

**Deconstruction of City-Owned Properties:  
North American Policy for Construction and Demolition Waste**

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## Executive Summary:

*Deconstructing infrastructure is recognized as an environmentally sustainable method to take down buildings, mitigate waste, and reduce overall environmental impact. However, the economic benefits of deconstruction continue to be contested, resulting in few municipalities formally implementing deconstruction policy. While this report recognizes that numerous factors influence policy, this report seeks to establish the variance in deconstruction practices across North America. This report has a particular focus on British Columbia in an attempt to determine how Vancouver's proposed deconstruction policy relates to other municipal policy and how the City of Vancouver's policy could be improved. This report argues that although Vancouver's deconstruction policy for city-owned infrastructure has yet to be formally executed, Vancouver does have a standard practice for the deconstruction of City-owned facilities and is one of the few leaders of the burgeoning field of deconstruction. Although few cities have developed and implemented binding deconstruction policy, Vancouver has the potential to benefit and learn from Los Angeles', CA deconstruction policy, which has various targets for different materials. Additional recommendations for the City of Vancouver include:*

- *As a building-owner, the City of Vancouver should implement a minimum target that necessitates recycling and reuse of a certain percentage of material. However, this target should not replace existing audits, which hold buildings to the highest possible standard of deconstruction.*
- *As a building-owner, the City of Vancouver should Implement separate targets for inert and "other" waste to avoid loopholes in deconstruction requirements.*
- *As a regulator, the City of Vancouver should continue to ban particular materials from landfills while simultaneously developing infrastructure that recycles prohibited goods appropriately.*
- *As a regulator, the City of Vancouver should consider placing governmental incentives on non-profitable demolition and construction materials.*

## Introduction:

The City of Vancouver currently strives to become the greenest city by 2020 – a goal that necessitates sustainable waste management. As of 2013, 22% of all landfill waste in Metro Vancouver was comprised of construction and demolition material.<sup>1</sup> While some of this material, such as asbestos, necessitates secure and unique disposal, much of this matter is reusable and the vast majority of construction and demolition material is recyclable.<sup>2</sup> The failure to distinguish and separate reusable and recyclable materials prior to disposing waste at landfills is one of the many consequences of traditional demolition practices.<sup>3</sup> Demolition is defined as the “the complete elimination of all parts of a building at a specific location and time”<sup>4</sup> and has been widely used based on economic and temporal advantages. However, all demolition waste is generally undifferentiated, compressed, and disposed in landfills. Therefore, demolition severely impacts the environment by increasing waste and augmenting the demand for new materials, which by extension, increases natural resource extraction. Conversely, deconstruction takes apart infrastructure, enabling all material to be sorted and disposed or reused of accordingly. Deconstruction has the capacity to mitigate environmental impact by extracting reusable and recyclable goods, which subsequently lessens waste and decreases greenhouse gas production by reducing the demand for processed goods and overall extraction. Several North American Municipal governments are considering replacing demolition with deconstruction to decrease construction and demolition waste and lessen a city’s environmental impact.<sup>5</sup>

Vancouver has long been recognized as an environmentally conscious city, however the implementation of the “Greenest City 2020 Action Plan” calls for the transformation of Vancouver’s current waste management polices.<sup>6</sup> Metro Vancouver has proposed to divert 80%

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<sup>1</sup> City Studio. (2013). Deconstruction Hub Project 1: <http://blogs.ubc.ca/citystudioproject1/> Accessed January 9, 2015

<sup>2</sup> Wilmot, S. (2013). Construction and Demolition Materials - Technical Memorandum. *Golder Associates*.

<sup>3</sup> Thomsen, A., Schultmann, F., & Kohler, N. (2011). Deconstruction, demolition and destruction. *Building Research & Information*, 327-332.

<sup>4</sup> *ibid*

<sup>5</sup> City Studio. (2013). Deconstruction Hub Project 1: <http://blogs.ubc.ca/citystudioproject1/> Accessed January 9, 2015; Pun, S., & Liu, C. (2011). A Framework for Material Management in the Building Demolition Industry. *Architectural Science Review*, 391-398.

