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An initiative hosted by the

Waste Management Association of Australia NSW Branch

Strategic Planning and Infrastructure Group (SPIG)

Discussion Paper No. 3

The systems and infrastructure needed to support a sustainable, recycling-minded and resource-efficient society

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Produced/published by the SPIG Steering Committee, C/- Co-chairs

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WASTE MANAGEMENT ASSOCIATION OF AUSTRALIA

Local Government and Shires Associations of NSW

BOOMERANG ALLIANCE

ACOR AUSTRALIAN COUNCIL OF RECYCLERS INC the voice of the recycling industry

Contents

1 Origins and objectives of SPIG

In the final plenary session of the Waste Management Association of Australia (WMAA) 2005 NSW Waste Conference, the delegates expressed frustration at not being able to make real progress towards a goal of sustainable recycling and resource recovery. The initial frustration was that the admirable vision and goals of the NSW Department of Environment and Conservation (DEC) waste strategy did not provide for sufficient stakeholder coordination and focused implementation.

Consensus emerged that the skills, needs and capabilities to implement the state targets rested with the collective membership of WMAA, the Local Government and Shires Associations (LGSA) NSW Branch members, the Boomerang Alliance (BA) of Australia's leading environment groups and the Australian Council of Recyclers (ACOR).

These groups later agreed to collaborate within the framework of a working group of the WMAA New South Wales Branch under the title of the Strategic Planning and Infrastructure Group (SPIG).

SPIG has met regularly over the past 18 months as a steering group to:

- express and reconcile the essential policy positions of the collaborating organisations
- develop agreed positions on vision and objectives for the SPIG initiative
- propose strategies for the group to stimulate and influence a paradigm shift in resource management outcomes from an unsustainable and wasteful society to a sustainable, recycling-minded and resource-efficient society.

For members of the SPIG steering committee see *Attachment A*.

1.1 SPIG vision

Australia is a wealthy and progressive first world country that should be a sustainable, recycling-minded and resource-efficient society whose use and application of resources have only minimal impact on climate change. Progress towards the achievement of this goal will generate a sustainable competitive advantage for Australia.

1.2 SPIG objectives

SPIG has three objectives:

- to employ the collective skills, expertise and capabilities of the collaborating parties to design, develop and stimulate the implementation of the systems and infrastructure that are needed to achieve the vision, so as to directly address the impacts of unsustainable resource use on climate change
- to develop a systems and infrastructure plan and facilitate its adoption and implementation in the greater Sydney region (GSR), in New South Wales and across Australia
- to recommend to government and the private sector the commercial, regulatory and legislative regime that is needed to implement the systems and infrastructure plan.

1.3 SPIG founding principles

In developing the systems and infrastructure plan, SPIG's deliberations will be guided by three principles:

- sustainability – not only as described in legislation but as adopted by WMAA, LGSA, BA and ACOR respectively
- highest net resource value (HNRV) – to ensure that the systems and infrastructure plan can support and encourage the allocation of new capital
- transparency and collaborative consultation – between SPIG and the respective organisations' memberships, third party stakeholder groups and the wider community.

2 What SPIG has done and agreed to date

The SPIG steering group has met five times over the past 18 months to advance the SPIG initiative. During that time it has:

- produced a number of discussion and working papers internally to reconcile the starting positions of steering group members
- commissioned an external consultant develop a "Defining the Vision" paper based on a steering group workshop
- presented a technical session breakfast to solicit wider stakeholder input.

The steering group is now presenting this document, Discussion Paper No. 3, to the entire membership of the participating organisations for review and comment.

2.1 The problem – waste

Following is a description of the problem presented by the current wasteful use of resources. This has been synthesised and agreed as a result of steering group deliberations and working papers over the past 18 months, together with submissions made by the participating organisations to recent Productivity Commission hearings held in various national locations.

Currently 50,000 tonnes per day of discarded resources and complex manufactured materials from the metropolitan solid waste (MSW), commercial and industrial (C&I) and construction and demolition (C&D) waste streams are lost to disposal outcomes in Australia. This situation is unsustainable for society as a whole. It presents SPIG with a significant opportunity to address it systematically, transparently and inclusively.

ACOR expresses this economic loss in terms of an "over provision of disposal services" which in turn destroys the opportunity to provide:

- more than $3.5 billion of eco-services nationally per year
- the annual recovery of $912 million of commercial value
- the annual recovery of 68,400 GWh of embodied energy
- the direct creation of between 5,000 and 9,000 jobs.

The current resource recovery systems that have struggled to emerge from the prevailing wasteful paradigm are still failing to recover the optimum net resource value from the materials under management in that:

- residual wastes still contain significant recoverable resource and energy value
- kerbside and dry recyclables systems and resource recovery pathways are still supply-driven and sub optimal
- organics recovery and processing systems and resource value recovery pathways are also supply-driven and failing to effectively recycle organic carbon back into the productive economy
- embodied and inherent energy recovery systems and infrastructure are nascent or non existent.

There is a need for the design, development and implementation of specific resource recovery systems, infrastructure and capabilities in place of the suite of waste management systems, infrastructure and capabilities that currently prevail.

ACOR has described the current waste management and disposal approach as an indication of “poor system performances” in the overarching market-based economy and believes that such an outcome is “ultimately unsustainable”.

