

The Impact of New International Waste Policies on the Australian Construction and Demolition Waste Stream

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Abstract

The launch of new waste policies by developing nations that ban waste import from other countries has put pressure on the waste management and recovery sector in Australia. Hence, the Australian state and territory governments have started to find solutions to mitigate its impact. However, the process to obtain such solutions need to be informed and backed by the industry key stakeholders' outlook. Therefore, this study aims to find out how various stakeholders perceive the impact of new waste policies and corresponding solutions. A cross-sectional (online) survey of a purposive sample of C&D waste management stakeholders operating in different Australian jurisdictions was conducted from June to September 2019. The results that are based on 132 collected responses showed that a majority of participants opined that the new policies have a positive impact on the Australian industry in the long run. The participants indicated that developing a domestic market for C&D waste is the best response to the new changes. Besides, the study presents open-ended responses on the nature of new policies impact on the Australian waste management and resource recovery sector. Lastly, the study provides a set of mitigating strategies extracted from academic sources to resolve the issues arising from implementing these policies. It is expected that the findings of this study assist policymakers and authorities in local agencies and government departments with providing the best solutions to the potential issues. Such findings would contribute to developing sound policies that do not negatively affect the key stakeholders.

Keywords

C&D waste management, environmental protection, government, regulations, recycling.

1. Introduction

The construction industry in Australia has grown significantly in the past two due to population growth, migration, and expansion in the tertiary education industry. The growing population has necessitated extensive property development, better public transport, and improved infrastructure. The range of construction activities involves businesses engaged in the construction of residential and non-residential buildings, engineering structures, and associated trades and services (ABS, 2006). The industry is identified as the fourth largest contributor to Australian growth domestic product (Trading Economics, 2018); with more than 1 million employees working in the industry. Unsurprisingly, this construction quantity brings about a considerable quantity of construction and demolition (C&D) waste. In 2017-18, approximately 27 Mt of C&D waste was generated in the Australian construction industry, accounting for 44% of the total core waste generated in Australia (NWR, 2020). Due to the massive worldwide construction, the management of such waste materials has become a priority in many developed

and developing countries as their mismanagement are found to have inflicted environmental, social and financial consequences (Shooshtarian *et al.*, 2019a).

1.1. Literature Review

One of the issues that have a mixed impact on Australia's waste and resource recovery system is the introduction of a new waste policy enforced by foreign countries such as China's National Sword Policy' and 'Green Fence 2013' (Earley, 2013, Carr *et al.*, 2019), that aim to ban the import of certain foreign waste materials, with a strict level of contamination, to benefit the national policy environment (Healy, 2018). China has long been the main end-market for recycling materials for developed countries such as Australia. It is reported that the import of recyclables partially has fuelled China's economic boom. In 2016 alone, China imported the US \$18 bn of recyclables (Ritchie, 2018). This policy's new restrictions have presented challenges for the waste industry (Shooshtarian *et al.*, 2019b). The waste producers can no longer avoid landfill levies or recovery operation fees by shipping waste overseas. Although this policy only focuses on certain types of metals, textiles, plastic and not all C&D waste, the announced level of acceptable contamination is a real hurdle to exporting C&D waste from Australia. Some Australian organisations have claimed that the ban diminishes the ability of material recovery facility (MRF) operators to market sorted recyclables, and consequently stockpiling, and more landfilling will likely occur (Senate Environment and Communications References Committee, 2018).

At the same time, this new policy comes with some advantages for Australia's waste recovery industry. In a series of interviews with experts at Melbourne Law School, University of Melbourne (Leggatt, 2018), it was stated that *'for too long we have looked elsewhere to deal with our waste problems'* and *"it's probably a little bit overplayed in some parts of the media, but I also think that it's a long-term issue that needs to be addressed"*. While interim solutions such as considering other waste destinations (e.g. Vietnam, Thailand, India, and Malaysia) on the government's radar, it seems that other strategies have to be pursued for the long term.

The effective mitigation of this issue through sustainable solutions presents an opportunity to shift Australia's perspective from simply passing the issue of waste on through overseas waste recovery operators. This change also triggers a conceptual shift from linear waste management approach to a circular economy of waste resources. Previous studies have adopted contingency theory to build circular economy and resource efficiency (Lahti *et al.*, 2018, Kortmann and Piller, 2016). This theory assists decision makers in understanding the management challenges associated with implementing the circular economy. Notably, it conceptualises the need for structural adaptation through a realignment to fit with the new conditions.