<sup>6</sup> Greenest City 2020 Action Plan. (2014) <http://vancouver.ca/green-vancouver/greenest-city-2020-action-plan.aspx> Accessed January 12, 2015

of all waste derived from demolition, land clearing, and construction by 2020 and has committed to banning drywall, organic waste, and most recently, clean wood waste.<sup>7</sup> While Vancouver has successfully prohibited certain waste materials from landfills and has set noteworthy goals, the implementation of deconstruction would drastically reduce the overall production of waste. However, effective policy is dependent on comprehensive research and understanding the risks and difficulties associated with demolition and deconstruction. This report will explore how other North American municipalities manage demolition and deconstruction waste from city-owned infrastructure in an attempt to determine how Vancouver's proposed deconstruction policy relates and how it could be improved.

Despite countless municipalities and numerous scholars recognizing deconstruction as an environmentally friendly and an economically practical method of disposing deconstruction waste, few governments have implemented binding deconstruction policy. This report argues that although Vancouver's deconstruction policy for city-owned infrastructure has yet to be formally executed, Vancouver does have a standard practice for the deconstruction of City-owned facilities and is one of the few leaders of the burgeoning field of deconstruction and the municipality is one of the few leaders of the burgeoning field of deconstruction. This report will begin by providing a comprehensive summary of the research previously conducted throughout North America on the benefits and disincentives associated with mandatory deconstruction policy before delving into research methods, findings and recommendations.

## **Literature Review:**

The public and private sectors have investigated the impact of construction and demolition waste (C&D waste) extensively. Audits conducted across North America reveal that

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<sup>7</sup> Brandon Ho, Interview April 9<sup>th</sup> 2015; City Studio. (2013). Deconstruction Hub Project 1: <http://blogs.ubc.ca/citystudioproject1/> Accessed January 9, 2015; SOLID WASTE BY-LAW NO. 8417

C&D waste comprises 15 – 25% of all landfill material.<sup>8</sup> In other words, the construction and demolition sector produces tens of thousands of tonnes of waste annually.<sup>9</sup> The environmental benefits of deconstruction are endless; deconstruction has the capacity to decrease the total amount of C&D waste produced, mitigate site disturbance, conserve landfill space, save energy by reusing materials, and decrease deforestation, greenhouse gases and groundwater degradation.<sup>10</sup> While the environmental benefits of deconstruction are apparent, the economic viability of deconstruction is heavily contested due to high startup costs and the extended duration of deconstruction projects – deconstruction takes 22 days to dismantle a building, while demolition requires 1 or 2 days. Deconstruction generates a demand for higher skilled labour for a longer duration and while this may be a detriment to contractors, increased employment has an overall positive economic effect.<sup>11</sup> Despite the expenses, deconstruction has the potential for high economic profit.

Although examination methods vary drastically between researchers, the majority of academics agree that deconstruction has the capacity to generate a higher overall economic profit than dumping demolition

materials in landfills.<sup>12</sup> Table 1 illustrates the varying cost between demolition and deconstruction. While the initial costs for deconstruction almost doubles the input costs for demolition, deconstruction potentially covers initial costs and generates a profit. This is because deconstruction provides municipalities with the opportunity to sell used materials, which, in the case of the Eburne Sawmill in Vancouver, BC, could lead to

**Table 1.** Project costs under different demolition techniques (AU\$, 2006).

Demolition Techniques	Input Costs	Output Cost	Total Cost
Actual Demolition	5,817	-9,931	-4,114
Mechanical Demolition	5,312	3,913	9,225
Deconstruction	10,748	-14,908	-4,160

Source: Pun, S., & Liu, C. (2011).

