

Building Community Capacity in Construction and Demolition Waste

Winston Churchill Memorial Fellowship Report
Mark Roberts
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Executive Summary

In 2019 I was awarded a Winston Churchill Memorial Fellowship to undertake a study tour of organisations in the USA and Canada that are active in deconstruction, to understand the underlying conditions, operational factors, and regulatory demands that are successful in keeping deconstructed material in the circular economy. Due to travel restrictions, I was finally able to undertake this study tour in May 2022.

I visited and met over 30 diverse organisations, from social enterprises, businesses, and government and non-government organisations across the USA, Canada, and, subsequently, England.

The key learnings from this study tour reveal a compelling case for building capacity among organisations active in construction and demolition (C&D) waste. Some common factors lead to success in these enterprises.

Having suitable facilities with secure tenure to process and resell materials is vital to receiving, storing, processing, and selling items indoors and maintaining the value of recovered materials. Moving locations is very disruptive, especially in the case of not-for-profits. Logistical support, typically box trucks, for recovering and selling materials makes the recovery and sales of materials more effective.

Developing relationships and integrating well into local communities is essential to successful resource recovery, whether residents, businesses, or contractors. In return, resource recovery organisations effectively provide jobs, training, and volunteering opportunities to their communities, especially for marginalized people or seeking support to gain new skills.

Supportive regulation that encourages and drives building materials to be reused underpins the efforts of community-based organisations and businesses that recover C&D waste. The key common attribute I found in the many successful organisations I visited, is the people who founded and lead these groups. The degree to which they are personally invested in the success and outcomes that they seek to achieve is a vital ingredient for their organisations.

Acknowledgments

This project would not have been as informative and inspiring without the support of a lot of people. It has been a privilege to have had the assistance of:

- Auckland Council for supporting and encouraging my application to the Winston Churchill Memorial Trust and providing the time to tour the USA and Canada.
- Brenda Martens from Lighthouse Sustainability Society for arranging a meeting with local government agencies and businesses in Vancouver.
- A huge number of people from public organisations in the USA and Canada who assisted me, including The US Environmental Protection Agency, The City of Los Angeles, The City of Vancouver, The City of North Vancouver, Metro Vancouver, The City of Richmond, The City of San Francisco, The City of Palo Alto and the City of Philadelphia as well as The University of the Fraser Valley. These people have provided me with a wealth of information on C&D waste policy and regulation.
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- Bradley Guy from Material Reuse for providing me with a considerable amount of useful knowledge and resources and inviting us to his unique home in Gainesville.
- The dedicated owners, management, staff, and volunteers of the deconstruction, reuse, and salvage businesses and not-for-profits I visited in the USA.
- The Winston Churchill Memorial Trust for making this study tour possible and to my wife Debbie for acting as my tour manager and travelling companion.

Introduction

Background

I am a Senior Waste Planning Specialist at Auckland Council. My role is to implement the actions relating to C&D waste in Auckland Council's Waste Management and Minimisation Plan 2018.

Construction and demolition accounts for around half of all the waste sent to landfill in New Zealand, with this source waste totalling 3 million tonnes (Ministry for the Environment, New Zealand Waste Strategy, 2010). There is widespread use and demand for salvaged building materials, but most are lost when buildings are demolished with a digger at the end of their life rather than being deconstructed. Most of this waste is hidden in skip bins and transported directly to a landfill or, if it is lucky, to a facility that will separate the major components for recycling and use as biofuel.

The scale of the problem is set to grow substantially with the current demolition of over 10,000 and build of 22,000 social houses in Auckland over the next 8-10 years¹. This alone is set to result in 303,000 tonnes of C&D waste. This resource could be used to create value in the Auckland community.

Auckland Council's investment in Community Recycling Centres proves that with the right facilities, waste can be diverted, with jobs and training opportunities created. Investing in C&D waste infrastructure will also create new small innovative businesses that collect, sort, and process recyclable and reusable materials.

¹ Rohani, M., T Huang, L Hoffman, M Roberts and B Ribeiro. (2019). Cost-benefit analysis of construction and demolition waste diversion from landfill. A case study based on HLC Ltd development in Auckland. Auckland Council technical report, TR2019/009



Figure 1 Artist's impression of the proposed EcoPark in South Auckland. (Southern Initiative).

A recent 'EcoPark' proposal (<https://tinyurl.com/w2u6jsx8>) describes a desire to flip Auckland's \$5 billion waste problem into a catalyst that provides direct and measurable benefits for communities and, in doing so, reshaping the market in recovered and recycled materials at scale.

Several community-led initiatives in Auckland turn waste into a resource, for example, Community Recycling Centres in Auckland (see photo below), as well as Raglan, Wanaka, and other places. These facilities continue to grow their capability and specialisation to effectively tackle larger volumes of construction and demolition resources.



Figure 2 - Tipping Point Community Recycling Centre, Auckland

The aim of this Fellowship

This fellowship intended to build a greater understanding of how community-led deconstruction hubs in North America operate and have remained sustainable in the long term.

Deconstruction is the dismantling of a building in such a way that the maximum practical volume of materials, fixtures and fittings are removed in a way that preserves and maintains the value of materials, maximizing reuse.

This project has sought to understand how community-led deconstruction hubs, common in many North American cities, can, by deconstructing buildings rather than demolishing them, divert construction and demolition materials from landfill to beneficial uses and creating opportunities for people who may otherwise have difficulty gaining work skills, training, and meaningful employment.

I set out on this trip with a reasonably clear idea of the organisations I wanted to visit. I could not have predicted the number of interesting places, organisations, and people I had the privilege of being introduced to and hearing the stories and explanations of how their valuable work contributes to construction and demolition waste minimisation. For this reason, I have included mention of as much of that work in this report as I can.