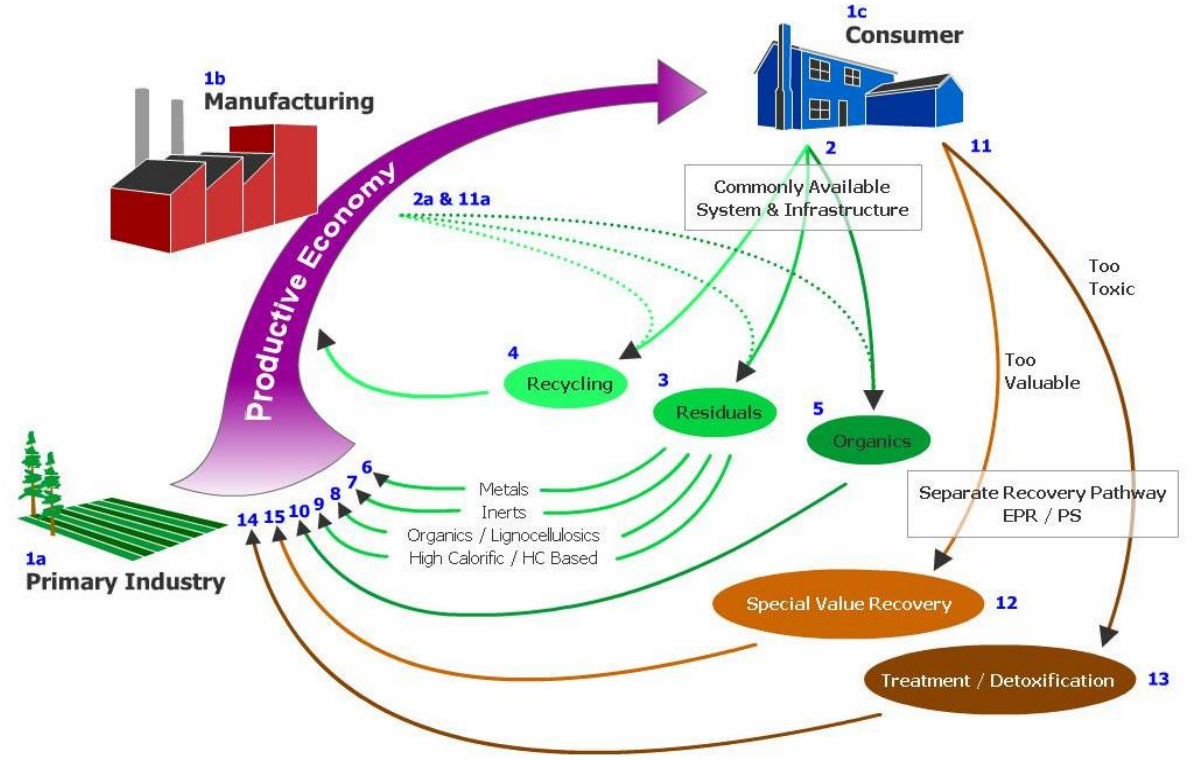
SPIG advocates for the design, development and implementation of specific Resource Recovery systems, infrastructure and capabilities as a complete replacement of the current suite of waste management systems and infrastructure that are delivering the wasteful outcomes that currently prevail.

Manufacturers and consumer service providers are being encouraged to “dematerialise” the provision of goods and services. However, these moves are often hampered or frustrated by a lack of post consumer systems and infrastructure that would allow their products and services to be designed with the least possible life cycle impacts.

In a sustainable, recycling-minded and resource-efficient society, essential material needs and wants would be met without irrevocably depleting the Earth’s natural resources or impairing the biosphere’s ability to provide vital ecosystem services.

Therefore, an essential outcome of any nationally adopted suite of resource recovery systems and infrastructure would be to ensure that all spent, surplus or generally unwanted resources can be, and are, returned for reuse in the productive economy in their highest net resource value application (see Figure 1).

Figure 1: Conceptualisation of zero waste physical and economic pathways



The actual installed capabilities, systems, infrastructure and "reverse logistics" needed to achieve this vital economic and strategic goal are as follows:

- The optimum size of the productive economy should be such that it fulfils community needs while avoiding over consumption or over production. Creating feedback loops within the current system will reduce the reliance on virgin natural resources. This will also result in environmental, social (public health) and economic benefits
- industry and domestic consumers and waste generators would be encouraged, incentivised or required to discard surplus, spent or otherwise unwanted materials to the appropriate and readily available channel or discard option, container or facility
- the provision of widely implemented and commonly available systems and infrastructure for systematic resource recovery would, by its operations, maintain strong commercial and societal signals up through the supply chain to:
    - encourage waste avoidance and minimisation (biomimicry) at all stages
    - support and encourage dematerialisation of services to society and encourage the move to service-based delivery of consumer needs and wants
    - discourage wanton consumption and wastefulness
- the focus of sustainable resource recovery systems and infrastructure would be to ensure that all surplus, spent or otherwise unwanted materials are

streamed, collected, processed or treated so that they are all presented back into the productive economy in accordance with their highest net resource value (see Figure 1). The cost for delivering such a service, net of the receipts from the individual purchaser in the productive economy, would be met from an equitable allocation of fees and charges to the generators of the secondary resources, as stimulated by market-based instruments introduced as an integral part of the paradigm change to sustainable resource use

- current initiatives to promote extended producer responsibility (EPR) or product stewardship arrangements are severely hampered by an almost complete lack of appropriate and cost-effective systems, infrastructure and sustainable resource recovery pathways for the post-consumer materials themselves (with the partial exception of kerbside recycling to support the objectives of the National Packaging Covenant).

  The SPIG initiative specifically addresses this issue in the context of separate resource recovery pathways for materials too inherently valuable or potentially toxic to be effectively recovered by the main resource recovery pathways (see section 4 (11–15) and Figure 1).

3 What SPIG aims to achieve

3.1 Formation of a broad-based reference group

SPIG has been initiated by four organisations whose collective membership will be directly involved, influenced or supportive of all or any of the changes being developed and recommended.

As the ideas, strategies and recommendations of SPIG become more developed and refined, other important stakeholder groups will be invited to join the initiative.

The origin of the SPIG initiative (the WMAA 2005 NSW Waste Conference) demonstrated **not** that the prevailing state government strategies were necessarily inadequate, but rather that the quantum changes required to move from a waste sector, with some resource recovery at the margins, to a more holistic system of resource management incorporating resource recovery, involved a great many stakeholders of which the state government was but one.

The SPIG steering committee understands that the broadest societal change will be required to achieve its ultimate vision. By the four initiating organisations taking the lead, a nucleus will be created to think and act across boundaries or silos of narrow self interest.

With the release of Discussion Paper No. 3 to the entire membership of the four organisations, a platform will be created for informed review and comment on the ideas contained in the document. It is anticipated that the document will also elicit interest from a broad range of interested individuals who would be prepared to act as an Expert Reference Group (ERG) to the steering group.

Any individual volunteering to formally participate in such an ERG would review working papers and drafts of documents and ideas being developed by the steering group for detailed review and comment. Ideally this ERG would provide the widest possible input and advice to the SPIG steering committee and could have up to 100 committed participants.

Volunteers who wish to participate in the ERG or who wish to receive more information are invited to contact the SPIG co-chairs in the first instance.