<sup>8</sup> Wilmot, S. (2013). Construction and Demolition Materials - Technical Memorandum. *Golder Associates*.  
And Greenest City 2020 Action Plan. (2014) <http://vancouver.ca/green-vancouver/greenest-city-2020-action-plan.aspx> Accessed January 12, 2015

<sup>9</sup> *ibid*

<sup>10</sup> Languell, J.L. (2001). Development of a Prototype Assessment Tool to Evaluate the Potential to Successfully Implement Deconstruction as a Regional Waste Reduction Strategy, *PhD thesis, Dept of Civil Engineering, University of Florida, USA*

<sup>11</sup> *ibid*

<sup>12</sup> Pun, S., & Liu, C. (2011), 391-398.

considerable profit. Eburne Sawmill salvaged 200,000 board feet of Douglas fir posts and beams and sold them for \$125,000 CND to a Chilean company.<sup>13</sup> While this was clearly a deal for Vancouver, the Chilean company saved approximately \$39,374 CND by purchasing salvaged materials.<sup>14</sup> Although Eburne Sawmill is an exceptional case, Emmanuel Ekanem conducted a study of Pennsylvania's market values for C&D materials and determined that the majority of C&D materials have the capacity to generate some profit if sold for reuse or recyclable material (Table 2).

Ekanem generated a mathematical model that enables stakeholders to calculate the expected profit from recycling construction and demolition waste.<sup>15</sup> Although

Material:	Profit:
Drywall to gypsum agricultural products	30.00 \$/ton
Roofing shingles to asphalt	8.50 \$/ton
Wood to woodchips	3.78 \$/ton
Concrete/brick/asphalt to mixed aggregates	4.00 \$/ton
Non-ferrous mettle	0.93 \$/ton

**Table 2: Source:** Ekanem, E. O. (2011) *Effective Recycle Planning for Construction and Demolition Wastes*. MS Thesis, Dept. of Civil Engineering Temple University. Philadelphia, Pennsylvania.

Ekanem's study is applied to Pennsylvania, the formula is universally applicable and can help any municipality determine profits associated with particular C&D materials. Ekanem found that the Pennsylvania's economic market provides a natural incentive to deconstruct and recycle certain materials – recycling drywall, roofing shingles, and wood generates substantial profit. Conversely, the recycling of concrete, brick, block, and asphalt do not have high market values. Consequently, individuals will likely require government incentives to recycle concrete, brick, block, and asphalt due to the lack of market incentives. Municipal deconstruction policy may differentiate due to different natural market incentives for diverse goods. Additionally, the type of governmental incentive implemented to encourage the recycling of non-profitable C&D waste varies drastically between municipalities.

<sup>13</sup> Parfitt, B. 2000. Timber Mining. *The Georgia Straight*. Vancouver, BC. Jan. 27—Feb.3: 15-22.

<sup>14</sup> Greater Vancouver Regional District (GVRD). 2000. *Old to New Design Guide: Salvaged Building Materials in New Construction*. GVRD: Burnaby, BC. pp. 62.

<sup>15</sup> Ekanem, E. O. (2011) *Effective Recycle Planning for Construction and Demolition Wastes*. MS Thesis, Dept. of Civil Engineering Temple University. Philadelphia, Pennsylvania.

There are three main types of governmental policy that intend to create incentive to recycle C&D waste – direct regulation, market incentives, and education.<sup>16</sup> Direct regulation is often imposed by the government or private sector and requires or encourages waste diversion by those generating C&D material. Disposal bans and percentage requirements are clear examples of direct regulation and have been implemented in numerous municipalities across North America. Disposal bans prohibit selected materials, such as wood pallets, cardboard, metal, or land clearings from being disposed of in landfills. Conversely, percentage requirements demand contractors to recycle a predetermined minimum percentage of C&D waste. However, percentage requirements are difficult to enforce on a case-by case basis. Therefore, many municipalities have certified recycling facilities that are consequently held to a higher standard and required to recycle a certain percentage of all material deposited.

