

CAN WE FIX IT? LETS HOPE SO! TURNING THE WASTE MANAGEMENT HIERARCHY THE RIGHT WAY UP

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Introduction

2005 saw the release of the Millennium Assessment, an examination of the earth's ecosystems. It concluded that human changes to ecosystems in the past 50 years had caused largely irreversible losses in diversity of life, substantially reducing benefits that future generations could gain from ecosystems (Millennium Assessment, 2005).

Our use of resources is therefore unsustainable; business leaders respond by claiming technology will save us (Hamilton, 2003). It is of course true that technological advances have reduced use of resources, but relying on this takes "a risk on behalf of future generations" and although "there may be no limits to technological innovation ... of this we can't be sure" (Hunt, 1986 p.69). The solution is to use resources sustainably so future generations ability to use the resource is not limited.

The waste management hierarchy promotes sustainable use of resources, waste is not a homogenous mass, but separate items (Gertsakis & Lewis, 2003). Bob the Builder is a great advocate of the hierarchy and starts each day not only shouting "Can we fix it? yes we can", but has now added "reduce, reuse, recycle". His latest building project in Sun Flower Valley is a bastion of sustainability and Bob works hard to follow the intent of the hierarchy. Only if he can't use material in any other way, will he take it to the recycling centre.

The rest of society virtuously bypasses reduce and reuse as they head to the recycling centre! While their efforts are important and recycling has had an impact in reducing the use of virgin materials, such as in the paper industry (Hamilton, 2003), it seems the hierarchy has been tuned upside down, and we are encouraged to recycle, not reduce or reuse.

The result in Kaikoura, is that while rates of recycling have increased, the rate of waste disposal has not decreased (Innovative Waste Kaikoura, n.d.) suggesting we are no further ahead than when the hierarchy was developed in the 1970's.

This paper will visit the mountains of Austria, the whales of Kaikoura and the carpets of the Interface factory to consider if the waste management hierarchy has been turned upside down and we remain as unsustainable as ever, or if there's a light at the end of the tunnel.

a) The Waste Management Hierarchy – the theory

Waste is fundamentally a human invention, a by product of economic growth with a strong correlation between increases in gross domestic product and waste. It is defined as any material that is unwanted and/or unvalued and discarded or discharged by its owner (Ministry for the Environment, 2002).

Humans are a resourceful race, always aiming to increase the quality of life. Entire production processes are dedicated to producing the goods, which seems quite acceptable as life is meant to be fun! The problem is the proportion of natural capital being wasted at each stage of the products “life”, which is putting the future of the planet at risk.

Resources are extracted, waste is generated; product is manufactured, waste is generated; product is sold, serves its useful purpose or is broken and becomes waste dumped in a landfill – a linear trip from resource extraction through the factory to the landfill.

Nature meanwhile approaches things cyclically; it assimilates everything, other organisms finding a value in nature’s “waste” somewhere. Nature has much to teach us regarding sustainability and the treatment of waste, “the environment can absorb waste, redistributing and transforming it into harmless forms” (Hawken, 1994, p.37) used by others.

It is only through mankind’s interference that we face a climate crisis and are knee deep in waste. The problem is that “just as the earth has a limited capacity to produce renewable resources, its capacity to receive waste is similarly constrained” (Hawken, 1994, p.37).

The other issue is that humans have become very adept at producing synthetic products; things created by man and not known at all in nature. For example the organochlorine family, created when chlorine meet hydrocarbon. This delightful family is toxic to all living organisms, and some of the family (uncles DDT and Chlordane) have been banned. Further, like a bad house guest, they are not easily persuaded to leave, some studies showing they can last in the environment for decades (Hawken, 1994).

Such products cannot be incorporated into the life cycle of any organism on earth, instead building up in the environment and accumulating in waterways, food and the fatty tissues of humans (Hawken, 1994). Millions of kilograms of organochlorine is released into the environment annually, potentially existing for thousands of years, nobody is really sure.

By introducing “synthetic toxins into the biological process, regardless of the intent or original application, we are changing a cyclical process to a linear one” (Hawken, 1994, p.53). Nature has its fair share of toxins, and some are carcinogenic, but as they are natural they are part of the cyclical system, meaning nature has developed ways to deal with these toxins.

