the physical and social sciences is its recognition that elements can be both "concrete" and "abstract". In the physical sciences, many of the elements are "concrete". We can feel, see, or touch them – even if we need aids, such as microscopes, to do so. In the social sciences, many elements we identify and describe are "abstract" (feedback, behaviour, length).

This flexibility lets us describe both abstract systems and concrete system. An abstract system is made up of only abstract elements. Psychological concepts such as id and ego are examples of abstract systems. Concrete systems are made up of concrete elements or objects (eg. roads, wires, tree canopy), or a combination of abstract and concrete elements. Examples of concrete systems are organisations – which are a combination of abstract concepts and concrete elements – and an electricity grid – which is a combination of concrete elements. An economy, is another example of a concrete system. We describe the elements that make up an economy as a series of transactions, interactions and activities. Some of the elements in the economy are "concrete", such as money, but the value of money is an abstract construct.

In describing a system as "abstract" or "concrete" we are implicitly drawing boundaries around something. We could say that everything is interactive with everything else, and each element within a system is probably a system in

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<sup>6</sup> Adapted from [Martin, 1999 #165]

## Box A.1 : Systems theory terms (adapted from [63]):

An analytic system is a representation of a real system, whose elements consist of signs or concepts: i.e. the concepts of length and width; of id, ego, and superego; of supply and demand; of ethics, morality and responsibility. These can be representations in the forms of pictures, maps or words. A map itself, of course, is physically real. But the real paper and ink are not themselves a system. They are only a representation of the author's view of the real system being depicted. Analytic systems may or may not correspond to real systems, or be intended to.

The boundaries of a system are logically defined by listing all the components of the system; any elements not listed are construed as falling outside the analytic system. Whether elements not in the system should be ignored or be listed as part of the environment depends on whether they are relevant to the problem under study.

A closed system is a system in which interactions occur only among components of the system. There are no inputs from or outputs to the environment of either information or matter-energy. A real system can be partially or temporarily closed by sealing it from its environment. An analytic system can be closed by assuming that no influences are felt from the environment.

An element is any identifiable entity – concrete or abstract, object or event, individual or collective – such as an electron, a person, a law, a standard, a point, a line, a word, a book, greenness, swimming, the industrial revolution, the universe, economics, the church, existentialism, or all bassoon concerti in F-sharp minor.

Equifinality is a general property of open systems such that as far as they attain a steady state, this state can be reached from different initial conditions and in different ways (von Bertalanffy, 1968).

Input is any movement of information or matter-energy from the environment across the boundaries and into an acting system. An input necessarily modifies the system in some way.

An open system is a system that receives inputs from or releases outputs to its environment – that is, it is influenced by and influences its environment. All real systems are presumably open at some time, in some respects or to some degree.

Output is any movement of information or matter-energy from any acting system across its boundaries to the environment. any action of the system's surface on its environment (as a foot making print in the mud) is construed as a movement "across the boundary." Any output necessarily modifies the environment in some way.

A pattern is any relationship of two or more elements. The elements can be related repeatedly, directly, and in the real world, like protons and electrons, politics and elections, capability and ethics. Or they can be related infrequently, indirectly, or in the imagination alone, like electrons and elections, alchemy and gold, unicorns and satyrs.

A subsystem is a system that is itself a component of a larger system

A supersystem (or a suprasystem) is the larger system of which a given system is a component.

A system, in the broadest sense, is any pattern whose elements are related in a sufficiently regular way to justify attention.

itself. When we go down this path of analysis we find that the number of variables we are dealing with rise, and the range and sophistication of the interactions between these variables expands exponentially. Such an exercise might be interesting but, at least with current state of scientific sophistication, we would not be able to draw any conclusions.

To limit the number of variables we deal with, we draw "boundaries" around the phenomenon we are trying to understand. By drawing boundaries we decide what elements and interactions we will include. We set limits on the complexity of the system we want to study. For example, a biologist might want to study an individual cell. She may elect to define the cell system as interactions confined by the cell membrane. She may acknowledge that the membrane is permeable and there are many transactions that occur across that membrane which explain why the cell is constructed the way that it is. However, her study purpose may not involve those

interactions at this time. Should she decide to include the organ within which the cell resides the perspective on the cell itself will change. The cell system, in fact, becomes a subsystem of the organ will significance only for its interactions with the whole.

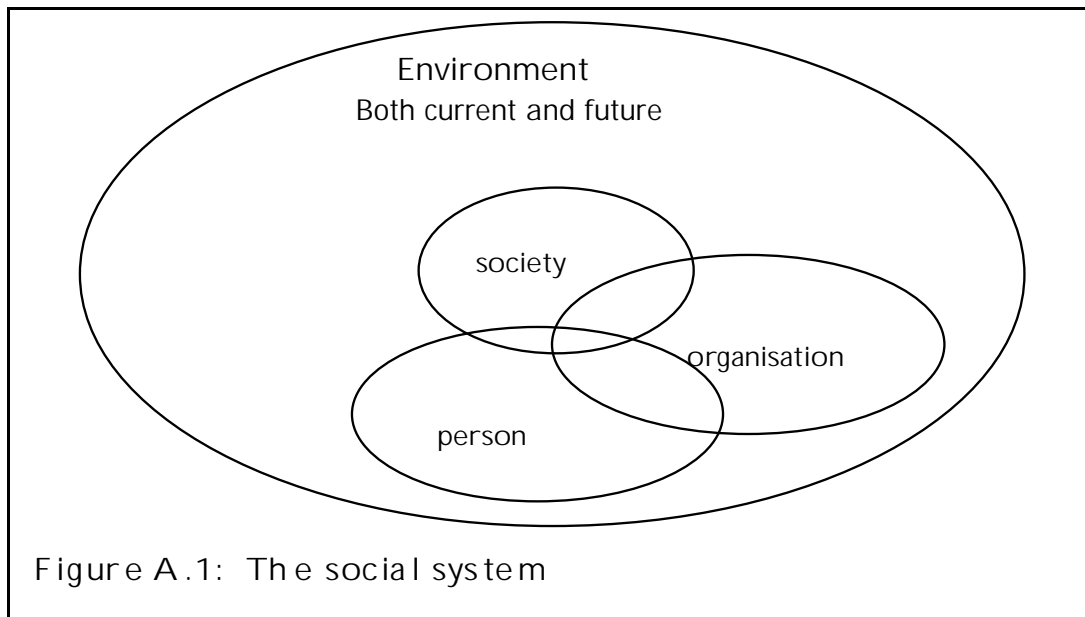
We, in our daily lives, constantly set boundaries to our observations. Our boundary setting, however, is often implicit rather than conscious. We talk about the "community in a suburb", "the transport network", the "solar system", the "family unit", a "university". These "systems" require us to make conceptual choices about boundaries and equally conceptual choices about the range and depth of their elements. Boundaries, however, may also be physical such as those nature provides when we study a flower or a house.