Critical questions the fellowship project asks.

- What are the underlying conditions (e.g., community interest, regulation, business partnerships) ensuring that deconstruction hubs keep deconstructed material in the circular economy instead of being directed to landfills?
- How do these deconstruction hubs operate at scale, remain financially viable, and access key markets for the deconstructed materials? What are the activities that haven't worked?

- How do these community-led deconstruction hubs deliver new opportunities for low-skilled or marginalised people and provide wraparound support for those people over the longer term?

The method of my study was to meet with individuals, organisations, and businesses who are active in reducing construction and demolition waste. I also met with three individuals in online meetings for purely practical reasons. This meant a busy three-week itinerary that took in organisations on both the east and west coast of the USA, as well as a visit to a site in the south of England as part of a private trip. This is detailed in Appendix 1:

About the Winston Churchill Memorial Trust

The Winston Churchill Memorial Trust assists New Zealanders with a passion and interest in any aspect of society or environment, to discover first-hand, new opportunities and solutions from around the world.

Taking Sir Winston Churchill's belief that greater international understanding could be promoted through people travelling to other countries and experiencing other cultures, the Winston Churchill Memorial Trust (WCMT) was established in 1965 to award Churchill Fellowships. Fellowships provide New Zealanders with extraordinary opportunities to bring back new insights & understanding that will enrich their communities and New Zealand as a whole.

Key Findings

Community-based organisations and social enterprises are highly successful in diverting construction and demolition waste.

While numerous highly successful for-profit organisations are working in this area around the USA, not-for-profit organisations are also achieving great outcomes for their communities and diverting waste. Many of the difficulties faced by salvage and reclaim organisations, for example, having stable premises, are common to both.

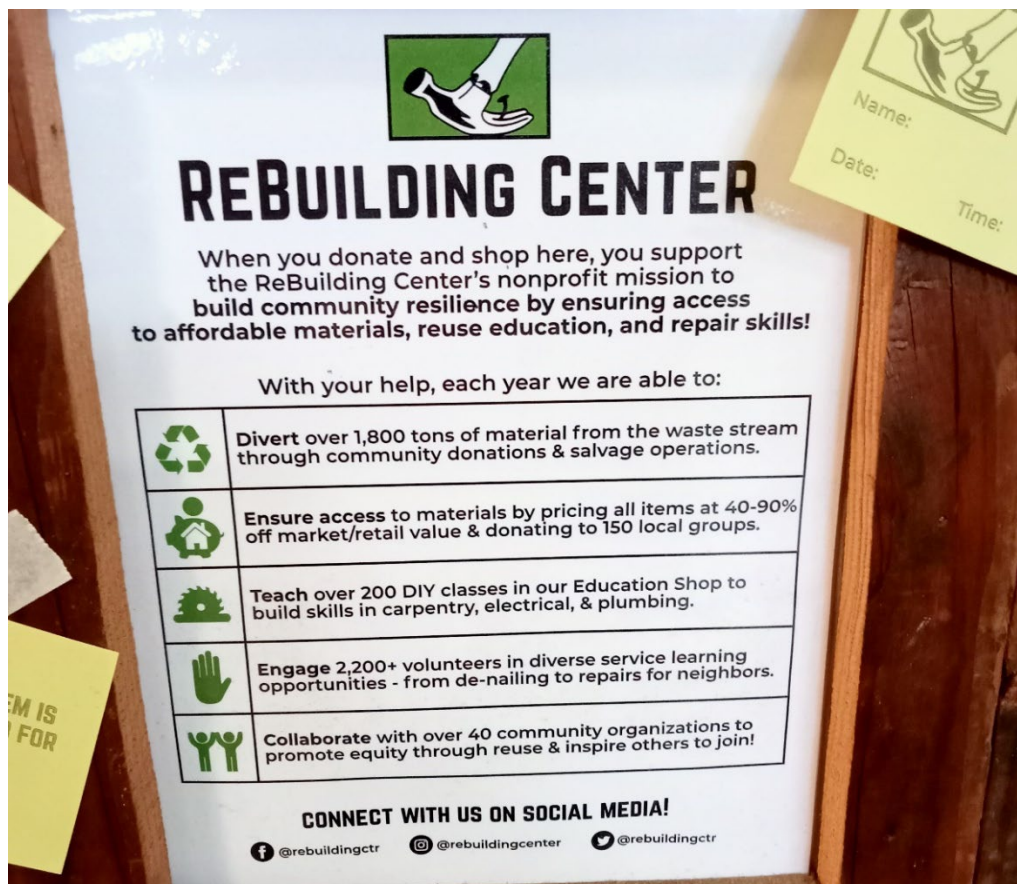


Figure 3 ReBuilding Center information card

I observed examples of not-for-profit and for-profit organisations, such as Placemakers (San Carlos) and Second Use (Seattle), which are highly organised and operating with well-established systems. The owners pointed out that they had been in operation for a long time, often decades, allowing them

to develop and re-invest in their business. All these organisations are well integrated within their communities and their supplier networks. Some are well known in their local area as a destination, an interesting and curious alternative to shopping-mall or big-box DIY store culture.

It isn't always plain sailing to operate in the recovery of construction and demolition materials. Several organisations referred to the same challenges, such as having enough space, sufficient trained or experienced staff, and security of tenure in a building.

Tax rules on donations to not-for-profits in the United States.

Like New Zealand, cash donations to registered charities attract a tax refund in the US.

However, in the United States, any type of donation, including the value of physical items such as deconstructed building materials, can also be claimed as a tax deduction.

In the case of house deconstructions, a registered appraiser needs to schedule the items that can be retrieved before work takes place and the receiving organisation provides a tax receipt.

