Good Recycling, Bad Recycling and how to tell the difference

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Scope of this paper

- Sustainability defined
- Environmental Myths
- Factors affecting recycling sustainability
- E-waste examples
- Cost – benefit analysis
- The kerbside study
- Other views
- Consequences
  - Materials in kerbside programs
  - Targets
- Conclusions

Sustainability defined

- “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (World Commission on Environment and Development, 1987)
- Environmental, economic and social outcomes optimised – total benefit optimised
- Positive environmental outcomes at optimal community cost (financial, resources, social)

Intergenerational Equity

- Physical / Environmental Resources not squandered – (if resources are scarce or likely to become scarce and cannot be substituted)
- Economic resources used wisely - (spending on achievement of environmental objectives not out of proportion with spending on society's other needs – e.g. education, health, infrastructure – or with the benefits achieved)
- Social resources (e.g. voluntary effort) not squandered at expense of achievement of other worthwhile objectives

Environmental Myths

- We are not running out of landfill space
  - Quarrying for gravel, clay, sand etc in and around cities generates holes at a rate 10 times faster than they can be filled. There IS a shortage of long term planning
- Reduce, Reuse, Recycle – not a rigid rule
  - RRR often misapplied in waste policy – ‘Reduce’ given as the reason for reducing packaging even though the use of packaging yields environmental benefits
- The ‘waste hierarchy’ lacks a scientific basis
  - There are many cases when ignoring the ‘hierarchy’ gives better outcomes – enforcing the hierarchy leads to higher costs or impacts – ‘Avoid’ translated into avoiding packaging

Environmental Myths

- Australians are not ‘the most wasteful people on the planet’
  - Waste data not comparable – Australians produce more garden waste because of our fondness of ¼ acre block/climate
- A ‘throw away society’ not necessarily bad
  - Single use products often have lower impact than multiple use. Newer models of durable product can have lower impact – making disposal of older models beneficial
- ‘Recyclable’ does not mean ‘low environmental impact’
  - E.g. Aluminium cans recycled 100% have a higher impact than like plastic or paper based packaging (Tellus study)

Factors affecting recycling sustainability

- Homogeneity/ complexity
- Quantity
- Proximity
- Dispersion
- Resource / material value
- Collection / reprocessing cost

- The significance of entropy
- Where do households come in?

Factors – cont.

- Factors such as homogeneity, quantity (available at each site), proximity (to reprocessors / markets) and dispersion all impact on the ease with which material can be recovered from the environment
- Collection costs and material value affect the economics of collection and recycling
- Factors are location dependent and sometimes time dependent (e.g. material markets / seasonal variation in beverage packaging)

The significance of Entropy

- Entropy is a term used in physics to measure the state of disorder. The universe is running down – like a clock – increasing its state of disorder.
- In order to reverse the process – increase the state of order – work has to be done - i.e. energy expended
- It therefore follows that the more disordered a system is – the more effort is required to induce order
- In recycling terms this means it requires a lot of work (energy, impact, expense) to collect a non-homogeneous mixture of recyclables from Australia's dispersed 8 million households – this type of recycling is less likely to be sustainable

Examples

- Examples of 'good' recycling involve the recovery of larger quantities of reasonably valuable material from fewer sites closer to reprocessors / markets
- Examples include:
  - The use of regrind in plastic moulding operations
  - In-house use of glass cullet in glass manufacture
  - In-house use of reject / off-cut steel in steel mills
  - Reprocessing of roll ends, off-cuts in paper mills
- Other examples include:
  - The recovery of paper from printers
  - The recovery of scrap from metal processors / can makers
  - The recovery of reject glass (and other materials) from customers

Examples cont.

- Closer to home:
  – Clothing through charity bins
  – Cascading of appliances – and final recovery of steel
  – Newsprint / mixed paper from households??
  – Aluminium cans??