Within the social system we are studying to understand waste management behaviour, we note the importance of three subsystems (figure A.1) shows three subsystems, "person", "organisation" and "society", nested within in a supersystem "environment":

- The "person" subsystem . Organisations are made up of people and organisations serve the needs of people. People are actors that drive an organisations and society to behave in the way they do.
- The "organisation" subsystem . We are interested in understanding the behaviour of organisations (making up the C & I sector). Part of the definition of an organisation is that it utilises structuring mechanisms to achieve goals. These mechanisms have powerful behavioural impacts on individuals within the organisation and, ultimately, on the behaviour of the organisation. The influence of structure is, of course, not one-way. People set up the structures that effect other people and modify them to effect people differently. Effects and counter-effects (the change process), however, do have time-lags and often we can assume, for analysis purposes, that the effects of structures are stable<sup>7</sup>.
- The "society" within which the organisation operates . Arguably, society itself is an system of which the organisation is a subset. In the "society" subsystem, however, we are predominantly interested in identifying the elements that explain relationships people have with one another. We are interested in questions of the type of social world we live in, its political and cultural aspects as well as the reason why be have certain norms of relating to one another.
- The environment in which the society, the individual and the organisation operate . The environment is all encompassing in our conception. We include in the environment concrete physical elements such as air and water, raw materials, various natural systems, even the space beyond our stratosphere. We also include abstract elements, such as the concept of "future". We identify this concept because of the growing awareness of limits to physical consumption as we discover the finiteness of our resources and how our utilisation of them is creating future scarcity.

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<sup>7</sup> By "stable" we mean enduring for study purposes – making it possible to predict causative effect of one factor on another.



There are a number of common linkages that bind the three subsystems. These links enable the system as a whole to adapt to changed environmental circumstances and the enhance its own survival changes (that is, make good use of its resources and capture more resources). Table A.1 describes these links or processes:

Table1: Processes across subsystems

Subsystems and processes	INDIVIDUAL	↔ ORGANISATION	← SOCIETY
<b>INFORMATION</b> (the feedstock for choices)	The flow of information to and from the individual, and the structuring and processing of that information to make decisions	The flow of information to and from the organisation, and the structuring and processing of that information to make decisions	The flow of information to and from society, and the structuring and processing of that information to make decisions
<b>BELIEFS</b> (the shapers of choices)	The values and self-standards of the individual, incorporating those that are received, self developed, or imposed by society or organisations.	The culture and standards of the organisation, incorporating those that come from the individuals, who make up the organisation, self developed, or imposed by society.	The culture and rules/laws of the society, incorporating those that come from the individuals, organisations, or which is self-developed by society.
<b>RESOURCES</b> (the subject of choices)	The personal resources of the individual, productive activities of the individual using those resources, the investment or export of resources, and the securing of new resources from society or organisations	The resources of the organisation, productive activities of the organisation using those resources, the investment or export of resources, and the securing of new resources from individuals or organisations	The resources of the society, the allocation of these to organisations and individuals to serve societal needs, and the reallocation of these away from organisations/ individuals for either punitive reasons or to meet other societal needs.
<b>LINKAGES</b>	The host of linking mechanisms and institutions that exist to give effect to the operation of the systems and the processes, including: Law, religion, commerce, philosophy, politics.		

There are many institutional and other linkage mechanisms, which operate across the subsystems and give effect to the processes of information exchange, resource transfer and belief systems. These include:

- religion
- law
- politics
- commerce
- philosophy

The operation of the system of organisational choices could be dealt with by reference to the operation of these mechanisms. But our intention is to go to the substrate of the system.

As with all open systems, the continuance of the organisation requires a constant importation of energies (resources) to counter balance the export of these. The need to constantly access resource is the prime disciplining mechanism for the operation of the organisation.

Organisation goals (and performance relative to those goals) have to sufficiently represent means for those who control energy flows to the organisation to satisfy their purposes, to maintain the flow of resources or information to that organisation. Those who control these flows include those who use the outputs (customers and clients), and a great range of stakeholders who provide or control the inputs. Included among these are the people who provide the labour and skill that are harnessed by the organisation.

The structure of the organisation is the mechanism used for structuring these flows, which in turn determines the patterns of organisational response to the outside world. This in turn shapes its effectiveness in demonstrating to those who control resource flows that it is satisfying their purposes.

The pursuit of energies acts as a constant pressure on the organisation to fit with its context, at least to the extent of ensuring that it is able to continue to secure its required resources and information inputs.

Information is the material that is used by the organisation to make the decisions required to ensure fit with the environment, and with the needs and interests of the providers of its resources. It is the feedstock of the decisions that are taken. Without a flow of information to the organisation, the organisation is left with reliance on its own internal information to make its decisions, increasing the risk that the organisation will drift out of fit with its context.

Regardless, however, of whether the organisation seeks and is able to use information, it is in constant receipt of a flow of signals from the outside world, and it is sending a constant flow of signals to the rest of the world. These information flows might be unheeded or confusing, but they are nonetheless information. Information flows have the character of an open system.

However when we come to consider beliefs within societies and organisations, the character of the system is somewhat different. It takes but a little reflection on the way in which societies develop patterns of thinking and relating to realise that beliefs are largely self generated within the society which holds them. They may be triggered by information, and shaped by responses to the readiness with which resources flow, but they are internal in their very nature. Systems of meaning are, according to Luhman (1995) "autoipoetic" – self-referencing and self-generating.

This is important for our consideration of the three subsystems with which we are concerned. Whilst it might be possible to track a number of the ingredients that go to trigger the development of culture, the end processes is somewhat circular. Ideas

breed new ideas, which breed new ideas on the back of the decline of the old idea. The development of is an ample indication of this process.

## Representing choice systems

In our task of representing processes of choice and implementation across the three subsystems we have taken a number of principles to heart.

- The representation does not pretend to be comprehensive nor does it make any claim to be 'right'. The representation of choice systems is a reflection of the elements and linkages that seem to us to be the most important to consider in deriving a systematic approach to organisational responsibility. Others may perceive and represent the real world quite differently to us.
- We have taken a consciously naïve approach, using rich theoretical perspectives to highlight key features of the choice systems under consideration, but not being bound to adopt the various theories in all their depth and complexity. We are looking for the basic themes, which span a number of fields of theory.
- We have culled from our representations many elements and linkages that could rightly be considered as relevant. This we have done in the interest of being able to communicate the approach, rather than becoming bogged down in the details. One of the pervasive characteristics of this set of systems and processes is that nested within each element and each linkage is a number of other elements and linkages. We have "buried" many of these in the interest of ease of communication.
- We have been prepared to violate a number of systems thinking conventions. Many of the systems diagrams that follow began their lives as Systems Dynamics models following the approach pioneered by Jay Forrester (1961). They were originally drawn using iThink (Richmond and Peterson, 1996). However, we have elected to depart from these conventions to at least some degree, in large part in response to the need to include consideration of systems of meaning, with all of the embedded circularity that this set of concepts involved. Accordingly the diagrams that are used are something of a polyglot creation, which follow many but not all of the disciplines of conventional Systems Dynamics.

