

Faculty of Design

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Rebuilding the royal city

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**Circular Opportunity
Innovation Launchpad**

ReBUILDING THE ROYAL CITY

System Map Highlights

Zero Waste Economic Transformation Lab
January 2023

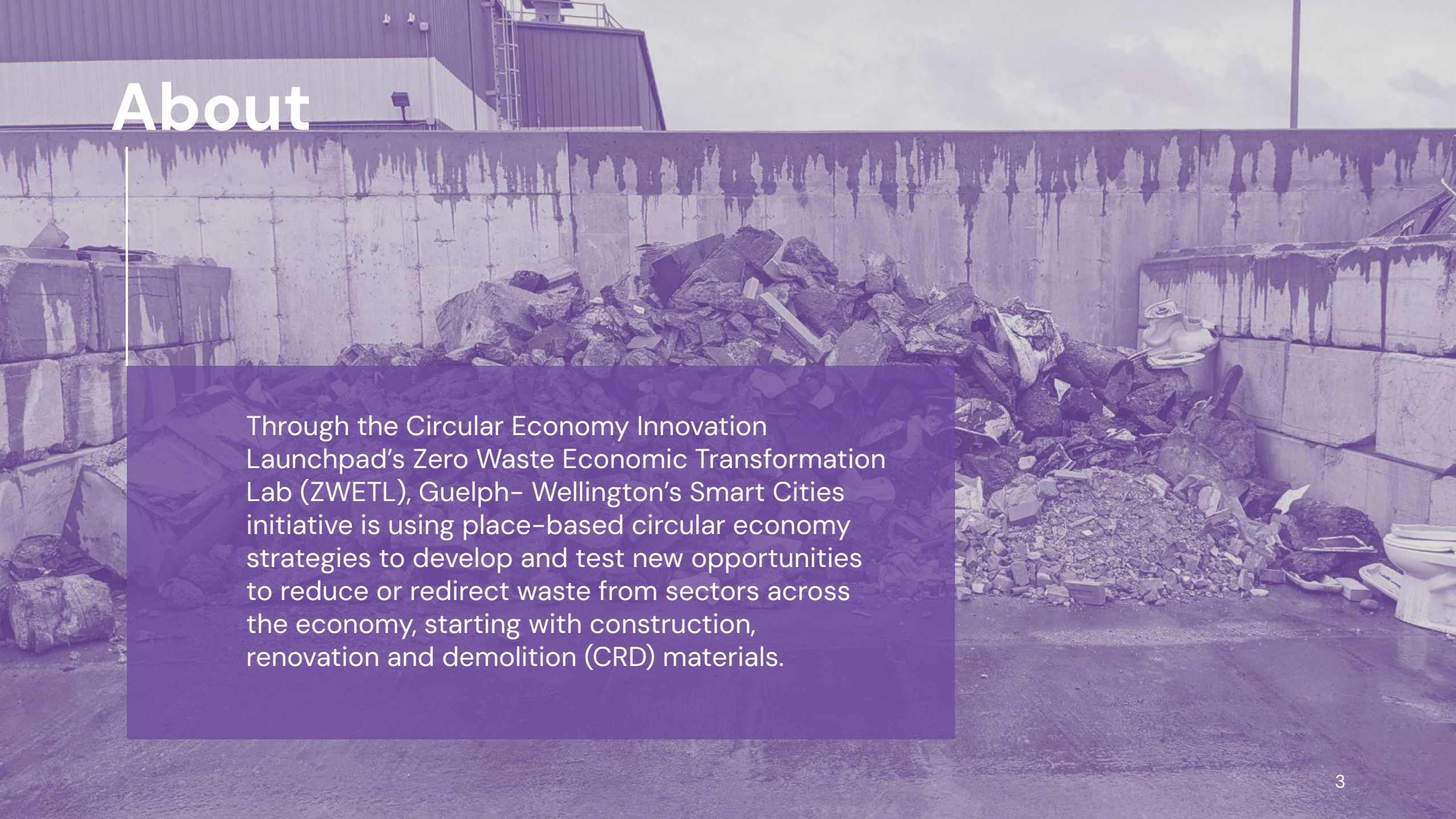
Systemic Design Research Project



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About



Through the Circular Economy Innovation Launchpad's Zero Waste Economic Transformation Lab (ZWETL), Guelph- Wellington's Smart Cities initiative is using place-based circular economy strategies to develop and test new opportunities to reduce or redirect waste from sectors across the economy, starting with construction, renovation and demolition (CRD) materials.



Research Question

What are the main enablers, barriers, and norms to fostering the circular economy in the construction, demolition, and renovation industry in Guelph and Wellington County

By exploring a Systemic Design analysis to understand individual orientations, the regulatory context, and economic landscape, we uncovered opportunities that could help advance the circular economy.

Methods

Literature Review

Explore and examine the ideas, systems, and decisions that underpin the current waste system in Ontario and the solutions proposed, debated, and implemented to fix the system.

Environmental Scan

Scan trends and gather information to consolidate an understanding of the circular economy ecosystem around construction, renovation, and demolition waste. Explore and examine the existing innovative solutions used by other regions to tackle this wicked problem.

In-Depth Interviews

Conduct one-on-one interviews with people who have been working within the dominant system and others exploring innovative solutions.

Expert Interviews

Conduct one-on-one interviews with experts in business, government and academia who have dedicated their careers to exploring the problems and solutions.

Sample

Generators of Waste

- Homeowner managing a heritage home renovation,
- Passive House architect,
- City of Guelph real property official,
- Contractors,
- Track home builders,
- Developers,
- Insurance representatives, and
- Renovators

Managers of waste

- Guelph, Wellington, Oxford and Vancouver waste resources officials,
- Guelph building services official,
- Guelph and Toronto planners,
- Haulers, and
- Ontario waste management official

Innovators of waste

- Reuse store manager,
- Owners of two deconstruction companies,
- Recycled content building component manufacturers,
- Zero-waste builder and component manufacturers,
- Source-separation company owner, and
- CRD recycler

Industry experts

- Circular economy experts,
- Consultants,
- Standards officials, and
- Non-profit professionals



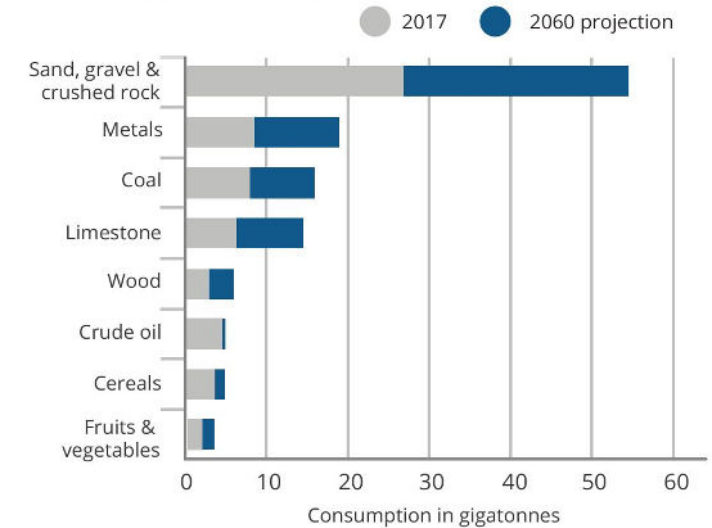
Guelph-Wellington
Region

30+
INTERVIEWS

Global Resource Use Set To Double

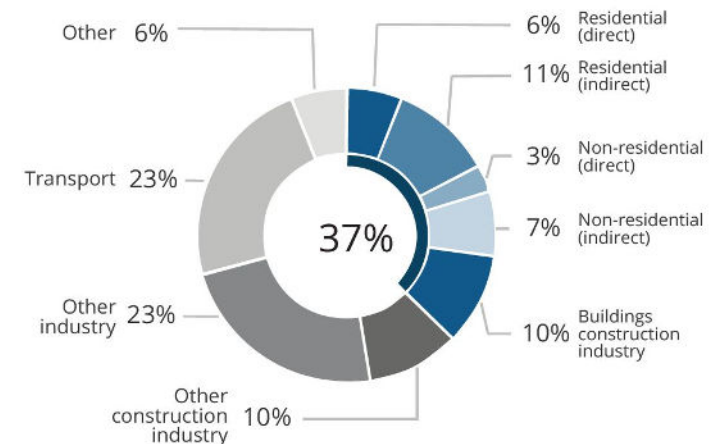
- Global consumption of raw materials is set to nearly double by 2060
- Buildings and the construction sector accounted for 37% of global carbon emissions.
- The extraction of raw materials, fuels, and food contribute to 90 percent of biodiversity loss and water stress
- G20 countries account for close to 75 percent of global materials use.

