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# Sustainability and Really Cool Technologies (Energy, Water, Waste)

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**‘Learning-by-Notes’ Package for  
Year 10 Students**

## **Lesson 4: Waste**

*Smart Solutions towards No-Waste Lifestyles*

## **Teaching Sustainability in High Schools: Subject Supplement**

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Project Leader: Mr Karlson 'Charlie' Hargroves, TNEP Director  
Principle Researcher: Ms Cheryl Desha, TNEP Education Director  
TNEP Researchers: Mr Michael Smith, Mr Peter Stasinopoulos  
Copy-Editor: Mrs Stacey Hargroves, TNEP Copy Editor

This document is available electronically, and is supported by a teacher supplement. Enquires should be directed to: Mr Karlson 'Charlie' Hargroves, Co-Founder and Director, The Natural Edge Project

<http://www.naturaledgeproject.net/Contact.aspx>.

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### **The Sustainable Living Challenge ([www.sustainableliving.com.au](http://www.sustainableliving.com.au))**

The Sustainable Living Challenge is a leading Australian secondary schools program that encourages students and their teachers to explore sustainability issues as a part of the school experience. It aims to encourage young people to raise their awareness, engage their minds and develop their skills to be better able to respond to the challenge of sustainability in their future personal and professional lives. The annual program is available to all Australian schools (Grade 7 – 12) and is free to enter. The Queensland Node of the Sustainable Living Challenge is hosted by Griffith University.

### **The Port of Brisbane Corporation ([www.portbris.com.au](http://www.portbris.com.au))**

The Port of Brisbane Corporation is a Government Owned Corporation responsible for the operation and management of Australia's third busiest container port. Its vision is, '*To be Australia's leading port: here for the future*'. Sustainability for the Port of Brisbane Corporation means making economic progress, protecting the environment and being socially responsible. In response to the recent drought, and the wider global debate on climate change, the Port is committed to working with the port community to showcase the Port of Brisbane as a sustainable business precinct. Initiatives aimed at reducing the Port of Brisbane's ecological footprint include energy efficiency, a green corporate fleet and constructing green buildings.

### **The Natural Edge Project ([www.naturaledgeproject.net](http://www.naturaledgeproject.net))**

The Natural Edge Project (TNEP) is an independent non-profit Sustainability Think-Tank based in Australia, administratively hosted by Griffith University and the Australian National University. TNEP operates as a partnership for education, research and policy development on innovation for sustainable development. Driven by a team of early career Australians, the Project receives mentoring and support from a range of experts and leading organisations in Australia and internationally, through a generational exchange model. TNEP's initiatives are not-for-profit. All support and revenue raised is invested directly into existing initiatives and development of future initiatives.

## Lesson 4 - Waste:

### Smart Solutions towards No-Waste Lifestyles

*In the American economy, the material that we extract from the planet, that we mobilise for economic purposes, and process and move around and ultimately dispose of, totals about 20 times your body weight per person per day... only about one per cent of it ends up in durable goods; the system is about 99 per cent waste.*

**Hawken, P. et al, *Natural Capitalism*, 1999<sup>1</sup>**

#### Educational Aim

The aim of this lesson is to introduce the significance of waste that comes from our everyday practices, and the extent to which waste-to-landfill impacts on the health of our society and the environment. This part will introduce the benefits of reducing and eliminating waste, and highlights some examples of what companies and governments around the world are doing to achieve 'zero waste' goals.

#### Key Words for Searching Online

Reduce Re-use Recycle, E-Waste, organic waste, waste to landfill, zero waste, waste management plan, product stewardship, extended producer responsibility.

#### Learning Points

1. 95 percent of all raw materials used in production are transformed into waste products within six months of being sold.
2. Most waste results from consumer behaviour, where people deliberately purchase goods that are discarded or fall into disuse relatively soon (within 12 months) of purchase.
3. Recent research findings show a dramatic increase in electronic goods use in Australia and internationally over the last five years. However, there also seems to be a disturbing lack of re-use or recycling of these products, and in the disposal of toxic e-waste there seems to be minimal or no evaluation of social or environmental consequences.
4. The Department of Environment and Heritage estimates that, *'There are approximately 45 million major appliances... 9 million computers, 5 million printers and 2 million scanners in households and businesses across Australia of which 2.5 million are being discarded each year. Of these 2.5 million discarded units, 1.4 million are computers; of which more than half, equating to almost 20,000 tonnes, are sent to landfill.'*<sup>2</sup> In 2004, 7 million mobile phones

<sup>1</sup> Hawkin, P., Lovins, A. and Lovins, L.H. (1999) *Natural Capitalism: Creating the Next Industrial Revolution*, Earthscan, London.

