28 October 2003

The Secretary
Standing Committee on Environment and Heritage
House of Representatives
Parliament House
Canberra ACT 2600
Email: Environment.Reps@aph.gov.au

Dear Sir/Madam

Re: Inquiry into Sustainable Cities

Introduction

I am pleased to make an individual submission to the Committee. Employed in the Building Management Division of the SA Government and part-time with the University of SA, I have qualifications in architecture, building surveying, planning and asset management, gaining my doctorate in 2002.

My comments relate to several of the Terms of Reference. They address the optimum use of the existing built environment, thereby limiting overbuilding and reducing the environmental and social effects of sprawling urban development. Furthermore, I wish to offer some suggestions for inclusion in a 'blueprint' for ecologically sustainable patterns of development.

As such, my comments pertain mainly to the following Sections of the Discussion Paper:

- Section 4: Manage and minimise domestic and industrial waste, and
- Section 6: Incorporate eco-efficiency principles into new buildings and housing.

After briefly outlining my comments in this covering letter, I shall then elaborate upon these within the attached submission.

Section 4: Manage and minimise waste

I wish to address the question of 'what strategies are appropriate to encourage eco-efficiency and the reduction of industrial waste?' in the context of the opening paragraph:

> *Large cities have been characterised by large amounts of waste which is more difficult and costly to transport to depots for treatment. The sustainable city must more fully embrace the ethos of product stewardship with suppliers and purchasers recognising a responsibility for the waste generated from production processes, packaging and consumption.*

and the statement that

> *A sustainable city must embrace green businesses and driven by environmental awareness. Sustainability initiatives, including energy efficiency and waste and water management, cannot happen 'around' industry. They must have the active commitment and leadership and participation of industry.*

Whilst the Discussion Paper has properly addressed the reduction of waste, coupled with minimisation of water and energy use, I believe the use of materials and resources is also worthy of attention. As I have mentioned above, better use of existing infrastructure and building stock can significantly reduce waste and the demand for new raw materials and energy.

Section 6: Incorporate eco-efficiency principles into new buildings

The Discussion Paper alludes to the need for 're-use' and to increase the useability of commercial and residential premises, suggesting that better practices need to be incorporated into new construction and encouraged as part of major 'retro-fits' and renovations.

In this regard, my comments concern the adoption of 'life cycle thinking' by designers of new buildings, that is, design for adaptability and re-use so that, after one life, a building component or entire building may be adapted or converted easily to a new use. Adopting the industrial ecology concepts being implemented in the product field, buildings and their components can be designed for disassembly or deconstruction.

Closing comments

I have been motivated to make a submission to the Committee as I believe the better utilisation of existing built resources, by adoption of 'cradle to cradle' or cyclical processes, requires far greater attention and has much potential to improve the sustainability of cities. I shall therefore discuss the related concepts of industrial ecology, 'biomimicry' and 'cradle to cradle' not only in terms of industrial manufacture of materials and products, but also in relation to better utilisation and management of the built environment and the building stock. Hitherto, the 'cradle to cradle' approach emanating from product design and industrial ecology does not appear to have been extended to management of the building stock and the sustainability of cities. This simple concept should form an important part of the blueprint for sustainable cities.

I should be pleased to provide more information or to appear before the Committee.

Yours faithfully

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B Arch, Master of Urban and Regional Planning, PhD

Enc: Body of Submission.

House of Representatives Standing Committee on Environment and Heritage

Inquiry into Sustainable Cities 2025

Individual Submission: Dr David Ness, October 2003.

Summary of main points

- The benefits of product stewardship or extended producer responsibility may be realised more fully when products are *leased* to consumers or client organisations. This is known as the service economy characterised by procurement of services rather than ownership of products.
- Under such schemes, the producer or authorised leasing agency is responsible for periodic repairs and maintenance, and at the end of its usefulness a product can be taken back, disassembled, remanufactured, and then leased to another client. So the product has life after life in closed loop material flows.
- This requires adoption of life cycle thinking by designers i.e. 'design for disassembly'.
- The feasibility and costs/benefits of this new business model, pioneered by companies such as Interface Inc and Fuji Xerox, require further investigation. It appears to offer advantages not only in terms of reduced demand for raw materials and reduced waste, but also cost savings due to reduced capital costs, increased employment generation, coupled with improved service provision. The Commonwealth Government should consider changes to its procurement policies so that such approaches may be introduced, starting with products and later extending the principle to building procurement.
- Sustainable cities are those that practise stewardship of their resources, keeping existing resources (e.g. buildings) in use and modifying or adapting this where necessary. They are those that better manage their existing asset stock, by improved asset management, in a similar manner to stewardship of products.
- Transferable licences or vouchers could be issued for products, as suggested by Hawken, and this concept could be extended to the regulation of building stock so that it matches real demand, reducing volatility of property cycles.
- In essence, the 'cradle to cradle' philosophy being applied to products (e.g. carpets) can be extended more widely to the design and management buildings and to the management of the building stock in cities.