Future projected global resource use



Source: OECD, 2019

Global buildings and construction emissions

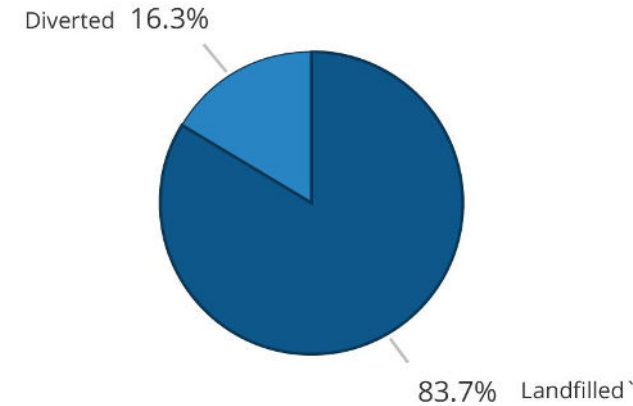


Source: UNEP, 2020

Landfills Filling Up

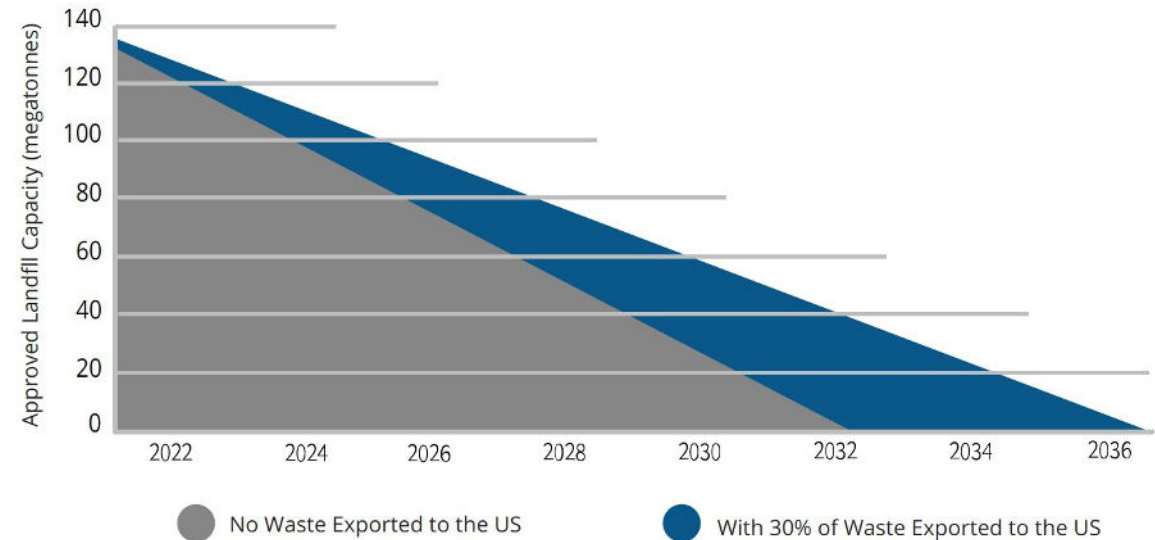
- In Canada, 3.4 million tonnes of CRD materials are sent to landfill annually
- Only about 16% of those materials are recycled or reused.
- Research shows that the reverse amount can be diverted.
- Buildings and related energy account for 18% of carbon emissions.
- Ontario's current landfills are projected to reach capacity in 10 to 15 years, depending on the availability of US exports.

Canada's CRD waste



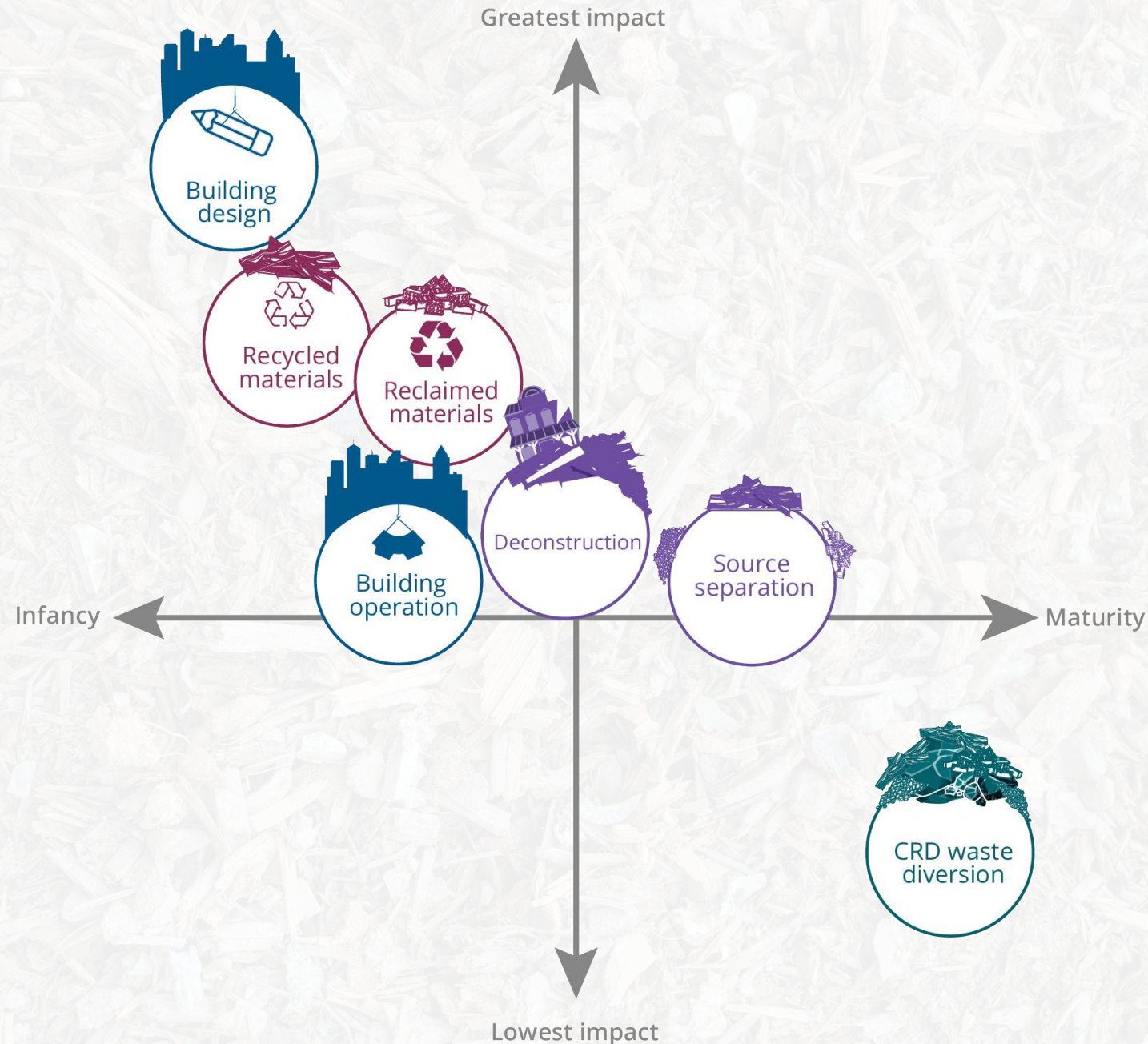
Source: CCME 2019

Ontario's shrinking landfill capacity



What is the Circular Building Ecosystem?

- Diversion gets waste out of landfill but most options downcycle the materials.
- Source separation of CRD materials enables clean and contamination-free materials to support the creation of secondary markets.
- The deconstruction of buildings, rather than demolition, is needed to support source separation and increase diversion.
- Reclaimed and recycled content materials leverage the used CRD materials to make new products.
- Building use and operations uses techniques to extend the life of buildings.
- Circular building design uses principles and standards to eliminate waste, design for flexible use, modular reuse, durability and the end-of-life disassembly of materials.



What are the Available Materials?

- Metals have the largest economic opportunity and are diverted at all stages because the cost signal makes it with the investment.
- Concrete's economic opportunity exists due to its weight, which results in a high landfill tipping fee.
- Re-use options exist for windows, doors, cabinets, plumbing and lighting fixtures, but the secondary market exist within a charitable model.
- Knocking down barriers to foster the reuse of some of the most voluminous items – concrete, wood, and gypsum – would help build the foundation of a reclaimed materials market.