<sup>2</sup> Department of Environment and Heritage (2005) *Electrical and electronic product stewardship strategy*, DEH, Australia. Available at, <http://www.deh.gov.au/settlements/waste/electricals/index.html>. Accessed 7 August 2007.

were purchased, and according to the Australian Mobile Telecommunications Association, only 1.5 million were returned for recycling.<sup>3</sup>

5. E-waste contains over 1,000 different substances, many of which are toxic, creating significant health risks and serious pollution problems associated with disposal. These toxic substances include lead, cadmium, mercury, and plastics, to name a few.
6. E-Waste and all other forms of waste (coming from both consumers and industry) pose big risks for the environment and our society now and in the future. But where there is a challenge, there is also an opportunity! Some of Australia's largest companies have been founded on developing innovative ways to re-use waste or achieve 'zero waste to landfill'. For example:
  - *Fuji/Xerox*, Australia's Eco-remanufacturing Centre, is world class, achieving several world firsts, and saving the company AU\$25 million per year. They have produced the first guaranteed recycled paper in Australia.<sup>4</sup> The paper is made up of 50 percent recycled waste from Australia's cotton industry – a feature known to significantly strengthen this paper and improve durability - and 35 percent wood pulp from sustainably managed forests.
  - Australian company *Close The Loop* is the first company in the world that has been able to completely recover all material and resource value from toner and inkjet cartridges, with zero waste to landfill. Their clients include larger international companies such as *Hewlett Packard, Canon, Epson, Brother* and *Panasonic*.<sup>5</sup>
7. In most urban societies around the world the cost of landfill (large areas of land to dump rubbish) is skyrocketing. Yet landfill fees only cover a small part of the cost. The true costs of landfill - when all burial, amenity, administration, security, replacement and on-costs are included - are in most cases at least three times the cost charged 'at the gate'.
8. The benefits to minimising waste are significant, such as:<sup>6</sup>
  - Conserving valuable resources such as minerals, energy and forests;
  - Saving money through less disposal costs and more efficient practices; and
  - Reducing our impact on the environment.
9. A number of waste prevention or 'zero waste' techniques are available that are commonly summarised as the 4Rs: Reduction, Reuse, Recycling and Recovery. Both local and international governments are recognising the opportunities arising from 'zero waste' initiatives which encourage business to successfully commit to dramatic waste reductions.
  - The Australian Capital Territory (ACT) Government became the first local authority in the world to release a zero-waste strategy; 'No Waste by 2010'. Since the program began, the ACT has reached a point where it now recycles 66 percent of its waste and in the process has created 200 new employment positions in the Canberra community.<sup>7</sup>

<sup>3</sup> Bannerman, M. (2004) 'Phone recycling claims called into doubt', *Australian Broadcasting Commission*. Available at <http://www.abc.net.au/7.30/content/2004/s1260911.htm>. Accessed 7 August 2007.

<sup>4</sup> See Fuji Xerox website at [www.fujixerox.com.au/index.jsp](http://www.fujixerox.com.au/index.jsp). Accessed 7 August 2007.

<sup>5</sup> RMIT & Product Ecology (2004) *Electrical and electronic products infrastructure facilitation*, Department of the Environment and Water Resources, Australian Government. Available at <http://www.environment.gov.au/settlements/publications/waste/electricals/infrastructure/index.html>. Accessed 7 August 2007.

<sup>6</sup> See Sustainability Victoria - *Reduce, Re-Use and Recycle Fact Sheet* at [http://www.sustainability.vic.gov.au/resources/documents/Info3\\_The\\_3Rs.doc](http://www.sustainability.vic.gov.au/resources/documents/Info3_The_3Rs.doc). Accessed 7 August 2007.

<sup>7</sup> See ACT Department of Territory and Municipal Services – *Recycling and Waste* at <http://www.nowaste.act.gov.au/>. Accessed 7 August 2007.

