

DEVELOPMENT OF A DOMESTIC MARKET FOR CONSTRUCTION AND DEMOLITION WASTE IN AUSTRALIA

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Abstract

The growth in the generation of construction and demolition (C&D) waste in Australia and new China's waste policy have put pressure on the C&D waste and resource recovery industry. Therefore, new solutions need to be provided to minimize the adverse effects of C&D on the environment, society, and economy. One of the highly preferred options is to develop a domestic market for this waste stream. However, development of such a market is not straightforward and warrants a full investigation of influential factors such as legislative, technical and financial ones. Hence, this study, as a part of a bigger project entitled "A National Economics Approach to Improved Management of Construction and Demolition waste", aims to review the major factors that impede or boost C&D waste market development in Australia. The results are expected to guide future attempts in creating an effective national C&D waste management in Australia.

Keywords

National approach; Waste management; Legislative framework; China's waste policy; Construction industry

Introduction

The construction industry in Australia has grown significantly in the past two decades in the wake of 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 initiated in response involve businesses that are involved in creating residential and non-residential buildings (including renovations and additions), engineering structures, and associated trades and services (ABS 2006). The industry is identified as the fourth largest contributor to growth domestic product (GDP) (Trading Economics 2018); more than 1 million people work in the industry. Unsurprisingly, this volume of construction brings about a huge volume of waste, known in the industry as "construction and demolition (C&D) waste". In 2016-17, approximately 20.4 Mt of C&D waste was produced in the Australian construction industry, which accounts for 38% of the total core waste (solid non-hazardous waste and hazardous waste including liquids, and generated in the municipal, C&D and C&I sectors, generally excluding primary production) generated in Australia (NWR 2018).

Statistics have shown that, between 2016 and 2017, more than 6.7 Mt of C&D waste was transferred into landfills across Australia. Waste landfilling is recognised to be the worst waste management strategy due to the adverse social, economic and environmental consequences it causes. Furthermore, a part of Australian waste materials is being sent overseas including Vietnam, India, Malaysia, Indonesia, China and Bangladesh (Blue Environment 2018). According to ABS (2018) in 2016-17 the total amount of metal waste export was 2.15 tonnes with Vietnam, India, and Malaysia being the main destinations. However, these situations will not remain the same and there are emerging movements to stop waste landfilling both in Australia and overseas. In Australia, the federal government along with state and territory governments have started to change the waste management status quo. They have

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provided funds to investors and researchers and passing progressive regulation to protect the environment. Foreign countries are also developing initiatives targeting the import of waste materials. For instance, China has introduced a new policy, called the 'National Sword Policy', bans the import of certain foreign waste materials, with a strict level of contamination, to benefit the national policy environment (Shooshtarian, Maqsood, Khalfan, Wong & Yang 2019). This seems to have similar objectives to another program called 'Operation Green Fence 2013', which aims to restrict the import of contaminated recyclable materials. Other countries have also started to become stricter in accepting waste materials.

Given all mentioned above, in dealing with the C&D waste issues Australia has to consider sustainable alternatives whereby all parties (i.e. waste producers, waste consumers, recycling and construction industries, landfill owners, regulatory authorities and public) gain proportional benefits. As a result, Australian jurisdictions are drawing on the concept of a circular economy to improve their waste management system. Unlike traditional linear 'take-use-dispose' approach, this concept focuses on the maximum usage of resource and energy during the lifecycle of one product. To achieve this goal, Australia needs to move towards the development of a market wherein individuals can legally trade their waste materials. The development of a market for salvaged and recycled waste materials (including C&D waste) has been frequently emphasised in different policies, strategies, waste management principles and guidelines in Australia. The circular economy of waste has 5 principles, the third of which is to 'increase the use of recycled material and build demand and markets for recycled products', that is, market development. In the National Waste Policy (2018), Strategy 14 places emphasis on market development and research. Estimations, based on the current solid waste generation rates in Australia, project that Australian recycling capacity must increase by 400% by 2040 to address the issue of solid waste in the future (Environment and Communications References Committee 2018).

This paper aims to review the main strategies that contribute to the development of the market for recycled C&D waste. The review informs a larger research project entitled 'A National Economic Approach to Improved Management of Construction and Demolition Waste', which is being conducted at RMIT University and supported by the Australia Built Environment National Research Centre. This project endeavours to foster a holistic national approach to address C&D waste issues. Its objectives include the development of a consistent approach to define and measure C&D waste, identification of influential economic factors that govern disposal/reduce/reuse/recycle of C&D waste, conducting a feasibility study on the creation of a marketplace for trading C&D waste, and identification of opportunities to integrate supply chains model in the management of C&D waste.