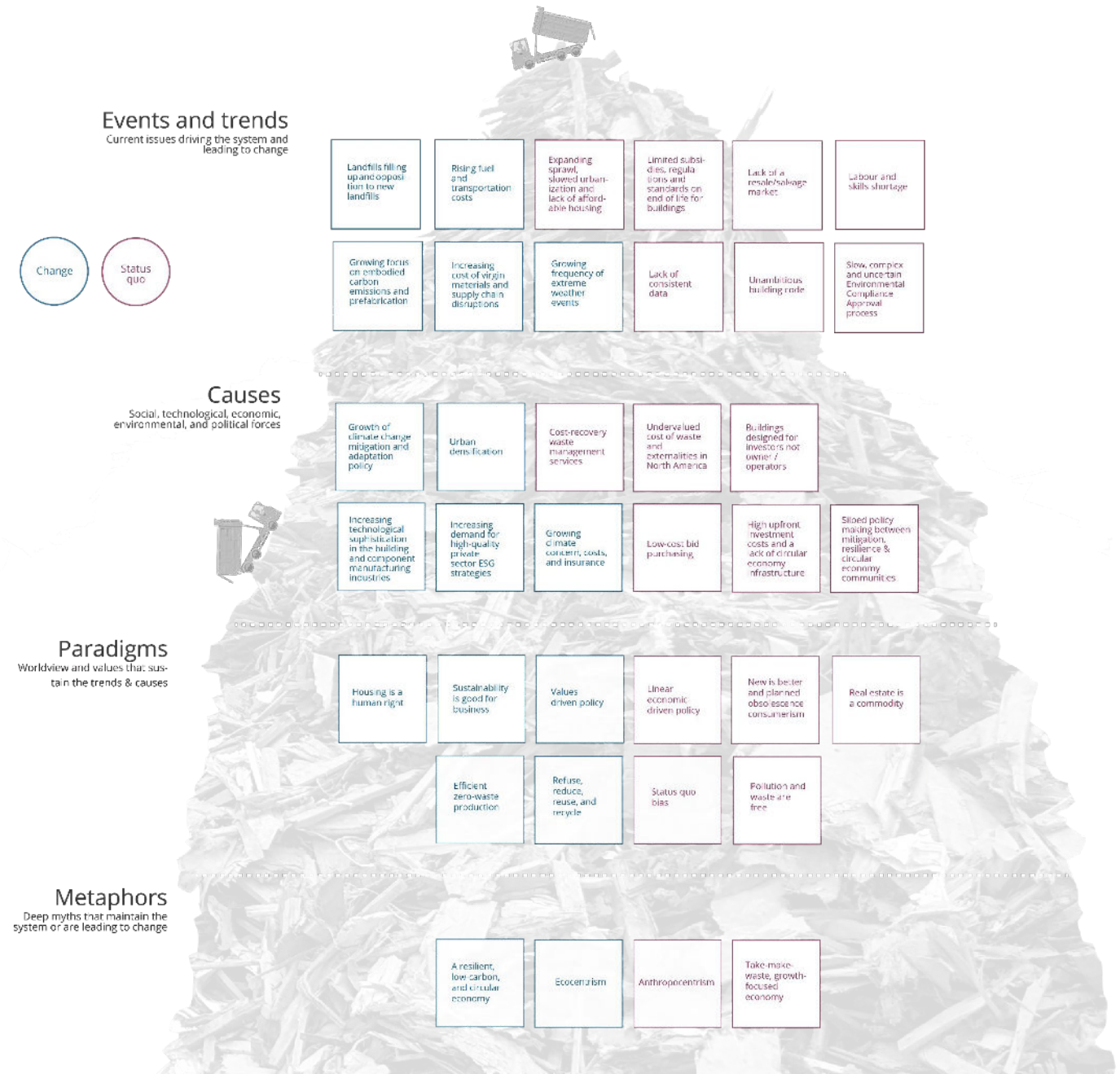
4. Why Don't We Build Circular?



Charting the trends, causes, paradigms and deep myths that underpin the current take-make-waste system, and provides insight on what is driving change in the system.

Why Don't We Build Circular?

- Compounding climate, health and housing crises challenge our current economic and regulatory environment.
- But deep-rooted forces work to keep our linear and siloed economic thinking in place.



Trends: Why Don't We Build Circular?

Events and trends

Current issues driving the system and leading to change

Change

Status quo

Landfills filling up and opposition to new landfills

Rising fuel and transportation costs

Expanding sprawl, slowed urbanization and lack of affordable housing

Limited subsidies, regulations and standards on end of life for buildings

Lack of a resale/salvage market

Labour and skills shortage

Growing focus on embodied carbon emissions and prefabrication

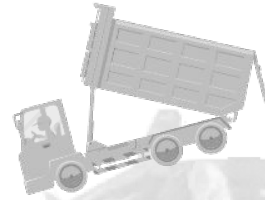
Increasing cost of virgin materials and supply chain disruptions

Growing frequency of extreme weather events

Lack of consistent data

Unambitious building code

Slow, complex and uncertain Environmental Compliance Approval process



Causes: Why Don't We Build Circular?

Landfills filling up and opposition to new landfills

Rising fuel and transportation costs

Expanding sprawl, slowed urbanization and increasing demand for new housing

Limited subsidies, regulations and standards on green buildings

Lack of a resale/salvage market

Labour and skills shortage

Growing focus on embodied carbon emissions and prefabrication

Increasing cost of virgin materials and supply chain disruptions

Growing frequency of extreme weather events

Lack of consistent data

Unambitious building code

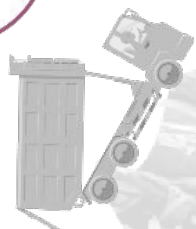
Slow, complex and uncertain Environmental Compliance Approval process

Causes

Social, technological, economic, environmental, and political forces

Change

Status quo



Growth of climate change mitigation and adaptation policy

Urban densification

Cost-recovery waste management services

Undervalued cost of waste and externalities in North America

Buildings designed for investors not owner / operators

Increasing technological sophistication in the building and component manufacturing industries

Increasing demand for high-quality private sector ESG strategies

Growing climate concern, costs, and insurance

Low-cost bid purchasing

High upfront investment costs and a lack of circular economy infrastructure

Siloed policy making between mitigation, resilience & circular economy communities