## The Individual subsystem

Three processes – information, belief and resource processes structure the individual's decision system. These are interlinked in many ways, with information (for example) being the nexus for decisions to invest, produce or secure resources, and goals and self standards being pervasive of the way in which information is filtered and adjusted leading to decisions. The system, in a highly stylised and simplified form, is represented below.

Please note in reviewing this diagram that a number of elements and linkages have been excluded to minimise complexity:

What does this mean for the management of organisations to maximise the likelihood that they will be "responsible"? The system tells us a number of things:

- 1 Within the information and decision making processes, it tells us that the issue of information access and information filtration is a fundamental ingredient in the processes of decision making, and that filtration influenced by beliefs is a proper concern of the strategist who is concerned with the quality of choices made by the individual.

- 2 The issue of decision-making capability, linked to raw competence, learning and experiencing opportunities, is an element in a comprehensive strategy. A failure of decision competence in a host of areas which have no overt moral overlay (eg. decisions in driving a vehicle, or within a family) can lead to problems which of their nature carry a moral dimension (eg. injury to other drivers, or emotional trauma to family members).
- 3 Issues of personal resource have a number of impacts on responsibility. They have an impact on the original decision making (how the person analyses the resources condition the immediate issue that they feel they have available and how they perceive this decision will impact on that). The quality and extent of the resource available to be applied to implement the choices made will impact on the outcomes of decisions. The impact of decisions also have an effect on the perception of the consequences of decisions, which in turn feeds into the development of goals and standards, through a learning and contingencies mechanism. This highlights, among other things, that incentive systems are a vital component in understanding patterns of decision making.

The system representation tells us that a systematic strategy to adjust the decision making of an individual to better reflect some desired preference, would encompass management of information flows, analytical frameworks, knowledge creation through learning and experience, and the pattern of incentives in place. It would also require attention to feedback on consequences and the way in which consequence is processed and assessed. This is in addition to any consideration of the ethical frameworks themselves.

Strategies, which might follow from this analysis of the subsystem elements and their relationship one with the other, include:

- Adjustment of information flows to ensure that appropriate information is available without adverse filtration effects;
- Recruitment and capabilities development programs, relating to both self standards and fundamental problem structuring and decision making;
- Ensuring that consequence information is actually captured and analysed with respect to self standards (incorporated into analytical frameworks) and impacts on the organisation's resources (the more common consideration);
- Developing and refining values, leading to strong goals and self-standards, is a process akin to learning, but with internalisation being the key process (though knowledge development does have an important part to play).
- Resourcing issues, in particular ensuring that the resource available is adequate to the task, come into focus as areas of potential strategic concern.

The system representation highlights a number of important linkages between the individual(s) and the organisation:

- As the mechanisms for collecting, filtering and providing information;
- As the source for decision making frameworks, systematised and adopted by the organisation;
- As influencers of the goals and self standards of the organisation;
- **As the providers of resource, produced outputs, and the takers of the resources (including the outputs) of organisations.**

These four systemic relationships point to the areas where strategies to increase the probability of responsible choice by individuals, who are the input providers and product takers of organisations, can have significant impacts on organisational decision making. It suggests that strategies to sensitise individuals within



organisations to the systemic effects that their actions in these four areas can have on the responsibility of the organisations with which they are involved, may be a powerful alternative approach to more traditional ethics training. The opportunity is to intervene in the mechanisms through which the patterns of operation of an organisation are created – information, decision making, goal setting and output provision.