Method

Data collection, processing, and analysis

This review study is based on the secondary data that are publicly available. The study employed a document analysis technique to explore effective strategies and enablers to develop a marketplace with the aim of further reducing, reusing and recycling of C&D waste in Australia. The sources reviewed in this study mostly include policies, guidelines and other relevant previous studies that focus on the economic factors influencing C&D waste marketplace development. In total, 15 sources were shortlisted and analysed for informing efforts towards market development. These sources were shortlisted based on their close relevance to the study objectives and their currency.

Context of study and C&D waste regulation in Australia

Australia is a large country with a population of 25 million that are mostly settled in capital cities. Significant growth in migration and population in Australia generate demands for more construction

activities. As a result, more infrastructure and new housing are needed to meet the requirements of this ever-increasing population (IBISWorld 2019). The statistics have shown that such activities generate a large quantity of C&D waste (NWR 2018). As such, the state governments attempt to regulate C&D waste management by enforcing relevant legislation and voluntary schemes. As previously mentioned C&D waste legislation mostly takes place at the state and territory level. Australia has 6 states: Victoria (Vic), New South Wales (NSW), Queensland (Qld), South Australia (SA), Western Australia (WA) Tasmania (Tas) and 2 territories: Northern Territory (NT) and Australia Capital Territory (ACT). The main difference between state and territory government is that states have the power to pass laws in their own right whereas in territories the federal government modifies or revoke laws. The majority of regulations and policies that govern C&D waste are produced and administrated by state EPAs. The history of C&D waste legislation dates back to 1970s when the first EPA act (Environmental Protection Act 1970) came into effect in Victoria. A review on the C&D waste-related regulations in different Australian jurisdictions is provided before in Shooshtarian et al. (2019).

Results and Discussion

The following sections present the results of the review on the main mostly economic factors that have a noticeable impact on market development for recycled and salvaged C&D waste materials. In total seven factors were identified that are presented in Figure 1. These include regulatory support, extended producer responsibility, the establishment of the effective supply chain, sustainable procurement, investments in technology and infrastructure, research and development and landfill levy imposition.



Figure 1. Seven factors influencing marketplace development for C&D waste materials

Regulation

It is vital that waste regulatory frameworks are set to be in favour of local market development and implementation of an effective circular economy. The issues that must be addressed in this regard are as follows:

- 1) Consistency in jurisdictional waste regulations throughout Australia
- 2) Clarification on when waste becomes a source and is not liable for landfill levy
- 3) Illegal dumping and stockpiling activities are severely discouraged
- 4) Consistent reporting obligations

Extended producer responsibility

Extended producer responsibility (EPR), otherwise known as ‘product stewardship’ and ‘take-back’ schemes are strong motivators for the establishment of a marketplace for C&D waste materials. These schemes are policy instruments that prevent waste generation. These schemes are long adopted in countries for different waste streams (Hanisch 2000). Technically, EPR makes manufacturers responsible (financially and/or physically) for the entire lifecycle of their products during the supply chain of materials, including design, manufacture, recycling and final disposal (OECD 2016). However, PER policy development and implementation, particularly for C & D waste, is still at an early stage in Australia. It is recommended that these schemes be regulated and implemented nationally because many of the potential participants work across Australian jurisdictions.

Sustainable procurement

Sustainable procurement can provide an incentive for further waste recovery. It is claimed that the implementation of SP has a great impact on the flourishing of the C&D waste material market. In response to China’s new waste policy, the Minister of Energy and Environment committed to supporting increased use of recycled materials in the goods procured by government, and to collaborate on creating new markets for recycled materials.

In Australia, reuse of recycled materials is strongly encouraged under Ecologically Sustainable Development (ESD) and Sustainable Procurement (SP) programs. At the national level, National Waste Policy (2018) sets a target to reduce waste generation through prevention, reduction, recycling, and reuse. This policy has also emphasised the application of the principles of a circular economy to support better and repeated use of the nation’s resources. Two strategies to promote sustainable procurement in Australia are at the forefront of this policy: Strategy 8 (Sustainable Procurement by Governments) and Strategy 9 (Sustainable Procurement by Business and Individuals). These two strategies urge the public and private sectors to promote demand for recycled materials and products containing recycled content. The Environment and Communications References Committee suggests that local governments practice sustainable procurement policies to ensure strong domestic markets for recycled material.