Variation in tax rates means for deconstruction, this normally is only attractive to individuals rather than businesses.

The tax benefit from a deconstruction can be lucrative, in some cases in the region of \$60,000.

Taxpayers can also spread their deconstruction tax deduction over multiple years. The tax system forces contractors to undertake deconstruction even if they typically wouldn't which one operator described as "the medicine they wouldn't otherwise choose to take."

Allowing a tax deduction for donating deconstructed materials is a key component in the financial viability of many not-for-profits working with deconstructed materials. These tax rules make deconstruction attractive and are instrumental in maintaining deconstruction capability in the industry.

Facilities that divert construction and demolition waste at scale are highly effective at creating job opportunities.

The creation of jobs is often referred to as a benefit of diverting construction and demolition waste.

The US EPA estimates that for 10,000 tonnes of waste, just six jobs are created if that waste is landfilled, but 36 jobs are created if that same waste is recycled.

Each of the organisations I visited demonstrated support for this job creation potential. Simply running an organisation that operates in a sizeable warehouse of 30,000 to 40,000 square feet takes people and skills. Community Forklift employs 35 people undertaking a range of work, while Second Use needs 45 staff over two locations. ReBuilding Centre employs 20-25 people at any given time.

Having facilities that accept materials for reuse also has a knock-on effect for jobs and small businesses outside of those operations. Examples include Vancouver-based Unbuilders, a small business set up to specifically offer deconstruction services, and Rheaply, a platform to exchange materials and items efficiently. These types of businesses operate on the back of a growing market for recovered and reused items and materials.

Job roles are far from limited to stores and retail. Some organisations, such as Placemakers Inc., have their own deconstruction teams working in the field, ensuring the supply of reusable materials to their store. ReBuilding Center is active in training and education as well as community outreach. This requires further skilled and experienced staff.



Figure 4 Urban Ore staff appraising and receiving inwards goods.

Within the store locations, specialist staff work on various aspects of the operation, including marketing, merchandising, and preparing stock for sale. Staff who receive stock also need the knowledge and capability to spot items that are or are not resalable. Most sites mentioned that this knowledge takes time, often years, to develop.

Some organisations, such as Community Forklift and Second Use are highly active in online sales and social media, requiring skilled IT and online system savvy staff. Community Forklift has five staff devoted to these functions.



Figure 5 Lighting shop in the Second Use store.

Many facilities depend on deconstructed materials from site clearances and deconstructions. This work entails higher levels of labour to recover items in resalable condition and creates more jobs than would exist if buildings were demolished mechanically with a digger.

A feature of some organisations is housing small businesses within their premises. Examples of this include the restoration of light fittings, which in the case of original antique or mid-century fixtures, can be profitable. Some specialist recycling operations, such as separating and sorting scrap metal, are undertaken to improve the value of the recovered materials.

The right buildings and facilities are a key to success.

It is not unusual to see large builders' merchants and DIY-type retailers operating out of a large box building and the facilities providing used and deconstructed materials. The locations I visited tend to also operate in high-stud, warehouse-like buildings.

Having a large, secure, and enclosed warehouse building allows for a lot of stock of bulky items. It also allows their condition and value to be maintained and for items to be properly displayed. Keeping stock dry and out of the elements is vital for maximising resale value and creating an attractive and engaging shopping experience for visitors.



Figure 6 ReUse People of America, Second Use, Urban Ore, and Community Forklift.

The recycling and reuse facilities I visited were typically in the range of 30,000 to 40,000 square feet (2,780-3,710m²) with high stud heights. These buildings often, but not always, come with built-in loading docks and high doors to easily move goods in and out without manual lifting and prevent weather damage during loading.

Most, but not all construction and demolition materials require a covered space. A common feature of facilities is a yard area that can accommodate materials such as stone, brick, concrete items, and some building plastics such as pipes and metal items. In the case of Urban Ore, this space is at least as big as their warehouse facility.

In-house logistical support builds stock turnover.

Most recycling and reuse organisations I visited can provide some of their own logistical support. This helps them access materials people or businesses would otherwise have difficulty getting to the site. This usually consists of box trucks, sometimes with a tail lift.

Having their own vehicles also allows organisations to offer a delivery service. In most cases, pick-up and delivery are charged for, typically around \$20.00. ReBuilding Center offers free pick-up and delivery to prevent transport from being a barrier to their community, either providing or buying materials.



Figure 7 Examples of resource recovery collection vehicles.

For some organisations, the provision of pick-up services significantly contributes to their stock. Collected items are often bulky and valuable, and one organisation told me that 70% of their revenue comes from items they pick up with a resale value of \$4,000-\$5,000 per day. Urban Ore grew from recovering items at a local transfer station, and this hasn't changed as a source of stock, so logistics capability is also a key part of their operation.

Great marketing and merchandising drive sales.

Community-based organisations operating as social enterprises in construction and demolition materials can find themselves in positions of undertaking cause, product, and service marketing. Organisations that can successfully do this mix of marketing types can unlock extra sales volume.

A large retail space allows for a large selection of stock. Multiple locations mentioned the need to stock a large variety of doors, with Community Forklift indicating they stock up to 2000 doors to meet demand.

Some organisations have become extremely adept at using online systems and social media. Community Forklift has a team devoted to marketing on YouTube, Facebook Marketplace, eBay, and Chairish. This is in addition to their own Shopify online store.

Second Use has developed sophisticated online systems to control and sell stock. All items valued over \$10.00 are measured, described, photographed, and loaded into their own stock management system. This enables products to appear immediately online for sale. The system also indicates to buyers exactly where the product can be found in the warehouse.