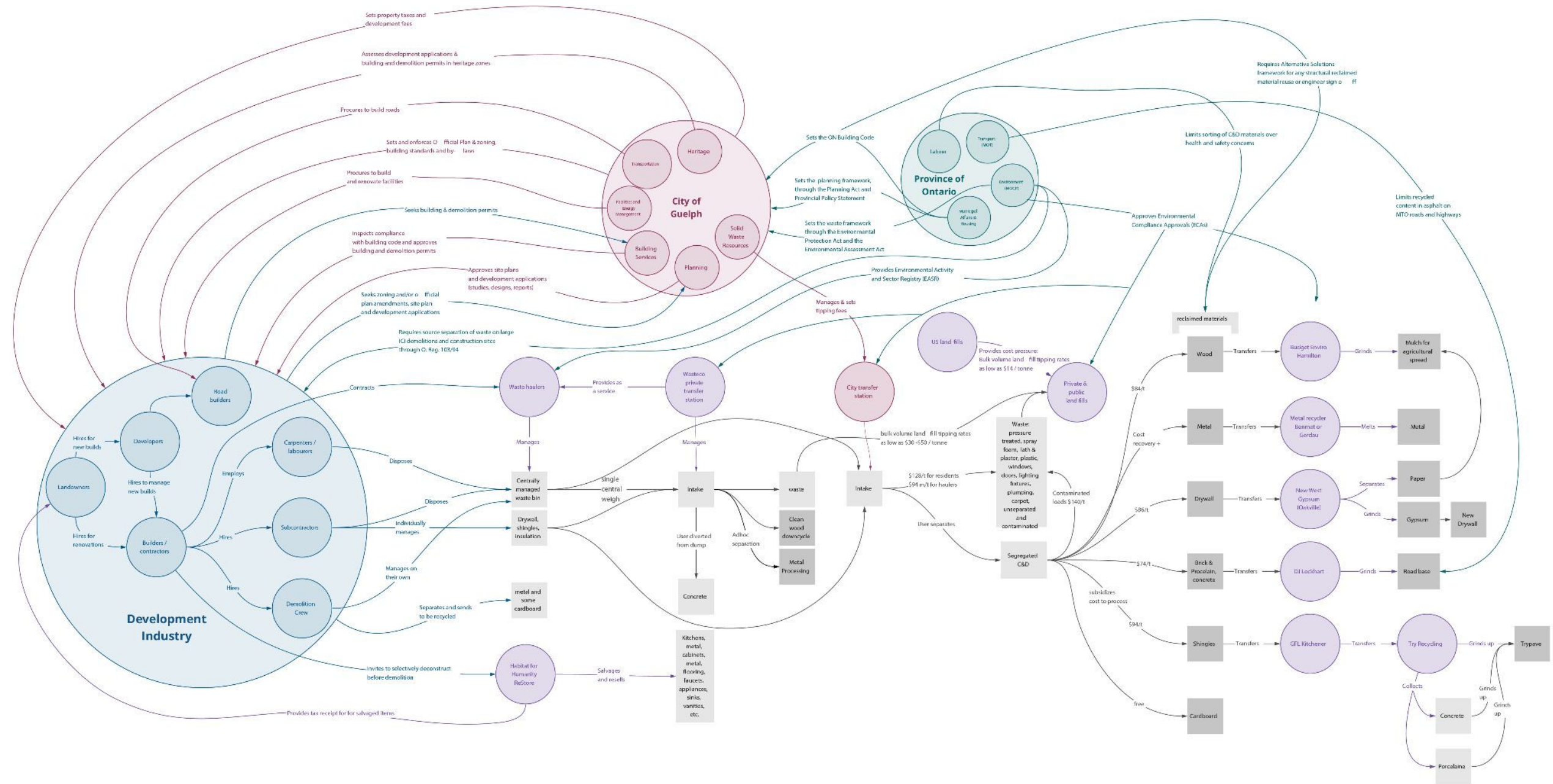
Opportunities

- **Building Code:** Participate in the process to develop building standards, guidelines and code changes to support the use of reclaimed and recycled content building materials.
- **Data:** Collaborate with other municipalities and private-sector partners to explore how municipalities can improve data collection and usage. And advocate to the provincial government to provide collected data from private waste facilities as part of the private facilities' ECAs.
- **Procurement:** Leverage a quality-based selection process for the public procurement of architectural and engineering consulting services.
- **Cost-recovery Framework:** Re-examine a cost-recovery framework in the municipal waste and planning to account for externalities and building a circular economy.

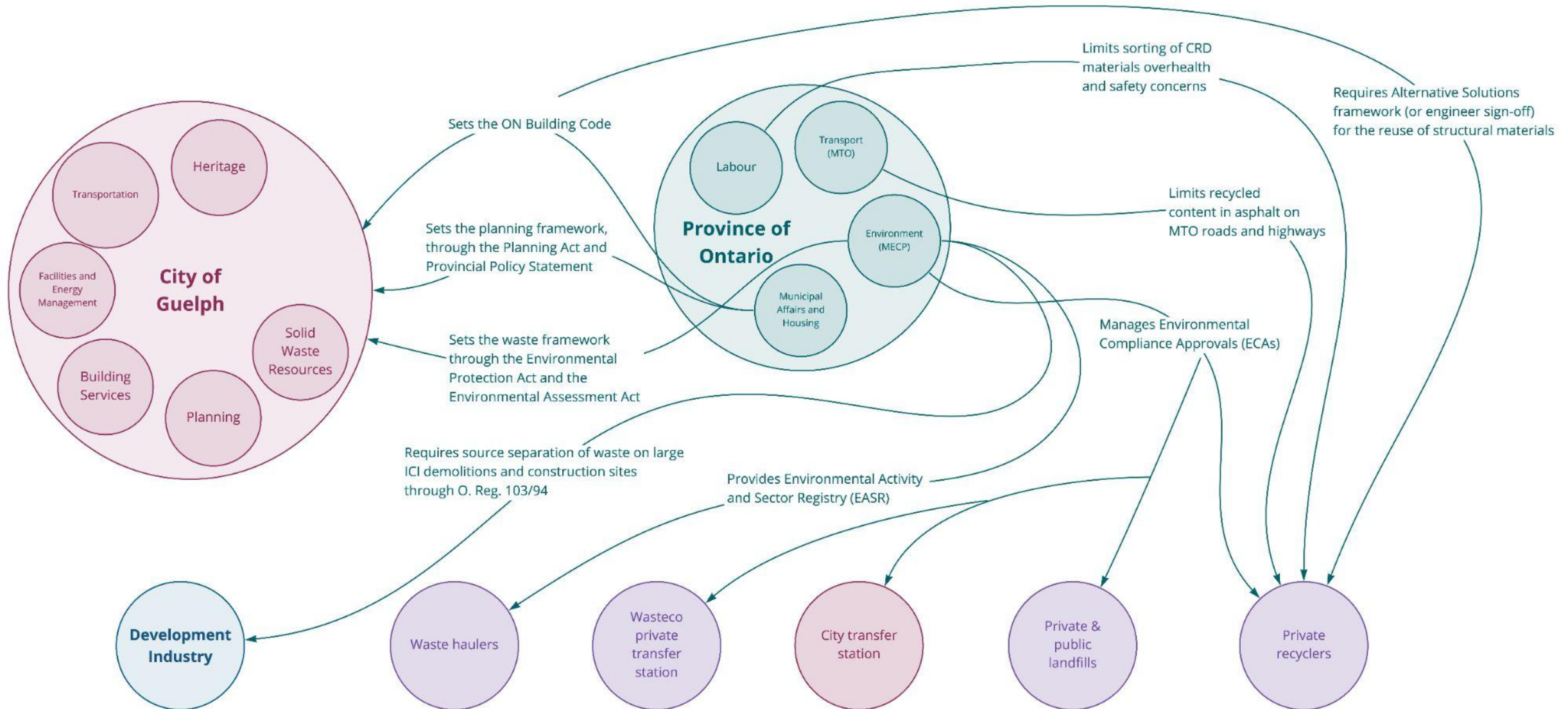
5. Regulating the Status Quo?



Shaped by the provincial government's planning, building, and waste frameworks, in competition with neighbouring municipalities, and facing criticism for lengthening delays and process, local governments nevertheless have a number of front-line regulatory interactions with the building and waste industries to shape circular economy policies and outcomes.