- In New Zealand, The Tindall Foundation established the Zero Waste New Zealand Trust, which now has 32 councils registered as local authorities with a zero waste focus.<sup>8</sup>
  - Japan's Zero Emissions Research Initiative (ZERI) uses nature as a model for process and product design to achieve 'zero global emissions, zero water waste, zero solid waste, and zero waste in the air'.<sup>9</sup>
10. A significant part of our every day waste is 'organic material' which includes food scraps, manure, and animal and plant matter. Over 30 percent of landfill is organic and a significant part of this has come from agricultural processes.
  11. Farming in some ways is similar to the mining industry in that it progressively removes not only organic material (such as crops and animals) but also minerals and trace elements from the soil. All of this material is either exported or carried into cities where it is processed through people and a waste management system. It then ends up in either landfills or sewage treatment systems, creating further problems of contamination and pollution due to leaching. In addition, removal of organic material, minerals and trace elements from soil due to unsustainable farming practices leads to soil degradation, costing the nation millions of dollars per year.
  12. If this organic material could be returned to the food chain we could eliminate landfill problems, create local employment programs and go some way to relieving the destruction of our soils through overuse of chemical fertiliser and unsustainable farming practices.
    - Example: effective packaging design combined with major corporate commitments to the development of safe biodegradable plastics will see increasing usage of compostable or recyclable packaging within the near future, and hence significant reductions in landfill volume.
  13. From the examples above, it is becoming increasingly noticeable that industries such as the electronics/computer manufacturing industry are now taking greater responsibility for the waste their products create (or become) once they have been used. This is known as *product stewardship* or *extended producer responsibility* (EPR). This means that producers now take greater responsibility for the environmental impacts of their products throughout the product's *whole* life. This also includes taking back used products through 'take back' services (see Brief Background Information on examples of this in the electronics industry).
  14. Given that companies have to be more responsible for the impacts of their products, they are now more than ever designing products that are reusable, biodegradable, have less toxins, produce fewer greenhouse emissions and help the environment as well as ourselves.

<sup>8</sup> See The Tindall Foundation website at [www.tindall.org.nz](http://www.tindall.org.nz). Accessed 7 August 2007.

<sup>9</sup> See Zero Emissions Research and Initiatives (ZERI) website at [www.zeri.org](http://www.zeri.org). Accessed 7 August 2007.

## Brief Background Information

The world is moving steadily into the age of conservation, with recovery and recycling as an integral part; essentially 'closing the loop' on the manufacture of goods and services, and moving towards the ideal of 'zero waste'. Engineers have a key role to play in closing the loop, and a key part of that is reducing the amount of resources needed in the first place, designing for re-use of the materials, recovery, and recycling resources as much as possible. Through this 4R approach - reducing, reusing, recycling and recovery of resources - waste is minimised.

'Eco-Efficiency' is fundamentally about doing more with less for longer with renewable and non-renewable resources. Rather than thinking about 'cradle to grave', where things ultimately end up in landfill, we also have the opportunity to think about 'cradle to cradle', keeping materials cycling endlessly through the human system.

### ***Innovations in Separation of Waste and Recycling Achieve Close to 'Zero Waste'***

With decades of experience in recycling and re-manufacturing in our modern urban environment, we have substantial knowledge on how to separate and recycle most of the materials in the major waste streams – paper, cardboard and timber products, metals, plastics, and organics. New ways to recycle products are being discovered every year. Such innovations are allowing more and more local governments around the world to commit to achieving zero waste. Since there are so many innovations in this field, engineers and scientists have a critical role to play to ensure that decision makers in business and government do not miss these profitable opportunities to help shift society towards zero waste.

Today, separation and recovery of resources/materials and recycling is a large part of industry internationally. Technologies and techniques are now available for a significant percentage of the major waste streams from cities and towns to be separated and recycled. Ideally it is best to separate waste at the source (for example at the home, or individual business), but technologies and techniques now exist to separate the waste streams. Innovations in waste reduction, recycling and recovery are now enabling most materials to be recycled, often yielding multiple benefits.