Another notable aspect of Second Use's stock control is the use of wheeled platforms called 'dollies.' A large proportion of stock is placed on dollies. Store owner Dirk explained that this enabled them to easily relocate stock, reconfigure parts of the store and prevent lifting injuries.

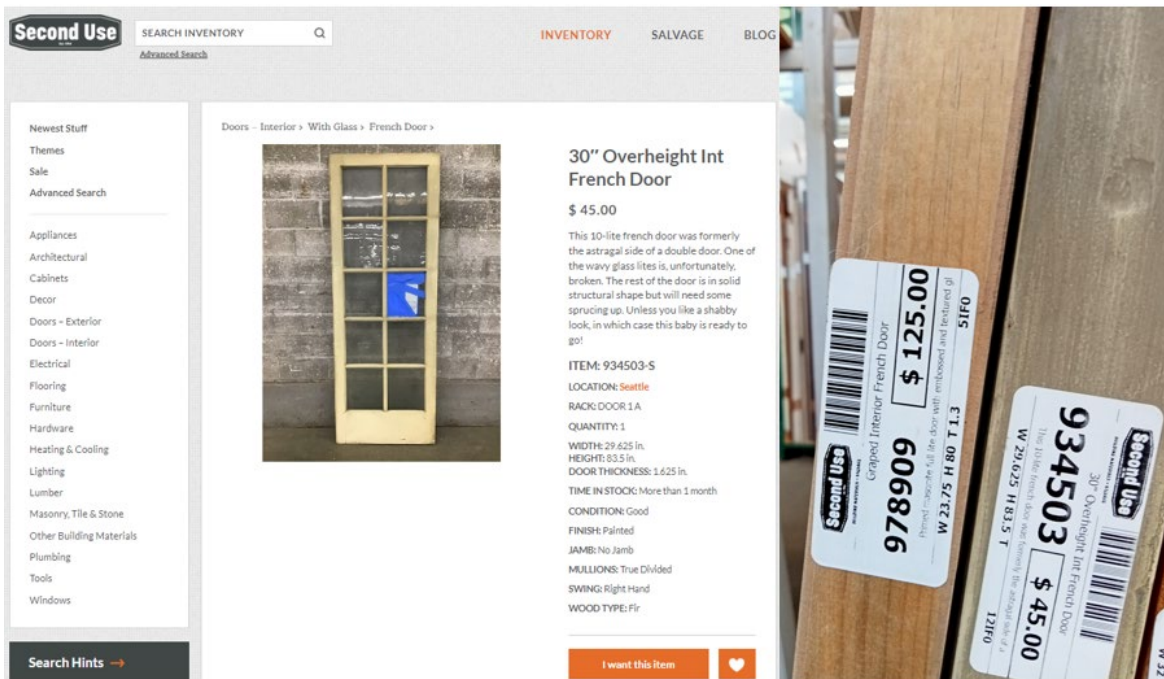


Figure 8 An example of a product on the Second Use website and physically in the warehouse.

Creating a compelling shopping experience through merchandising is a priority for all retail outlets. Each organisation I visited goes about this in its own way. Some sites like Urban Ore and Building Resources make a dedicated feature out of creating a place that is jam-packed with interesting curiosities, historic fixtures, and fittings, which makes for a charmingly chaotic appearance that makes Urban Ore such an attractive and interesting destination.

This can be contrasted with organisations that give much attention to arranging their store and detailed merchandising by creating room scenes or creatively grouping similar items like antiques, techniques commonly used by department stores.

Selling reclaimed timber in any quantity requires special attention to the quality of the materials and presentation. Locations like Provenance, Placemakers, Rebuilding Centre, Second Use, and ReUse People do this well. Recovered timber needs to be presented as if it were new, de-nailed, stacked, and



Figure 9 Merchandising displays at Community Forklift and Provenance

filleted into neat packets . This makes it easy for customers to locate what they are looking for and makes it eminently more usable.

Philadelphia based Provenance has become especially adept at sourcing and presenting old-growth timber exported worldwide and used domestically. The first thing that strikes you when walking into their warehouse is how orderly and neatly displayed it is. All lengths are trimmed and strapped into packets like freshly milled timber, promoting its resale value.

Being reclaimed, this timber often comes with a back story of where it was recovered, with barn wood timber becoming particularly desirable for interiors because of this.



Figure 10 Timber on display at Provenance, Second Use, Placemakers, and ReBuilding Center.

Not-for-profits are also innovative in seeking new items and materials for recovery and reuse. An example is Urban Ore which has identified that equipment from solar power systems renewals is being discarded, despite still having useful life left in it. Urban Ore is recovering this equipment and making it available for reuse.



Figure 11 Recovered solar panels awaiting reuse at Urban Ore.

Reclaimed materials aren't just for furniture making

It is commonly believed that reclaimed materials can only be used for furniture making, interior fit-out, and landscaping. Florida-based architect and academic Bradley Guy has devoted a career to discovering and teaching how reclaimed materials can be used again, along with creating energy-efficient buildings.



Figure 12 Reclaimed timber framing. Photos, Bradley Guy.

I was fortunate to visit Brad's recently built house in Gainesville, Florida. After carefully deconstructing the previous house on the site, he built the new house using as much of his recovered materials, mostly timber, as possible. Submitting plans that clearly stated the structural properties required and how these reused materials would perform, the plans and build process passed building control requirements.

All the reused materials were processed by Brad onsite, including de-nailing, sorting, and grading timber.



Figure 13 Reused timber can be seen in the cladding and soffits.

From the street, the house looks like a stylish, architecturally designed home. On closer inspection, the integration of the materials from the previous home gives the home strong texture and interest.

Reclaimed timber has been used in the cladding, soffits, internal detailing as well as the framing. The house even sits on the footprint of the previous home.