Market incentives make waste diversion more appealing by providing economic benefits. Although market incentives are rare due to the complexity associated with their implementation, they have the capacity to be most effective in the short term. Examples of market incentives include disposal surcharges, subsidizing recycling, and expanding the market for reusable goods. Disposal surcharges force contractors to pay a designated amount, often per tonne of C&D waste disposed at a landfill. Although this is popular and theoretically provides disincentive for individuals disposing waste, the surcharge is rarely enough to eliminate C&D waste dumping. Subsidizing recycling is a positive incentive that promotes reuse and recycling by providing a profit. However, this is arguably unsustainable in the long run due to the cost incurred by the city. Ideally, reusable markets expand and provide a natural profit incentive for municipalities to deconstruct buildings and recycle materials. However, this is the most difficult policy to implement due to the free hand of the market and the similarity of C&D Waste products within a region.

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<sup>16</sup> Cochran, K., Henry, S., Dubey, B., and Townsend, T. (2007) *Government Policies for Increasing the Recycling of Construction and Demolition Debris*. Department of Environmental Engineering Sciences University of Florida

Lastly, education policies disclose the importance of the environment and the benefits of deconstruction and recycling. Education policies are often in the form of advertisement campaigns (Fig.1) and attempt to appeal to individuals' morals and call for a higher standard of ethics.



Figure 1: Metro Vancouver's ban on organic garbage campaign exemplifies a current advertisement campaign focused on educating the public Source: <http://vancouver.ca/home-property-development/food-isnt-garbage-2015-organics-ban.aspx> (2015)

Divergence in policy between municipalities exemplifies the need for policy that enhances regional specific market benefits, while attempting to overcome hindrances. However, different municipal policies also provide insight into Vancouver's proposed deconstruction policy for city-owned infrastructure and how it relates to other North American municipalities and where Vancouver's policy could be improved.

## Method:

This project relied heavily on eight interviews with municipal staff across Canada and the United States.\* Interviews provided qualitative data, which was used to compare and contrast deconstruction and demolition municipal policies across North America. Research prior to interviews was dependent on accessible governmental documents, legislation, and city-specific academic works. Interviews extended this knowledge by providing additional information on three fundamental research objectives:

- How do other North American municipalities manage demolition or deconstruction waste?
- How were practices implemented and how are they reinforced?
- What challenges did municipalities face and how were they overcome?

Although empirical data attained from interviews was essential to this project, quantitative data was also vital in deciphering best practices for the City of Vancouver's deconstruction policy. Therefore, interviews addressed how cities track and record data concerning demolition waste.

\* See Appendix for a copy of interview questions

Finally, this project amalgamated quantitative and qualitative research, subsequently providing recommendations for improving deconstruction practices for city-owned buildings within the City of Vancouver.

## **Results:**

Interviews were conducted with various municipal employees across Canada and along the western coast of the United States. Although every municipality recognized the importance of deconstruction from an environmental perspective, very few have implemented a formal deconstruction policy that holds city-owned buildings to a higher environmental standard, and even fewer had quantitative data available. Many municipalities claim they do not participate in deconstruction. Additionally, municipal deconstruction efforts failed to differentiate city-owned infrastructure from private property, potentially hindering the development of deconstruction policy since it affects a greater number of individuals.

### ***Fredericton, New Brunswick***

Although Fredericton has no formal deconstruction policy for city-owned infrastructure, the municipality requires all C&D waste to be disposed at regional landfill facilities, which claim to repurpose as many materials as possible. There are five landfill facilities within the region, all of which can be found within “100km of anywhere,”<sup>17</sup> in an effort to make facilities more accessible. Although these facilities are successful in keeping C&D waste out of landfills, it is unknown how (or if) materials are recycled within the designated regional landfills due to a lack of monitoring. However, Fredericton does ensure that all waste is being disposed at designated facilities through a ticketing system, which holds contractors accountable.<sup>18</sup> Contractors are administered a ticket after disposing materials appropriately which they return to the city.