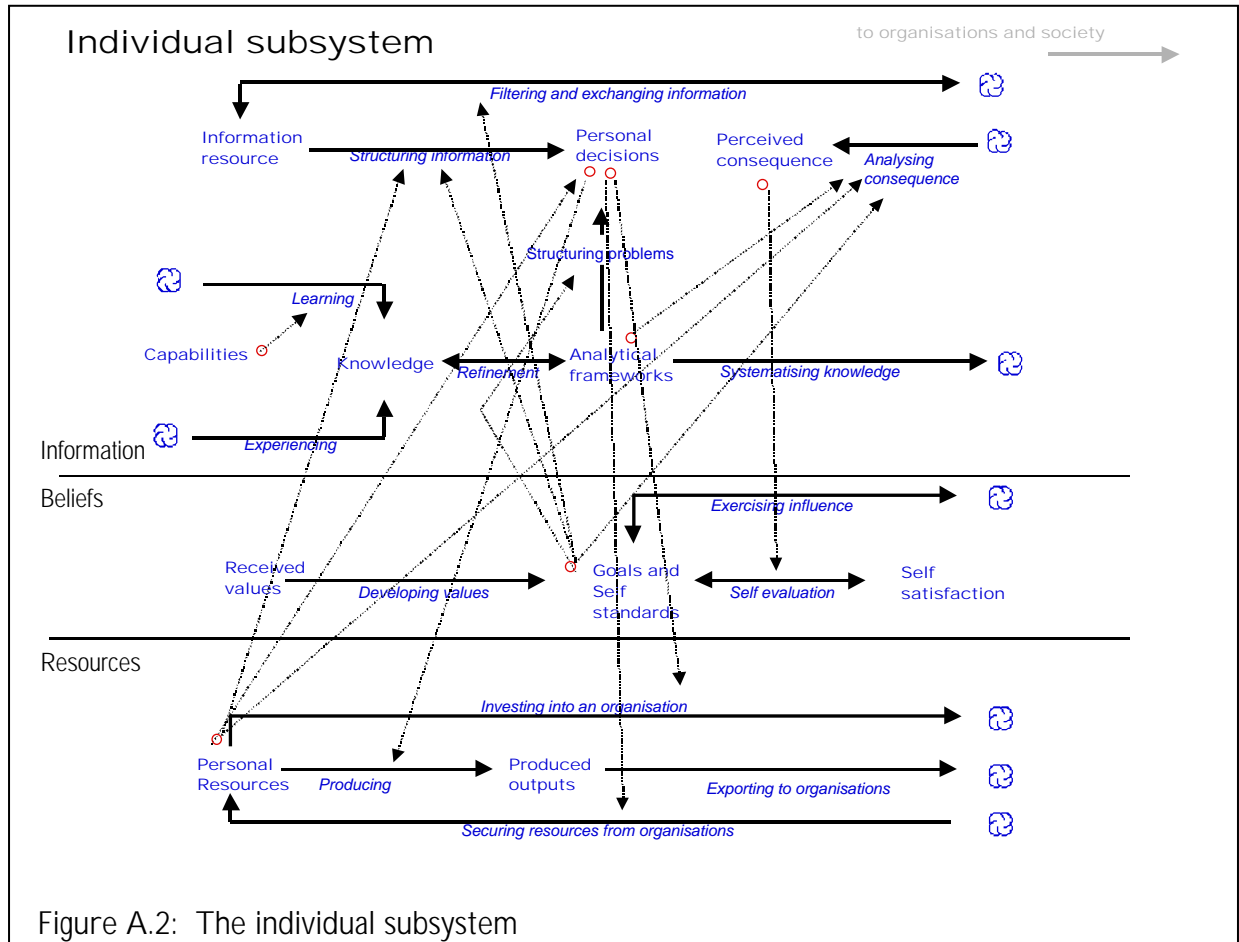


Figure A.2: The individual subsystem

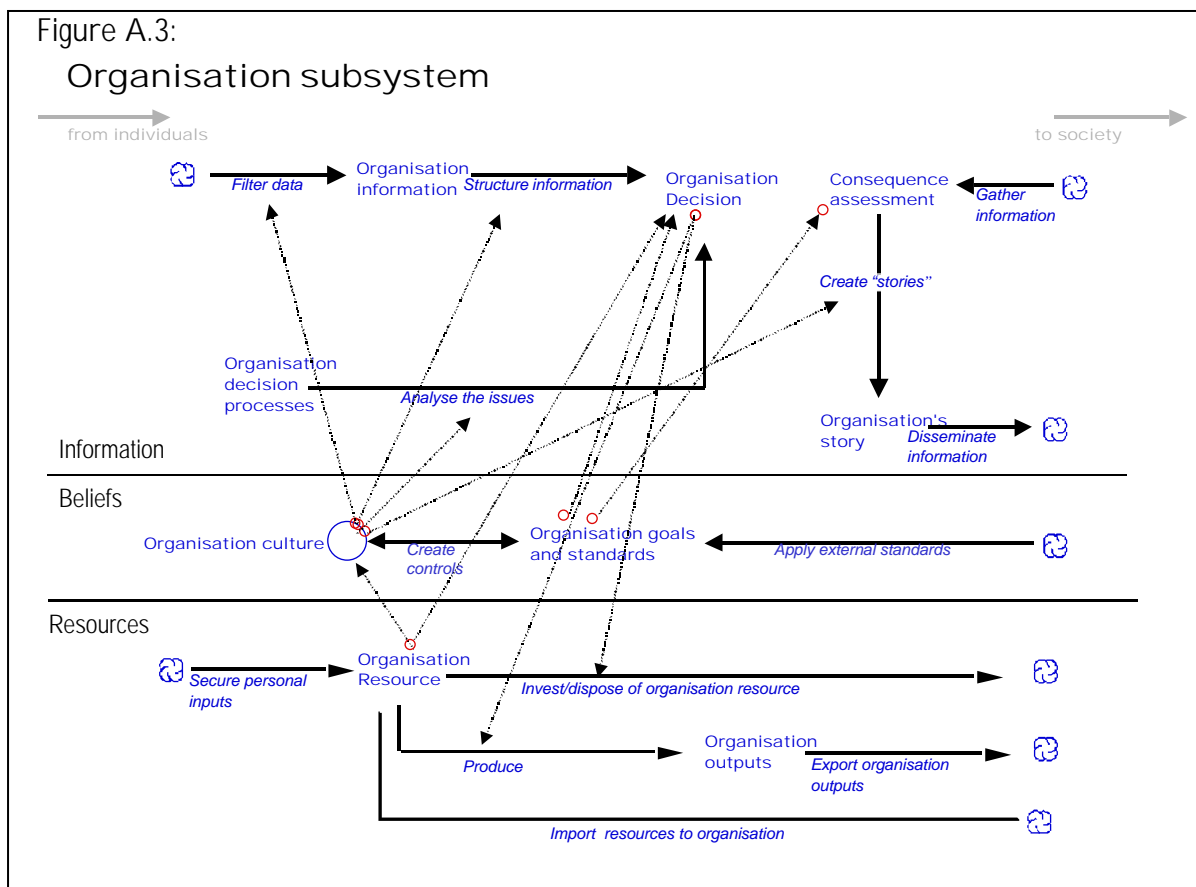
## The organisation as subsystem

The organisation carries out analogous processes of information processing, belief formation, and resource movement to the individual. But the collective characteristic of the organisation gives it some unique characteristics, not least of which is the development of a culture independent of any individual within the organisation. The patterns of response to the signals from the outside world, and the patterns of resource allocation, represent a collective rather than an individual response by the system to its context and purposes.

In the following diagrams, a circle is used to represent collective culture. A number of signals to the creation of culture, and effects of culture on the decisions of the organisation, are highlighted. However these are not represented as direct relationships. What does this system representation tell us about strategies that are likely to increase the likelihood of any organisation acting in a consistently responsible manner?

- It tells us to pay attention to data capture and data filtration in our pursuit of a desirable level of organisational responsibility;

- The representation highlights that outside of governance through organisational goals, standards and compliance, how the organisation goes about processing information for decision making is an important concern in the operation of the system through which organisations make choice.
- The representation shows a direct link between the identification and assessment of consequences, and a process of story creation and dissemination. This is representative of a number of organisational processes, from public reporting through to marketing and public relations activity. This highlights the importance of such story making and dissemination in the operation of organisations. Whilst not represented in this subsystem, the effectiveness of story telling is linked to the organisation's capacity to secure access to community resources.
- Organisational goals and standards represent a composite of imposed requirements and internalised standards. Beneath the representation is an implied interaction between these two – when organisational culture and imposed requirements line up, then one can anticipate a fairly powerful incorporation into organisational standards. When this is not the case, there is a weaker default position that either culture or societal imposition can create standards applied in organisational decision making. We will revisit this issue in a later module.
- The organisation secures resources from society and from individuals within that society. The diagram represents a process of import, processing and transformation, and export which roughly parallels that for the individual. The disciplining of the organisation to society's requirements occurs in part through this process, and in part through the inputs from individuals who make up the organisation (their values, decision criteria, information and processes).



The implications of these matters for strategy making for environmental management by organisations are substantial. They highlight that a comprehensive approach would

involve information systems, decision making processes, 'story making' and public image issues, collective culture, and both internally generated and externally imposed standards of performance.

There are a number of linkages between the organisation and individuals, and organisation and society. We have already highlighted some of these in relation to individuals. In relation to society, the following are important to note:

- Information about consequences of choices comes to the organisation through a number of channels from society. Market intelligence, market signals from purchasing patterns, media, informal feedback, letters from customers or regulators etc. all provide the basis for reviewing the effectiveness of past decisions (and their deployment) on achieving the organisation's goals and meeting its standards. Information gathering from society achieves a position in the constellation of possible strategies on this basis.
- Society is also the target for the organisation's stories, whether in the form of product marketing, political positions, representations, advocacy, public relations or a host of other communications mechanisms used to position the organisation favourably in the eyes of society (or parts of society), to free up the flow of resources to the organisation.
- External standards, in the form of laws, technical standards, customer standards, or any of a host of other mandated or strongly persuasive standards, form intrinsic elements in the organisations' control and governance system. The strength of this incorporation depends on a number of other variables (such as fit with culture, power of the enforcement mechanisms and the like). Examination of external standards, and linking these to the capacity of the organisation to secure resource, is a potentially powerful mechanism impacting on organisational decision making.
- Finally it is the flow of resources to the organisation from society that will most dictate its strategies, culture and behaviour. Strategy making is fundamentally the pursuit of resources by the system, generally with a nexus to achieving some desired goals (the achievement of which justifies the community investment of resources into the organisation). Adjusting both present and likely resource flows from society to the organisation is for that reason a powerful motivator for organisational behaviour.