It was refreshing to see reclaimed materials being so thoughtfully and creatively used in a new build, challenging all the myths of using these items. Brad indicated that using reclaimed materials did present some challenges for the builders. However, the result is a new home that embodies the previous home, and Brad's philosophy of reusing materials creates a new dwelling with genuine interest.

Further use was made of the timber from two trees felled on the site; this was milled onsite for use in building a workshop adjacent to the house.

The wider benefits that go with reusing materials.

“There are also environmental and social benefits to the reuse and recycling of the materials. The avoidance of landfilling materials extends the life of existing landfills. The reuse and recycling of materials preserves the embodied energy of the existing materials and substitutes for the energy costs of producing new materials. When materials are reused / recycled within the radius of the local community, transportation fuel use is avoided in the importation of materials produced elsewhere.

The salvage of architectural components allows for renovation and rehabilitation of other structures using the “original” styles and materials rather than either changing to inappropriate new styles or making costly reproductions.”

Deconstructing Hume Residence Hall, Guy and Strong, 2001

A secure location to operate from helps... a lot

Every organisation needs a home and having a secure site to operate from is a critical factor in the success of reuse organisations. A few organisations indicated that they had been required to relocate, often several times, to new locations. This stresses the organisations typically carrying a lot of stock and operating with low reserves. One organisation had been required to move because of the pandemic, which has clearly been a double blow to their activity. This organisation is now fighting courageously to get back on its feet.

All the organisations I met with, for-profit and not-for-profit, typically pay commercial lease rates. This can be as much as \$30,000 per month for their warehouse and yard premises. The need to be able to pay the lease each month certainly provides some of the drives behind making sure that the operation, marketing, and merchandising are efficient and profitable.

Security of tenure is critical for all types of operations that work in waste minimisation. It enables systems and processes to be settled, developed, and adapted to the market over time, free from the threat of relocation. This problem is real for all these organisations. Since my return, Community Forklift has been given notice on their premises and are seeking a new location.

The power of strong relationships

The most successful reuse organisations have built strong and enduring relationships with other businesses and within their local communities. Ensuring a regular supply of stock and ongoing sales means being able to work with others. In the case of deconstructed materials, this typically means working with deconstruction contractors and building appraisers who facilitate tax rebates for developers. Deconstruction contractors regularly use the same reuse and salvage destinations for their recovered materials.



Figure 14 Placemakers Inc. partnership with the City of San Bruno

I also observed examples of private, not-for-profit, and public working together. San Bruno-based Placemakers Inc has partnered with The ReUse People of America to facilitate developers claiming the

tax benefit of deconstruction and allowing more significant volumes of timber to be sold through their yard. To lift their capacity, Placemakers Inc has received a grant from the City of San Bruno to improve and increase the timber capacity in their yard.

A further source of stock for reuse organisations is new surplus materials no longer required by builders and other businesses. It is not unusual for materials to be left over from building projects due to the prevalence of over-ordering. Wholesalers also over-order stock and having relationships with these businesses is a valuable source of new materials for sale. In most locations, we saw many new, unopened boxes of tiles that had been over-ordered for building projects. Refits of hotels are also a regular source of quality fixtures and fittings. Maintaining strong relationships with local businesses can be an important way of obtaining excess and new stock.



Figure 15 Pallets of brand-new unused tiles for sale at Community Forklift

Google in the circular economy

A leader in cutting-edge technology and innovation, Google is also pushing boundaries on sustainability. With over 130,000 employees and buildings in multiple campus-type locations, Google is a large operation. Famous for creating office spaces that have a fun and casual style, they have an extensive building renewal programme. Excess furniture and other fittings are held in their furniture warehouse, prepared, and made ready for reuse. Other items are released to specialist reclaim and distribution contractors who told me this allows recovered items to go to second-hand and community outlets in regional towns, who can have more difficulty obtaining the level of stock often seen in large city second-hand outlets.

Google have their sights set on creating office buildings of the future and have been building new office spaces to LEED platinum status as well as Living Building Challenge certification on buildings on their Sunnyvale Campus. Lauren Sparandara, Sustainability Partner at Google, indicated that they are designing buildings with their eventual reuse or deconstruction and re-entry into the circular economy in mind.

The most important relationship is with local communities. This is especially evident in social enterprises. Organisations like ReBuilding Center have a thriving reuse and salvage outlet, they have added wrap-around services for their community that are empowering their community with the skills to use the materials they sell. Part of their aim is to use deconstructed materials to deliver on their purpose as a climate justice organisation, making reuse and repair affordable for everyone in the Portland community.

Success comes from people who are completely invested in what they are doing.

It was noticeable among all the organisations I visited that there is a huge level of personal and, likely, emotional investment in those organisations. Many organisations are still being led by the people who started them, meaning they are deeply connected to what they are doing, why they are doing it, and to

their continued success. As well as a commitment to waste minimisation, there is typically a deep commitment to the community and people involved in operating the organisation. This can extend over decades.

It isn't easy running a business or social enterprise in this sector. Whilst many resource recovery organisations have multi-million-dollar turnovers, the challenge of staying active and viable is ever-present. Yet there is often a long-standing commitment to continue to trade and operate over the long term.

This personal investment is also present in the local and central government officers I met. Developing policy, gaining political interest, and implementing initiatives in any aspect of waste minimisation takes a long-term perspective, and again, I saw a lot of investment in the cause from people working on this.



Figure 16 A selection of amazing people doing great work to tackle construction and demolition waste.