The Australasian Procurement and Construction Council Australian and New Zealand Government Framework for Sustainable Procurement is implemented by the federal government to pursue three aims when procuring goods, services, works, and utilities. These aims involve the reduction of environmental impacts, social impact and economic impacts through the procurement process. This framework also shares some premises with the circular economy in considering alternatives to the ‘take-make-dispose’ approach. According to this framework, the government has a decisive role in providing a market driver for increased use of recycled materials in the goods and works that it procures. Therefore, the federal government and some local government developed SP guidelines to coordinate their decisions and actions towards SP and the purchasing of recycled materials. In 2012, the state government of South Australia was the first authority to release a Sustainable Procurement Guide. One year later, in 2013, the federal government also released the first Australian guideline on

SP1. This work was further complemented by state-specific guidelines to tailor sustainable procurement requirements in the ACT (2015), NSW (2017) and WA (2017).

Supply chain

Providing an efficient and effective supply chain to the waste and resource recovery industry is instrumental in developing a local market for C&D waste. The supply chain for this purpose needs to consider the principles of the circular economy and be driven by the industrial ecology (symbiosis) concept¹. An effective supply chain system can assist in the implementation of EPR and similar schemes, provision of stockfeed for waste recovery facilities, and motivating compliance with GS and GI tools requirements. The World Economic Forum acknowledges that the circular economy approach can be applied to supply chains functioning at a local level, as well as those supporting complex global multi-tier material flows (World Economic Forum 2014). 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 the creation of an effective supply chain has resulted in some 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 make connections between waste producers and waste consumers. In 2012, the Department of Energy and Environment (then known as the Department of Sustainability, Environment, Water, Population and Communications) released a guideline on the supply chain of C&D waste materials. This document primarily aimed to promote industrial ecology in the C&D waste stream and secondarily to showcase successful examples of C&D waste trade in Australia. Some of these examples demonstrated the effective development of a supply chain system, particularly with respect to product stewardship application.

The following are the key issues regarding building a supply chain system for C&D waste stream that are identified in different Australian based literature:

1. Initial resistance from stakeholders to accommodate new safety requirements for C&D waste trade
2. The inaccuracy of reporting of C&D waste such as stockpiles
3. Decentralised purchasing systems are a challenge for most local governments
4. Involvement of various subcontractors that limits control of builder or construction company over supply chain management
5. Lack of strategic procurement and partnerships as key inhibitors towards a supply chain management framework
6. Poor organisational communication across units to facilitate change⁵
7. The government's main concern was health issues of occupants, particularly with regard to the lack of quality control

Investments in technology and infrastructure

Advancements in waste recovery technology and infrastructure are advantageous to domestic market development. Building modern and efficient facilities not only addresses public social and environmental concerns but also provides better services to the waste and resource recovery industry through economies of scale. Government funding to improve waste and resource facilities together with 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

¹ The wastes or by-products of one industry are used as inputs in another industry, thereby closing the material loop of industrial systems and minimising waste.

producers and collectors (waste responsible) from sending waste across the Australian states such that it would be easier to implement the proximity principle. Technically, a lot of waste minimisation practices and strategies, such as extended producer responsibility, depending on the availability of technologically advanced local infrastructures. Several waste management strategies in Australia have highlighted the need to keep pace with changes in technology for smarter and more efficient waste management. Many wastes and resource recovery stakeholders in Australia believe that hypothecating landfill levies should be invested towards developing new technologies and infrastructure. The use of new technologies, such as Building Information Modelling (BIM), Geographical Information Systems (GIS) and the online marketplace can solve several issues toward the successful establishment of a market for salvaged and recycled C&D waste material.

Research and development

An integrated waste management system greatly benefits from research and development (R&D). Almost every single strategy, policy, action plan and regulation on waste management in Australia has highlighted the role of R&D alongside with encouragement and enforcement for an effective development and implementation of waste related plans. In Australia, authorities have recently started taking advantage of R&D benefits and hence have engaged research and consultation entities to provide the information required for regulation of C&D waste streams. To date, the product of such collaboration has partially contributed to the decision making processes on an extended range of issues. Table 1 presents some seminal examples of these studies that are commissioned by public authorities and are published in the form of publicly available reports:

Table 1. Summary of research reports released to inform legislation, decision making or raising awareness