Manmade toxins however have not existed long enough to have such history, and cannot be incorporated by the normal metabolic processes of cellular life (Hawken, 1994). What is needed is to change the process of managing waste from linear (find a hole and bury it) to cyclical (waste able to be used by other living things).

A concept that promotes a cyclical approach to waste management is the waste management hierarchy.

Developed in the 1970's the hierarchy regards waste as separate items not a homogenous mass to be buried. Instead each item is separated and treated differently, some should not be produced, some reused, some recycled and some burnt or buried (Gertsakis and Lewis, 2003). The principle of the hierarchy is that prevention is better than cure, an approach adopted in the health industry. Prevention of waste is encouraged to avoid the problem in the first place, rather than a reactive approach, dealing with the waste once it arrives at the site.

This is an idea in line with principles of cleaner production (Gertsakis and Lewis, 2003), a concept that attempts to avoid, eliminate, prevent or reduce the causes of the problem, not manage its impacts. Although the phraseology alters, the waste management hierarchy generally follows the pattern outlined below;

Goal	Attribute	Outcomes
Reduce	Preventative	
Reuse	Predominantly ameliorative part preventative	
Recycle	Predominantly ameliorative, part preventative	
Treatment	Predominantly assimilative, partially ameliorative	
Disposal	Assimilative	

Table 1; Waste Management Hierarchy (Gertsakis and Lewis, 2003)

At the top of the hierarchy the aim is prevention, designing waste out of the process. If this fails then an ameliorative approach is taken to try and minimise the waste problem including reuse and recycling measures, with less emphasis on prevention. If all else fails then waste is assimilated, but this needs the wider ecosystem to be able to absorb and integrate the material.

The hierarchy has been widely supported by environmentalists, industry groups and elected officials since its inception, (Schall, cited in Gertsakis & Lewis, 2003), the shortened version (reduce, reuse, recycle) popular with educators and Bob the builder! The hierarchy has also become embedded in legislation, national waste strategies, policies and programmes (Gertsakis and Lewis, 2003). In New Zealand, the Local Government Act 2002 requires that in the preparation of a waste management plan the waste management hierarchy must be considered by local authorities.

b) The Waste Management Hierarchy – the reality

With this apparent popularity one would assume there is a significant amount of waste prevention occurring. The reality however is somewhat different and two schools of thought have developed on how the hierarchy should be interpreted and implemented:

- The hierarchy is a ‘menu of options’ to select from depending on the situation, there is no good or bad option, each is valid and adopted according to the prevailing situation.

- The hierarchy needs to be strictly followed, prevent first, then maximise recycling and only bury or burn what can't be avoided (Schall, cited in Gertsakis and Lewis, 2003).

While local authorities and communities have tended to adopt the latter, industry has taken the former, meaning the emphasis is placed on recycling not reducing. Some companies however have looked at their systems and attempted to design waste out of the process.

3M for example is well known for its Pollution Prevention Pays programme, started in 1975 with some success and the New Zealand Business Council for Sustainable Development lists a number of companies making an effort to reduce their impact. Studies in Australia have similarly shown patchy implementation of the hierarchy, with only a limited number of producers engaged in prevention of waste (Gertsakis and Lewis, 2003).

There is little evidence of widespread reuse, refurbishment or remanufacturing activity that can be classed as anything other than cottage-based or boutique in its orientation (Gertsakis and Lewis, 2003, p.8)

There are of course example of businesses innovating to prevent or remanufacture products, such as Fuji Xerox who is considered a world class remanufacturer. But as in New Zealand these examples are “insufficient to demonstrate the success of public policies directed at achieving higher levels of waste avoidance and reduction” (Gertsakis and Lewis, 2003, p.8).

One problem preventing implementation of the hierarchy may be that waste managers have little control over the generation of waste. The Local Government Act 1974 requires territorial local authorities to “promote effective and efficient waste management within its district” (Local Government Act 1974).

In other words local authorities have to manage the aftermath, once products have been finished with. This gives little opportunity to undertake anything but education, recycling, composting and residual waste management and while waste management plans are required to follow the hierarchy, they can do little to encourage industry to reduce and reuse.

In his essay “The Death of Recycling” (2007), Palmer argues the recycling industry has become lazy, relying on old methods and is bereft of new ideas to inspire the public and industry to eliminate waste. He states that while recyclers promote themselves as opposed to waste, their income is from the waste stream, “recapturing small amounts of smashed up low grade materials” (Palmer, 2005, p.1).