3.2 SPIG next steps – what, how & who

The broad strategy of the SPIG initiative is to consult and develop consensus on what is needed and how to achieve it and then to promote this to stakeholder groups and the wider community.

The first step is to develop consensus on the generic systems, infrastructure and physically installed capabilities that are needed to provide the physical and economic pathways for sustainable, systematic resource management and recovery (see section 4 and Figure 1). This consensus will be developed first from within the four member organisations and then taken to a broader audience and the community as a whole.

Once what is physically needed is better understood, the next step for SPIG is to turn its attention to the question of how to achieve it. This will involve a review of the legislative and regulatory regimes that would be optimum to achieve the vision and a consideration of the commercial and market-based signals that need to be created to gainfully engage the inventiveness, flexibility and enthusiasm of the private sector to actually deliver the outcomes.

Once the “what” and “how” are understood by the SPIG participants, the third step is to promote the outcomes to the widest possible stakeholder groups and the community as a whole.

3.3 Compatibility with possible national implementation

The recent Productivity Commission report into “Waste Management and Resource Efficiency” (see draft at http://www.pc.gov.au/inquiry/waste/draftreport/waste.pdf) identified considerable benefits if such waste management and resource recovery issues were:

- planned and coordinated nationally by the federal government, since the generators, end users and materials themselves were no longer respecters of state boundaries
- regulated and implemented by the state jurisdictions within a national framework of extended producer responsibility
- such a national framework of systems, infrastructure and common capabilities could then be supplied by appropriately funded councils and regional groups of local government, whose focus would be on collection and common levels of service provision

The SPIG initiative and deliberations are entirely compatible and supportive of any such nationally planned framework.

4 Towards zero waste

The following is a high level conceptualisation of the physical and economic systems and infrastructures that are seen as essential to support the SPIG vision of Australia becoming a sustainable, conservation-minded, recycling-minded and resource-efficient society.

The SPIG Steering Group has been made aware that a number of jurisdictions have adopted zero waste stretch goals and are advocates for a biomimicry approach.

In comparison, the Productivity Commission takes an overly technical, thermodynamic position and rejects “zero waste” as even remotely possible.

The Boomerang Alliance adopts “Towards a zero waste society: a vision for a national extended producer responsibility approach”.

LGSA accepts the waste hierarchy as a “valuable and complementary tool” and prefers “upstream” solutions which avoid waste rather than overly complicated “end of pipe” solutions to divert or treat waste. LGSA advocates for resource efficiency which should result in “little or no residual waste”. The LGSA attempt to visualise a sustainable outcome is addressed in its “Beyond Recycling” (2004) publication.

ACOR supports a “net benefits” approach to choosing optimal resource recovery options.

Clearly there are aspirational goals adopted in the above that need clarifying and consolidating if they are to align with the achievement of the SPIG objectives.

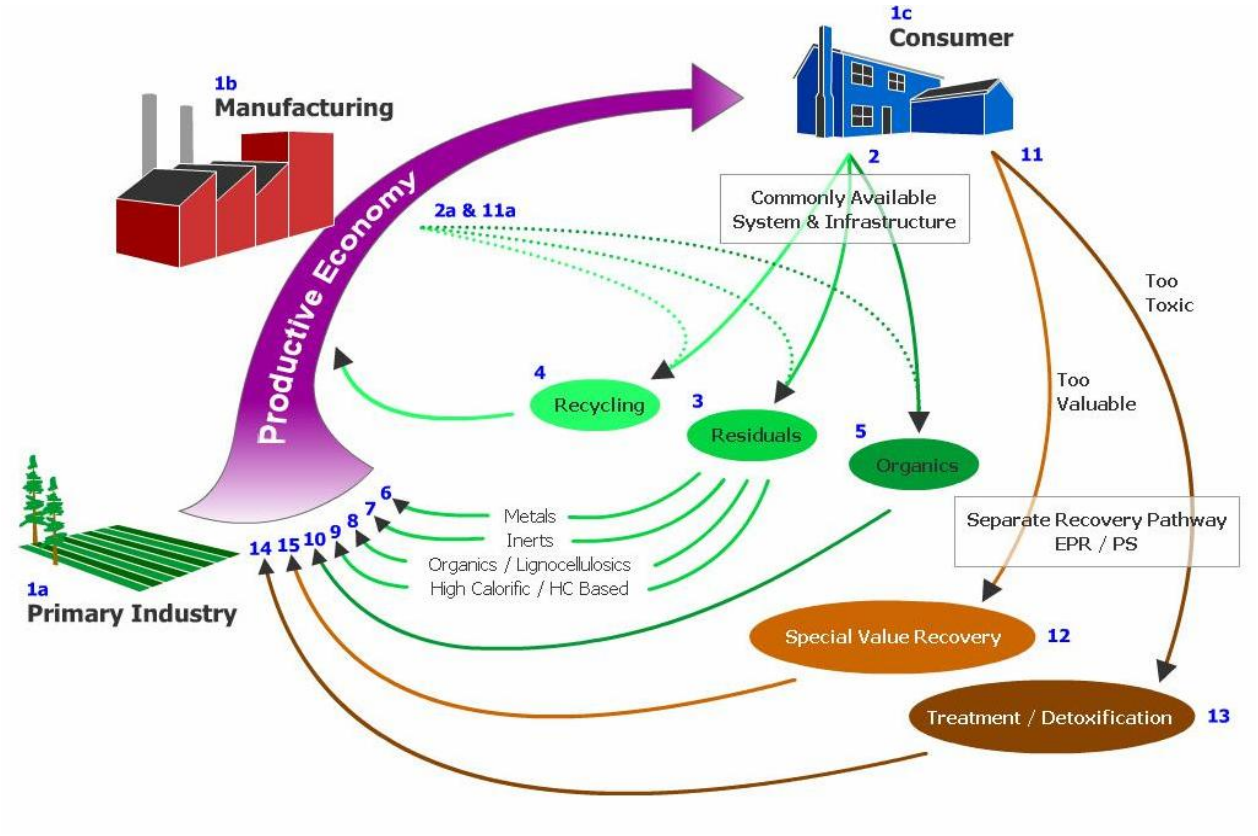
What follows is an attempt by the SPIG co-chairs to synthesise the hopes and aspirations of the collaborating parties into a more practical and workable description of what a zero waste or biomimicry future may look like.