## Considering society

Society is in one sense a supersystem, and in another a subsystem when considering organisational choices. Because organisations are a social artefact, most resources used by organisations never leave society. They are reprocessed and recycled within the society. The only point of true export from society is when they become removed from use (such as when waste returns to the ecosystem, including when a person dies).

Similarly, ideas and beliefs circulate within society and do not leave it. They have no life outside the society. They may become redundant and replaced by others, but for so long as they exist they do so within a social framework. For these reasons the representation of import and export between society and organisations and between society and individuals is a convenient fiction.

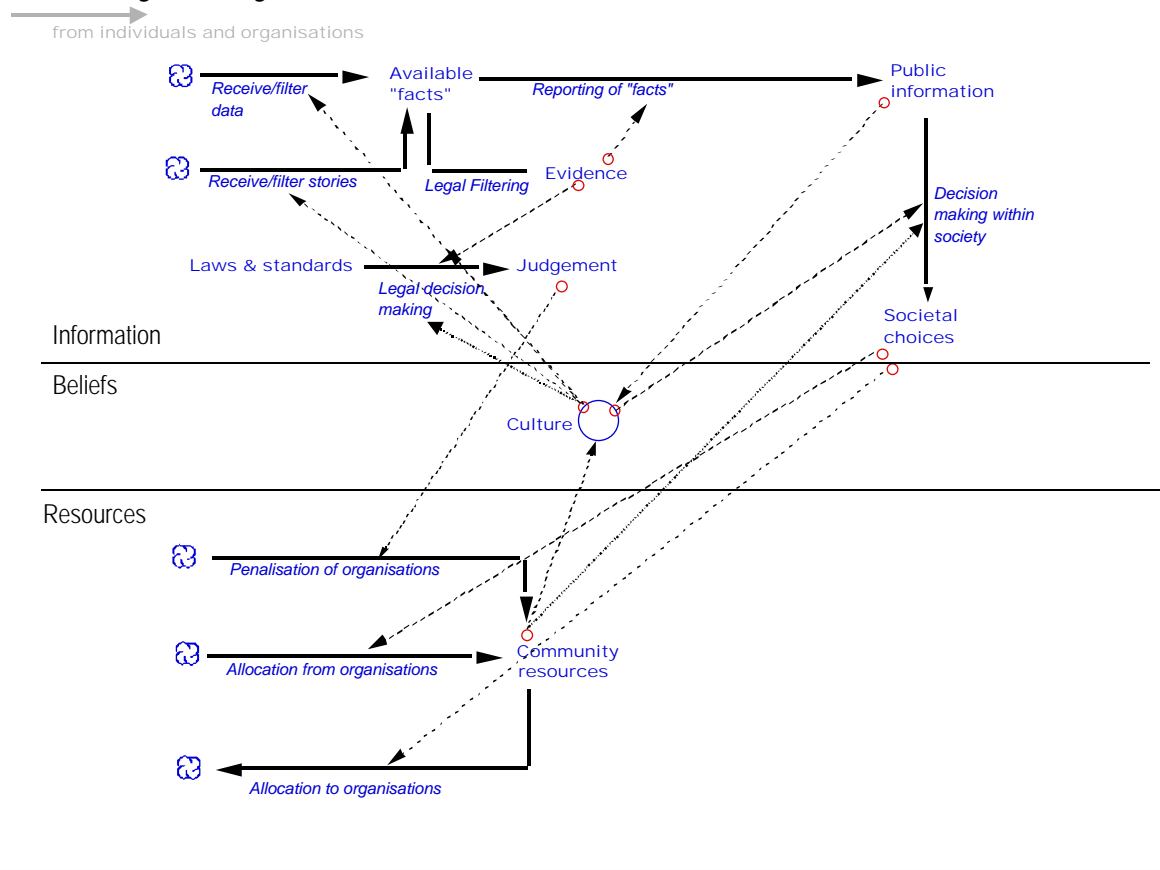
However taking that as given, by adopting that fiction we can discern some potential points of intervention to improve the likelihood of sustained responsible behaviour by organisations.

- Society uses information in many forms. They include real data (scientific facts), stories from people and organisations, and information self generated within the society (literature, scientific theory, myths), and information generated for the purpose of regulating the operation of the society itself (laws and standards). The information available within a society is a subset of the mass of information that might be presented to it, with the extent of the gap between the possible information and the captured information reflecting limits to technology and filtration processes used within the society. This suggests that an issue in the management of waste management is the nature of information flows within society. For organisations, awareness that information flow will be filtered highlights the need to align the messages sent by the organisation to the culture and beliefs of that society, if it is to be received. If the intent of the analyst is to come up with strategies to ensure that the organisation is, and is perceived to be, responsible, this suggests that the management of the flow of information to society is part of the task.
- Of the available facts, only some receive wide dissemination to the members of the society. Mechanisms for that reporting include not only the media, but also informal and word of mouth, political processes, and a host of mediated flows of information into the public consciousness. Stories created by the organisation and fed into this flow are only a small part of the total available facts, and may not make it through the filtration mechanisms. Strategies to ensure that they do often fall within the ambit of marketing and public relations professionals.
- Public information and culture (which provides the mechanism for adding meaning to information) are the keys to decision-making society. The choices made by society impact on the allocation of resources to organisations (and individuals) through mechanisms such as purchasing preferences, political actions, pricing of resources, legislation, and direct action (such as consumer boycotts or consumer selection of preferred suppliers). One of the important observations from this systems perspective is that these feedback loops are indirect, suggesting that attempts to directly link economic benefit to responsible behaviour by organisations may often be problematic.
- The operation of laws and standards, as formal mechanisms for exercising control over organisations and individuals, is a special case of these social control mechanisms. The culture of a society is reflected in its laws and in the way in which judgements are made within the legal system. The outcome of judgements is part of the flow of information into the general community, but more particularly is represented by the transfer of resources within the society. In this representation of the system, this is characterised as 'penalisation' of organisations (though of course in civil matters at least, this penalisation is often accompanied by a corresponding benefit to the successful litigant).

The system highlights the need to consider information flows, decision processes, resource allocation and the combined effects of self standards, organisational culture and standards, the law and the culture of the society, if one is to truly understand how organisations make choices, and how these choices come to be considered as either responsible or irresponsible.