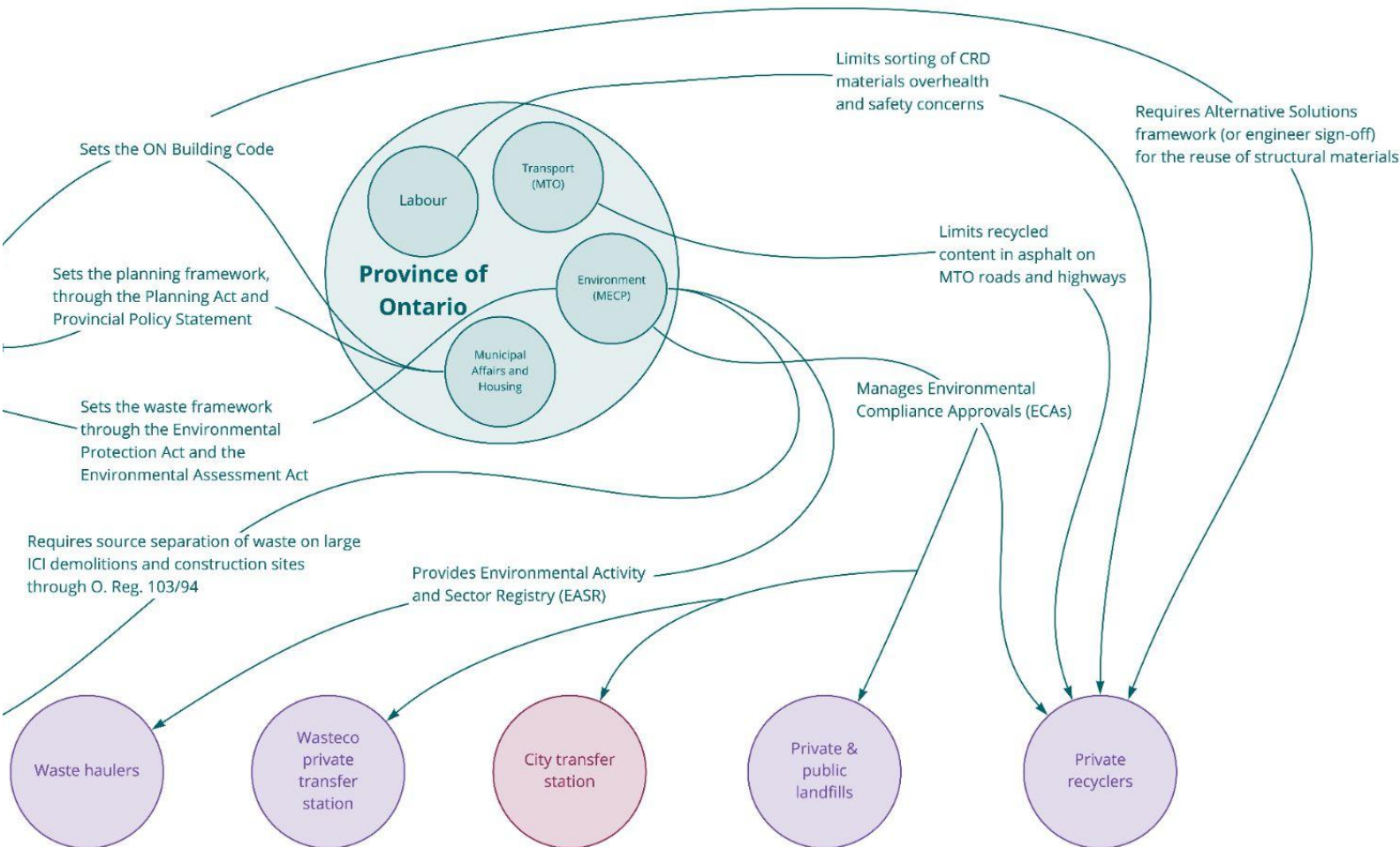


Regulating the Status Quo? - The Province



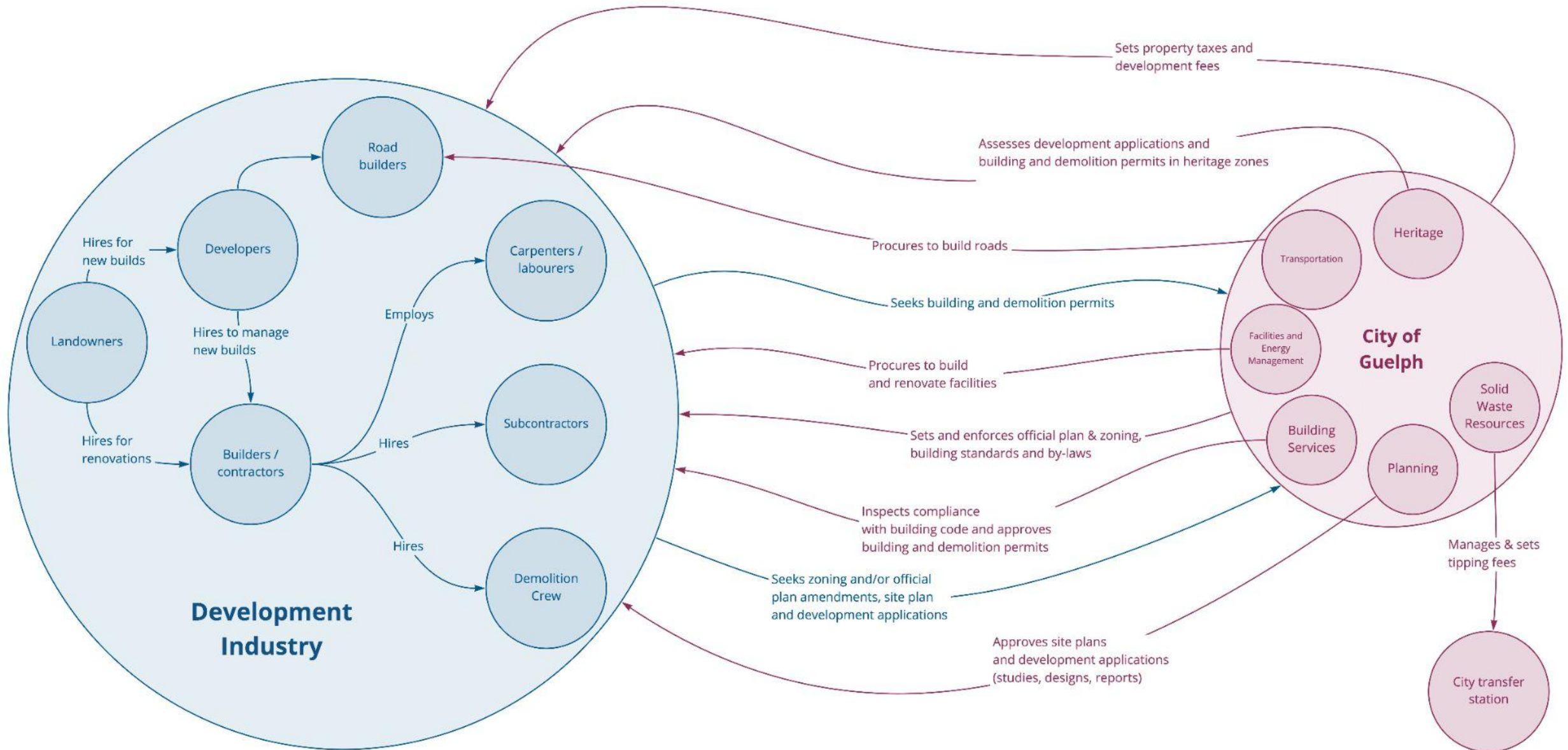
Regulating the Status Quo? - The Province

Provincial leadership would have the biggest impact system wide (e.g landfill bans)

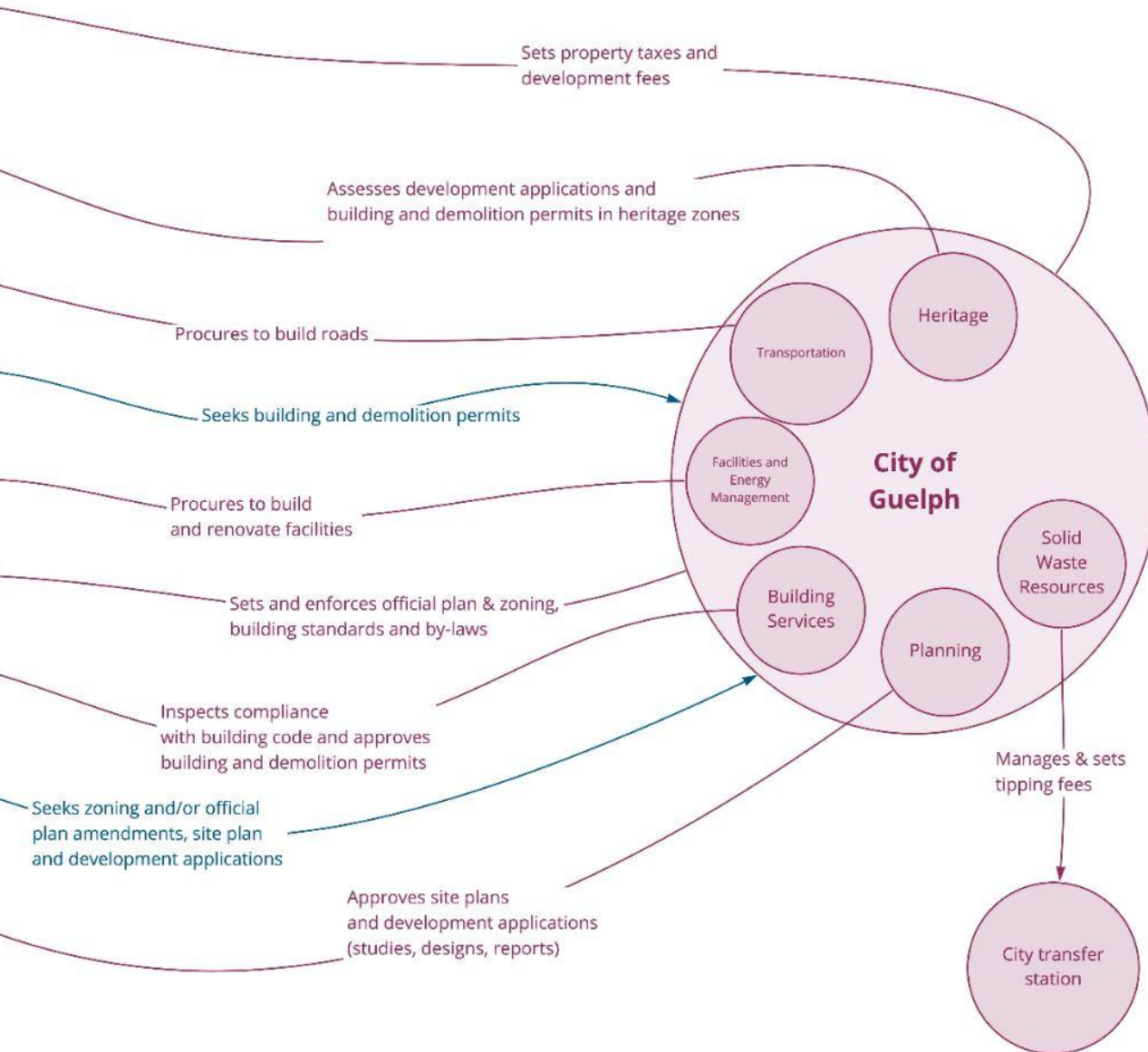


- Seeking an ECA is a long, complex and uncertain process
- In Ontario, source separation is required for large ICI buildings (O. Reg 103/94), but diversion is not.
 - Ontario AG: in ten years, the ministry had not inspected any demolition sites for compliance
- Building code process is regulatory captured and results in unambitious code
 - Alternative Solutions framework often run by municipalities through a cost-recovery basis penalizes innovators.
- MTO highway standards, widely adopted by municipalities, limits recycled content.