### ***Innovations in Organic Recycling***

Consider this: over 30 percent of landfill is organic and a significant part of this has come from agricultural processes. Once organic material is removed all other products in a typical waste stream become available for reuse. If this organic material could be managed and returned to farming land to help soil fertility, we could eliminate landfill problems, create local employment programs and go some way to relieving the destruction of our soils through overuse of chemical fertiliser and unsustainable farming practices. Most commercial farming is essentially a mineral extractive industry that progressively removes not only the organic fraction but also minerals and trace elements from the soil, leading to soil degradation. All of this material is either exported or carried into cities where it is processed through people and a waste management system. It then ends up in either landfills or sewage treatment systems, creating further problems of contamination and pollution due to leaching.

Costs of landfill in many countries are also increasing. If these funds were redirected, this money could be used for the processing of our organic materials into a compost suitable or even designed for specific farm use. In most instances the cost of this process would be far less than the current cost of landfill. Built environment professionals such as engineers, planners and

scientists have a key role to play in explaining and promoting such opportunities to government and business.

### ***The Challenge and Opportunity of Innovating in Electronic Waste Recycling***

E-Waste typically consists of electronic products coming to the end of their useful life, such as computers, televisions, VCRs, stereos, phones, automobile and manufacturing components. The huge range and complexity of component materials in e-products currently makes it difficult and expensive to dispose of or recycle them safely and at a profit. Many of the materials used are of high value and highly recyclable – such as gold and platinum, but, many others are non-renewable - such as plastic - and are currently either discarded or recycled to form lower grade material. The biggest concern with E-Waste is the presence of toxic materials such as lead, cadmium, mercury and arsenic, toxic flame-retardants, printer cartridge inks and toners that pose significant health risks.

According to the European Commission, *'E-Waste is the fastest growing component of municipal trash by a factor of three'*.<sup>10</sup> In 2005 the United Nations Environment Program gave an estimate of 20 to 50 million tons of E-Waste being generated every year world wide.<sup>11</sup> Short-life equipment such as computers and mobile phones are the most problematic.<sup>12</sup> The number of personal computers worldwide have *'increased fivefold – from 105 million machines in 1988 to more than half a billion in 2002'*.<sup>13</sup> By 2005, more than 1 billion computers were being sold each year while 100 million computers reached the end of their useful lives, 75 million of which were landfilled.<sup>14</sup> It is for this reason that international regulations such as the 'Waste from Electrical and Electronic Equipment' and 'Reduction of Hazardous Substances' directives are now being implemented.

In this problem lies a significant business opportunity. A growing number of e-product manufacturers - Apple, Canon, Compaq, Dell, Fujitsu, Hewlett Packard, IBM, Lexmark, NEC Packard Bell, Toshiba, Xerox, Phillips, Ericsson, Nokia, AT&T and Sony - have programs that are beginning to respond to the challenge of E-Waste through the re-design of products and processes as well as recycling programs.<sup>15</sup> These companies in Australia and around the world are taking advantage of such emerging regulations and consumer pressure to introduce recycling and product take-back services as a means of achieving an advantage over their competitors.

### ***Innovations in Plastic for Carbon and Energy***

Take the everyday plastic soft drink or milk PET bottle: Veena Sahajwalla<sup>16</sup> has recently shown the steel industry that they can use waste plastic bottles to make steel. The plastic replaces coal as a source of carbon in the steel-making process. It's been a hard sell in a conservative

<sup>10</sup> Schmidt, C.W. (2002) 'E-junk explosion', Environmental Health Perspectives, Vol 110, no. 4. <http://ehp.niehs.nih.gov/members/2002/110-4/focus.html> (viewed 4 May 2006)

<sup>11</sup> Brigden, K., Labunska, I., Santillo, D. and Allsopp, M. (2005) Recycling of Electronic Wastes in China and India: Workplace & Environmental Contamination, Greenpeace International. <http://www.greenpeace.org/raw/content/india/press/reports/recycling-of-electronic-wastes.pdf> (viewed 9 July 2006)

<sup>12</sup> Greenpeace (n.d.) What is e-waste? [www.greenpeace.org/usa/campaigns/toxics/hi-tech-highly-toxic/e-waste](http://www.greenpeace.org/usa/campaigns/toxics/hi-tech-highly-toxic/e-waste) (viewed 1 May 2006)

<sup>13</sup> Worldwatch Institute (2005) When your computer becomes toxic trash, Worldwatch Institute.