Figure 8.3:

### Society subsystem



# Attachment 2: Literature Review - recycling and market behaviour

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There exists a significant body of economic research exploring the interactions between incentives and outcomes in ecological and environmental management. Some of this is concerned with issues of waste management and recycling. Very little of the material which we uncovered dealt explicitly with the economics of recycling in the C&I sector. However, it does provide a significant base from which inferences can be drawn about the issues of relevance in designing an effective recycling system for this sector.

We have summarised below highlights of the material we reviewed to provide additional support to our conclusions.

## International perspectives on economic incentives [64]

This case book deals with a large number of programs in different economies, all focused on supporting sustainability. It addresses the energy and automotive sectors, agriculture, air and water pollution, waste management and environment and development policy.

States considered include California, Denmark, Ontario, Germany, Canada, EEC, UK, Holland, France, Sweden, Scandinavia, USA, Iowa, Victoria, Louisiana.

Particular chapters of interest are:

Chapter 1 (The Greening of Budgets: The choice of governing instruments) pp1-27. provides a summary of the principles that are derived from this comparative study. It highlights that "the single most important instrument of power over environment and development policy that government policy makers can state and give effect to is contained in the government's annual budget." p2

"The possibility of reducing pollution and waste through the budget and tax system, by reinforcing the axiom that prevention is better than cure, is generally not taken into account in budget making decisions. Environment externalities - that is, the impacts of economic activity on the environment - are not considered market transactions ... increasingly they (policy makers) will be required to promote cost internalisation and account for the likely impacts of program expenditure or tax may have on social and environmental welfare.." p3.

The chapter provides a comparative examination of different approaches. It firstly provides a typology of a mix of policy instruments (various types of voluntary, regulated, public expenditure and taxation) p4. and budgetary instruments (Public expenditure instruments, revenue generating instruments and budget neutral instruments) p5. It outlines the categories indicated by the OECD, which are taxes and charges, subsidies, deposit-refund systems, market creation and financial enforcement systems and provides a critique of that framework.

Of greatest importance in this chapter is a detailed discussion of the lessons learned from these studies. Five matters are given priority:

- "The broader budgetary system of taxes and expenditures can impede or undermine effective environmental policy development" p20.

- " Economic instruments can be effective environmental policy tools" p21.
- " Policy certainty is critical to the effectiveness of economic incentives" p22.
- " Market-driven technological advances can drastically increase environmental effectiveness and reduce the economic cost for industry of large environmental taxes" p22
- "Program delivery by non-economic departments or third parties can increase the effectiveness of an economic incentive program" p22

For each of these five principles, illustrative examples are provided.

A number of integrative lessons are drawn from the studies.

- "Environmental concerns need to be integrated into development policy" p23.
- "Good policy design requires careful consideration of the interaction between an economic instrument and the broader tax system" p23.
- "Economic instruments and regulatory measures can enhance each other" p23. Five examples are given of this symbiosis. California's renewable energy credits economic incentives in conjunction with emission controls, the German experience of using tax incentives for consumers which led to competition among manufacturers to create less polluting vehicles, which then led to the ability to regulate to tighten emission standards. The regulatory ban on Dutch farmers spreading manure, which worked alongside the levy on manure mineral releases to the environment. The US government's use of regulations phasing out Ozone Depleting Chemicals coupled with a tax initiative to do so. A Dutch levy on surface water pollution which in turn created the at-source information to allow more effective regulation.
- "Politics, economics and institutional reform can complement each other" p24.
- "Subsidies and tax allowances can serve both environmental and economic development goals by accelerating the commercialisation of a technology." p24. Examples given are catalytic converters, and renewable energies.

The authors provide three guidelines on public acceptance, and then five lessons about policy design. The most significant of these is probably number 2, which stresses that environmental taxes are about behaviour change.

Chapter 20 ("Recycling credits in the UK: Economic incentives for recycling household waste" by Kerry Turner, Ece Ozdemiroglu and Paul Steele) pp 281- 296 deals with a UK program designed to improve sorting of waste streams to aid recycling. The program is introduced through the Environment Protection Act Part II of 1990. Under it, agencies receive a credit for the savings that they have generated through improved sorting, as a percentage of the costs of the collection system. This program has been evaluated but with divergent outcomes. The main problem with the program has been that the credits are too small to have the desired effect.

Chapter 21 ("The user pay waste management initiative in the Victoria Capital Regional District" by John Moffet and Francois Bregha) pp297-306 deals with a program that dealt simultaneously with a substantial increase in tipping fees (seven fold); improved landfill efficiencies, increase in the user charge to households, and extra charges for additional pick up; all coupled with a range of recycling services. It is estimated that this program resulted in a reduction of waste by 18% in its first 12 months, and 22% in its second.

The study highlighted a number of policy issues:

- the regressive nature of user pays;
- the need to go to great lengths to overcome illegal dumping, which in turn results in a number of other costs entering the system (like putting locks on commercial dumpsters!)
- The need to significantly increase efficiencies in the system, and adopting technology that permits this.
- Payment by volume does not create the right incentives (as users simply do the compacting themselves).
- There are practical limitations to user pays, mainly based on consumer expectations.
- Sunk costs can impede the capacity to adopt innovations, particularly in the replacement of trucks and other infrastructures.

Chapter 22 ("SARCAN: Promoting Recycling and Employment of Disabled People" John Moffet and Francois Bregha) pp307-319. This is a study of a litter reduction focused container deposit scheme. It examines some of the arguments for/against deposit schemes versus kerbside recycling, and highlights (p315) indications of much higher effectiveness of deposit schemes. The program is innovative in a social sense because of the use of disabled people in operating the scheme. The paper also considers the relative merits of recycle vs. reuse systems. Finally the study considers the relative difficulty in controlling waste from within one state in a federal system.

## Do economic incentives really make sense?

The Tellus Institute has been a major source of research on waste management and environmental policy. This significant base of research has been carefully explored by Frank Ackerman [65]. This provides a solid integration of a range of studies, spanning a significant number of incentive systems designed to promote sustainability. The most significant outcome of this integration of knowledge is to put a direct focus on the underlying community values and beliefs as the driver of recycling and reuse behaviour.

The book deals with the debates about recycling, research concerned with packaging, and then waste reduction and materials policy directions for the future.

It examines "why recycle?" from a number of point of views. Some of these relate to waste issues (disposal capacity, emissions, litter) and then benefits relating to recycling (reduction in energy use and emissions, reduction in extraction and manufacturing, and conservation of raw materials) p21.

Chapter 2 deals with pricing errors and market incentives. It highlights that the enthusiasm for economic incentives is not necessarily supported by proven effectiveness. A critique of theoretical models is provided, based on a review of empirical experiments in the US. The outcome is "The problem is that people just do not respond very much to moderate prices for garbage collection", p31. He highlights that based on other studies (Jenkins) shows a price elasticity as low as -0.12.

Other studies (Fullerton and Kinnaman) deal with unit pricing. One important outcome is the rapid increase in illegal dumping, highlighting that there is third alternative response to increased pricing.