Regulating the Status Quo? - Municipal



Regulating the Status Quo? - Municipal



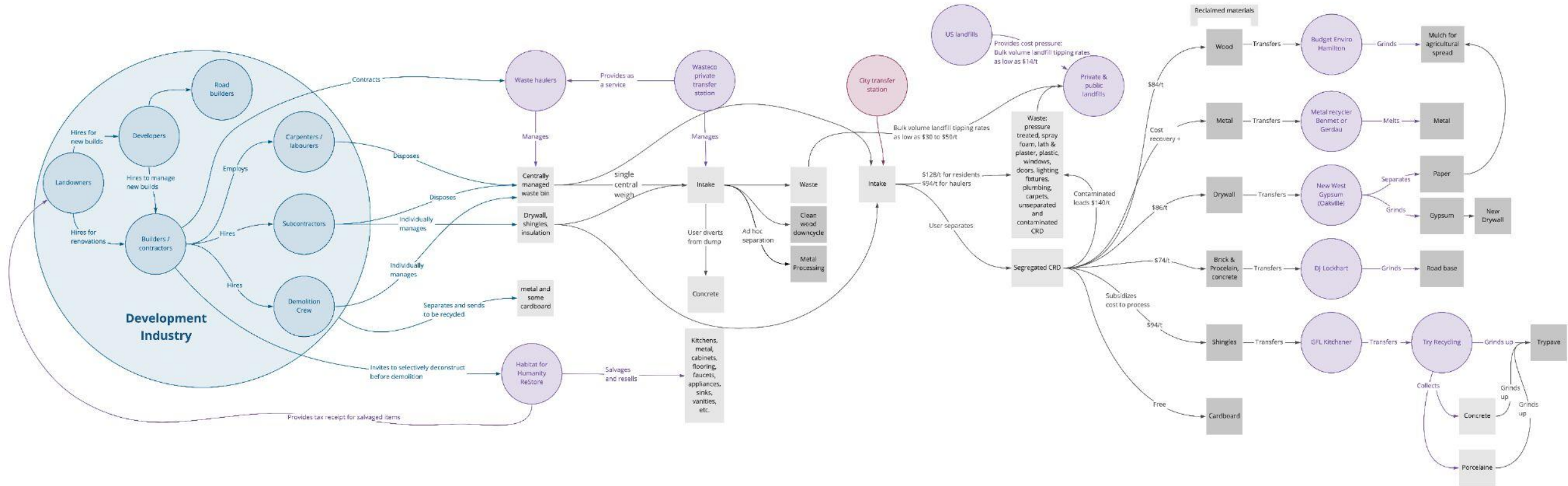
- Bylaws can kick-start new businesses but planning delays are hindering development
 - Canada ranks 67 out of 190 countries for ease of getting building permits, dropping from 54th in 2013
- In 2018, the City of Richmond initiated a pilot to use recycled asphalt in municipal roads to build market confidence.
- A number of West Coast municipalities have enacted deconstruction bylaws that require the deconstruction, source separation, and diversion of building materials from buildings before a certain age (e.g., 1950).
- Nine Ontario Municipalities have developed tiered green development standards for new mid- and high-rise builds. The Toronto Green Standard contains circular criteria in the upper tier of the standard.

6. Trying to Add Economic Value

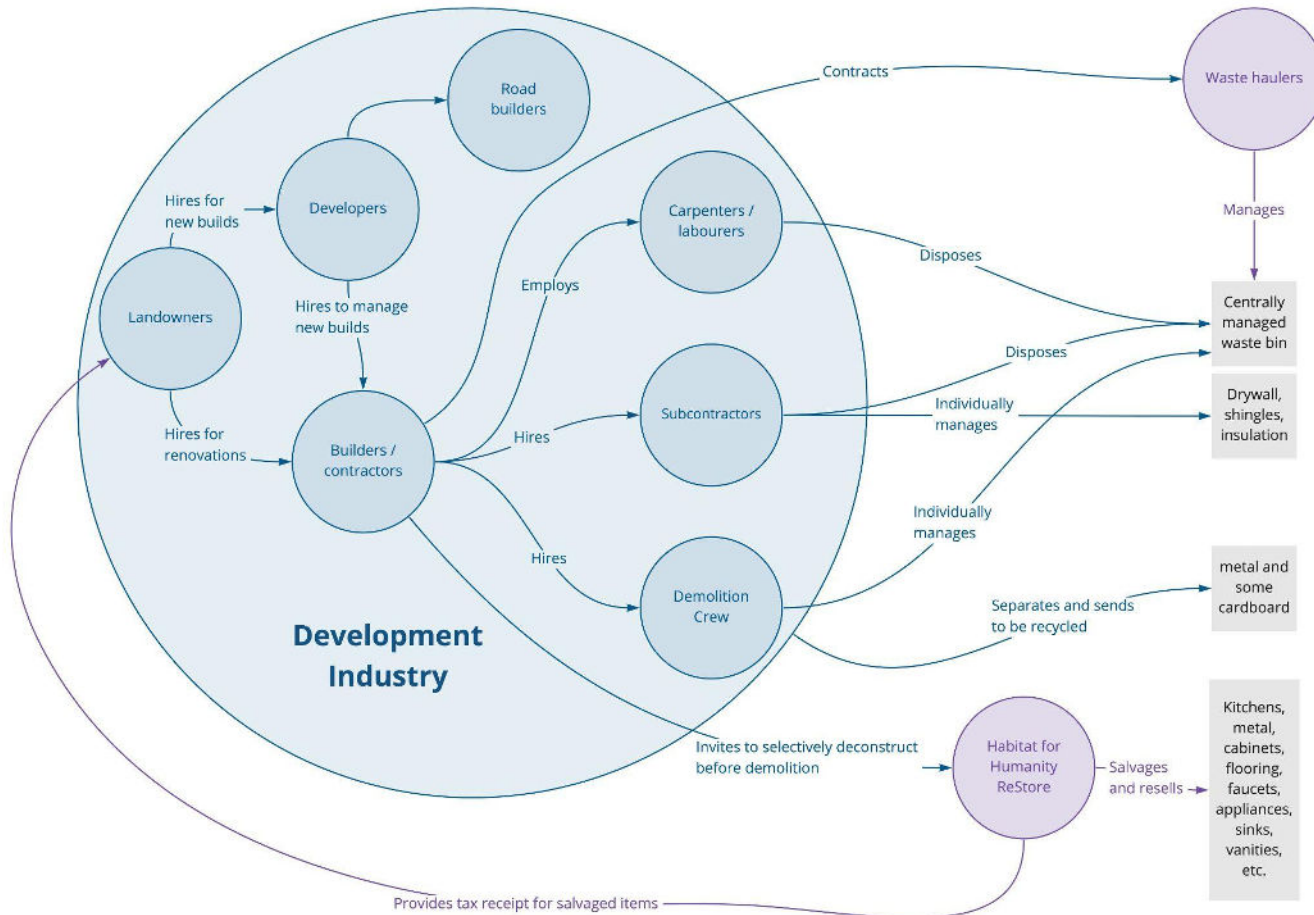


The building industry operates under tight timelines and margins, while avoiding risk to maximize profit. Under existing low landfill tipping fees relative to recycling rates, very little construction and demolition waste is diverted consistently. Some innovators work under the constraints while others look for policy change before committing more resources.