Examples

- Australia's steel industry recycles over 3 million tonnes of steel of which a little over 1% (40,000 tonnes) comes from households
- More cardboard comes from shops and supermarkets than from households
- Perhaps the only material that is more prevalent in households than in industry is newsprint

'Bad' Recycling

- The non-homogeneity and dispersion of materials in household waste could result in 'bad' recycling – i.e. recycling that does not give the community or the environment good, or optimum, value for money and effort
- Whether this is the case can be determined by cost-benefit analysis
- The following E-waste examples show what happens when recycling policy is adopted without cost-benefit analysis
- In the case of the EU these policies were adopted under EPR rules – as government did not have to pay there was no incentive to determine costs and benefits

E-Waste Examples

- There can be too much recycling as well as too little
- Sometimes recycling yields little or no environmental or community benefit or is actually detrimental to the environment
- E.g. review of the 10 year old EU battery recycling directive found that NiCd batteries contribute less than 1% of the cadmium risk – most cadmium came from fertiliser applied directly to food crops – so why recycle batteries?

E-Waste Examples

- A review of e-waste recycling conducted for AIIA by Planet Ark Consulting questions the benefit of recycling CRT screens
- Leachate test misapplied/not suited to CRTs
- A cost benefit analysis of landfilling CRT monitors compared with a number of recycling related policy options is explored in a recent paper in the *Journal of Environmental Management* (MacCauley et al, 2002).
- The conclusion of that study is significant:

E-Waste Conclusion

"We find that the benefits of avoiding the health effects associated with CRT disposal appear far outweighed by the costs for a wide range of policy options.

For the stock of monitors disposed of in the United States in 1998, we find that policies restricting or banning some disposal options would increase disposal costs from about $1 per monitor to between $3 and $20 per monitor.

Policies to promote a modest amount of recycling of monitor parts can be less expensive. In all cases, however, the costs of the policies exceed the value of the avoided health effects of CRT disposal".

An Australian Example of 'Bad' Recycling

- SA's Container Deposit Legislation
  - Recovery costs range from 5c to 10c per container
  - SA consumers pay for two recycling systems – both are less cost-effective
  - Deposit redemption involves extra transport impacts as consumers need to travel to a redemption centre
  - Recovery costs are as high as $30,000 per tonne for the smallest containers