Report	Ordering authorities	Objective(s)
<i>Construction and Demolition Waste Status Report (2011)- Hyder Consulting Pty Ltd</i>	<i>I. Department of Sustainability, Environment, Water, Population & Communities Queensland II. Department of Environment & Resource Management in accordance</i>	<i>Evaluation of the current conditions of C&D waste management in Australia & providing relevant reforms</i>
<i>Waste definitions and classifications, report on issues, opportunities and information gaps(2012)- Hyder Consulting Pty Ltd</i>	<i>Department of Sustainability, Environment, Water, Population & Communities</i>	<i>Review on (legal) definitions used for various waste streams in different jurisdictions</i>
<i>An Investigation into the Performance (Environmental and Health) of Waste to Energy Technologies Internationally (2017)- WSP Global Pty Ltd</i>	<i>Western Australia Department of Environment and Conservation</i>	<i>A review of legislative & regulatory frameworks, state of the art technologies and research on health and environmental impacts</i>
<i>A review of the scientific literature on potential health effects in local communities associated with air emissions from Waste to Energy facilities (2018)-Environmental Risk Sciences</i>	<i>EPA Victoria</i>	<i>Evaluation of potential issues associated with EfW technologies</i>
<i>Global Landfill Regulation & Waste Levy Review (2012)-SLR Consulting Australia Pty Ltd</i>	<i>I. Western Australian Department of Environment & Conservation II. Waste Authority</i>	<i>Review on landfill levy regulations in Australia and worldwide</i>
<i>Waste to energy consultation and case study for Melbourne's West (2017)- Reincarnate Pty Ltd</i>	<i>The Department of Environment, Land, Water & Planning</i>	<i>Investigation of the approved expansion of large residual waste landfills at Ravenhill & Werribee</i>
<i>An investigation into the Transport of Waste into Queensland (2017)- a</i>	<i>I. Environment & Heritage Protection</i>	<i>To review and assess strategies to limit the</i>

<i>research team from different entities</i>	<i>II. National Parks & the Great Barrier Reef</i>	<i>transport of waste across Qld</i>
<i>Construction & Demolition waste guide - recycling & re-use Across the supply chain (2012)- Edge Environment Pty</i>	<i>Department of Sustainability, Environment, Water, Population & Communities</i>	<i>To identify the issues of supply chain and review some case study of existing C&D waste supply chain</i>

Note: the name of some of the authorities mentioned in this table may have now changed to other names.

The Australian legislation process is underpinned by consultations with the main stakeholders who are affected by developing regulations. Consultation drafts as a form of R&D call for submissions from industry, authorities, researchers and the public to ensure that any ensuing legislation provides a level playing field for all parties concerned.

Universities are important players in providing research services to decision-makers, regulatory authorities, industry and wider communities. In a study in Spain, the role of universities, as a key new actor, in the enhancement of C&D waste management through the creation of a 3R model (reduce, reuse and recycle) was stressed. The researchers of this study noted that “*Studies on C&D waste often forget to include a key player in waste management... Universities can advance the possibilities of solving technical problems and applying new methods of recycling and new market-oriented applications according to the current legislation*” (Calvo, Varela-Candamio & Novo-Corti 2014, p. 422). According to this study, other contributions from universities in this respect include:

1. Availability of infrastructure and qualified academic staff to effectively develop R&D in this field so that the cost of concentrating research efforts can be reduced
2. An ability to demonstrate recycling achievements to be applied in the recycled market-endorsing C&D recycled materials
3. Training of professional staff for C&D waste and resource industry through postgraduate courses for construction

Another function of R&D is to raise public, industry and authorities’ awareness. Indeed, several research studies demonstrated the positive role of evidenced-based awareness received through R&D activities. Then this awareness underpins management practices towards the development of a market for C&D waste materials. R&D can also be employed to explore new opportunities for re/use of C&D waste materials. For instance, a study report indicated that recycled brick and concrete could be used in the landscaping industry with competitive prices compared to alternatives. In the case of EfW, the research is needed to facilitate the use of energy produced in the local power grid.

Landfill levy

The approach to taking advantage of a landfill levy is not straightforward due to the role of varying factors in the effective management of waste. While in some circumstances a landfill levy is the best economic driver, it can act as a disincentive in other circumstances. In the literature, conflicting results are reported in response to the imposition of a landfill levy, both in domestic and international contexts. The mechanism and other characteristics of imposing a landfill levy in different Australian states and territories have been stated previously in Shooshtarian et al. (2019). In this section, the relevant literature is reviewed to understand the impact of this enforcement mechanism in Australia and elsewhere. In the first part of this section, worldwide evidence regarding the effectiveness of this mechanism is provided; the second part discusses the findings that show how landfill levies are perceived in Australia.