[www.worldwatch.org/pubs/goodstuff/computers](http://www.worldwatch.org/pubs/goodstuff/computers) (viewed 15 May 2006)

<sup>14</sup> Department of Environment and Heritage (2005) Electrical and electronic product stewardship strategy, DEH. <http://www.deh.gov.au/settlements/waste/electricals/index.html> (viewed 12 May 2006) p. 6

<sup>15</sup> A summary of the variety of E-Waste minimisation programs, including industry associated programs; company programs; collaborative R&D programs; office consumables programs; and related industry programs can be found in RMIT & Product Ecology (2004) Electrical and electronic products infrastructure facilitation. <http://www.deh.gov.au/industry/waste/electricals/infrastructure> (viewed 9 May 2006), Appendix C.

<sup>16</sup> Australian Museum Eureka Prizes (2005) Winner of Eureka Prize for Scientific Research, Australian Museum Eureka Prizes. Available at [www.amonline.net.au/eureka/scientific\\_research/2005\\_winner.htm](http://www.amonline.net.au/eureka/scientific_research/2005_winner.htm). Accessed 3 January 2007.

industry, but now steel-makers around the world are picking up her ideas. She expects to see the technology in use in Australia and the US within two years. Forty percent of the world's steel is produced in electric arc furnaces operating at 1600°C. *'Up to 30% of the coal in these furnaces can be replaced with recycled plastic and we are aiming for more,'* says Sahajwalla. *'Not only does the plastic replace coal as a carbon source, it also acts as a fuel, reducing the power requirements for the furnace, and the extreme temperatures of steelmaking eliminate pollutants like dioxins'.*

### ***Innovations in Tyre Recycling***

Another great example of recent 'out-of-the-box' thinking comes from backyard innovator in Australia, John Dobozy, who has invented a new recycling technology for extracting lucrative materials economically and environmentally from waste tyres. The Molecetra<sup>17</sup> process reclaims all of the components that make up a tyre cleanly and efficiently without waste, residue, or emissions while extracting various products for re-use. The process recycles 100 percent of the tyre, integrating mechanical, chemical and microwave treatments to cleanly and efficiently break the tyre down into its base materials – oil, carbon, rubber granules, steel and plastic fibres - which can then be made into valuable products and resources. Through recycling and recovering all the components of the tyre John has made the recycling process more profitable. The problem of how to recycle tyres is a major international problem. Annually there are an estimated 1.2 billion old tyres that are discarded around the world, continually adding to the growing stockpiles. Australia contributes around 18 million to this number each year. The United States generates by far the most – a staggering 270 million every year. Some experts estimate that there are close to 3 billion waste tyres stockpiled throughout the United States alone. Yet with new insights and a fresh approach John has discovered a totally new way to solve this problem.

### ***More Examples of Making Business out of Waste***

- Australian-based company *Close the Loop* have recently achieved zero waste to landfill by recovering all material and resource value from toner and inkjet cartridges.<sup>18</sup>
- *VISY Industries* have grown to be the largest private recycling company in the world.<sup>19</sup>
- *Collex* has gradually evolved from waste stabilisation and simply collecting rubbish to accommodate almost every type of liquid and solid waste known. Over the last thirty years *Collex* has quietly developed its capacity to now have annual revenues of AU\$300 million and some 1700 staff.
- *Cosco Holdings Ltd.* is a local Australian closed-loop company that 'harvests the forests of the city offices'. They claim to already service three of Melbourne's major universities and make the Coles supermarket in-house brands out of 100 percent consumer waste. They are a local closed-loop, rather than an international closed-loop, thus reducing Greenhouse emissions.
- Even the construction industry has some pioneering companies, like the *Alex Fraser Group*, who recycle 750,000 tons of concrete per year. There are many other companies that have made progress on many fronts similar to Fuji/Xerox Australia, and are on the road to sustainable development.

<sup>17</sup> For additional information see Molecetra Technologies - Homepage at [www.molecetra.com.au](http://www.molecetra.com.au). Accessed 3 January 2007.

<sup>18</sup> Hargroves, K. and Smith, M.H. (2005) *The Natural Advantage of Nations*, Earthscan, London, Chapter 6: Natural Advantage of the Firm, pp75-77; See Close the Loop - Homepage at [www.closesthe-loop.com.au](http://www.closesthe-loop.com.au). Accessed 3 January 2007.