Certainly, if SPIG can agree on the stretch goal, it will greatly inform the SPIG task of facilitating the transition from the prevailing wasteful paradigm to the “recycling and resource efficient society” as advocated in the SPIG vision.

Figure 1 is a high level and figurative concept of the material flow pathways needed to achieve a zero waste future. The numbers **1** to **15** relate to the brief explanations following the figure of the physical and/or economic conditions that exist at each point.

Most important is that if the member organisations can agree on the basic structure of the resource recovery systems, infrastructure and capacities needed as they are outlined below, the scoping and definition of the SPIG implementation strategies will be relatively straightforward.

Figure 1: Conceptualisation of zero waste physical and economic pathways



***1* The productive economy** *– refers to all the collective activities that make up society's use or demand for goods and services as measured currently by GDP.*

***1a* Primary industry** *refers to all the primary or original inputs into the productive economy whether from farms, quarries or mines. Most, if not all, of these inputs require later transformation, value-adding or distribution systems to reach the consumer.*

***1b* Manufacturing** *refers to the various and aggregated converters, processors and value-adding processes, including their respective transport operations, that prepare the accumulated resources to present to the consumer in a form that is readily consumable.*

***1c* Consumer** *refers to both the individual consumer, and society as a whole, with needs and demands to be satisfied with material or resource-based goods and services.*

***2* Point of discard for metropolitan solid waste (MSW)**

This post consumer discard option refers to mainstream, regular domestic discards.

*This activity is differentiated from **11** — the occasional discard of bulky, valuable or hazardous materials.*

The individual consumer can make a big contribution to overall resource use and resource value recovery outcomes by being selective in their choice of goods and

*services. This is a vital decision-making point with regard to dematerialisation in the provision of goods and services. For example, the decision to use goods and services such as photocopiers, carpets, cars and so on without having to own them has a direct and reciprocal effect on the systems and infrastructure to facilitate or hinder the dematerialisation outcomes. In the supply and demand relationship between industry and consuming society, only those goods and services for which there is a clearly articulated and communicated demand or need will be made (**1b**). In turn, this will affect the demand for primary resources (**1a**).*

The conscious act of discarding spent, surplus or otherwise unwanted materials by individual members of the community can significantly affect the level of net resource value recovered in any reverse logistics or systematic resource recovery system. It is therefore an important focus for education programs and must be supported by commonly available and easily used discard systems. The current commonly provided containerised, kerbside collection systems are a perfectly acceptable starting point.

*The main residuals disposal channel **3** meets the statutory public health and safety obligations. The provision of a specialised discard option for dry recyclables **4** and organics **5** is only of net benefit if the consumer uses the receptacles as intended and the environmental, social and economic benefits outweigh the costs. Where a particular individual unnecessarily cross-contaminates the dry recyclable or organic containers, the quality of the stream and its net resource recovery value is lost or jeopardised.*

*Once discarded to the appropriate and available receptacle, the materials require collecting and transporting to the respective first points of receival **3**, **4**, and **5**.*

***2a* Point of discard for commercial and industrial (C&I) waste**

The manufacturing sector produces a range of wastes that share many mutual characteristics with the materials discarded by consumers. This results in potential synergies from processing or recovering the highest net resource value from these materials within the same systems and infrastructure. It therefore warrants detailed analysis.

A feature of C&I materials from individual generators is that they tend to be similar in characteristics week-in, week-out — e.g. a furniture factory generates timber waste or a clothing factory generates fabric scraps and so on. Because there are often inappropriate collection systems for these materials they are strong candidates to be value-added as by-products rather than being managed as mixed wastes.

***3* First point of receival for residual MSW**

The first point of receival for residual MSW is traditionally undertaken as discharge direct to landfill disposal or transfer station. At the transfer station the individual loads are consolidated for later transport to landfill.

Since there are problems with both simple disposal and consolidating loads in traditional transfer stations, both of these functions need to be completely replaced in a sustainable society. Under the SPIG vision the disposal activity becomes the

*new "filling land" activity (see **7** below) , and the load consolidation (transfer) function is replaced by the first process stage in separation of the residual MSW into at least its generic material types — metals **6**, inerts **7**, biomass **8** and hydrocarbon-based fractions **9**. Whilst these separated fractions will require further processing at specialist facilities, any later transport stage is justified to aggregate like materials rather than unnecessarily increasing heterogeneity and causing mixture and cross-contamination problems.*

*This process stage is effectively the first definable function of what is now loosely described as alternative waste technology (AWT). Whilst some AWT sites may include first point of receival **3**, later material processing and final beneficiation **6, 7, 8**, **9** to the standard needed for optimum reuse back into the productive economy **1**, the functional specification for the first point of receival function is determined by catchment and collection vehicle run efficiencies. The optimum size and operating efficiency of the plant required to reprocess the individual streams, and final beneficiation **6, 7, 8**, **9**, is not derived by catchment but by issues of process efficiency. Such specialty process plants might receive specialty feed from a number of first-point-of-receival or primary separation sites.*

The metals, inerts, biomass and hydrocarbon fractions will have residual cross-contamination when forwarded as semi-homogenous streams. This will facilitate more stream-specific processing on receival, especially the biomass and hydrocarbon fractions.

***4* First point of receival for dry recyclables**

The first point of receival for dry recyclables is traditionally the materials recycling facility (MRF) that will sort the materials into their generic types — paper, cardboard, plastics (by polymer)), glass (by size and colour), metals (ferrous and non ferrous) and remove the contaminants.

*Whilst this process could benefit from optimisation and de-bottlenecking, an installed processing capability is emerging in the larger urban areas/centres and cities that mostly requires only incremental development rather than the type of wholesale change that is needed for residuals **3**.*

Most products from MRFs require beneficiation, either at the end user's facilities or before they are accepted at the end user's plant.

Further development in this sector is likely to emerge as more secure markets and outlets are defined. Returning the dry recyclables back into the productive economy at their most cost-effective highest net resource value or beneficial point needs to be developed in line with the recovered materials' inherent properties. At present many such materials are being captured as cheap inputs to the original manufacturing sector, which may not represent the HNRV outcome.