Recyclers he claims accept waste as inevitable, trying to find new ways to reuse as much as possible. It is an end of the pipe solution that, while contributing, will not resolve the more fundamental problem that waste needs to be designed out of the system. Even when successful, Palmers contends that recycling only delays burial, for example if 50% of a material is recycled, then 50% is still dumped. So recycling has reduced use of virgin materials, but 50% is still dumped so the torrent of waste continues, but at a slower rate.

Kaikoura is an example of this reality, it is a town known for whales, growth in tourism and desire to become sustainable. Its zero waste aspirations are well documented, the community increasing diversion by 56% in 11 years and in 2004 it became the first community in New Zealand to achieve Green Globe 21 community status.

The economic restructuring of the 1980's had a significant impact on Kaikoura and led to the towns development as a tourism destination. By 1998 Kaikoura was firmly on the tourist map and Lincoln University research into tourism in Kaikoura found that 873,000 tourists visited Kaikoura that year and this was increasing by 14% annually (Simmons & Fairweather, 1998).

Though tourism does mean good economic returns with 30% employment in tourism (Butcher, Fairweather & Simmons, 1998), it also puts pressure on Kaikoura's environment. Tourists visit because of the environment and a negative impact could mean a decline in tourists and a return to economic problems of the past, which the community wishes to avoid.

The community's vision is a future with sustainable growth providing employment, social amenities and consumer choice but not at the expense of the environment (Kaikoura District Council 1995).

As a result of increased tourism Kaikoura's waste was growing at 10% per annum in 1998 and Wastebusters Trust Kaikoura estimated in 1999 the landfill would be full within 4 years. For the community to avoid the costs of developing a new landfill, radical action was needed.

So in 1998 Kaikoura adopted a policy of zero waste to landfill and stopped kerbside collection of rubbish. Since that time diversion from landfill has increased steadily, however waste disposal has also increased as shown in the following graph.

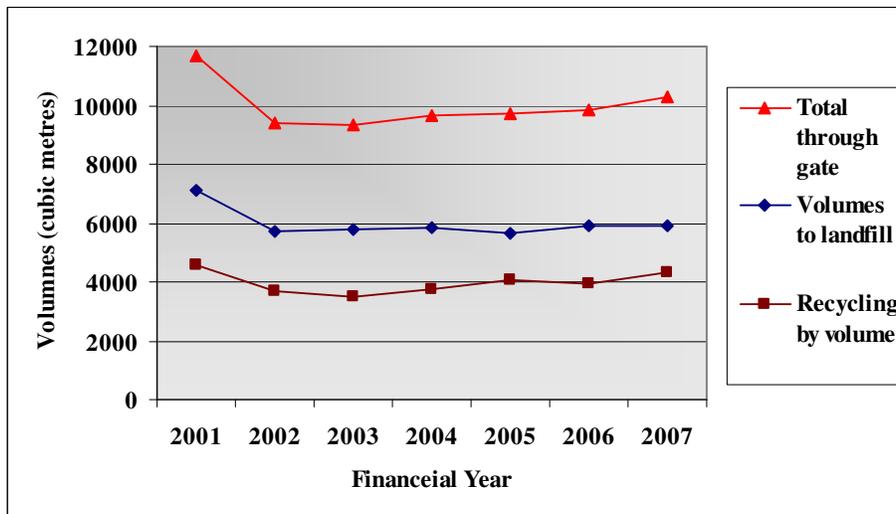


Figure 1; Change in volumes to landfill and recycling at Kaikoura, July 2000 – June 2007

Between 2001 and 2007 there was an increase in recycling of 17%, however in the same period waste also increased by 4%. So instead of Kaikoura's community reducing its waste by 17% it continued to consume, generating roughly the same quantity of waste annually. The drop in volumes to landfill between 2001 and 2002 was due to a refuse press being installed, saving considerable airspace, it is not clear why recycling also dropped that year.

In July 2004 dump fees increased, which it is thought resulted in the drop in waste to landfill, this waste "coming back" the following year as residents got used to the charges. An export bailer and weigh bridge were introduced the same year enabling more efficient processing of recycling and accurate recording of waste to landfill.