From this new perspective, further analysis of the waste recovery regulatory framework, investment in infrastructure, and domestic market development would be beneficial. Several submissions to Senate Environment and Communications References Committee, 2018 inquiry stated that there had been a preference to ship unprocessed waste overseas rather than incurring waste recovery operation fees and landfill levies. Relevant organisations such as the National Waste and Recycling Industry Council suggest that there must be immediate, short, medium and long terms responses to this issue (Waste Management Review, 2018); in the immediate term, for instance, two large Australian states, namely New South Wales (NSW) and Victoria committed to AU \$47 m and \$13 m financial support, respectively. For the medium-term, the federal parliament passed legislation banning the export of unprocessed waste overseas via the Recycling and Waste Reduction Act 2020 (Downes and Read, 2020).

1.2. Aim of the study

Given the pressure of such policies on the waste recycling industry in Australia, this research study explores the key stakeholders' perception of the impact and to identify the best approach to tackle this issue. The study also informed a larger research project entitled '*A National Economic Approach to Improved Management of Construction and Demolition Waste*', conducted at RMIT University and supported by Australia Sustainable Built Environment National Research Centre. This project endeavours to foster a holistic national approach to address C&D waste issues.

2. Methodology

Surveys are considered an appropriate data collection method to obtain information from primary sources using well-planned questionnaires and are widely used by researchers within the construction management domain. In this study, an online questionnaire survey was considered the most appropriate modality for the same reasons as Saez et al. (2013), that they are an efficient and flexible approach that ensures participant confidentiality. In addition, conducting questionnaires online is now the most common delivery method, which means participants are familiar with the approach and more likely to respond

2.1. Data collection

A cross-sectional survey of a purposive sample of stakeholders of C&D waste management operating in different jurisdictions of Australia was conducted from June to September 2019. According to the Australian National Statement on Ethical Conduct in Human Research (Australian Research Council, 2007) and RMIT University Human Ethics Committee instructions and requirements, recruitment was executed. The project industry partners including the Waste Management and Resource Recovery Association of Australia (WMRR) and the SBEnrc assisted with the recruitment process by providing their network contact details. WMRR's members consist of businesses and experts who are engaged in recycling and waste management activities. SBEnrc members include experts from government, industry and academia who are involved in issues around the management of the built environment notably C&D waste management. The former organisation is the industry partner of the project presented in this paper, and the latter funded the research project. Since the project study aimed to capture responses from a wider range of stakeholders, therefore, in order to increase the potential response rate, one of the main selection criterion used was an adequate experience in dealing with the management of waste in Australia. Email communication was the method of recruitment. An email, including the online link to the survey and the project's information sheet, was sent to a list of participants compiled by the research team that included 250 individuals with relevant experience in the waste management and resource recovery sector. The list consisted of members of the two organisations as well as other experts separately identified by researchers. The research team sent a reminder email to those who did not respond to the first round of the survey. Participation in this study was voluntary and a completed survey implied informed consent.

The target population consisted of the main stakeholders of C&D waste management including design, construction and resource recovery industries, and government organisations officials with experience in waste management. To recruit participants, the research team considered

different approaches. Firstly, the researchers circulated the questionnaire survey link to their network. Secondly, the recipients were asked to forward the link to others with C&D waste interest and experience. Thirdly, two industry associations, namely The Waste Management and Resource Recovery Association of Australia and the Sustainable Built Environment National Research Centre, were approached to use their network to spread the word. According to Qualtrics records, the six questions presented above took 5 minutes to complete on average. In total, 132 survey responses received from which only 84 had an acceptable response level (more than 70%) were considered.

2.2.Data analysis

In total, 132 responses (53% response rate) were received and recorded in the Qualtrics database. After screening the responses, the data from the survey were analysed. Descriptive statistical techniques were applied to explore the participants' demographic details and their opinion on C&D waste issues and opportunities (Holcomb, 2016). For the quantitative data, frequency distributions were examined to compare different categories of responses received from participants. For qualitative data, a thematic analysis (Braun and Clarke, 2006) of responses on the impact of new policies on the Australian C&D waste management sector. NVivo V.11 was used to conduct a thematic analysis of participants' qualitative responses.