***5* First point of receival for organics**

Whether straight garden waste, or biowaste (kitchen scraps included), organics need to be sorted and decontaminated before being processed physically, aerobically, anaerobically or thermally (drying/carbon concentration).

The source-separated organics processing industry is an emerging one and as the market matures for its products the specific functions required for recovering the highest net resource value will become better defined.

Certainly the compost sector needs to be supplemented with other technologies, and products that can:

- *concentrate the resource value available from the raw materials*
- *increase the resultant product value to facilitate wider geographic markets*
- *demonstrate greater value to end users and therefore optimise the return of these materials back into the productive economy.*

6 Return of materials into the productive economy — metals

The metals recovery industry is a very advanced sector throughout the world that is based on high values of recovered metals (relative to extraction of new metals from virgin ore), meeting the specific needs of the market. The sector has established market organisations (LME, CBT etc.) and clear product specifications that allow or facilitate "unseen" trading. In most respects, the processes, systems and infrastructure developed and operated in the recovered scrap metals sector have many positive lessons for the future development of all the other product streams available from urban wastes considered by SPIG.

*The partially processed metals emerging from the dry recyclable stream **4**, the processing of residual MSW **3** and organics **5** all require further processing, decontamination, sorting and preparing into recognised product grades. Existing scrap metal yards currently undertake these functions. Little other than incremental optimisation and occasional system de-bottlenecking would seem to be required to streamline the reintroduction of metals back into the productive economy.*

7 Return of materials into the productive economy — inerts

Inert materials in urban waste streams are the biochemically inert, fully mineralised materials and residues that are usually ballistically separated such as dust, sand, gravel, masonry, ceramics, glass undersize and fines and miscellaneous building materials. In many cases these materials can be processed to produce civil aggregates and fill materials if fully separated from residual materials such as metals, biomass, organics and hydrocarbon-based materials.

At worst case, these materials may be applied to "filling land" in the highest net resource value introduction back into the productive economy. This application, "filling land" so that selected sites can be brought back into optimum beneficial use to the land development sector, is an entirely different outcome to the existing landfill disposal sector. Using these materials by presenting them as land-filling products produces remediated land that itself will have a much broader range of productive uses.

As the WMAA NSW Landfill Working Group presented in its submission to SPIG (Draft Discussion Paper – Rev 3 20/09/02), landfill has only four legitimate functions in a sustainable society:

- ***filling land*** *— to remediate extractive industry voids or to be used in civil projects*

- ***storage*** *— to manage the inventory imbalances of suitable materials whose current rate of presentation is in excess of the prevailing market's current needs*

- ***remediation and stabilisation of putrescible material streams*** *— to ensure minimum public health outcomes are maintained until the alternatives are systematically available. Remediation and stabilisation of putrescibles is a traditional function for landfill in the current waste management paradigm. Its ongoing need and cost-effectiveness needs to be objectively benchmarked against alternative waste treatment and resource recovery options. This needs to include a detailed valuation of the lost opportunity cost inherent in these operations. As SPIG strives to achieve its vision, this application for landfill will be relegated to a transitional function*

- ***failsafe*** *— to provide a last resort disposal option. Since the optimum resource recovery systems and pathways depend largely on the availability of mechanical or process pathways and market dynamics to maintain reliable outcomes, absolute system disruption or failure could occur. Since the rate of urban waste generation is disconnected from the markets for recovered resources, a last resort outlet for the materials must be available.*

These four functions for landfill present their own specific performance specifications which in turn inform the outcomes for (re)engagement with the productive economy. However, none of them includes the current practice of wasteful and unsustainable disposal.

8 Return of materials to the productive economy — mixed organics and biomass

Mixed organics and biomass traditionally comprise 50–60% of residual MSW by volume and weight. They consist of:

- *contaminated paper and cardboard*
- *recyclable paper and cardboard that was not discarded to the dry recycling channel*
- *garden waste that was not discarded to the organics channel*
- *food and kitchen waste that was not discarded to the organics channel*
- *wood and woody materials.*

This material gives the residual MSW its putrescible properties and generates the majority of the potential impacts that require residual MSW to be treated in the interests of public health.

By recovering this fraction from the mixed residual MSW stream, there will initially be certain physical and chemical contaminants that:

- *need to be physically removed where practical*
- *need to be chemically measured and assessed*
- *will determine what beneficial end uses the material can be put to.*

Composting can stabilise the material and produce a product suitable for application to land — subject to residual levels of physical and chemical contamination.

Digestion can also stabilise the material and produce an energy (biogas) product and digestate that could also be applied to land. Again, this is subject to the residual levels of physical and chemical contaminants.

Where the quality of the material is unsuitable for composting or digestion, other drying or carbonising processes may be appropriate to not only stabilise the material, but to produce concentrated (organic) carbon-based products for industrial or other land application uses.

*These materials are more problematic than those derived from source-separated organics **10.** However, in a carbon-constrained world, these renewable biomass sources have a wide range of potential uses and present opportunities for introduction back into the productive economy.*

9 Return of materials to the productive economy — high calorific and hydrocarbon-based materials

This fraction of residual MSW is usually 20–30% by volume and consists of:

- *unrecycled plastics*
- *unrecyclable plastics via the usual MRFs **4***
- *textile, clothing, footwear that wasn't recycled*
- *rubber, floor coverings, soft furnishings.*

If it is derived by mechanical sorting this fraction will often have a cross-over timber content. Properly sorted and processed, it can present back to the productive economy as:

- *recovered polymers*
- *carbon products (reductants)*
- *energy products for heat and power.*

No systematic resource recovery pathways (facilities) exist for this fraction in Australia at present. However, subject to stringent environmental controls and host community support and with adequate sorting, decontaminating and processing

these materials could be beneficially applied to existing facilities such as kilns, power stations and certain industrial metallurgical plants.

10 Return of materials to the productive economy — source-separated organics

*By the nature of their dedicated discard **2** and later streaming and processing, the products manufactured from source-separated organics are likely to be uncontaminated and suitable for application to land as quality soil conditioners and fertilisers.*

As composted products, they are likely to be light, bulky and have in excess of 50% moisture content. In the current market, these materials have difficulty justifying the transport needed to reach distant markets. This in turn places emphasis on the balance between the supply and demand for such materials within any particular locale. Such composts produced in excess of the local demand will need to be significantly value added to facilitate the viable presentation in more distant markets.