Regulation as a driver of material reuse

Policy supports good deconstruction practice

In New Zealand, we can typically see somewhat of a ‘hands-off’ approach by local authorities to demolition and site clearance. This is supported by an enduring general belief in the demolition industry that the only effective way to remove a building is to literally smash it with a mechanical digger and cart the waste to the most convenient landfill. In recent years, a best-case scenario has been that materials find their way to a material recycling facility like the Kalista plant in Auckland or a recycler if available.

A few local authorities in New Zealand have adopted some bylaw requirements to approaches that have become common in the cities I visited on the tour.

My discussions with local government and the resource recovery organisations revealed that regulation can play an important role in directing demolition contractors to deconstruct and soft-strip materials, providing a supply of reusable materials that would otherwise go to landfill.

Soft-strip demolition is the removal of any fixtures and fittings, and retrievable building materials before a building is mechanically demolished.

Demolition permits are the regulatory bottom line.

The requirement to obtain consent or a permit to remove a building is a common regulation covering site clearance in the USA. While in New Zealand, this requirement has been phased out by many local authorities. Having to apply for a demolition permit will alert local authorities to site clearance activity and provide data on the scale and extent of demolitions. This also provides a means for local

authorities to provide information and resources to developers on alternatives to demolition, such as soft stripping.

The role of mandatory site waste plans

A requirement to submit a waste plan before undertaking construction or removing a building is common in North American cities, especially in California. Mandatory site waste plans ensure that at least some consideration of waste is made before demolition or construction starts and that this is adequately managed.

The City of San Francisco requires a Demolition Debris Recovery Plan to be submitted by contractors to indicate how they will deal with demolition waste. The plan is submitted online and links to tracking the city make on the flow of demolition waste.

Palo Alto requires documentation of waste volumes and their eventual destination to be uploaded into a tracking system, Green Halo, indicating that materials on the salvage survey were properly salvaged by a City approved reuse organization.

Waste plans also sit alongside the requirement for waste tracking and reporting that may be required by local authorities and ensure that targets for diversion can be met. In San Francisco, licensed waste collectors are engaged to remove waste.

Setting salvage and recovery targets.

Setting targets for developers and contractors can also be an element of mandatory site waste plans. In the City of Vancouver, there are requirements to meet recovery targets depending on the age of the house being cleared. For homes built before 1950, a minimum of 75% of materials by weight must be

reused or recycled. Houses of this era and those deemed as “character houses” by the city, are required to salvage a minimum of 90% of materials by weight (excluding hazardous materials) that must be reused or recycled. In addition, houses listed on the City of Vancouver Heritage Register or built before 1910 have a minimum wood salvage requirement of 3 tonnes.

Targets can also apply to processing facilities. In San Francisco, regulations detail that for MRFs to maintain registration, their operational effectiveness must achieve a minimum 65% reported recovery rate of mixed construction and demolition debris.

Licensing of collectors and construction waste processors

It is not unusual for local authorities to require the permitting of waste collectors, processors, and landfills. This is also the case in Auckland, where the solid waste bylaw obliges waste collectors and facilities to be licensed with Auckland Council.

The City of Los Angeles requires persons who collect, remove or transport construction and demolition waste, including construction and demolition (C&D) waste, source-separated materials, or co-mingled recyclables, generated from within the City of Los Angeles, must obtain a solid waste hauling permit from the Bureau of Sanitation. In addition, building and demolition contractors must engage a permitted waste haulage contractor who must, in turn, take all construction and demolition waste to one of eleven MRFs licensed by the City of Los Angeles. One such facility is California Waste Services in Gardena, Los Angeles.

Building scale in Materials Recycling Facilities

Materials recycling facilities (MRF) receive discarded items and materials, typically mixed, and sort them for recycling or further processing. MRF's vary in scale and in sophistication but the California Waste Services (CWS) site is undoubtedly a leading facility. The first thing that strikes you is that despite being consented to receive 900 tonnes of waste per day, the site is spotlessly tidy. All work is gradually being brought indoors and there is absolutely no sign of litter blowing around or getting caught in gutters or fences. For context, this plant could process half of Auckland's C&D waste each year.

CWS accept both co-mingled C&D waste and inert material. Inert material goes through some mechanical and manual separation of large pieces of concrete and brick with those materials being crushed and soil separated. Interestingly, crushed concrete and soil are given away for free for use as basecourse.

Co-mingled C&D waste goes through multiple layers of separation and processing. A combination of manual separation, magnets, sieves and ballistic separators pull out wood, metals, concrete, plastic and plasterboard of various sizes to achieve a level of 70% diversion.



The key learning from this visit is the relationship between regulation and investment in processing capability. CWS are consistently improving their processing capability, but this is underpinned by the certainty that regulation will bring a flow of materials to process.

Making deconstruction mandatory

Since July 2020, The City of Palo Alto, CA, has sought to reduce the volume of the two major sources of waste in the city, food waste and construction and demolition waste. In the case of demolition waste, the city has implemented an ordinance that has banned site clearances by demolition in favour of deconstruction. The ordinance requires the careful disassembly of building components to maximise the recovery of materials, fixtures, and fittings.



Figure 17 Residential building undergoing deconstruction in Palo Alto

To obtain a permit to remove the building, the ordinance requires buildings to be surveyed and scheduled for salvageable materials before a demolition permit is issued. An approved deconstruction surveyor must undertake this schedule.

Sorting of materials must be done onsite, preventing materials from leaving in comingled skips, and then collected by an approved collection contractor. The results of the deconstruction, materials, and volumes recovered must be entered into Green Halo, an online system for recycling and recovery levels. An official from the City of Palo Alto visits each site to check that deconstruction methods and site separation are being implemented.

The economic case for deconstruction

Deconstruction of buildings to recover the materials it's built of is not a new concept, but it has generally fallen out of favour as mechanical, digger-based demolition has made site clearances quick and cheap. Recent changes in methods used by Kāianga Ora, Tamaki Regeneration, and others have revitalised deconstruction.

