# Inquiry into waste generation and resource efficiency

**Productivity Commission**

## CSIRO submission

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CSIRO makes this submission to the Productivity Commission Inquiry with primary reference to the adequacy of current data on material flows and its impact on resource efficiency recovery, economic activity and government policy development. Secondary reference is made to strategies for reduction of waste volumes and the greater acceptance of recycled materials.

## Introduction

Improving Australia's performance on managing solid waste is a crucial part of the Government's approach to sustainable development. Strategies to address solid waste need to fit into a wider framework in order to achieve more sustainable use of natural resources while promoting flows for goods and services that are sustainable. The strategies must be well integrated with other Government strategies and policies

The underpinning challenge of sustainable development is to establish models of development that are more efficient in its use of natural resources. Additionally, there is sound business sense in making environmental best practice the norm to further drive reduction in waste disposal costs and increased re-use of recovered 'waste'.

The primary pressure from waste generation is the need for disposal, and the consequent environmental impacts. Currently, the main form of waste disposal in Australia is landfill, which accounts for over 95% of solid waste in some states and territories. The impact of landfill disposal includes consumption of increasingly scarce urban land through to the transportation of wastes to landfills located mostly on the fringes of cities.

Environmental levies and other economic instruments can provide incentives for behaviour that protects or improves the environment, and deter actions that are damaging to the environment. But there are also the potential significant gains through a paradigm change in thinking - from seeing waste as a problem to management of resources, so that productivity is increased and waste is managed in ways that underpin the goals of sustainable development; *e.g.*

- waste production is minimised through best practice, and
- solid by-products that are produced are viewed as potentially valuable resources rather than waste.

## A National Waste Database

Efficient waste management planning depends on reliable information about the quantity, types, locations and rates of generation of recyclable materials and resources. Strategic policies to promote markets for recycled products cannot be made without clear knowledge of waste quantities and types of materials. A comprehensive national waste information reporting system is needed to facilitate informed waste regulation, statutory controls and policy development.

CSIRO proposes that in order to achieve sustainable national solid waste practices a detailed and rigorous National Waste Database will be a crucial underpinning component.

A unified national waste database would provide a resource for those concerned with the planning, operation and performance of systems and facilities for the management of wastes in Australia as well as meeting our international reporting obligations.

In addition it would provide opportunities to identify where wealth can be made from waste resources or where waste minimisation strategies need to be applied where wealth opportunities cannot be identified.

A database would provide a nationally consistent set of data of baseline information on generation and spatial variation of waste from waste disposal, urbanisation, industrial pollution, mineral exploration and mining activities, while providing a platform on which potential land-use practices and uses for waste can be explored.

A further key element of the waste information shortfall is the lack of a centralised and accessible national waste information platform for rapid information access. Such a platform would facilitate better management of waste, both at local and national level, and facilitate more realistic planning for waste prevention and minimisation while ensuring informed decision making. A centralised data system would enable waste management to

be conducted in a responsible and environmentally sensitive manner, and to better manage the link between economic growth and ever-increasing waste production.

The database would also provide benchmarks for measuring national performance against set goals.

## Establishing the Database

To establish a database, national waste statistics along with an inventory of generation, disposal and recovery facilities of all major classes of the waste chain need to be collected and stored.

The database would need to address institutional and State disparities in data collection and reporting. The primary sources of data on solid and liquid waste streams are Federal, State and Local government agencies. Among this group, the main sources of data on solid waste streams are the defunct CRC for Waste Management and Pollution Control and State agencies and Environment Protection Agencies. Data are collected, stored and analysed according to guidelines issued by various agencies, but the compositional results of these samplings are not readily available and are unlikely to have been recorded in an accessible database for further reference and retrieval.

There is a need for National Standards to be established for data collection and for the database to include sub-categories such as inert waste disposal at landfills, sanitary landfills and secure landfills. Only then would it be possible to translate existing State systems into a truly National data system.

The ACT, NSW, WA, Victoria, SA and Queensland appear to have good waste data albeit available in an aggregated qualitative format. The extent, reliability and consistency of the data, as well as gaps, need to be assessed. Statistical methods could be devised to fill certain gaps. It is essential to develop further data collection protocols to achieve acceptable standards on waste streams in urban and regional Australia as well as facilitate geocoding of data with entries that possess a well-defined spatial component. Maps of specific waste streams would help to provide a clearer picture of waste "hotspots."

## Some Specific issues

Some specific issues that need to be addressed include:

*Waste definitions*

- A variety of waste classifications are presently used in Australia. These should be rationalised.
- Waste definitions are inconsistently used in the absence of nationally agreed waste classification standards.

*Waste monitoring methods*

- A diversity of methods are used to monitor wastes.
- Standardised waste analysis protocols should be adopted.

*Waste data*

- Comprehensive data are scarce and reliability can often not be determined.
- There is no uniform definition and classification system. This often prevents meaningful data aggregation and cross referencing.
- Data about quantities of waste generated, treated and disposed are sparse and disaggregated.

Current solid waste policies are developed on a waste stream basis. As such, current classification of waste is based on sectors of the economy that generates it (e.g., construction and demolition waste, mining waste, etc). This approach makes it difficult to identify wide ranging synergies between different waste streams in relation to impacts, re-use potential, legislative drivers and economic factors.

## Expected Outcomes

A nationally consistent waste database would provide baseline information on generation and spatial variation of waste from waste disposal, urbanisation, industrial pollution, mineral exploration and mining activities from which land-use practices and waste utilisation options could be assessed.

The database would provide waste generation trends essential in the setting of public policy.