1. Cradle to cradle products

There is no question that the sustainable city must more fully embrace the ethos of product stewardship, with manufacturers and suppliers having more responsibility for their products and waste generated. According to Benyus (1997), 85% of manufactured items quickly become waste. The environmental advantages of cyclic 'cradle to cradle' processes over linear 'cradle to grave' processes, in terms of reduced demand for raw materials and reduced waste, have been well documented by Anderson, Hawken, McDonough and others. Product stewardship has advantages, too, over recycling as usually practised. Most recycling is actually 'downcycling', as it reduces the quality of a material over time (McDonough and Braungart 2002, p. 56).

Instead of designing cradle to grave products, dumped at the end of their 'life', companies such as Interface Inc embrace a 'cradle to cradle' philosophy, characterised by cyclical flows and the elimination of waste, and are committed to 'The Natural Step' principles of sustainability established by Karl-Henrik Robèrt in 1989 (see Robèrt 2002). They seek to transform industry by creating products for 'cradle to cradle' cycles, within which materials are perpetually circulated in closed loops. Products are being designed not only to be long life to ensure they remain in circulation, but also able to be regenerated and recycled once they have exhausted their first useful life. The more materials that can keep in the loop, reclaimed and recycled, the less needs to be taken from the planet and the less go to waste (see Anderson 1998). In this regard, the Australian Academy of Technological Sciences and Engineering is keen to promote product stewardship or extended producer responsibility and to enlist the support of the Government (ATSE 2003).

2. The service economy

The full benefits of product stewardship or 'extended producer responsibility' can be realised by adoption of a new business model involving leasing of services rather than ownership of products. This requires a cultural change from 'product oriented' to 'service oriented' consumer patterns (Wimmer 2003). Benyus termed this movement 'leasing as a way of life' and described it as the ultimate in 'dematerialisation' (Benyus 1997, pp. 265-6). Hawken, Lovins and Lovins (1999) envisaged that someday businesses would lease their office furniture, office equipment, manufacturing equipment, and even a whole building. They pointed out that

> *The service economy has important macro-economic implications. The concept of service and flow goes to the heart of the business cycle, the periodic booms and busts in capital investments...*

While buying frenzies exaggerate the peaks and troughs of the business cycle, the leasing of services dampens volatility (Hawken, Lovins and Lovins 1999, p. 142-3). In my PhD thesis, I also highlighted the damaging environmental and other results of the excesses of the commercial property industry, outlining a scheme for matching the supply of commercial property with real demand in terms of office employment. This is explored further in Section 4 of this submission.

The Commonwealth Government, through its procurement policies, should play a lead role in introducing the concepts of product stewardship and leasing (refer Terms of Reference 4). Rather than procuring *products*, the Government could procure *services*. This could not only demonstrate leadership in sustainability and pursuit of 'zero waste', but also could result in cost savings and improved service provision. Under leasing contracts, the producer would be responsible for periodic repairs and maintenance, updating products,

and ensuring that at the end of its life a product can be taken back, 'remanufactured' or reconfigured, and commence another life. Under a sale system, there is an incentive to build in obsolescence to gain repeat business, whilst under a leasing system there is an incentive to build in longevity. In a similar manner, build-own-operate (BOO) contracts are conducive to lower life cycle costs. Adding the transfer to BOO makes it into a BOOT contract and destroys all the potential life cycle benefits (Burns 1996). Therefore, the Commonwealth Government should both embrace these concepts itself and use its influence on the Australian Procurement and Construction Council (APCC) to promote them nationally.

3. Cradle to cradle buildings

Currently, at the end of the life of a building, most materials are disposed of in landfill, so that they are permanently lost and must be replaced by virgin raw materials. To overcome such wasteful practices, designers should be encouraged to adopt 'life cycle thinking', so that they not only design for the initial use, but also 'design in' adaptability, versatility and inter-changeability. Thus, after their first use, buildings and their components may be readily reconfigured for a new life. Again, this demonstrates the principles of industrial ecology, with cyclical rather than linear processes.