11 Point of discard — occasional, bulky, valuable or hazardous materials

*As a quite defined fraction there are a wide range of items and materials that by their nature and usage patterns are not discarded by the regular **2** MSW channel, and that currently present:*

- *as bulky or hard waste council collections*
- *dropped off by individuals to disposal or transfer facilities*
- *inappropriately discarded with regular MSW materials*
- *as charity donations*
- *to special collection sites and events.*

These materials include:

- *household hazardous wastes such as paints, oils, fuels, garden and pool chemicals, smoke detectors, batteries*
- *electronic appliances such as communication appliances, computers, entertainment equipment*
- *white and brown goods including appliances and furniture.*
- *soft furnishings/bedding and household textiles*
- *household bric-a-brac such as books, games, clothing, tools and toys*
- *light building materials such as doors, windows, kitchens and timber*
- *scrap metals such as large quantities of various metals, batteries and motor vehicle parts*

- *garden refuse comprising organic material from residential gardens, gardening contractors and tree loppers that missed the organics collection*
- *traditional dry recyclables such as paper, cardboard, glass, plastics, liquid paperboard, metals and textiles in excess of the dry recyclables collection system*
- *other light building materials such as aggregates, clean fill, glass, spoil and rubble*
- *council cleanup items comprising a mixed variety of discards.*

These materials retain the following features or defining characteristics:

- *they are occasional or discretionary discards*
- *they are specifically prohibited from regular MSW discard options **2***
- *if processed with regular MSW their full inherent resource value will not be realised or their toxic characteristics will degrade the quality of the products available from MSW materials **6, 7, 8, 9**. Because of this they are often most suitable as candidates for product stewardship or extended producer responsibility schemes.*

In a dematerialised, service-style economy many consumer services can only be delivered by the provision of certain material content — floor covering services need carpet, climate control services need air conditioning units, beverage provision needs containers and so on. If these service-style offerings are to achieve their highest material resource use, they will need common resource recovery systems, infrastructure and pathways.

*The prevailing discard options for these materials are not available with the same degree of uniformity as for MSW **2**. A systematic and reliably available resource recovery pathway is a major potential outcome from the SPIG initiative.*

11a** **Point of discard — valuable or toxic C&I

*The same manufacturers that produced the materials presenting as **11** are likely to produce wastes and by-products of their own that could stimulate the value recovery or treatment capabilities that could beneficially process the post-consumer sources of the same materials (e.g. household hazardous waste and waste electrical and electronic equipment, batteries).*

Or vice versa, the value recovery or treatment capabilities that are established to accept post consumer materials could process the similar by-products that arise from the originating manufacturing processes.

Where product stewardship and extended producer responsibility strategies are adopted, the eventual processing and resource recovery options may address both the MSW and C&I sources.

12 Special value recovery facilities

*Material such as appliances, furniture, electronic items, building materials and metals cannot be discarded or processed by the regular MSW **2** resource recovery option. Even if they could, their full inherent resource value would not be realised by that style of processing. It is therefore necessary for special value recovery facilities to be established.*

13 Treatment and detoxification facilities

*If they are discarded with regular MSW **2** and processed with them, materials such as household hazardous waste and some electronic items will contaminate the simple products available from such materials **6, 7, 8**, **9** and threaten the opportunity to specifically treat or recover value from the materials.*

Treatment and value recovery of these materials is optimised where critical volumes are available to justify the facilities, which requires an integrated "reuse logistics" framework to supply materials for treatment from multiple point sources.

Such facilities do not currently exist for this specific application other than some nascent single issue schemes and arrangements.

14 Return of materials to the productive economy — treated toxics and household hazardous

The treatment of metals in electronics and chemicals in household hazardous waste is a highly specialised area. These materials require highly specific pathways back to the productive economy.

Market forces are establishing that mineral oils require only two to three facilities to service Australia. The consumer battery sector has identified that one specialised facility is required for its purposes. These facilities require cost-effective reverse logistics pathways to be established from discard to processing to make them viable.

In the event that systems and aggregation pathways for these materials are not established:

- *the materials will continue to present as critical contaminants in a wide range of other MSW and C&I recovered product streams*
- *the inherent value in the materials themselves will be lost*
- *environmental degradation is bound to ensue in some form or another.*

Once satisfactory return pathways have been established — preferably through a collaborative product stewardship and extended producer responsibility scheme — the originating manufacturers and appropriate regulators will have established a firm basis for the design of future products.

***15* Return of materials to the productive economy — special value recovery**

Of the materials that are recovered in some form or other via charity or opportunity shops, clothing bins and localised drop-off facilities, the current process is not systematic, streamlined or cost-effective.

Whether for reuse, parts, disassembly or resale, the opportunity exists to streamline and systematise this pathway.

4.1 Summary

The Preliminary Gap Analysis begins the process of identifying specific systems and infrastructure items and capabilities that are needed if Australia is to become a "recycling-minded and resource-efficient society". Whilst this preliminary gap analysis can substantiate the need for a wide range of actions and initiatives, it does throw up some major fixed infrastructure requirements to achieve the SPIG objective of developing a systems and infrastructure plan and facilitating its adoption and implementation.

Preliminary gap analysis of systems and infrastructure needed for sustainable resource recovery

Node #	Function	Unsustainable feature of existing service provision	Features required to facilitate sustainability	Focus for SPIG initiative – action list
1	Productive economy	▪ Predominant focus on one-way consumption of primary resources ▪ Nascent, inefficient or non-existing reintroduction of recovered resources and energy back into productive economy as reliable inputs ▪ Unsustainable wastefulness of post-consumer materials and resources ▪ A prevailing waste management and disposal paradigm rather than a primary focus on systematic resource recovery as the primary focus	▪ Establish purpose-designed resource recovery, reverse logistics systems and infrastructure so that MSW and C&I materials can present back as quality-assured inputs to the productive economy without needing to apologise for their origins ▪ The cost of such an optimised system, net of the resource value created to substantiate the "service fee" or waste management charge (if any) to be recovered from consumers, ratepayers, taxpayers as is most cost-effective	▪ Scope, design and specify the systems and infrastructure needed to achieve the SPIG objective ▪ Facilitate the presentation of quality-assured recovered resources as reliable inputs back into the appropriate entry points in the productive economy
1a	Primary industry	▪ Currently providing all or most of the resource and energy inputs	▪ To supplement the provision of primary resources to the greatest extent practical and cost-effective with recovered resources and energy	▪ As above