This indicates two things; despite the council's efforts, the recycling component of the waste management hierarchy has dominated rather than reduced, suggesting the hierarchy has been turned upside down. It also suggests that Palmers assertions are correct and recycling is just delaying the day when Kaikoura must start sending its waste to an alternative landfill.

Clearly this is not to imply that recycling in Kaikoura is not valuable, as it has extended the life of the landfill by 6 years and created employment for 12 people. However, if Kaikoura is to achieve its zero waste aim then it must turn the hierarchy up the other way and find ways to reduce and reuse before businesses and residents rush to the town's resource recovery centre.

c) Turning the pyramid the right way up

A concept that will turn the hierarchy the right way up is zero waste, which has been adopted as a policy by local authorities throughout New Zealand; Kaikoura being the second in New Zealand to do so.

Unfortunately the high adoption by local authorities disguises the fact that some appear to have adopted it as a target not a philosophical approach to eliminating waste. However its adoption is still useful in so much as it provides the vision to motivate communities that Palmer (1995) argues is needed.

Far from being a simplistic target or a variant of recycling (more composting and can and paper collection (Lukhani, 2005)), zero waste is in fact a redesign theory that starts at the top of the waste management hierarchy to eliminate waste. It is really a way of thinking of approaching a production process from a perspective that removes waste from the process, and if this aspect can be grasped then zero waste will cease to be a target.

There is a world of difference between zero waste and recycling, Palmer (2005) asserting that while recycling accepts the existence of rubbish without question, zero waste rejects waste as a failure in the design of the product.

In the theory of zero waste, once all waste is eliminated, there will be no garbage, no need for any garbage collection, no garbage industry and no dumps. All that superstructure of garbage management will fade away (Palmer, 1995, p.2)

But is it feasible for a local authority to achieve zero waste? As previously stated the Local Authority Act makes it difficult for local authorities to do more than educate and provide recycling facilities, which plays a significant role; but it is difficult to see zero waste being achieved unless industry is heavily committed and involved.

Some businesses have adopted the principles of zero waste, quite successfully in some cases. Interface Inc for example, an American company designing, producing and selling carpets and fabrics, adopted cleaner production policies in the late 1990s after founder Ray Anderson read extensively about the environmental damage done by businesses.

I am a plunderer of the earth and a thief. I am part of the endemic process that is going on at a frightening, accelerating rate worldwide to rob our children and their children, and theirs, and theirs, of their futures (Anderson, 1998, p.7)

This revelation was “like a spear in my chest” (Anderson, 2000, p40) and led to Interface adopting the mission to “eliminate any negative impact our company may have on the environment by the year 2020” (Interface Inc, 2007). To achieve this, the company designed a path on the seven fronts; eliminating waste, benign emissions, renewable energy, closing the loop, resource-efficient transportation, sensitising stakeholders and redesign commerce.

In terms of eliminating waste, Interface states in its sustainability report that “our goal is to eliminate waste. To accomplish this, we are reexamining our current sources of waste and creating programs to first reduce and then to eliminate them” (Interface Inc, 2007). They define waste as any cost that does not produce value to its customers, including processes and what they don’t do right the first time.

A team called QUEST (quality utilising employee suggestions and teamwork) was established to identify measure and then eliminate waste streams. QUEST’s efforts reduced Interface’s waste from 9 million kgs in 1996 to 3.6 million kgs in 2006 and avoided costs of over \$300 million in 2005, proving that a company can do well by doing good (Interface, 2007).

Using the concept of “picking the low hanging fruit” (tackling those areas easily achievable) Interface also found that waste prevention can also be inexpensive, e.g. one of its plants saved 7.5 million litres of water a year after they installed an \$8.50 (USD) brass nozzle (Interface Inc, 2007).

By adopting the waste management hierarchy, Interface eliminated millions of tons of waste and made considerable savings, \$113 million USD saved in the first 4 years of QUEST alone.

Redesign is key to Interface’s strategy and it has developed a number of new products in recent years that will reduce resources used in production. It adopted a “less is more” design strategy, with its carpets made with as much as half a kilogram less material per square metre, making considerable savings in embodied energy and use of virgin materials.

Where Interface can't redesign or reduce however, it will recycle, but it recognises that this is not a long term strategy; "recycling is an important step in the quest for sustainability; it is a wonderful start, but not a solution" (Interface, 2007). It is therefore a temporary measure that will allow time to develop a longer term solution.