There are examples of the 'cradle to cradle' concept being applied to buildings – as in the case of 'Schools in Houses' Program of the South Australian Department for Education, in conjunction with the then SA Department for Housing and Construction. The Hallett Cove East Primary School, for example, was designed so that after it has outlived its usefulness as a school, it can be converted readily into housing rather than becoming obsolete. Long life, loose fit, low-energy buildings should be valuable not just for their current use but also for future alternative uses. Reclaiming existing buildings for new purposes uses materials that have already been harvested from the earth, often requiring less new material than building a structure from scratch (Ness and Atkinson 1996).

The Property Council of Australia (PCA) has acknowledged that the reuse of existing buildings allows an opportunity to take existing building stock and update it for current uses (PCA 2001). This makes efficient use of existing resources by reusing a building's materials, minimising the energy used to produce, transport, construct, install and dispose of building materials, and reduces landfill.

Buildings may be viewed as durables or 'products of service' as described by Hawken (1993). They may comprise a number of building components, wall and ceiling panels, doors and windows, light fittings and the like, which may be prefabricated by a manufacturer and assembled or installed on site. Over 40 years ago, Cook and other members of the futuristic 'Archigram' group in the UK envisaged a 'Plug-in City' composed of a large scale network or infrastructure containing access ways and essential services, into which are placed interchangeable units which cater for all needs and are able to be replaced when they become obsolete and reach the end of their useful life. Versatile modular panels were the basis of a 'rent-a-wall' concept (Cook 1991).

As discussed in the previous Section, building product manufacturers could lease or license the plug-in modular components to organisations requiring facilities. This idea appears attractive from both economic and environmental standpoints. Organisations should be able to minimise the large capital cost associated with constructing a new building and even out the peaks and troughs of their business cash flow. Monthly rentals for the building components could be offset by rental income from tenants, and the cost could be tax deductible in the same manner as other operating expenses (Hawken, Lovins and Lovins 1999). Moreover, the responsibility for the products and their condition would

remain that of the manufacturer, who can retrieve products as they wear out or need to be replaced for functional reasons. Importantly, the manufacturer could then rejuvenate and recycle these building products to other customers, so that they are kept in the loop, saving consumption of new raw materials and markedly reducing building waste dumped in landfill.

Through changes to its procurement processes and briefing of consultants, the Commonwealth Government should ensure that such 'cradle to cradle' principles are incorporated in the design of new buildings and refurbishment and management of existing buildings.

4. Cradle to cradle cities: management of existing building stock

There is certainly growing interest among developers and designers in Green Buildings. However, I take issue with the claim that Melbourne's proposed Eureka Tower, due to double glazing, smart technology to minimise energy consumption, and green building materials, would become the world's tallest 'eco-friendly' office and apartment building (McLaren 2002). I question whether 'eco-friendly' should be viewed solely in terms of these criteria. Are such massive structures necessary at all to satisfy human needs, given their significant consumption of scarce resources, their dubious role in responding to real occupant needs rather than financial gain, and the large quantities of existing building stock lying idle or demolished and dumped in landfill when it finishes its useful life? Arguably, construction of such edifices is not smart or sustainable. It is seldom understood that the construction of any new building will consume scarce resources, notwithstanding the incorporation of energy saving measures and the like.

Our cities are left with the legacy of previous construction booms, characterised by vast amounts of new construction with scant regard to their life cycle or accruing maintenance costs. In my PhD thesis I highlighted the detrimental social, economic and environmental effects of overbuilding and resultant disused commercial property, including waste of resources and increased urban blight. My thesis questioned the profligate construction of new office buildings at a time of low growth in office employment coupled with high vacancy rates among the existing office stock. Under these circumstances it may be more advantageous to utilise the existing built resource and convert existing stock where suitable. I found that the private property market is unable to achieve equilibrium of supply and demand and is unable to address these external community effects. Hence, there are arguments for restraining the size of cities to match real demand and the earth's carrying capacity. Certainly, increased emphasis should be placed on managing and utilising the existing stock as a valued resource (Ness 2002).

I therefore put forward what I believe is a novel concept that the concept of cradle to cradle design and management of products, whereby they circulate in closed loops (product stewardship), may be extended to the more macro design and management of the building stock and entire cities. As Benyus has explained, organisms use materials sparingly - they build for durability, but they don't overbuild. They fit form to function, building exactly what is needed (Benyus 1997, p. 265). Smart and sustainable cities are those that value their existing building stock and seek to make the best use of what they have. They don't allow their existing stock to deteriorate while continually adding new assets.