Cost-benefit analysis

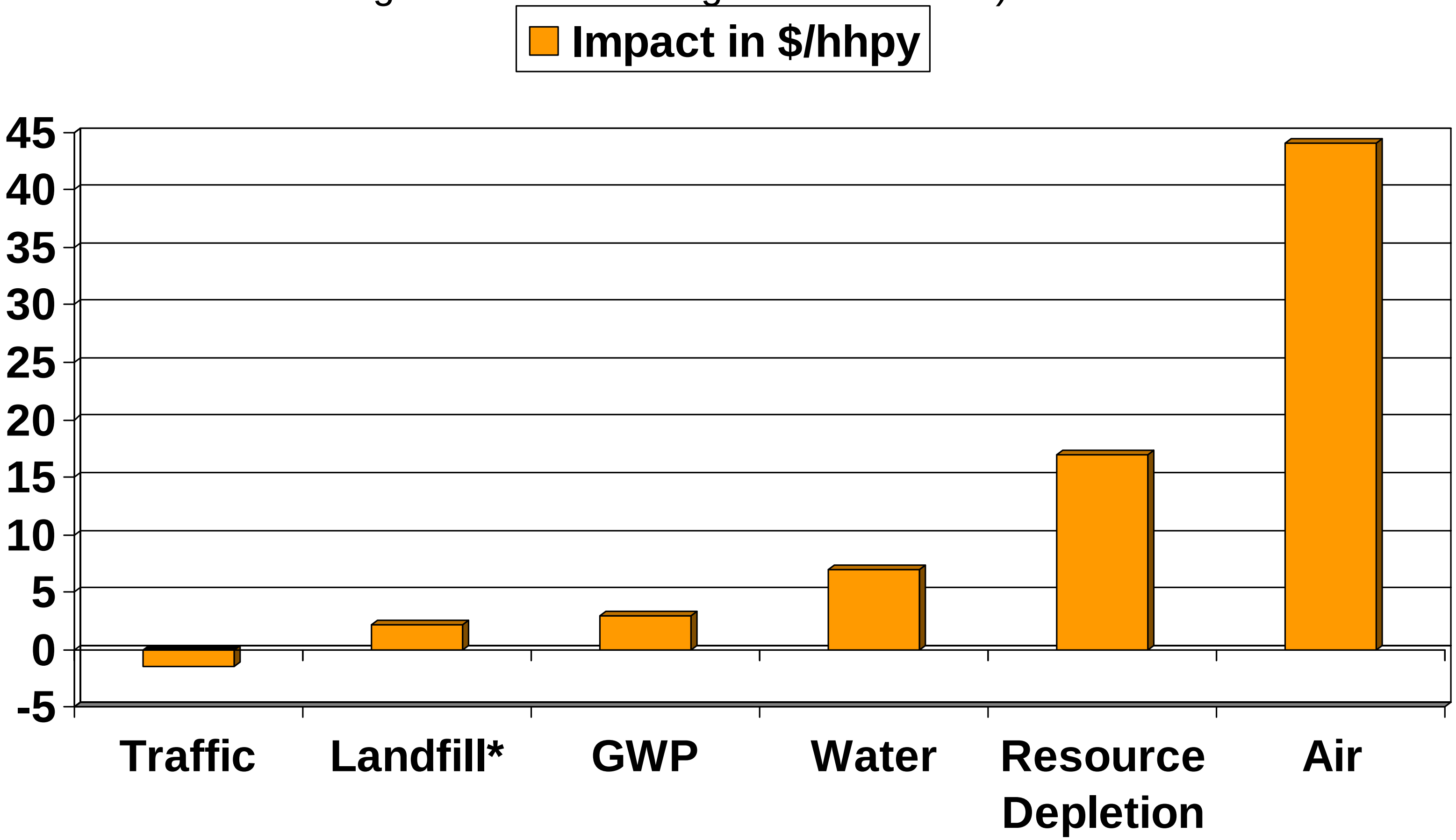
- Life cycle assessment – addresses the question of impacts at each stage
- Costs – Environmental, economic, social
- Benefits – Environmental, economic, social
- The objective is to ensure that any proposed policy will yield a net community benefit commensurate with the overall cost to the community

The NPC Kerbside study

- A groundbreaking study which attempted to assess the value of household recycling
- Intended to show which materials / locations were suited to recycling
- The idea was to reduce cost to councils / community by limiting recycling to materials / locations where recycling was most viable
- Result: Cost of $26 pa and environmental benefit of $68 pa – net benefit of $42 pa per household
- Non-viable for regional areas if distance to market exceeds 1300km (on average) or if less than 400 – 500 houses serviced per day

Summary

(Independent Assessment of Kerbside Recycling in Australia, Nolan-ITU et al, Jan 2001 –
* Regional and Metro figures combined)



Observations

- Cost of Environmental Impact is dominated by estimated air pollution
- This suggests that major benefit of recycling is a reduction in air pollution (mostly at the point of production of packaging raw material)
- The question then arises – Can air pollution be reduced more directly at lower cost to the community?
- Economic theory suggests a direct approach is more efficient – i.e. recycling is not the objective – reduction in pollution is

Observations – cont.

- Resource depletion cost should be zero as there are no materials used in packaging which are genuinely scarce or not substitutable
- Impact saving due to reduced landfill is very low

Other views

- Peer Review (P&G UK)
  - Study lacks transparency
  - Problem with aggregating dollar value of impacts into a single figure
  - Impacts due to collection and sorting unusually low
  - No distinction between local and global impacts
  - Impact of collection transport may be underestimated
  - Results are not material specific – i.e. do not show which materials are less viable

Other views – cont.