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<sup>17</sup> Calvin Thompson, Real Estate Manager at City of Fredericton. Interview. March 20<sup>th</sup> 2015

<sup>18</sup> *ibid*

According to Calvin Thompson, a Real Estate Manager at the City of Fredericton, this ticketing system was an easy solution to ensuring that materials were not simply dumped for convenience.<sup>19</sup>

### ***Los Angeles, California***

Los Angeles was the only municipality interviewed that had a formally implemented policy that directly regulated deconstruction. L.A. requires that 75% of all inert C&D waste and 50% of all “other” C&D waste (carpets, curtains, etc) generated from a project must be recycled in addition to all hazardous material, which is legally required to be disposed.<sup>20</sup> Inert materials are described as inactive waste that does not naturally decompose, such as concrete, brick, or asphalt. Although targets have the capacity to increase the overall rate of recycling, contractors have the ability to fulfill requirements by recycling just one type of material, particularly if the target is based on mass. Therefore, L.A.’s policy ensures material specific recycling and forces contractors to recycle more complex materials, such as carpets and drywall.

From 2004 – 2011, L.A. processors had the opportunity to become certified as a governmentally approved location by recycling 75% of all materials disposed.<sup>21</sup> In addition to governmental certification, processors received a rebate and free advertising.<sup>22</sup> However, in 2011, L.A. legally required all contractors to dispose material at certified processors, causing a massive increase in private processors hoping to become governmentally certified in order to retain business.<sup>23</sup> While this transition generated a lot of work for the city’s building permit offices, the new policy was considered an overall success. L.A. has more certified processing,

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<sup>19</sup> *ibid*

<sup>20</sup> Anonymous. Interview. February 15<sup>th</sup> 2015

<sup>21</sup> *ibid*

<sup>22</sup> *ibid*

<sup>23</sup> *ibid*

more material going to processors, and the city no longer has to administer rebates<sup>24</sup> – all of which has had incredibly positive effects on the city and environment.

### ***Metro Vancouver, British Columbia***

Metro Vancouver has implemented an Integrated Solid Waste and Resource Management Plan, which attempts to ensure the most sustainable practices and development. Although the plan does not specifically address deconstruction, the plan does outline designated recycling requirements, many of which can be fulfilled by deconstruction. Metro Vancouver's sample bylaw for municipalities calls for 100% of all C&D material to be deposited at approved facilities for purposes other than disposal, subsequently ensuring that all goods have the *opportunity* to be recycled.<sup>25</sup> However, the majority of the approved facilities are privately owned and while materials are likely to be sorted for the extraction of high-valued goods, the percentage of materials recycled will vary depending on the facility. A Metro Vancouver representative explained that all licensed brokering facilities and other facilities such as paving plants that handle source-separated materials recycle over 90% of the materials they receive, while existing facilities that receive mixed loads of demolition materials achieve lower recycling rates. Metro Vancouver has actively encouraged facilities to improve their environmental protocol and has implemented a disposal fee per tonne under bylaw 181, arguing that the greatest incentive to recycle is when the cost of disposal in or out of the region is higher than the cost of recycling.<sup>26</sup>

Additionally, the Integrated Solid Waste and Resource Management Plan by Metro Vancouver prohibits the disposal of clean wood and food waste, drywall, and mattresses into landfills.<sup>27</sup> A surcharge is applied to banned materials disposed at landfills in an attempt to

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<sup>24</sup> *ibid*

<sup>25</sup> Esther Berube, Senior Project Engineer, Solid Waste Planning, Metro Vancouver. Interview. March 25<sup>th</sup> 2015

<sup>26</sup> *ibid*

<sup>27</sup> City of Vancouver. SOLID WASTE BY-LAW NO. 8417. <http://former.vancouver.ca/bylaws/8417c.PDF> Accessed March 25<sup>th</sup> 2015 .

dissuade individuals from disposing of recyclable materials. According to Brandon Ho, a Senior Project Engineer for Metro Vancouver, audits have proven a successful decrease in wood waste over the past three months since the ban was implemented. Metro Vancouver has proposed expanding the list of banned materials to include asphalt shingles, upholstered furniture, and carpet within the next five years. While Ho says that this is feasible, the collection and recycling infrastructure must be present and capable of handling the increased supply associated with banning materials and diverting them from landfills.<sup>28</sup>