3. Findings

The results of the survey are presented below in three parts: the profile of participants, the impact of new waste policies on new C&D waste and the responses to the changes caused by new waste policies.

3.1.Profile of participants

The participants' profile, including the industry and geographical zone in which they performed their main activities and the length of their experience, was explored. The sample size represents the major stakeholders with direct involvement in the construction material end of life management: around 60% of the participants belonged to the construction (24%), waste recovery (20%), and landfilling (15%) sectors, the three sectors that are most affected by C&D waste regulations and policies. The responses also approximately align with the number of employees in each of these sectors. As expected, the study sample consisted of experts based in the four Australian major states (i.e., Victoria, NSW, Queensland, and Western Australia) that deal with the C&D waste management challenges the most and have a higher population and thus more construction activities. Around 44% of participants had less than six years of experience working in waste management, whilst fewer than 30% worked in the industry for more than 15 years.

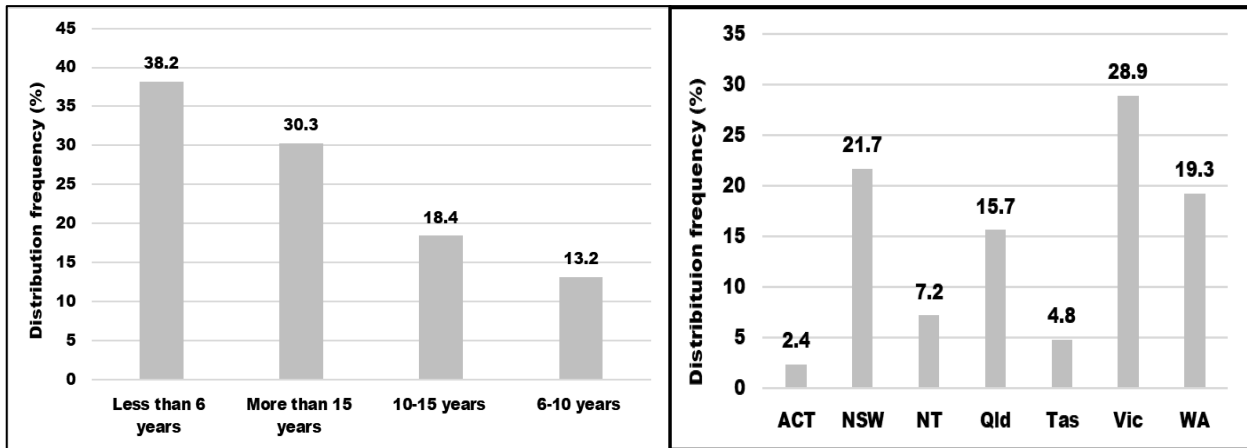


Figure 1. Left: summary of participants' experience; Right: frequency distribution of the main location(s) of their activities

The results showed that only 23.5% of respondents believed that this policy could negatively impact the waste management and resource recovery sector (Figure 2). Table 1 presents the qualitative responses from the participants for this question. According to the responses, about 55% of the participants surveyed opined that the imposition of restrictions on the Australian C&D waste could be beneficial to various industry and country as a whole.