- Five cents of benefit for each dollar of expenditure (Fashions in the Treatment of Packaging Waste: an Economic Analysis of the Swedish Producer Responsibility Legislation, Marian Radetzki, Multi Science Publishing Company, 2000)
- Markets are not wrong – (Why do we Recycle?. Markets, Values and Public Policy, Frank Ackerman, Island Press, 1997)
- The break-even distance for glass recycling from an energy perspective is 100 miles (160km) (Argonne Energy Laboratories-USA)

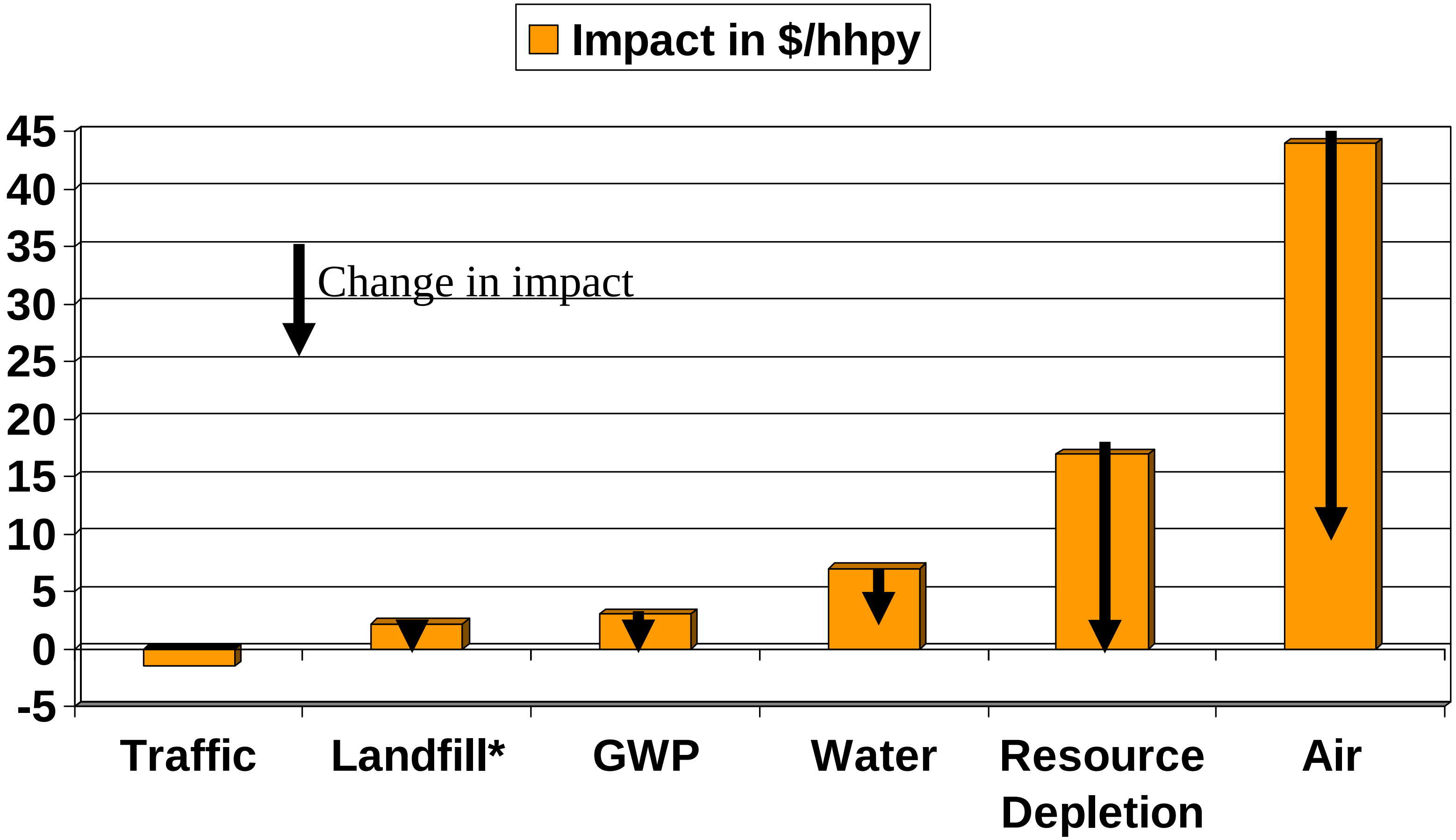
Problems with the study

- Overestimation of yield
  - 70-80% of glass collected in Sydney and Brisbane is crushed during collection and can't be sorted for recycling
- Overestimation of pollution impact/cost
  - Inclusion of upstream impacts
  - Pollution damage estimates overestimated - not adjusted for level of exposure / area
- Underestimation of collection impact/double counting of production impact
  - Collection truck impact modelled using trip time rather than stop-start model
  - Health impact of diesel particulates needs to be reviewed
  - Pollution licences internalise costs – this was not considered
- Study boundaries exclude related costs
  - Study ignores environmental impact of cleaning/preparation in the home and value of householder time taken to sort and store
  - Cost to companies – e.g. choice of recyclable materials for packaging, labelling etc.

Problems with the study (cont.)

  - Cost of space for expanded waste / recycling facilities in apartments
  - Inhibition of innovation – laminates, smart packaging, active packaging
- Worker health issues not costed
  - Study uses workers compensation premium as indicative of health costs – sickness and injury not covered by insurance not costed
- Public Health impacts not costed
  - Storage of contaminated material at home
  - Transfer of contaminants through use of recycled materials
- Lack of coincidence between expenditure and benefit
  - People who pay for recycling do not attract the benefit of reduced pollution if they do not live near the manufacturing facility for the packaging raw materials – this suggests that, even if there is an overall benefit to the recycling of some materials, most of those who pay for recycling miss out on that benefit – i.e. underlying distribution of costs and benefits are ignored.

Corrections to data?



Cost-benefit issues that need to be addressed

- Benefits need to be adjusted for actual yield – particularly in the case of glass
- Pollution impacts need to be weighted for true impact on population
- The full impact of collection activity – including new data on the health impacts of diesel particulates and new models for stop-start transport – needs to be assessed
- Costs associated with in-home material preparation and time taken need to be included
- Packaging / marketing company costs associated with choice of materials and labelling expenses need to be considered – as should the restriction on innovation imposed by the push to make all packaging recyclable