The use of deconstruction often draws the criticism that it is too expensive, with studies suggesting that this can range between 5-10%¹ to as much as 26%² more than a mechanical demolition.

However, when considering the benefits to society and the environment and the reduced costs of landfill disposal, the cost/benefit ratio can be as high as 2.6. In the USA, the tax system heavily encourages deconstruction, where a not-for-profit is engaged to receive salvaged materials for resale.

¹ Rohani, M., T Huang, L Hoffman, M Roberts and B Ribeiro. (2019). Cost-benefit analysis of construction and demolition waste diversion from landfill. A case study based on HLC Ltd development in Auckland. Auckland Council technical report, TR2019/009

² Guy, B., Building Deconstruction: Reuse and Recycling of Building Materials, Alachua County Solid Wastes Management Innovative Recycling Project Program

The introduction of a ban on demolition certainly has an apparent effect on the processes used to clear sites; this was obvious from the input provided by the City of Palo Alto site inspector. The two site visits I made with the inspector indicated that contractors have the skills and ability to make deconstruction effective. Supporting services such as building salvage surveyors and reporting tools are also available, making this approach to reducing construction and demolition waste very achievable and practical.

Conclusion and recommendations

The visits I've made to the thirteen salvage and reclaim organisations revealed that although they operate in their own way and respond to their own community, I have learned that there are some common factors to their success. These factors address the key questions this Winston Churchill Memorial Fellowship set out to answer.

- Good backing regulation sets up the type of activity social enterprises undertake. For example, the tax system in the USA, which allows any financial or material donation to be claimed as a tax donation, is a benefit to all not-for-profit organisations. While they are typically not fully dependent on this arrangement, it is a driver of deconstruction.
- Getting to scale takes time. All the resource recovery organisations have taken time to develop. Existing over a long period of time allows these organisations to understand what systems, relationships, and materials work best for them.
- Access to a large, enclosed building to house stock and operate out of is essential. A substantial, enclosed building preserves the value of stock and makes for a more attractive, all-weather retail space. Those organisations I visited that have a large building are busy, active enterprises with turnovers in the millions. Those that operate from a yard-type setting are less so.
- Moving location is a disruption to success. Residing in a stable, long-term, large-scale, enclosed building is a huge advantage. Having to move to new locations is very disruptive to social enterprises.

- Organisations need to be well connected to their community and customers. This can be done in many ways, from strong relationships with local contractors, tenacious use of social media, or undertaking in-house training of people in their area.
- The methods of presentation and merchandising of stock in the deconstruction hubs vary widely from highly sophisticated and online to gloriously chaotic. All methods and styles seem to attract customers equally. However, organisations that are successful with construction materials have well-organised marketing and slick in-store merchandising.
- Recovering construction and demolition materials creates jobs. Most of the recovery locations I visited have 20-40 paid employees who provide their communities with training and skills. MRF locations will also produce substantial numbers of jobs, although probably fewer per tonne than resource recovery.

Auckland Council and other local authorities across New Zealand are improving the facilities that can receive reusable construction materials. As these facilities are developed, I hope my learnings and this report can be incorporated into the design and setup of facilities and provide value and insights into how community-based facilities can divert waste and provide positive outcomes for their communities.

At the time of writing, I have already made a presentation of my learnings to Auckland Council staff (this will become available on the Auckland Council YouTube channel). I also have invitations to present to local government officers across New Zealand and WasteMINZ. A blog of my study tour can also be viewed here: <https://communityandconstructionwaste.blogspot.com/>

Appendix 1 – Study tour itinerary

My tour intended to meet with individuals, organisations, and businesses who are actively reducing construction and demolition waste. This meant a busy three-week itinerary that took in organisations on both the east and west coast of the USA, as well as a visit to a site in the south of England as part of a private trip. This is detailed below:

Date	Person	Organisation
Tue 17 May	Jessica Marschall, President and CEO/CFO	Online meeting with The Green Mission, Fredericksburg, VA.
Fri 20 May	Shufan Wei LA Sanitation and Environment, Solid Resources Citywide Recycling Division	Visit California Waste Services, Los Angeles, CA.
Mon 23 May	Nancy Meyer, CEO.	Visit Community Forklift, Edmonston, MA.
Tue 24 May	Greg Trainor, Executive Director	Visit Philadelphia Community Corps.
Wed 25 May	Marc Wilken & Nicholas Esposito	Visit Fairmount Park Organic Recycling Centre, Urban Wood Project, Philadelphia, PA.
		Visit 1850 American Way and Provenance, Philadelphia, PA.
	Christine Knapp, Director of the Office of Sustainability.	City of Philadelphia Office of Sustainability.
Fri 27 May	Bradley Guy, Architect.	Material Reuse, Gainesville, FL.
Sat 28 May		Visit The Repurpose Project, Gainesville, FL.
Tue 31 May		Meeting with a group of around 20 people from the greater Vancouver area working on construction and demolition from regulatory, research, advocacy, and business perspectives, hosted by Lighthouse Sustainability Society.