Node #	Function	Unsustainable feature of existing service provision	Features required to facilitate sustainability	Focus for SPIG initiative – action list
1b	Converting and manufacturing	▪ Provision of the widest range of goods and services to the consuming society with insufficient regard to: ▪ the defined actual need ▪ the depletion of primary resources to meet the demand ▪ the optimisation of potential by-products from materials currently presenting as wastes ▪ the sustainable post-consumer fate of the goods and services provided	▪ Post-consumer resource and energy value recovery systems and infrastructure to minimise life cycle impacts ▪ Goods and services to be designed to facilitate the optimum resource and energy value recovery via the available resource logistics systems and infrastructure	▪ As above
1c	Consumer	▪ Over-consumption of resources and energy ▪ Sustainable societal wants and needs not accurately provided for by the providers of the goods and services ▪ Lack of available options for even the conscientious consumer to discard spent, surplus and unwanted resources to optimise the recovery of the inherent resource and energy values	▪ Provide the full suite of convenient and cost-effective discard options and resource recovery pathways to minimise the sustainability impact for each individual and society as a whole	▪ As above
2 & 2a	Regular MSW and C&I discard option	▪ Most metropolitan residents have access to dry recycling, residual MSW and source-separated organics discard options, but inter-jurisdictional variations exist that confuse residents and mitigate against universal and appropriate usage	▪ The widespread availability of dry recyclable, residual MSW and source-separated organics discard options for residents and industry to be systematised and made universally available ▪ Advocacy for appropriate and universal use	▪ Analyse operational needs for similar materials whether sourced from C&I or MSW ▪ Advocate for common levels of service provision to optimise participation and product quality ▪ Particular emphasis on increased access and availability for source-separated organics discard

Node #	Function	Unsustainable feature of existing service provision	Features required to facilitate sustainability	Focus for SPIG initiative – action list
3	First point of receival and processing for residual MSW	▪ Current landfill disposal is a focus of SPIG to avoid ▪ Current transfer stations further degrade the material by increasing heterogeneity and cross-contamination	▪ Phase out landfill disposal until only legitimate landfilling is practised 7 ▪ Completely replace existing transfer station technologies with initial sorting and streaming technologies	▪ Assess residual capacities at landfills to meet revised requirements ▪ Scope and design "value adding" transfer station technologies and network ▪ Facilitate introduction of sustainable new systems
4	Resource recovery at MRFs	▪ Existing discard options and MRF systems and infrastructure are well established ▪ Markets for recovered materials are limited in scope and value	▪ Incremental optimisation and de-bottlenecking of the systems ▪ A wider range of products and grades need to be developed to supply a wider range of end uses	▪ Facilitate optimisation and streamlining of existing systems ▪ Identify and develop a wider range of markets
5	Organics receival and processing	▪ Current collection is not universal ▪ Processing is focused on simple composting ▪ Market is supply-pushed and does not reflect or reward product quality sufficiently	▪ Introduction of a greater range of processing options, leading to a greater range of quality-assured, value-added, biomass-based products ▪ High value products to expand the marketing range and potential from such renewable resources ▪ Development of concentrates and carbon derivatives	▪ Facilitate the development of alternative markets for biomass-based materials
6	Metals return to the productive economy	▪ Very advanced sector in terms of market mechanisms, systems, infrastructure and capabilities	▪ Increased extraction of metals from all streams of MSW for presentation to the existing scrap industry	▪ Learn from the metal sector to develop systems, infrastructure and marketing of recovered resources back into the productive economy
7	Inerts return to the productive economy	▪ Currently lost to expensive putrescible landfill, adding economic cost for little value and consuming hard-to-replace landfill air space	▪ Landfilling or disposal of MSW and C&I wastes to be phased out	▪ Adopt the revised roles for landfill 7 ▪ Advocate the position on landfill to third parties

Node #	Function	Unsustainable feature of existing service provision	Features required to facilitate sustainability	Focus for SPIG initiative – action list
8	Mixed organics and biomass return to the productive economy	▪ These potentially valuable renewable resources usually present as costly wastes to be remediated and stabilised before being lost to disposal	▪ The highest net resource value from these materials needs to be realised by the removal of contaminants and the provision of systems and technologies to make products that recognise their renewable qualities	▪ Facilitate the separation of this fraction from MSW and its processing into sustainable products and energy
9	High calorific and hydrocarbon-based materials return to the productive economy	▪ Most of these materials are lost to landfill disposal without any systematic recovery of their inherent resource or energy values	▪ These materials need to be separated from the general MSW materials and streamed to specialised facilities that will recognise and recover their inherent resource values	▪ Facilitate the separation and streaming of these materials to resource and energy recovery options ▪ Facilitate the development of facilities and markets for the products available from these non-renewable resources
10	Source-separated organic products return to the productive economy	▪ A limited range of facilities and technologies available to fully exploit the market potential from these resources ▪ Sector is supply-pushed with a detrimental impact on market prices	▪ Increase range of facilities and technologies to produce a wider range of organic carbon-based materials and products	▪ Facilitate the development of a wider range of biomass-based products and services ▪ Seek to redress supply and demand dynamics to see more market pull and less supply push
11, 11a, 12 & 13	Discard of bulky, valuable or hazardous items and materials from MSW and C&I where appropriate	▪ Currently most such materials are: ○ discarded inappropriately to residual MSW ○ collected by occasional council kerbside services for disposal to landfill ○ returned to charity or opportunity shops ▪ No convenient, systematic disposal and value recovery pathway exists	▪ Scope and develop a cost-effective network of drop-off facilities that can also act as hubs for local collection services in conjunction with: ○ product stewardship and extended producer responsibility schemes ○ local government ○ charities ○ product manufacturers and retailers	▪ Scope and develop the drive-through or convenient drop-off network facilities ▪ Facilitate their introduction ▪ Advocate for their adoption of 'drive-through recycling facilities'

Node #	Function	Unsustainable feature of existing service provision	Features required to facilitate sustainability	Focus for SPIG initiative – action list
14	Recovered metals and chemicals from treated toxics and hazardous materials return to the productive economy	▪ Some limited, special-occasion collections or bring-back services ▪ Mostly lost to residual MSW as degrading contaminants with potentially harmful environmental consequences	▪ Facilities and capabilities to convert these materials into recognisable products and materials for beneficial input back into the productive economy	▪ Encourage and facilitate the development of highly specialised processing facilities
15	Special value recovery and return to the productive economy	▪ Existing drop-off, charity, opportunity shop resource recovery pathways are barely cost-effective	▪ New drive-through and drop-off facilities to be scoped and delivered as a coherent network	▪ Work to include existing operators and operations into the new network of specialist drive-through and drop-off centres

4.2 Major systems and infrastructure capabilities and practices

The following list highlights and summarises the major or most significant areas of change identified in the Preliminary Gap Analysis.