The Australian experience

In 2012, a C&D supply chain guide prepared for the Commonwealth Government of Australia (Edge Environment 2012) reported that many stakeholders had indicated that landfill costs (landfill operation and levies) are a significant driver for the use of salvaged and recycled C&D waste. In 2018, various respondents to the call for submissions to the Senate's Environment and Communicates References Committee expressed support for continuous imposition of landfill levies. The submissions highlighted that levy schemes can act as a disincentive for waste disposal. Further, they concluded that the ensuing revenue is an important source of funding for investment in waste and recycling management initiatives. The following table (Table 2) shows the examples of support from different submitters:

Table 2. The evidence of the effectiveness of landfill levies in Australia

Respondents	Indicative language
WA Government	There has been a notable diversion from landfill for two waste streams (i.e. C&D and C&I) since 2011 when levy rates were considerably increased.
Re.Group (http://www.re-group.com/)	NSW's relatively high recovery rate for two waste streams (i.e. C&D and household waste) has been driven by the landfill levy.
SA Government	Progressive increase of waste recovery (reduction in waste disposal) has been concurrent to a continuous increase in levy fee. The increase was more than 20% in 2015-2016 (81.6%) compared to 2003-2014 (60%).
The Western Australian Local Government Association	There is evidence that the landfill levy has been responsible for diverting inert material from landfill; however, it is not known where this waste is being diverted.
Envorinex (https://envorinex.com/)	Landfill levies should be priced high enough to encourage major business to send their waste to recyclers and not to landfill sites.

Source: Environment and Communications References Committee (2018)

In addition, to support from the submissions to this committee, there are some concerns about the unintended consequences that emerge from the improper design of levy schemes. These concerns express that the jurisdictional legislation levy should not give rise to unintended outcomes such as interstate waste transfer because of cost disparity, discouraging private investors to invest in recycling infrastructure, high administrative costs corresponding to the application of complex schemes and stockpiling and illegal dumping. Furthermore, some respondents provided evidence that shows that imposing a landfill levy did not achieve the intended goals (e.g. reduction in waste disposal or an increase in waste recovery activities). Indeed, this evidence demonstrates that there are limits to what can be achieved through the imposition of a landfill levy. Table 3 summarises these challenges associated with landfill levies.

Table 3. Unexpected results from the implementation of landfill levies in Australia

Submitter	Indicative language
The Law Council of Australia	Landfill levies can encourage stockpiling and illegal dumping.
GCS Consulting	During the period when the amount of the metropolitan New South Wales levy doubled, the NSW's C&D industry was found to have reduced its recycling rate, which is contrary to expected market behaviour and the efficacy of the levy as a pricing mechanism that was achieved when the levy was at much lower levels.
Unspecified submitters	Little effect on waste generation, as ratepayers have no direct financial incentive to reduce waste destined to landfill.
Adelaide Hills Region Waste Management Authority	Waste disposal levies do 'not act as a direct driver for the community to reduce waste generation or increase recycling habits' because any increase in waste levies is 'covered by general rate revenue'.
The Australian Sustainable Business Group	Highlighted that there is evidence that an increase in the landfill levy results in incurring additional costs for the recycling industry.

National Waste and Recycling Industry Council	A levy on the disposal of recycling residuals reduces the competitiveness of materials sold into the international market.
Centre of International Economics	In NSW, the waste levy of \$ AU 120 reduced the profit margin of metal recyclers in 2011.
The Australian Council of Recycling	When recyclers are liable to pay the levy for the disposal of contaminants that have entered the recycling stream, they see it as a disincentive towards being involved in the recycling industry and instead it encourages shipping unprocessed waste overseas.
Re Group	The disposal of residuals generally represents a significant cost for recycling facilities, which can obviously create commercial incentives to seek lower disposal cost options. It also justifies transport waste to interstate locations with a lower disposal rate.
Visy, Owens-Illinois and SKM Recycling	Landfill levies penalise the recycling industry for the disposal of residual rubbish that enters the recycling stream.

Source: Environment and Communications References Committee (2018)

Aside from the views tabulated above and beyond the scope of this report, several respondents indicated that levies have little impact on domestic waste generation patterns in Australian cities. It is found that, because councils charge households at a flat fee to recover the levy fees, which they pay on behalf of ratepayers, they have no motivation to reduce the amount of waste disposed of. In other words, basically, the price signal is not passed on through the rates directly. There is a lesson in this causality that can be transferred to the context of C&D waste management; the levy should be accompanied with other financial incentives to effectively target waste generation at the origin, for example, during the design and construction stages.