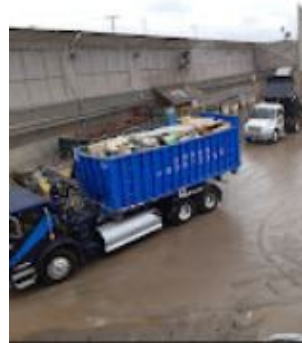
Thu 2 June	Dirk Wassink, Director.	Visit Second Use, Seattle, WA.
Fri 3 June	Mackendree Thompson, Community Philanthropy Manager	Visit ReBuilding Centre, Portland, OR.
Mon 6 June	Ted Reiff, President.	Visit The ReUse People of America, Oakland, CA.
	Max Wechsler, Operations Manager.	Visit Urban Ore, Berkeley, CA.
Tue 7 June	James Slattery, Eden Bruckman.	San Francisco Department of the Environment.
		Visit Building Resources, San Francisco, CA.
Wed 8 June	Timonie Hood, Zero Waste & Green Building Coordinator.	U.S. Environmental Protection Agency.
	James Dawes, Owner.	Visit Placemakers Inc, San Carlos, CA.
	Maybo AuYeung, Zero Waste & Environmental Program Manager.	The City of Palo Alto.
	Matt Russell, Government Account Executive.	Online meeting, Rheaply Resource Exchange.
Thu 9 June	Lorenz Schilling, Owner.	Online meeting, Deconstruction & ReUse Network, Inc.
	Lauren Sparandara, Sustainability Program Manager	Meeting at Google, Sunnyvale, CA.
	Francine Areas, Communications Manager.	Visit GreenWaste/Zanker Recycling, San Jose, CA.
Wed 20 July	Steve Bannatyne, Store Manager	Visit The Woodstore, Brighton. Part of a private visit to the UK.

Appendix 2 - Profiles of reuse and recycling organisations

California Waste Services

For-profit MRF located at 621 W 152nd St, Gardena, CA 90247

California Waste Services is a permitted construction and demolition waste materials recycling facility. They process around 900 tonnes of waste per day. As well as demolition waste, they accept and process inert materials such as concrete for crushing and soil.



Community Forklift

Not-for-profit reuse centre located at 4671 Tanglewood Dr, Hyattsville, MD 20781

Community Forklift accepts donations of unwanted and salvaged building materials throughout the Washington, DC, area. Materials are made available to the public at low cost through their 40,000-square-foot warehouse. They also specialise in providing vintage materials for restoring old homes.



Philadelphia Community Corps

Not-for-profit reuse centre located at 5200 Unruh Ave SE,
Philadelphia, PA 19135.

Philadelphia Community Corps has developed from a response to the significant number of vacant properties and redevelopment in Philadelphia with a desire to reduce waste and create job and training opportunities for their community.



Urban Wood Project

City of Philadelphia project located at Fairmount Park Organic Recycling Center.

This project turns felled urban trees into usable timber. Cut timber is stacked and filleted to dry before being sold to furniture makers and for use in the interior fit-out. Species typically recovered include oak, ash, and maple.



1800 North American Street

A mix of for-profit and not-for-profit enterprises located at 1800 North American Street, Philadelphia, PA 19122.

A hub for businesses that are capturing and selling fixtures and fittings of buildings from Philadelphia's past. The site includes Resource Exchange, which accesses a wide range of household fixtures, fittings, and props from the movie industry.



Provenance

For-profit located at 1801 North American Street, Philadelphia, PA 19122.

Provenance is a for-profit recovered timber dealer that has developed a highly honed method to collect, process, and sell timber and good-condition architectural features.



Repurpose Project

Not-for-profit located at 1920 NE 23rd Ave, Gainesville, FL 32609

The Repurpose Project is a community-led initiative to divert useful resources from landfill and redirect these items to the public for art and education. They operate from a large yard and warehouse facility that includes a large space for recovered building materials.



Second Use

For-profit located at 3223 6th Ave S, Seattle, WA 98134

Second Use operates an extensive materials recovery and sales operation from their warehouses in Seattle and Tacoma. With sophisticated stock control and merchandising systems in place, they have made the reuse of materials easy and efficient for their customers.



Rebuilding Center

Not-for-profit located at 3625 N Mississippi Ave, Portland, OR 97227

Rebuilding Center work on recovering reusable building materials and seeing them repurposed in their community. Their facility also contains a fully equipped woodworking classroom to provide their community with the skills they need to maintain their homes and develop new skills.



The ReUse People of America

Not-for-profit located at 9235 San Leandro St, Oakland, CA 94603

The ReUse People of America are a longstanding resource recovery organisation operating across nine states in the USA. They have worked on over 4,000 deconstructions and diverted over 400,000 tonnes of demolition waste since 1993.



Urban Ore

Not-for-profit located at 900 Murray St, Berkeley, CA 94710

Urban Ore is a festival of second-hand and recovered items. It's like a recovered materials theme park. With 30,000 square feet of warehouse sitting on a 2.5-acre site, anything you're looking for is likely to be there.



Placemakers Inc.

For-profit located at 1062 Center St, San Carlos, CA 94070

Placemakers are a deconstruction company with a difference. As well as being active in deconstructions in the Bay Area, they have developed innovative collaborations with not-for-profits and local government to expand their capacity for recovering interesting and eminently reusable materials, fixtures and fittings, and timber.



Building Resources

Not-for-profit located at 701 Amador St, San Francisco, CA 94124

Building Resources accept a wide range of building and landscaping materials, fixtures, and fittings for resale at their yard and warehouse in San Francisco.



Zanker Recycling

For-profit located at Los Esteros Road, San Jose, CA 95134

Zanker Recycling is a construction and demolition waste recovery operation based, rather ironically, on a closed landfill site near San Jose, California. Accepting a huge range of construction and demolition materials, the scale of their operation can only be described as mammoth. Some describe it locally as the Disneyland of construction waste.



The Woodstore

Not-for-profit located at Oakley House, Edward Street, Brighton
And Hove BN2 0BA, UK.

The Woodstore recovers timber from builders and demolition companies from all over England's South Coast. With a fully equipped workshop, they can provide training and skills to their community, including people recovering and reintegrating into the Brighton community, producing beautiful furniture for sale in their shop.