<sup>19</sup> See VISY website at <http://www.visy.com.au/>. Accessed 7 August 2007.

## Case Study: Creative Thinking in the Carpet Industry

The company *Interface Ltd* is a great example of what can happen when people commit to removing waste from the manufacturing stream. Here is an extract of the company's innovation journey, told by their CEO, Ray Anderson:<sup>20</sup>

*For the first twenty-one years of Interface's existence, I never gave one thought to what we took from or did to the Earth, except to be sure we obeyed all laws and regulations. That is, until August of 1994. At that time, our research division organized a task force with representatives from all our worldwide businesses to review Interface's environmental position and asked to give the group an environmental vision. Frankly, I didn't have a vision, except 'comply, comply, comply'. I had heard statesmen advocate 'sustainable development', but I had no idea what it meant. I sweated for three weeks over what to say to that group.*

*Then, through what seemed like pure serendipity, somebody sent me a book: Paul Hawken's 'The Ecology of Commerce'. I read it, and it changed my life. It was an epiphany. I wasn't halfway through it before the vision I sought became clear, along with a powerful sense of urgency to do something. Hawken's message was a spear in my chest that remains to this day.*

*In the speech, I borrowed Hawken's ideas shamelessly. And I agreed with his central thesis: while business is part of the problem, it can also be a part of the solution. Business is the largest, wealthiest, most pervasive institution on Earth, and responsible for most of the damage. It must take the lead in directing the Earth away from collapse, and toward sustainability and restoration. I gave the task force a kick-off speech that, frankly, surprised me, stunned them, and galvanized all of us into action.*

*Later, someone sent me a copy of Daniel Quinn's book, 'Ishmael'. I've now read it six times and I'm here to tell you that Hawken and Quinn together, will not only change your life, but make you understand why it should change. They did both for me. In 'Ishmael', author Daniel Quinn uses a metaphor to describe our civilization emerging from the first Industrial Revolution and the Agricultural Revolution that preceded it. 'Ishmael' likens this civilization to our early attempts at building a pedal-powered airplane - men trying to fly without understanding the laws of aerodynamics.*

*They sent their planes off high cliffs for the sensation of flying, only to crash to the ground. In this metaphor, the high cliff symbolizes the seemingly unlimited resources we started with as a species, resources available to us as we abandoned hunting and gathering, and began to shape our modern agricultural and industrial civilization. No wonder it took a while for the ground to come into sight. Quinn says that our civilization is in a free fall because we have become 'takers' all. From a three million year legacy of 'leavers' - thousands of diverse cultures who understood they belonged to Earth - the dominant culture today believes the Earth belongs to it. Pedaling harder will not prevent disaster if the aircraft can't fly. We need to discover the principles of sustainability that will allow us to build a civilization that can stay aloft, a civilization that flies.*

*In 1994, I offered the task force a vision: to make Interface the first name in industrial ecology worldwide through actions, not words. I gave them a mission: to convert Interface to a restorative enterprise; first by reaching sustainability in our practices, and then becoming truly restorative - a company returning more than we take - by helping*

<sup>20</sup> More information about this example is available at [http://www.interfaceinc.com/getting\\_there/Ray.html](http://www.interfaceinc.com/getting_there/Ray.html). Accessed 13 August 2007.

*others reach sustainability. I suggested a familiar strategy including: reduce, reuse, reclaim, recycle (later we added a very important one, 'redesign'); adopt best business practices and then advance and share them; develop sustainable technologies and invest in them when it makes economic sense; and challenge our suppliers to follow our lead. We named this EcoSense™.*

*I believe we have come to the threshold of the next industrial revolution. At Interface, we seek to become the first sustainable corporation in the world, and, following that, the first restorative company. It means creating the technologies of the future - kinder, gentler technologies that emulate nature's systems. I believe that's where we will find the right model. Ultimately, I believe we must learn to depend solely on available income the way a forest does, not on our precious stores of natural capital. Linear practices must be replaced by cyclical ones. That's nature's way. In nature, there is no waste; one organism's waste is another's food. For our industrial process, so dependent on petro-chemical, man-made raw materials, this means technical 'food' reincarnated by recycling into the product's next life cycle. Of course, the recycling operations will have to be driven by solar energy, too.*