In this regard, strategic asset management has a major role to play in achieving smart and sustainable cities. It is about achieving a close match between user needs and assets. The strategic decisions on whether to procure new assets, replace existing, refurbish, maintain or demolish have significant environmental and resource implications (Ness and Atkinson 1996). This is seldom understood. In essence, I believe that individual so-called

green buildings need to be seen in the wider context of the asset stock and its better management. Arguably, better alignment of the asset base with business demands can achieve the greatest efficiencies in resource use.

I have highlighted the importance of such concepts in a 1996 Environment Design Guide on *Reuse/Upgrading of Existing Building Stock*, and in my 2002 PhD thesis *Accounting for the Effects of Oversupply of Commercial Property*. In a recent paper on *Cradle to Cradle Carpets and Cities* for the CIB International Conference on Smart and Sustainable Cities, Brisbane, November 2003, I have shown how the concepts of biomimicry and industrial ecology pioneered by Hawken and others may be extended to the wider management of the building stock and cities.

Hawken introduced the idea that products, rather than being sold, would be *licensed* to the purchaser, with ownership retained by the manufacturer:

> *When you bought a refrigerator, a VCR, or car, you would buy the licence to use and operate it. The* ***licence would be transferable****, so that it you wanted to give or sell it to a friend, you could. But the product could not be thrown away or disposed of. Retailers of consumer products would become 'de-shopping' centres where we could drop off the products we no longer needed and obtain newer ones (Hawken 1993, bold type added).*

Similarly, the notion of transferable licences for consumer products may have applications at a more macro scale in regulating the supply of building stock and restraining the gross excesses, over-consumption and waste associated with the property boom and bust cycle. The use of Transferable Development Rights (TDRs), previously used for natural and heritage conservation, may be used for this purpose and make the reuse of existing stock a more attractive proposition. TDRs also represent a useful growth management tool as they enable growth and new development to be linked with the costs of this growth in terms of obsolescence and the environment. TDRs are akin to vouchers or licences, separate from the real estate, and more or less may be issued dependant upon demand – enabling the supply of (say) office space to be regulated. Within these limits, they may be sold or transferred within the private market. Developers wishing to add to the stock would be required to purchase TDRs from owners of existing rights who, whilst forfeiting the rights, could use the proceeds to convert their properties to other uses. Therefore, in a manner somewhat akin to product stewardship schemes, the use of TDRs may enable better stewardship and management of the building asset stock (Ness 2002). This may extend the thinking of Hawken, Lovins and Lovins (1999) who recognised that buying frenzies exaggerate the peaks and troughs of the business cycle, whilst leasing of services could 'dampen' the volatility of the cycle.

5. Concluding comments

I have found finding some parallels between my thinking and the concepts promoted by Interface Inc. With Michael Field, the National Sustainability Coordinator form Interface Australia, I have produced a paper on 'Cradle to Cradle Carpets and Cities' for the international CIB conference on 'Smart and Sustainable Built Environment', Brisbane, November 03. We have attempted to extend the product stewardship, biomimicry and industrial ecology philosophies of Interface and others to the wider built environment. The idea is that the 'cradle to cradle' concept, of keeping resources in circulation, can be applied not only at the product level (e.g. carpets) but also at the wider scale of buildings and cities.

Notwithstanding the attraction of the concept of product stewardship and leasing, Interface has found some financial and other barriers to its practical application. With the primary aim of examining how these barriers may be overcome and a new business model introduced, we are planning to collaborate on a research project led by Professor Jerzy Filar, Head of Mathematics and Operations Research at the University of South Australia, also involving the Centre for Design at RMIT University. The research is intended to focus initially on office fit-outs, using these as a testing ground for product stewardship and leasing approaches, and to then extend the lessons to the wider built environment and other industries. Prof Filar is very interested in synchronisation of waste from one product with the raw material demands of other products, and applying this to the manufacturing industry.

Glossary of terms

Product stewardship (otherwise known as extended producer responsibility)

This is a production method whereby manufacturers retain responsibility for the raw materials that they use, ensuring that they do not end up in landfill. Manufacturers and their designers that commit to product stewardship will design for re-use of products and their components after their initial life (Burns 2003).

Cradle to cradle

Another expression of product stewardship – that products never find their way to 'the grave' or landfill, but are continuously 'kept in the loop' being reprocessed and re-used (Burns 2003).

Biomimicry

Nature is designed as a circular flow, from seasonal re-birth where last year's growth dies and becomes food for the next season of growth, to the food chain itself. Industrial sustainability aims to mimic this circular flow instead of the linear flow – from nature to product to landfill – that we are currently following (Burns 2003).

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