Interface is making a bold effort to reduce its impacts, but would be the first to admit that although they began their journey in 1998, they are still some way from being considered sustainable. In the meantime they will keep looking for ways to reduce, reuse and recycle because if they and other industrial companies don't, then our use of resources will continue to be as unsustainable as ever.

Can a similar result be gained at a national level? Evidence from Austria would suggest that with guidance from central government a strategy of reduce, reuse and recycle can make headway nationally.

Austria is a landlocked country in central Europe with an area of 83,000 sq km and a population of 8 million. Known for its dramatic scenery Austria is not dissimilar from New Zealand in terms of the tourists it attracts annually to visit its environment. But there the similarities end, as the Austrian government has implemented a legislative programme that requires sustainable waste management.

In 2002 a new Waste Management Act was passed into law in Austria, placing new responsibilities onto state, business and individuals "to protect man and the environment while at the same time minimising emissions and optimising the use of resources" (Federal Ministry of Agriculture, Forestry, Environment and Water Management, 2006).

Central to the Waste Management Act is the precautionary principle, if there is a possibility that an activity will cause harm then it should not occur. For waste management therefore, material efficiency needs to increase and both waste prevention and recovery receive considerable attention in the Austrian Waste Management Plan which the act requires is rewritten every 5 years.

Waste prevention is particularly well suited to tackling the issue at source and the Austrians have included producer responsibility as a key strategy, a number of Austrian firms having their own recycling facility as part of their operations. If prevention is not possible then products are to be manufactured so that recovery and recycling is feasible. "However in no case may recycling activities lead to the dispersion of pollutants in the environment" (Ministry of Agriculture, Forestry, Environment and Water Management, 2006).

Recovery also includes the use of waste in incinerators generating heat and electricity, which has become increasingly popular in Austria and if the correct scrubbers are installed in the chimneys then emissions are eliminated. Waste that cannot be avoided or recovered must be disposed of in an environmentally sound manner, as any waste disposed of to landfill must not cause risk to subsequent generations.

Two basic objectives of the act are the separation of waste generation from economic growth, traditionally linked, and the reduction of material to landfill. In a country with limited land area, using it for an unproductive purpose such as a landfill does not make sense, also stopping the use of landfills prevents risk and cost to future generations.

Such strategies also appear to be working with a total of 1.6 million tonnes of waste collected from households in 2004 and 1.8 million tonnes of recycling and biogenic waste collected from households. This 3.4 million tonnes is sorted, recycled, composted and treated in plants designed to generate electricity and at the end of this process only 814,000 tonnes is landfilled, a diversion rate of 75%.

In 1989 waste destined direct for the landfill from households was 63.1% of total waste collected, in 2004 this had decreased to 7.7% of the total. A significant success for anybody and one that was achieved through a combination of public commitment but perhaps more importantly because central government took responsibility for the problems of the present generations and did not pass it on to future generations to bear the cost.

Conclusion

This paper has taken us on journey from the deep sea trench of Kaikoura to the mountain tops of Austria via the Interface factory in Atlanta, USA. The journey started by asking if the waste management hierarchy has been turned upside down and if we remain as unsustainable as ever, or is that a light at the end of the tunnel?

It is felt that the answer to these questions is a resounding yes; despite the hierarchy's integration into waste management, the emphasis has generally been on recycling not reducing. Most often the situation is like that in Kaikoura, a community and council working hard to recycle and achieving great results, but only delaying the day the landfill will be full.

There are two lights at the end of the tunnel however, the first is Interface Inc who prove it is possible to progress towards zero waste and remain profitable. It is believed that progress is only possible if more businesses adopt the same principles as Interface, because as much as a local authority may wish for their community to be zero waste the current political situation prevents them from doing little more than encouragement.

The second light is the situation in Austria, which demonstrates that with strong political direction it is possible to turn the hierarchy up the right way and work together towards a future with zero waste. Let's hope we can achieve this because if we don't the words of Ray Anderson may very well prove to be prophetic:

If the limits on nature's ability to supply humankind's demands for eco-services: air, water, energy, materials, food, and waste processing are not respected, we will kill ourselves. We cannot live without those services. Earth is *finite* in its ability to supply them. Present ways just cannot go on and on and on without dire consequences (Interface, 2007)

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