Trying to Add Value to Waste

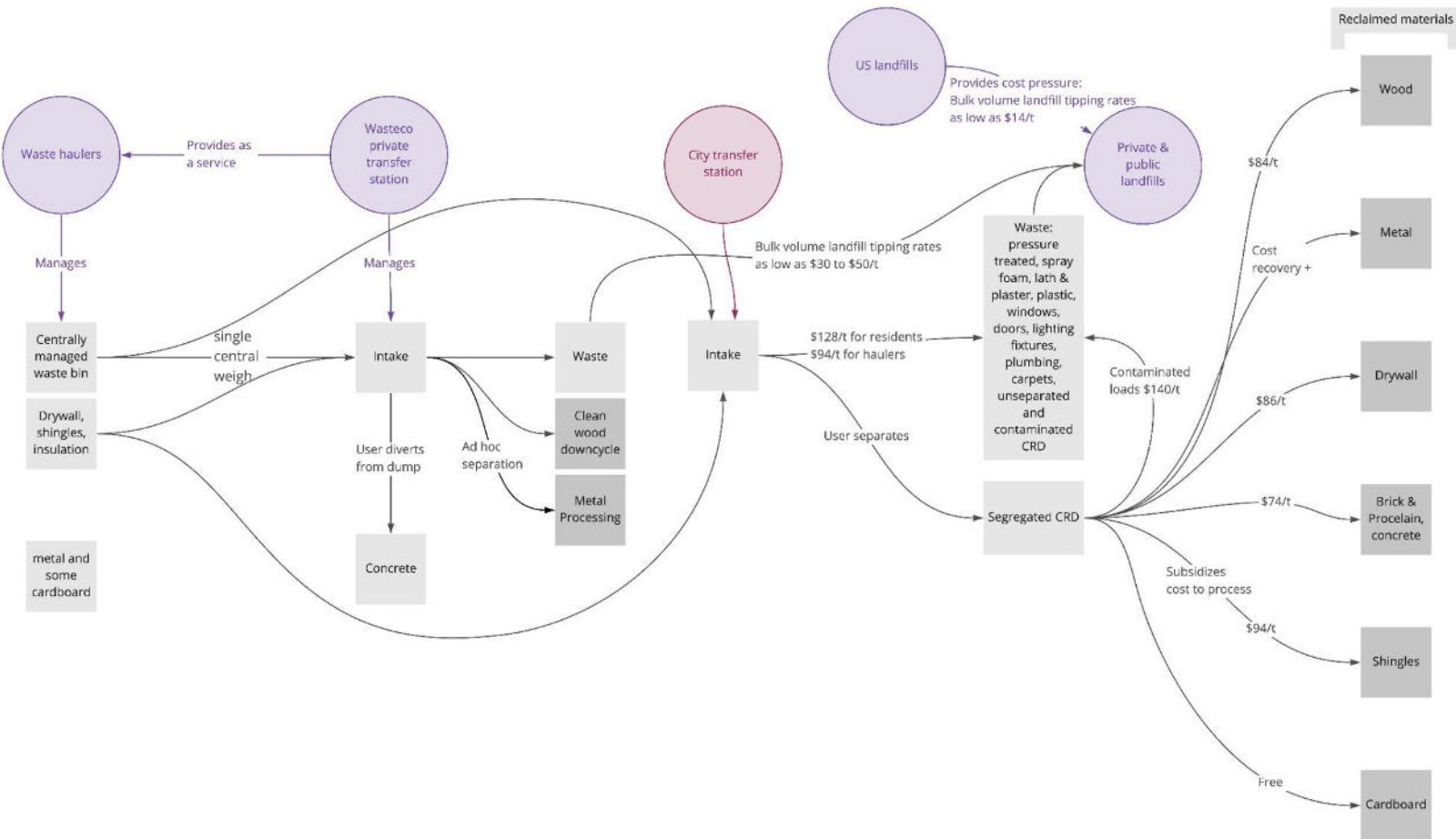


Trying to Add Value to Waste



- Most waste gets put into one bin and landfilled
- The labour, logistics and transportation costs makes deconstruction and separating the waste uneconomical
- Metal is pulled out of the waste stream – cost signals work! (Large concrete loads are pulled because weight)
- Circularity in third-party managed green building standards is also nascent. Data from 678 LEED-certified projects from across Canada reported an average diversion rate of 88%.
- TRUE is a new certification for manufacturers to develop zero-waste products
- Salvage industry is driven more out of a desire to limit waste than an economic benefit of a tax receipt.

Trying to Add Value to Waste



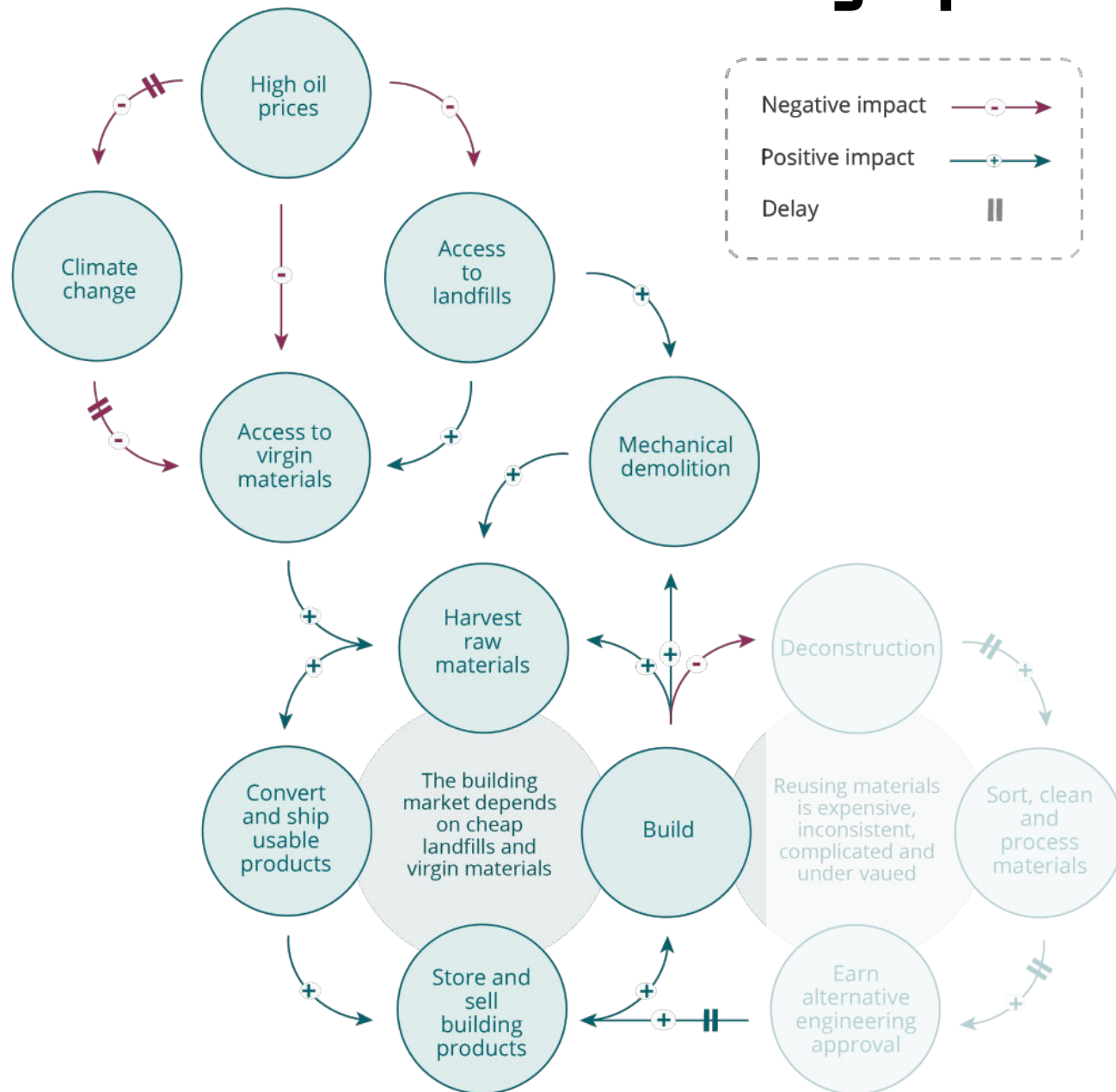
- Ontario, is one of the lowest cost provinces for landfill tipping fees in Canada, while also next door to much lower cost jurisdictions in the United States.
- Some innovators are working to foster new opportunities
 - A B.C. shingle recycler said if they can secure 40,00 tonnes of stock per year, they'd set up a plant in Ontario.
 - A deconstruction firm in B.C. envisions setting up a reclaimed wood manufacturing hub in Ontario, but only if landfill tipping fees were higher
 - An Ontario reclaimed materials re-seller wants to move more substantially into reclaimed wood reselling.
- A new reuse hub in Port San Antonio is offering training courses in the trades, a reclaimed material warehouse, venues for public workshops, and a tool library.

7. Shifting to circular behaviour

A decorative graphic consisting of several concentric, semi-circular arcs in a lighter shade of purple, located in the bottom right corner of the slide.