The establishment of a national waste database would ensure:

- Convergence to a uniform national waste classification platform, incorporating standardised waste data collection, survey protocols and reporting methodology
- Production of waste map representations of the database showing the spatial variation of waste resources throughout the nation and within sub-regions that are of priority.
- Creation of protocols and tools to compare and evaluate data collected.

### Barriers to Market Development of recycled materials and products

Continued high levels of waste generation without significant levels of waste recovery and recycling imply a high level of resource wastage. Further, high levels of waste generation not accompanied by sufficiently high levels of recycling impose increasing demands for disposal. Therefore, targets for resource wastage and recycling need reviewing in conjunction with the development of new initiatives to improve recycling rates.

Central to market development strategies for recycled products is the need for demonstration projects and the development of technical standards to foster consumer confidence. As consumers and producers tend to favor virgin materials, the price of recycled materials and products has to be attractive enough to encourage a switch from using virgin materials to recyclates.

Waste materials and industrial by-products can be used in building construction in an unprocessed form (e.g. as fill material) or processed to a limited degree for use as aggregates in concrete, or used as raw material for manufacturing building products. This reduces the need for extraction of virgin materials. The basic properties required for technical acceptance should be that they can perform their intended functions throughout the design life without being deleterious on the environment or associated constructional features.

For instance, many components of construction and demolition waste are readily recyclable and have the potential to replace up to 10% of virgin raw materials. In order to promote the sustainable use of raw materials, various possibilities for recycling the components should be demonstrated.

A number of interesting observations can be made about the engineering aspects of recycling. A few countries require recycled materials to meet the same specifications as natural materials and provide equal performance in the field. An approved product list is generally not used; ultimate performance is the determining factor in promoting the use of recycled materials. In Australia there is still concern that many engineering test methods do not predict true field performance.

Market expansion for eco-friendly products also depends on providing users with product information but evaluating the products requires technical standards based on acceptable test methods. This approach should be underpinned by government efforts to promote recycling and concurrent development of technical specification for the use waste;  for example, *CSIRO's Guide to Use of recycled concrete and masonry material HB 155-2002* (published by Standards Australia).

### Resource consumption analysis

Life cycle tools are now being applied to assist in the identification of environmental benefits of waste management techniques, but such tools require up to date data. The development of new decision support tools to assist in the implementation of strategies is also important.

There is a need to quantitatively assess those key human activities which have the potential to significantly impact the rate at which we consume natural resources and generate pollution and waste. While many of the activities and processes examined have negative impacts on the natural environment, analysis should also aim to identify where opportunities have emerged for mitigating or relieving pressure on the environment, whether it be through changes in production practices, technological innovations or consumer preferences.

There are a number of methods for assessing material, waste and energy stocks and flows. While the ecological footprint tool represents one approach, a more comprehensive method of analyzing 'stocks and flows' incorporating each of the identified sectors and activities should be considered.

CSIRO's *Australian Stocks and Flows Framework* (CSIRO Sustainable Ecosystems 2002) represents one possible approach to assessing the physical processes. The model uses a series of 'calculators' which, "account for the physical processes of buildings, transport, construction, manufacturing, energy supply, agriculture, forestry, fishing, mining, land, water and air resources and international trade" within the Victorian context. The CSIRO model could provide an account of current and past stocks and flows within and across the identified activity sectors.

A key question is whether policy and economic instruments on waste should be used to help secure the wider resource productivity agenda. For example, landfill tax instruments aim to discourage waste disposal at landfills. However they also have an added benefit of ensuring external costs are reflected in disposal price which increases efficiencies of the waste market and helps promote innovative uses of resources. This provides economic incentives for consideration of alternatives to landfill.

Thus taxes and other economic instruments can provide incentives for behaviour that protects or improves the environment, and deter actions that are damaging to the environment. For both consumers and businesses, these instruments can enable environmental goals to be achieved at the lowest costs and in the most efficient way. By internalising environmental costs, they help to signal the structural economic changes needed to move to a more sustainable economy. They can also encourage innovation and the development of new technologies. The Government has already discussed its approach to environmental taxation with a range of stakeholders.

Step-change innovation in waste treatment and waste recovery processes is needed. However, this will require a shift in thinking, from seeing waste as a problem to seeing it as management of resources, so that we increase national resource productivity and manage waste in a way that underpins goals for sustainable development and a cleaner environment.

There are many opportunities for step-change innovation if large-scale wastes are regarded as potential resources, legislative barriers to utilising wastes are removed, and waste disposal costs are fully internalised. Just two examples are:

- Red mud from bauxite refining is an iron-rich material which could be utilised as a soil conditioner, a raw material for making steel, a source for titanium minerals, and for making construction products.
- Fly ash from coal-fired power stations could be used for making construction products and as a source of magnesium.

## Conclusions

CSIRO recognises that a key barrier to the establishment of improved waste management planning, monitoring and enforcement is the lack of sound, reliable, comparable and available data.

While prevention should be the primary waste management initiative, compilation of waste data enables proper estimates of associated disposal and recovery costs, environmental impacts, and outcomes of policy-making decisions as well as providing indicators for establishing appropriate waste management infrastructure.

A waste inventory further provides consistent reference source of authoritative data on generation and spatial variation of waste from urbanization, industrial pollution, mineral exploration and mining activities for metering national performance against set goals.

A secondary recommendation is the need to expand recycled product specifications and standards to promote expansion of demands for eco-friendly products. Underpinning this goal is the need to develop sound methods for resource consumption analysis, innovative waste processing technologies and identification of drivers for change in consumer and producer behavior including scenario planning and impacts of unforeseen consequences of policy options.