The author deals with the significant economic incentives for virgin materials (extractive industries) and the likelihood that "if subsidies for energy use were removed, virgin materials would become more expensive relative to their recycled



counterparts, improving the market position of recycling" p35. Studies showing the extent of these subsidies are cited. However the author highlights that "Yet these amounts have almost no effect on recycling, for two reasons... Almost none of the subsidised virgin materials compete for the state's recycling efforts" and "even in the few cases where subsidised virgin materials do compete directly ... the state incentives are far too small to make a difference." The author highlights that other problems (such as transactions efficiency and supply of quality materials) are of greater significance.

A substantial range of incentive kinds are examined such as producer responsibility levies, differential taxes based on recycling content.

In Chapter 3, the author provides a solid critique of some of the received wisdom. He highlights that "First, the presumption that the market selects efficient technologies is not always appropriate: current levels of recycling may reflect historical accidents and social forces, rather than as economic optimum. Second, concern for long term environmental problems and the welfare of future generations cannot be adequately represented by market mechanisms, which are oriented to choices within a single lifetime. Finally, there are decisions that cannot be reduced to individual consumer preferences, and intrinsically non-economic values that cannot be translated into dollars and cents; a different kind of decision making is required to address these questions", p46. Examples are provided including the adoption of the QWERTY keyboard. The concept of technological lock in (path dependence) is discussed in this context.

Chapter 4 deals with specific examples of waste management programs and experiments. It highlights that except in conditions when tip space is reaching saturation, there is generally little economic value in incurring the costs of avoiding disposal. The chapter highlights how technology replacement (in this case trucks) can make a significant difference to the underlying economics.

The erratic nature of scrap etc. prices is highlighted with a number of historical charts (cardboard, newspaper, aluminium, iron and steel scrap). The range of causes of this volatility are examined. The implication in terms of stability and viability of recycling programs are considered. Part of the difficulty is the economic costs of uncertainty.

However the study does show the shift from materials to labour that goes with the implementation of recycling.

Pollution pricing is considered in Chapter 5. The significant environmental hazards of PVC etc. are discussed. However the author highlights that the studies on a lifecycle basis provide a different insight into the issues of concern if minimisation of pollution is the key concern. The key issue that emerges from Tellus Institute studies is weight and on this basis, styrofoam and similar materials emerge as benign alternatives to conventional recyclables like glass.

The Green Dot program from Germany is considered in Chapter 6. A key consideration in this examination is the significance of the lag in the development of the industrial infrastructure, and the link to a mandated legal requirement to force industry to create its own voluntary producer responsibility program. A number of analogous programs (Austria, France, Belgium) are examined.

Disposables are considered in Chapter 7, which focuses on litter programs.

Organic waste is encompassed in Chapter 8, and negawatts in Chapter 9. The concept of service units replacing sale of product (ie electricity) is considered.

## Modelling insights

Robin Jenkins provides a solid framework for looking at econometric models of waste management and incentives in his "The economics of Solid Waste Reduction [66]. The aim of the book is to develop an equation that explains residential demand for solid waste services. The book asks two questions: Do residents reduce demand in response to a user fee? and How much is the welfare gain to society if a user fee is imposed? It provides some information on price responsiveness of the commercial sector.

The book reviews the literature on user fees and solid waste disposal, and the response of users to pricing levels, set as both volume and service bases. Other variables such as socio-economic (household size, age distribution, population density) and income are assessed.

Various models are examined - econometric issues are considered. Laws and policies for different US cities are also considered.

Modeling is used to show the impacts of residential and other user fees.

One of the major results of the study (p94) is "Thus our results suggest that the response of commercial establishments to changes in the price of SWS is greater than the response of households. The average user fee charged to businesses in our sample was \$9.30. Consider the impact of an increase in this price on the average quantity of commercial waste, 7.5 pounds per employee per day. If the user fee rose to \$10.00 the pounds per employee per day should fall to 7.34. This suggests that the quantity of commercial waste discarded in a year within a community will fall by 58 pounds for each person working in the community."

The study then provides equations for forecasting waste quantities.

Modeling of the operating performance of waste management systems is considered in depth in Economic Models and Applications of Solid Waste [67].

## Waste Reduction Tax – Denmark [68]

In ten years of existence, the waste tax in Denmark has largely decreased the amount of waste delivered to both public and private sites throughout Denmark. From 1987 to 1997, the amount of waste collected has decreased by almost 26 percent. A study done in 1993 showed that household waste decreased 16 percent, construction waste by 64 percent and mixed waste by 22 percent.

Accompanying the remarkable decreases in waste collection there has also been a significant rise in the recycling and reuse of varying types of household, construction and industrial materials. The recycling and reuse of construction materials has risen over 100 percent, a jump from 800,000 tons in 1991 to over 1.6 million tons in 1995. The composting of organic household waste has increased some 580 percent from 86,000 tons in 1990 to 500,000 tons in 1994. The recycling of paper and cardboard has expanded over 77 percent, a rise from 300,000 tons in 1986 to 531,000 tons in 1995. Glass recycling has expanded over 50 percent and the reuse of fill has also greatly increased.

Although these results are promising, they cannot fully be linked to the waste tax. Shortly before the waste tax was adopted, recycling was made mandatory. There was also an increase in the availability of recycling centres. Throughout the existence of the tax there has been a growing market for used construction materials which makes it easier to sell them before they are deemed as waste. Even though these conditions can account for some of the behavioural change in the

general publics, they can not account for it all. when asked, over 70 percent of municipal authorities said that the waste tax had an important role in their waste management decisions.

## Disposal or incineration [69]

A model of municipal choice of solid waste disposal technologies is developed to examine three competing local options: incineration in energy recover facilities (ERFs), landfilling, and recycling. The authors show that the desirability of incineration and the optimal size of an ERF depend on the underlying costs of the various disposal options and the characteristics of the waste stream, and that under most conditions allocating resources to incineration reduces the incentives to recycle. They examine the implications of several extra-local policies on optimal disposal strategies. Most notably, they find that successful source reduction policies and minimum-recycling targets render incineration less attractive.

## Product stewardship - [70]

This paper introduces the concept of "product stewardship" as a new policy approach towards solid waste management. The German Packaging Ordinance is analysed as a prototype of this new approach. Particular attention is paid to the economics of the Packaging Ordinance, to the practical implementation problems and to the likely impact of the planned EU Directive. Finally, what can be learned from the German experiences for the future design of waste management policies involving product stewardship is discussed.

Concludes: "...there are (at least) three lessons that can be learned from the German Packaging Ordinance concerning the design of future regulations involving product stewardship. First, in order to assure a reasonable degree of certainty for the involved industries and to avoid mis-investments, the respective regulations should establish clear legal requirements that are in line with existing or eventually anticipated regulations on the EU level. Second, the respective regulations should be as flexible as possible concerning the required institutional structures. In particular, it should be left to the involved industries to identify the most cost-effective way to cope with the obligation for taking back used products. Third, in order to ensure economic efficiency, legislators should refrain from any attempt to fix recycling quotas or other mandatory waste management options. Instead, the obligations for taking back should be supplemented by additional economic incentives like taxes on landfill as well as on harmful products and emissions."