Node 1 – Manufacturing

- Appropriate assignment of extended producer responsibility to manufacturers, requiring them to take life cycle responsibility for the impact of their products and services
- Rigorous regulatory provisions which use economic incentives and impose sanctions as required to encourage / mandate industry accountability.

Node 3 — First point of receival and processing for residual MSW

- Review existing landfill capacities in any particular region to ensure the availability of the revised services required (Node 7).
- Scope and design “value adding” transfer station technologies, both where operated in isolation and where operated in conjunction with subsequent processing plants — for one or more of the 4 streams generated.

Node 5 (& 8) — Organics processing and marketing

- The traditional composting of such materials is limiting the market potential for products derived primarily from such inputs.
- Not withstanding the cost-effectiveness of the composting process to produce products of tangible benefit as soil amendments and fertilizers,
    - The markets are geographically constrained due to compost’s inherent value/bulk density issues.

- The low entry cost into the compost sector has seen a “supply pushed” industry develop that has established unsustainably low product pricing in the market.

- The fit-for-purpose/net product benefit balance equation for customers has not been established sufficiently as to provide a reliable base for simple marketing initiatives.

- Knowing the inherent properties of both source separated and MSW derived organic streams, products need to be developed that defined markets actually want/need and that they will pay a premium for. Such products must not be transport constrained.

Node 9 — High Calorific / Hydrocarbon materials marketing

- Once these materials can be systematically separated (at Node 3) so as to present as a reliable stream of resource, the potential markets/end uses can be stimulated including:

  - The potential for polymer recovery

  - Facilities to beneficiate the materials to produce proprietary fuel products for kilns, power stations and/or metallurgical processes subject to stringent environmental controls and host community support (see WMAA EfW Sustainability Guide and Code of Practice for possible framework).

Nodes 11, 12, 13, 14 and 15 — The development of a network of drive through recycling centres

- Provide (or initiate) the focus to develop and refine the systems and infrastructure and stakeholder participation that will eventually become the network of facilities that will manage all the valuable, toxic or occasional discards that are currently lost to disposal for the lack of a systematic resource recovery channel.

This initial and high level comparison between existing and required resource recovery systems and infrastructure demonstrates:

i) That considerable more work is required in the detail, to scope and refine the definitive network of systems and infrastructure needed

ii) That SPIG can not deliver such an ambitious program alone

This suggests a revised program delivery strategy for SPIG.

5 Suggested steps to progress the SPIG initiative

The following suggested action plan seeks to build on the collective strengths and capabilities of the participating organisations and to produce tangible results at each stage.

Now that the size of the task is coming into focus, SPIG needs to leverage off this initial work to stimulate broad community agreement that:

- there is a problem
- new systems and infrastructure are essential to produce a lasting and sustainable outcome
- the SPIG proposals are the most cost-effective solution.

The preliminary gap analysis highlights the multi-million dollar investment needed in systems and infrastructure and the fact that little other than speculative investment will occur without a clearly articulated and coordinated plan being established. SPIG could strongly influence the emergence of such changes.

In addition, SPIG would need considerable funding to deliver this ambitious outcome. Such funding will not be available until there is widespread stakeholder agreement and engagement in the concept and project.

The suggested SPIG implementation model builds on existing capabilities and strengths as a platform for future project expansion and implementation.

The following step-wise approach is proposed.

Step 1 — SPIG steering group take the necessary steps to reach broad agreement on the systems and infrastructure needed for Australia to become a "recycling-minded and resource-efficient society".

Step 2 — The four current separate SPIG participating organisations canvass and debate individually and collectively the concepts agreed by the steering group in Step 1.

Step 3 — The steering group develop an agreed systems and infrastructure plan as the basis of:

- an invitation for other important stakeholder groups to join the SPIG initiative. Examples of potential groups are the Department of the Environment and Heritage (DEH), industry manufacturing groups, Australian Local Government Association (ALGA), specialist product groups (batteries, WEEE, Household Hazardous Waste)
- attracting funding for ongoing program development and implementation.

Attachment A: Steering group membership

Name	Representing
Tony Wilkins	Publishers National Environment Bureau (PNEB)
Tony Kanak	Commpost NSW
Ron Wainberg (co-chair)	Alternative Waste Technology Derived Organic Rich Fraction (AWT/DORF) Committee
Mark Glover (co-chair)	Waste Management Association of Australia Energy from Waste Division
Nav Brah	Landfill Division
Mike Ritchie	Waste Management Association of Australia NSW Branch
John Cook	Biosolids
Jeff Angel	Total Environment Centre (TEC) / (NPC)
Dave West	Boomerang Alliance
Bob Verhey	Local Government & Shires Associations (LGSA)
John Lawson	Australian Council of Recyclers (ACOR)

References

Documents submitted to or prepared with the SPIG Steering Group:

WMAA NSW Landfill Working Group, *Draft Discussion Paper – Rev 3*, 20/09/02

Mark Glover, *SPIG Working Paper 1*, April 2006

Warnken Industrial & Social Ecology (WISE), *Australia as a Recycling and Resource Efficient Society: Defining the Vision*, August 2006

Publicly available Productivity Commission submissions (http://www.pc.gov.au/inquiry/waste/subs/sublist.html):

LGSA of NSW	-	Submission No. 98
The Boomerang Alliance	-	Submission No. 54
ACOR	-	Submission No. 40
WMAA NSW Branch	-	Submission No. 1
WMAA SPIG	-	Submission No. 76
WMAA EfW Division	-	Submission No. 82