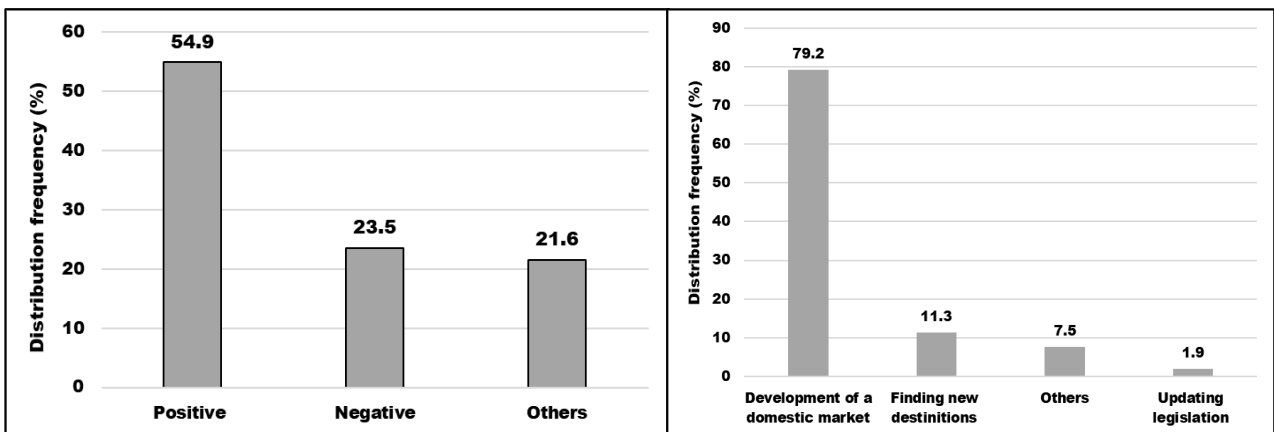


Figure 2. Left: frequency of responses to the impact of new waste policies on the Australia C&D waste management system; Right: the frequency distribution of participants responses to mitigation strategies

3.3. Response to new waste policies

Participants were also given choices to express their opinion on the best approach to respond to these restrictions. An overwhelming majority (79.2%) of the participants had "development of a domestic market" among their responses (Figure 1). Understandably the lowest frequency belonged to "finding new destinations" implying the maturity in the perceptions of those involved in the C&D waste management about the sustainable approach in managing C&D waste.

Table 1. A summary of selected participants' qualitative responses to support the three key categories

Category	Example quotes (open-ended responses)
Negative impact	<ul style="list-style-type: none"> • <i>In the short term, it is forcing a lot of materials into landfill. It is resulting in recyclables being landfilled. Now contaminated waste will be disposed of in Australia, earlier it was too easy for lazy Australian companies</i> • <i>What are we doing with it now?</i> • <i>Raises issues that may not be correct</i> • <i>Highlights the challenges in the waste industry</i> • <i>We can no longer recycle the cardboard boxes (builders packaging from ovens, dishwashers, tile boxes etc) that is sorted from mixed C&D waste as it had dust/sand on it so is not acceptable to bale and recycle anymore.</i>
No impact	<ul style="list-style-type: none"> • <i>Unlikely to have a significant impact on actual recovery given the bulk of C&D recycling occurs locally, however it may undermine confidence in recycling overall</i> • <i>Plastics, timbre and other materials recovered have a lower value</i> • <i>No C&D waste was ever being exported in NSW.</i> • <i>Because Australian leaders have already started to support new investments in the recycling industry</i>
Positive impact	<ul style="list-style-type: none"> • <i>We can act locally and create jobs - its an opportunity for the industry. Resource recovery is getting the attention it deserves</i> • <i>It will force change locally and drive investment in recycling infrastructure</i> • <i>It's forcing us to confront this issue and be more sustainable</i> • <i>We need to invest here in Australia</i> • <i>The China Sword highlights opportunities to increase local recycling to provide jobs and investment and minimise the impacts of transporting waste (in other words, minimise reliance on overseas markets). C&D recycling is generally done locally, so the C&D sector could leverage positive messaging about 'opportunities for local recycling.'</i> • <i>It forces Australia to develop new industries, promotes employment</i> • <i>Waste materials must now be sorted at source prior to transporting to MRFs</i> • <i>This forces more collaboration in recycling techniques</i> • <i>We need to be developing methods to manage these products locally (and regionally) not just metro areas</i> • <i>It forces us to act.</i> • <i>Cause we must deal with instead of closing our eyes</i> • <i>Forces others to take waste issues seriously</i> • <i>Positive (long term) as products look to use Australian recycling within Australia</i> • <i>Has motivated us to take responsibility</i> • <i>Enforces Australia to manage its own waste</i> • <i>Forces Australia to acknowledge and catch up with reuse/recycling initiatives already established elsewhere.</i> • <i>Because it will force development of local reprocessing rather than relying on other countries to sort through our waste</i> • <i>Enforces local market and adaptive activities to deal with the waste internally</i> • <i>Forces the issues to be addressed</i> • <i>Because it means we are forced to develop an economy and mature industry around integrated waste management not just a basic logistics companies</i> • <i>Australia will need to reuse its own recovered materials</i> • <i>We have to do something about the rate of production of waste, rather than just shipping it abroad for someone else to deal with</i> • <i>We are stuck with it, now we might create jobs and uses here</i> • <i>We need to invest here in Australia</i> • <i>It will promote increases in our own local recycling efforts.</i>