## Waste management program - [71]

There are many institutional constraints on local authorities which do not enable them to effect the production (and hence the minimisation) of waste. Most local authorities need to take less than ideal strategies. The CRD experience indicates that local governments can significantly reduce waste destined for landfill. Their plan is:

- Increased tipping fees with an increasing number of items banned and higher tipping fees for selected substances such as gypsum, wallboard, and asbestos
- increased efficiency of landfill operations
- households are charged an basic annual fee which is shown separately from general rates

- extra garbage is charged for
- a wide range of recycling services and educational programs to help resident reduce their garbage is offered: kerbside pick-up, drop-off depots, composter distribution program centralised yard and garden composting facilities, salvage areas.

The paper comments that unfortunately user pays effects poorer people most but there appears to be no observed distinction in response to the program based on wealth. Increased dumping does occur and needs to be planned for. Also, it is important that recycling centres are adequately staffed to reduce dumping of contaminated materials.

## Unit Pricing - [72]

In resident solid waste management, the United States has a great deal of experience in applying incentive-based environmental policy in the form of unit pricing. This study examines the two most common forms of unit pricing practiced in the United States. It offers intuition and empirical evidence suggesting divergence of theoretical expectations and actual outcomes regarding the effects of switching to unit pricing. Data collected from households in Marietta, Ga. during a solid waste pricing experience serve as a basis for the analysis.

Re-asserts the superiority of economic instruments over regulation. Detailed experiment on behavioural effects of different disposal pricing regimes. Shows limited effects of any one waste generation, but effects on disposal options.

## Market incentives to encourage recycling - [73]

Waste disposal is typically funded by lump sum taxes or flat payments. This type of funding provides no incentive to produce less waste because the marginal cost of waste disposal is zero. Households will typically choose the method of lowest cost (including the opportunity costs of their time and effort). The cost structure of waste disposal can be changed in a number of ways. Drop-off sites and curbside recycling decrease the cost of recycling for households, whereas mandatory recycling and quantity based pricing increase the cost of disposal. Compliance of mandatory recycling depends on making recycling easy for households. When the cost structure of recycling is changed to increase the cost of disposal and decrease the cost of recycling, the probability of recycling is greater.

Quantity based pricing programs increase the marginal cost of disposal thus creating economic incentives to recycle. However, some potential problems with quantity based pricing do exist. It is anticipated that illegal forms of waste disposal, such as dumping and burning, would occur with a greater regularity. What price to charge per container of waste must also be determined. If the price is too high, a greater likelihood of burning or dumping would result. Another potential problem is that the revenue is hard to predict. Predicting the revenue is necessary when it is earmarked for funding of the solid waste or recycling programs.

Quantity based pricing is not feasible when there are common receptacles. The use of common receptacles such as a dumpster at an apartment or office building is a problem for two reasons. First, it would be hard to determine which trash belongs to which person who lives in an apartment and has a common receptacle. Second, individuals that do not live where there is a common receptacle, may chose to place their trash in the dumpsters at apartment or office buildings. This issue is different

from pure dumping of trash because the waste is being collected properly, but the individuals are not paying for the collection.

From a study reported in this article, the results are as follows: The most effective policy combination included both mandatory recycling and curbside pickup. Use of this combination increased the probability of recycling newspaper and glass by 22-37% relative to drop-off centres alone. Communities which had a combination of curbside recycling and quantity based pricing displayed an increase in recycling of glass (27%), plastic (35%), and cardboard (58%). Areas with mandatory recycling, curbside collection and trash tags found an increase in recycling of newspaper (23%) and glass (37%). The issue of burning and dumping is considered to be a problem primarily at the beginning of a quantity based pricing system. These various programs in which the cost structure of waste disposal is changed have proven to provide incentives in order to increase recycling.

In conclusion, these programs do increase the likelihood of recycling by changing the costs of both recycling and waste disposal. Quantity based pricing causes individuals to experience the marginal costs of trash disposal. marginal cost pricing is much more effective than flat fee pricing because it creates incentives for individuals to recycle. However individuals are also more likely to recycle when the costs of recycling are reduced by providing curbside recycling. The combination of such programs has the greatest probability of decreasing the quantity of solid waste.

## Waste paper – recycle or energy production [74]

The US pulp and paper industry has undergone significant changes in material and energy use efficiencies over the last 2 decades. One of the drivers of this change is the increased use of wastepaper as a source of fiber for the production process. Increased use of wastepaper, however, means use of technologies that do not generate significant amounts of biomass for energy recovery, and thus requires that more energy is purchased by industry. If wastepaper is incinerated instead of repulped, energy purchases can be reduced, but the fiber is lost as a material input and CO<sub>2</sub> emissions per ton of product increase.

This paper addresses the trade-off between wastepaper repulping and incineration and present likely future material, energy and CO<sub>2</sub> emissions profiles of the industry under a range of scenarios regarding production growth and technological change. The results are derived from a dynamic computer model that captures feedback processes among various production stages and analyzes the implications of these feedbacks for the industry aggregate for the years 1988-2020.

Conclusions: 1 industry aggregate energy use, CO<sub>2</sub> emissions and consumption of pulpwood are not likely to decline if the future is characterized by moderate growth in aggregate production and current rates of technological change. 2. Redirecting some recovered wastepaper from pulping to burning for energy does not change this overall result. 3. The rate of energy-saving technological change and production growth are critical factors affecting industrial material and energy conservation. 4. The impacts of alternative wastepaper utilization strategies are context specific and cannot be isolated from the dynamics of technology change and production growth.

A combined wastepaper recycling and rapid technological change strategy outperforms the WTE scenario in terms of purchased energy, CO<sub>2</sub> emissions and pulpwood conservation

## Determinants of Recycling Behavior: A Synthesis of Research Results [75]

This article classifies variables affecting consumer recycling behavior into four theoretical groups: intrinsic incentives, extrinsic incentives, internal facilitators, and external facilitators. These clusters of variables, taken from 67 empirical studies culled from published and unpublished research, were meta-analyzed. Of these sets of variables, the strongest predictors of recycling are internal facilitators: specifically, consumer knowledge and commitment to recycling best predicts propensity to recycle. External incentives – in particular, monetary rewards and social influence – are the next best predictors. One external facilitator that significantly relates to recycling is frequency of collection. Finally, these relationships are further examined to isolate the impact of moderator variables. Three variables are shown to have some moderating effects: sample size, when the study was done, and mode of data collection. Based on the results, the authors propose a model and provide practical implications for motivating consumer participation in waste separation programs.

## Garbage – variable rates [76]

Variable rate programs in the United States have successfully reduced the amount of domestic refuse destined for landfill. This paper examines the various programs being used in the United States and assesses the feasibility of these programs working in Victoria, Australia.