### ***New Westminster, British Columbia***

Although New Westminster has no formal policy for city-owned infrastructure (and currently has no plans to develop one), they are piloting a bylaw that ensures the takedown of buildings follows Leadership in Energy and Environmental Design (LEED) standards and is in line with Metro Vancouver's Integrated Solid Waste and Resource Management Plan.<sup>29</sup> LEED is a point system developed to incentivize sustainable development through the design, construction, operation and maintenance of buildings, homes, and neighborhoods. LEED is applied to all civic centers within the municipality and while there is no designated requirements for deconstruction, taking apart and recycling buildings generates numerous LEED points, subsequently incentivizing New Westminster to deconstruct city-owned infrastructure. However, due to the lack of formally implemented deconstruction policy, the city has not developed a means to track recycled material.<sup>30</sup>

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<sup>28</sup> Brandon Ho, Senior Project Engineer, Solid Waste Operations, Metro Vancouver. Interview. April 9<sup>th</sup> 2015.

<sup>29</sup> Anonymous New Westminster Employee. Interview. March 20<sup>th</sup> 2015.

<sup>30</sup> *ibid*

***Stockton, CA***

Several areas, including Stockton, California, claim they do not have a specific policy for city buildings.<sup>31</sup> Alternatively, the city determines if deconstruction is worthwhile by conducting an audit on buildings prior to their demolition.<sup>32</sup> Deconstruction is only favored over demolition if there are enough salvageable items that can be donated, subsequently generating a federal tax benefit and economic profit.<sup>33</sup> Therefore, while the city of Stockton is aware of the benefits of deconstruction, they have failed to implement municipal tax benefits or foster any local incentive for those that deconstruct city-owned buildings rather than demolish infrastructure. This fits with the preliminary research outlined above – municipal governments and scholars acknowledge the benefits of deconstruction, but have yet to implement policy that would promote C&D waste recycling.

***Vancouver, British Columbia***

Vancouver has yet to implement a formal deconstruction policy for city-owned infrastructure. However, the city has set various deconstruction goals, and if implemented, would result in Vancouver becoming a leader in deconstruction policy. In the past, the City of Vancouver has conducted audits on city-owned buildings that were being taken down -- if the expense of deconstruction was within a range of the price of demolition, the city would implement deconstruction practices.<sup>34</sup> However, this comparative practice soon gave way to pure deconstruction audits, which dictated the percent of recyclable or salvageable materials.

Although the City of Vancouver has not settled on a specific minimum target for all deconstruction projects, the Greenest City 2020 Action plan strives to divert 80% of all C&D

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<sup>31</sup> Sabine Verelst, Public Works Department. Solid Waste and Recycling. Stockton, CA. email. February 5<sup>th</sup> 2015.

<sup>32</sup> *ibid*

<sup>33</sup> *ibid*

<sup>34</sup> Hugo Haley, Senior Sustainability Specialist, City of Vancouver. Interview April 31<sup>st</sup> 2015.

waste from landfills.<sup>35</sup> Additionally, Vancouver has vowed to ban wood-waste from landfills by 2015.<sup>36</sup> While prohibiting drywall and mattresses from landfills was a step in the right direction, banning wood waste will have a major environmental impact since wood waste is the primary contributor to C&D waste deposited within Metro Vancouver's landfills.<sup>37</sup>

Vancouver's proposed legal policy approach has the capacity to provide direct results. While Vancouver's policy may not be the most effective at generating economic profit, the primary goal of the policy is to reduce environmental impact by decreasing greenhouse gas emissions and reducing total waste produced and disposed of at landfills.