4. Discussion

Based on the qualitative responses, survey participants favour C&D waste market development, making Australia independent of other countries' policy changes, generating new jobs, and shaping a circular economy. However, developing a thriving market for these resources hinges on several factors. These factors are determined by extensive analysis of relevant literature, findings from the survey published before (Shooshtarian et al., 2020a) and are informed by application of contingency theory. As depicted in Figure 2, these factors include supportive regulations, extended producer responsibility (EPR), optimised supply chain, sustainable procurement (SP), investments in technology and infrastructure, and research and development. Figure 3 summarises these influential factors.

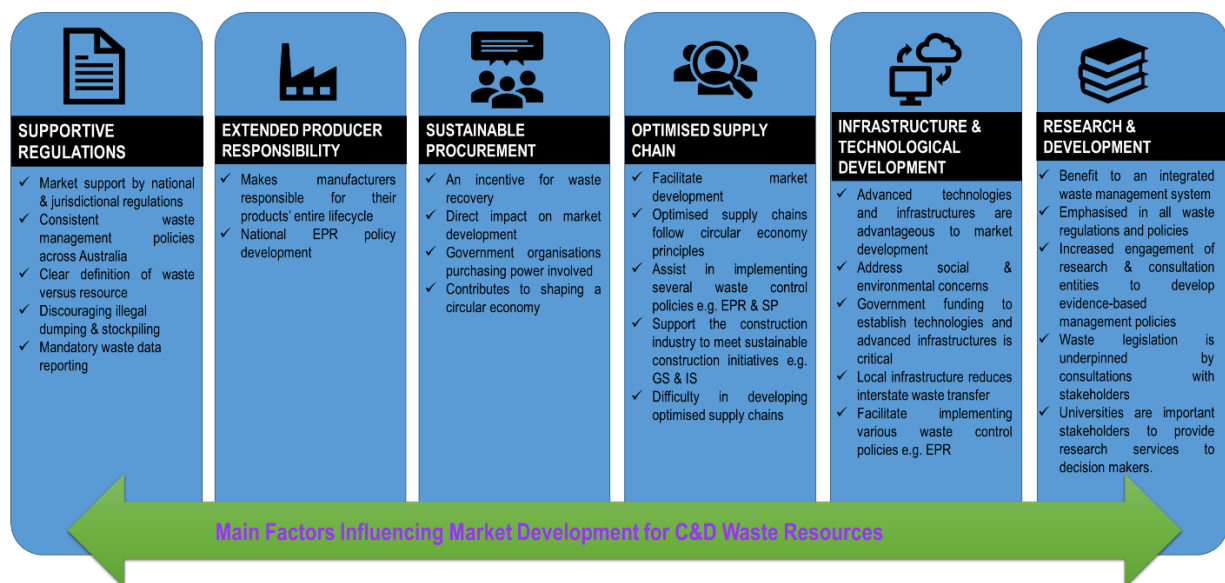


Figure 3. Structural changes required to develop market for C&D waste resources.

4.1. Regulations

Federal and state waste regulatory frameworks should support domestic market development to promote resource efficiency and a circular economy. Notably, regulatory support should facilitate consistent waste management policies throughout Australia, clarify when waste becomes a source and is not liable for landfill levy, discourage illegal dumping and stockpiling activities, and mandate consistent waste data reporting. The approach to taking advantage of a landfill levy is not straightforward due to varying factors in the effective management of waste. While a landfill levy is the best economic driver in some circumstances, it can act as a disincentive in other circumstances. In the literature, conflicting results are reported in response to a landfill levy (Shooshtarian et al., 2020b), both in domestic and international contexts.

4.2. Extended producer responsibility

EPR is a strong motivator for establishing a marketplace for C&D waste materials. This scheme is a policy instrument that eventually reduces waste disposal and is long adopted in countries for different waste streams (Hanisch, 2000). Technically, EPR makes manufacturers responsible (financially and/or physically) for their products' entire lifecycle including design, manufacture, recycling, and final disposal (OECD, 2016). However, EPR policy development and implementation, particularly for C&D waste, is still at an early stage in Australia (Shooshtarian et al., 2021). It is recommended that these schemes are implemented nationally because many of the potential participants work across Australian jurisdictions.