*We look forward to the day when our factories have no smokestacks and no effluents. If successful, we'll spend the rest of our days harvesting yesteryear's carpets, recycling old petro-chemicals into new materials, and converting sunlight into energy. There will be zero scrap going into landfills and zero emissions into the biosphere. Literally, our company will grow by cleaning up the world, not by polluting or degrading it. We'll be doing well by doing good. That's the vision. Is it a dream? Certainly, but it is a dream we share with our 5000 associates, our vendors, and our customers. Everyone will have to dream this dream to make it a reality, but until then, we are committed to leading the way.*

Ray C. Anderson  
Chairman, Interface, Inc

Interface Ltd focused initially on efficiency savings and then, with the money saved from efficiency investments, they have been able to also focus on re-designing their products, their processes and where they source their raw materials to achieve sustainable development. By focusing on efficiency, Interface Ltd found areas where highly cost effective gains were possible. The original gains were quick and effective; in one particular plant they were able to increase energy efficiencies by 92 percent simply by resizing the pump and redesigning the piping between the pump and the equipment.<sup>21</sup> Interface Ltd concentrated initially on those areas where cost effective gains could be made and is now saving over US\$200 million per annum with their efficiency initiatives, which is then paying for sustainability orientated initiatives. These financial savings from resource efficiency have allowed Interface to try improvements that have started affecting the company on a much more fundamental level.

Now the company has largely replaced petrochemical based carpets with carpets made from renewable biomass such as corn waste that can be recycled with little loss of quality. The new carpet is the first certified climate-neutral product in the world; that is, all of the climate impact of making and delivering it has been offset before it gets to the customer. The carpet is so non-toxic that it is certified as being edible, thus eliminating Occupational Health and Safety concerns. Rather than owning the carpet the customer leases it from Interface who then collect the worn out squares for recycling. In the first four years of this business model and wringing out

<sup>21</sup> Refer to [http://www.naturaledgeproject.net/Whole\\_Systems\\_Design\\_Suite.aspx](http://www.naturaledgeproject.net/Whole_Systems_Design_Suite.aspx) for examples of detailed designs.

waste in its own operation, Interface say they more than doubled their revenue, more than tripled their operating profit, and nearly doubled their employment, all at the same time. Overall they have achieved a 97 percent total reduction in materials used while providing a better service in every respect.

Interface is on the way to becoming the first genuinely 'Sustainable Corporation' on the planet, and there are virtually unlimited opportunities for organisations in every part of society to strategically work towards the same goal. Whether it happens or not is up to our generation – it is perhaps our biggest challenge and exciting opportunity at the same time - to get creative and innovative, to be a part of the solution!

## Key References – Waste

(Alphabetical Order)

1. Japan Zero Emissions Research Initiative, [www.zeri.org](http://www.zeri.org). Accessed 7 August 2007.
2. Organic Recycling Centre at UNSW, [www.recycledorganics.com/](http://www.recycledorganics.com/). Accessed 7 August 2007.
3. Planet Ark's highly endorsed and extensive website covers developments in waste management, [www.planetark.org/recycling/index.cfm](http://www.planetark.org/recycling/index.cfm). Accessed 7 August 2007.
4. The Worldwatch Institute's *The Good Stuff* Guides provide useful information on what goes into and comes out of all kinds of everyday products we purchase, <http://www.worldwatch.org/taxonomy/term/44>. Accessed 7 August 2007.
5. The following state government websites provide a variety of locally and nationally relevant information for students and teachers on all forms of waste management and prevention:
  - NSW Dept of Environment & Conservation, <http://www.environment.nsw.gov.au/education/recyclingandwaste.htm>. Accessed 7 August 2007.
  - Zero Waste SA, [www.zerowaste.sa.gov.au](http://www.zerowaste.sa.gov.au). Accessed 7 August 2007.
  - ACT No Waste, [www.nowaste.act.gov.au](http://www.nowaste.act.gov.au). Accessed 7 August 2007.
  - Sustainability Victoria, <http://www.sustainability.vic.gov.au/www/html/1717-what-we-do.asp>. Accessed 7 August 2007.
  - WSN Environmental Solutions for useful educational facts, hints and tips on composing, recycling and alternative waste management technologies, <http://www.wsn.com.au/dir138/publish.nsf/Content/education>. Accessed 7 August 2007.