In response to the call made by the WA Department of Waste and Environmental Regulation for submission to a discussion paper on landfill levy several trends emerged. Some of the submissions presented different issues that were not considered in the relevant regulations and policies. The following are a selection of their responses to the latest levy regime in WA:

“A levy, by its nature, is a penalty/cost impost. In what way is the payment of a levy an incentive? Those paying the levy have fewer funds available to put into their own research and subsequent implementation of their own waste reform policies and systems”.

“In addition, we are concerned that this appears to be revenue-raising activity rather than a legitimate pursuit of better environmental outcomes for Western Australian”

1. Levy should be articulated as the ‘key environmental lever’ not an ‘economic policy lever’
2. A rebate system has to be in place for those who involved in landfill diversion
3. Allow alternative methods of calculating waste volumes, rather than just utilisation of weigh stations

Another barrier to effective enforcement of landfill levies is to nationally harmonise gate fees. The support for harmonisation is abundant (Environment and Communications References Committee 2018) and it is believed it can substantially minimise inter-jurisdictional waste transfer. However, it should be remembered that such an arrangement might not produce the best results. Simple harmonisation may overlook the existing contextual conditions in each jurisdiction. It may also interfere with the specific waste management system implemented in different states and territories. Hence, it is better to set up the levy fees in a way that ensures the negative impact on the effective management of C&D waste across Australia is minimised. For instance, a rate disparity should be calculated to the extent that it does not prompt unnecessary long-distance waste transfer.

Conclusion

This study reviewed and presented the main factors that are believed to have an important impact on the development of the market for trading C&D waste in Australia. Development of a sustainable C&D waste market wherein everyone can benefit from a fair, legal and cost-effective trade cannot be achieved overnight. Indeed, it needs a fair amount of preparation activities including receiving support from different key stakeholders. In the past, there were several attempts to creating such a marketplace; however, these did not succeed in achieving the desired results. This study identified and discussed seven main strategies including 'regulation', 'extended producer responsibility', 'supply chain management', 'sustainable procurement', 'investment in technology and infrastructure', research and development', and 'landfill levy'. It is expected that this study provides a platform for further research and development in order to remove barriers toward the development of a well-perceived market across Australia.

References

- ABS 2006, *Australian and New Zealand Standard Industrial Classification* ABS.
— 2018, *International Trade*.
- Blue Environment 2018, *Data on exports of recyclables from Australia to China*.
- Calvo, N, Varela-Candamio, L & Novo-Corti, I 2014, 'A dynamic model for construction and demolition (C&D) waste management in Spain: Driving policies based on economic incentives and tax penalties', *Sustainability*, vol. 6, no. 1, pp. 416-35.
- Edge Environment 2012, *Construction and Demolition Waste Guide - Recycling and Re-Use Across the Supply Chain*, The Department of Energy and Environment Canberra, Australia.
- Environment and Communications References Committee 2018, *Never waste a crisis: the waste and recycling industry in Australia*, Commonwealth of Australia 2018.
- Environmental Protection Act 1970, *Environmental Protection Act 1970*, EPA, Melbourne, Australia
- Hanisch, C 2000, 'Is extended producer responsibility effective?', *Environmental science & technology*, vol. 34, no. 7, pp. 170-5.
- IBISWorld 2019, *Construction in Australia*, IBISWorld.
- National Waste Policy 2018, *Less Waste. More Resources*.
- NWR 2018, *Australian National Waste Report 2018*, Department of the Environment and Energy.
- OECD 2016, *Extended Producer Responsibility: Updated Guidance for Efficient Waste Management*, Organisation for Economic Cooperation and Development, OECD Publishing, Paris.
- Shooshtarian, S, Maqsood, T, Khalfan, M, Wong, P & Yang, R 2019, 'Managing construction and demolition (C&D) waste in Australia', paper presented to CIB World Building Congress 2019 'Constructing Smart Cities', Hong Kong, China, 17-21 June
- Trading Economics 2018, *Australia GDP from Construction*, Trading Economics <https://tradingeconomics.com/australia/gdp-from-construction>.
- World Economic Forum 2014, *Towards the Circular Economy: : Accelerating the scale-up across global supply chains*, Geneva, Switzerland.