4.3. Sustainable procurement

SP policies provide an incentive for further waste recovery. SP's implementation has a great impact on the flourishing of the waste materials market. In response to China's new waste policy, the Minister of Agriculture, Water and the Environment committed to supporting the increased use of recycled materials in the goods procured by government organisations and collaborating with the industry on creating new markets for recycled materials. In Australia, the reuse of recycled materials is strongly encouraged under Ecologically Sustainable Development (ESD) and SP programs. This policy has also emphasised applying a circular economy's principles to efficient use of national resources.

4.4. Optimised supply chain

An optimised supply chain in the waste and resource recovery sector facilitates waste market development. The effective supply chain follows circular economy's principles and the industrial ecology (symbiosis) concept. Optimised supply chain aid with implementing EPR policy, ensuring the sustainable provision of stockfeed for waste recovery facilities and motivates an alignment between the industry practices and green construction programs such as Green Star (GS) and Infrastructure Sustainability (IS) tools (Shooshtarian *et al.*, 2019b). Creating a supply chain is not a straightforward task, as it involves numerous actors, each playing their part in the delivery of supply chain objectives. In Australia, a decade's worth of effort towards creating an effective supply chain has limited success. NSW is the leading state in building a supply chain system for domestic waste. In 2009, this state established an organisation called the Australian Industrial Ecology Network to promote the concept of industrial ecology and identify the opportunities to link waste producers and waste consumers. In 2012, the Department of Agriculture, Water and the Environment released a guideline on the supply chain of C&D waste materials. This document primarily aims to promote industrial ecology in the C&D waste stream and secondarily showcase successful C&D waste trades in Australia.

4.5. Investments in infrastructure and technological development

Waste recovery technology advances and infrastructure development are advantageous to domestic market development. Building modern and efficient facilities addresses public social and environmental concerns and provides better services to the waste and resource recovery sector through economies of scale. Government funding to improve waste and resource facilities and effective law enforcement provides an impetus for further waste recovery activities and diminishes the reliance on waste export. An increase in the number of local infrastructures frees waste producers and collectors from the interstate waste transfer. Technically, many waste minimisation practices and strategies, such as EPR and the proximity principle, depending on the availability of technologically advanced local infrastructures. Several waste management strategies in Australia have highlighted the need to keep pace with technology changes for smarter and more efficient waste management. New technologies, such as Building Information Modelling (BIM), Blockchain, Geographical Information Systems (GIS) and online marketplaces can be helpful

4.6. Research and development

An integrated waste management system benefits from R&D. Almost every single strategy, policy, action plan and regulation on waste management in Australia has highlighted the role of R&D alongside encouragement and enforcement for effective development and implementation of waste-related programs (Shooshtarian *et al.*, 2020c). As authorities'

realisation of R&D benefits increases more research and consultation entities are engaged to develop evidence-based C&D waste management policies. The Australian legislation process is underpinned by consultations with key stakeholders who are affected by developing regulations. Consultation drafts calling for submissions from industry, authorities, researchers, and the public are a bridge that fill the gap between regulation and R&D. Universities are important players in providing research services to decision-makers, regulatory authorities, industry and broader communities (Calvo et al., 2014).

5. Conclusions

The paper aimed to determine how various stakeholders perceive the impact of new waste policies in developing countries on the Australian waste management and resource recovery sector, notably in the C&D waste stream. The research findings showed that most participants opined that the new policy positively impact the Australian industry in the long run, and the development of domestic end-markets for C&D waste is the best response to the new resultant changes. The paper also discussed the key factors contributing to developing the C&D waste management market. It is expected that the findings of this study assist policymakers and authorities in local agencies and government departments with providing the best solutions to the potential issues. Responses to these changes should be reflected in new policies that also consider affected stakeholders. Future research themes include working with relevant stakeholders to develop domestic markets for C&D waste, investigating the success of national and state government initiatives in supporting waste recovery industry to respond to new conditions and studying the feasibility of harmonisation of waste efforts across Australian territories and states.

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