### **Policy Recommendations:**

Policy recommendations are context dependant. A city that has a pure economic focus will generate a very different policy than a municipality concerned with mitigating their environmental impact. Therefore, policy adapted by the City of Vancouver with the intent of becoming the greenest city by 2020 places a premium on environment, while cities such as Stockton may prioritize economic gains. Due to the regional focus of this project, it is recommended that the City of Vancouver, as a governmental entity, continue to legally ban the disposal of certain C&D waste within landfills. Although it is commendable that the City of Vancouver has vowed to eliminate wood waste, this report recommends banning all products of high economic worth from landfills, such asphalt shingles. However, this suggestion is impractical without the proper infrastructure to recycle waste appropriately. Therefore, this report supports Vancouver's Deconstruction Hub that separates and recycles deconstructed materials and suggests development of additional facilities. Furthermore, it is recommended that governmental incentives be placed on materials that don't generate high economic returns, such

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<sup>35</sup> City of Vancouver (2014) *Greenest City 2020 Action Plan*. <http://vancouver.ca/green-vancouver/greenest-city-2020-action-plan.aspx>  
Accessed January 9, 2015

<sup>36</sup> *ibid*

<sup>37</sup> *ibid*

as concrete, in order to decrease the economic disincentive associated with certain deconstruction materials.

As a building-owner, Vancouver should implement a minimum target that necessitates recycling and reuse of a certain percentage of material. However, audits should continue to occur prior to deconstruction projects. In the event a building is capable of deconstructing a greater overall percentage, the city-should be held to the highest possible standard and deconstruction the greatest percentage possible. Lastly, it is recommended that Vancouver follow Los Angeles, CA policy and separate target percentages between inert and “other” waste to avoid loopholes in the deconstruction requirements.

### **Suggestions for Future Research:**

This report acknowledges that there is currently ample room for further research. Although this project set out to attain quantitative data, very few municipalities knew what percentage of materials were recycled, let alone statistics on specific material or how C&D waste was being reused. Qualitative data is beneficial, particularly when comparing policy. Collecting quantitative data would be a natural progression of this research. Conducting numerous audits at several landfills within each municipality would provide quantitative evidence for the amount of recyclable or reusable waste currently being disposed of in landfills. This quantitative information could potentially show a correlation between the type of policy implemented and the successful mitigation of environmental degradation.

### **Conclusion:**

There is a general consensus that deconstruction has environmental merit, however few municipalities have developed deconstruction policy due to economic uncertainty. Despite the numerous studies supporting the economic benefits of deconstruction, profit is determined by

regional economy and is dictated by the type of materials being deposited within landfills. It is because of this inconsistency that a uniform policy has not been developed or implemented across North America, subsequently providing value to researching how North American municipalities manage C&D waste from city-owned infrastructure. Although Vancouver's deconstruction policy for city-owned infrastructure has not been formally implemented, the City does have a standard practice for deconstruction. Additionally, Vancouver has made efforts to be recognized as a leader in the deconstruction industry. However, the city must formally commit to past statements and should let actions speak louder than words.

## Appendix

### Deconstruction Interview Questions for Willing Participants:

*\* Please note that while this document uses general terminology such as “the municipality,” this will be altered to address specific municipalities upon distribution or during an interview.*

1. Has deconstruction policy been implemented within the municipality? If not, are there plans to implement deconstruction policy? Has deconstruction policy ever been considered by the municipal government?
  - a. In the event that deconstruction policy has been considered but rejected, what were the primary factors that resulted in this decision?
2. Please explain the general parameters of the municipality’s deconstruction policy.
3. Are targets implemented for contractors or private companies? I.e. does a certain percent of all material legally need to be reused or recycled?
  - a. If yes, how do you manage or enforce these targets?
  - b. How do you measure these targets?
4. Are hazardous materials included in the net total of deconstructed materials?
5. Have you encountered any challenges prior, during, or after the implementation of deconstruction policy? How did you overcome these difficulties?
6. Are there any innovative or distinct factors within your deconstruction policy?
7. Do you know of anyone else that I could discuss this with? Perhaps in another municipality or state?

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### Supplemental Resources

California Integrated Waste Management Board. (2002) *C&D Recycling Plans and Policies: A model for Local Government Recycling and Waste Reduction*. Online <http://calrecycle.ca.gov/Publications/Documents/LocalAsst%5C31001014.pdf>. Accessed January 9, 2015.

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