- A better estimate of worker health costs is needed
- The lack of coincidence between cost and benefit needs to be explained – It is clear that regional centres that do not host manufacturing facilities get little or no benefit for their efforts and expenditure

Consequences of deficiencies

- Costs not fully accounted for
  - The study underestimated costs and impacts associated with recycling and therefore could not achieve the main objective – determination of what was worth recycling from where
- Materials in the kerbside program
  - The study did not differentiate enough between those materials ‘worth’ recycling and those less so – because it concluded that the total activity was worthwhile
  - The study failed to conclude that – at least for some if not all materials – there should be no recycling outside major centres – and that some materials are not worth recycling at all
- Targets
  - The study suggests recycling is good and more recycling is better – this contradicts other studies and economic theory which suggests an optimum level should exist for each material – this level may well be zero for some materials – This means that any targets set need to be carefully considered

Final points:

- The best form of recycling involves the recovery of larger quantities of homogeneous, higher value material from fewer locations closer to the reprocessing facilities / markets – 'Good recycling'
- A worse form of recycling involves the recovery of highly mixed and dispersed material such as that collected from Australia's 8 million households.
- This means kerbside recycling may have little or no net benefit – depending on the circumstances – in many cases it is 'Bad Recycling'
- It is highly doubtful that a simple objective to reduce waste going to landfill is sustainable or that 'zero waste to landfill' targets, such as set in some jurisdictions, are sustainable
- The cost-benefit study conducted in support of kerbside recycling in 2001 needs to be repeated to include new knowledge and address identified deficiencies

Final Points – cont.

- We may well find that there are only a few materials worth collecting at kerbside – e.g. maybe newsprint / mixed paper
- A revised study could also confirm that regional recycling has little value – such a conclusion would have significant implications for local councils who now carry the costs of implementing state government recycling policies
- Such a study should also review the viability of the materials proposed to be added to recycling systems – as proposed in the new National Packaging Covenant as well as the benefits and cost of the proposed push for 'away from home' recycling
- The new study could also address the question of material targets and overall recycling targets and their validity

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