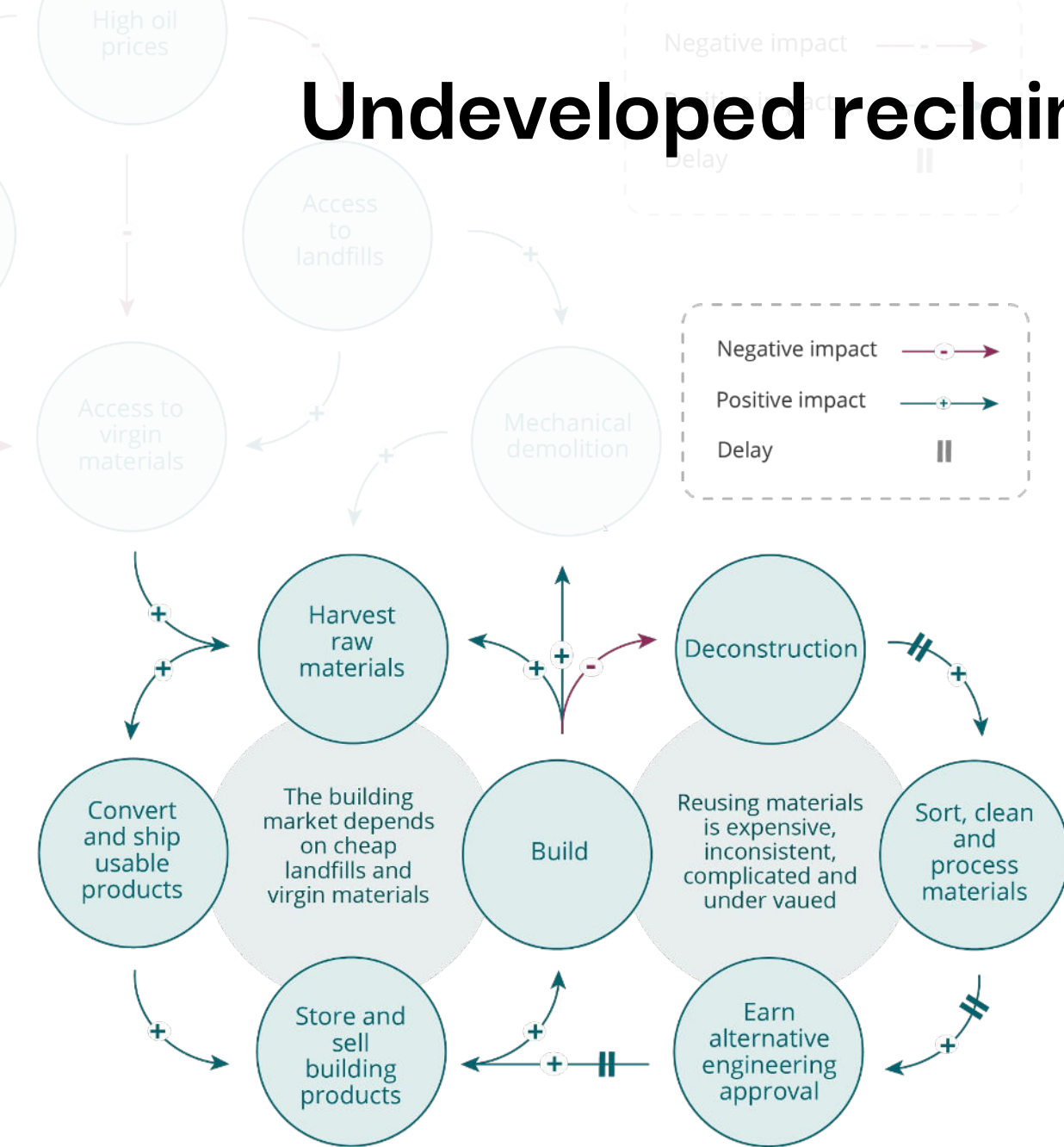
The human behaviour underpinning the current system is well worn from many years of operation that keeps change at bay.

Landfills filling up & resources depleting



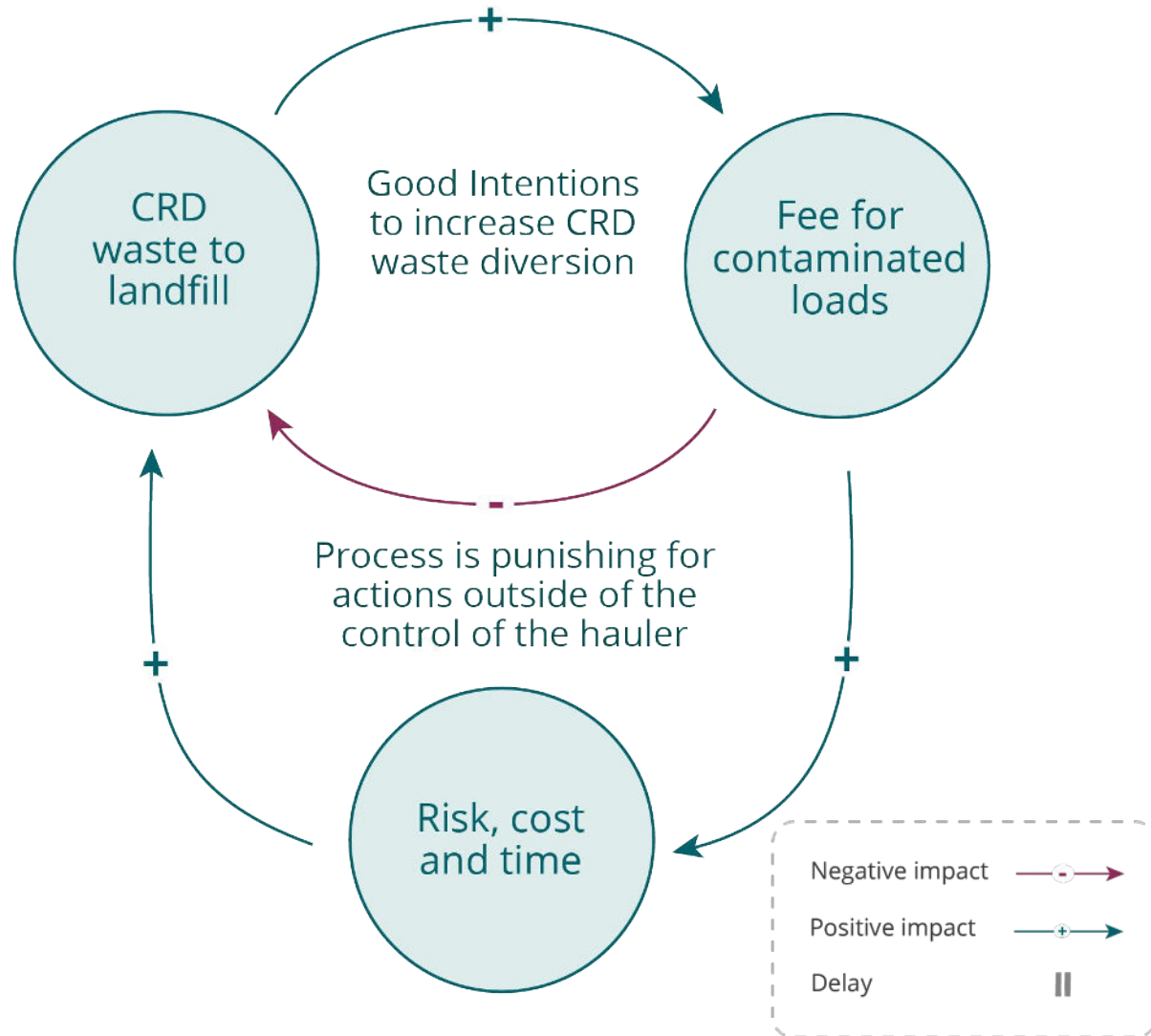
- High oil prices
 - reduces the impact of climate change;
 - increases the cost to send materials to landfill, and
 - boosts the cost to extract natural resources.
- Easy access to landfills makes mechanical demolition (and dumping) and the harvesting of virgin materials the low cost option
- Landfills, in Ontario, are filling up and access to materials is already and will be more constrained by climate, environmental, and societal shocks.

Undeveloped reclaimed materials market



- Deconstruction in small scale residential projects is virtually non-existent and it exists in a few larger ICI projects.
- Considerable labour and time associated with sorting, cleaning, and processing the materials
- Limited economies of scale
- Reclaimed structural materials need engineering approval or Alternative solutions framework
- Store and sell just in time
- Limited policy support
- Results in boutique builder custom projects

Punishing contamination reducing diversion



- Source separation is required but businesses to fulfill this requirement.
- Mixed loads get higher diversion but downcycled
- Signage and awareness of CRD diversion options is low
- Fees on contamination increase risks for haulers and as a result send them to other low-risk operations to dump.

Opportunities

The recommendations are geared toward increasing waste diversion, deconstruction materials reuse, and the development of circular buildings.



Provide financial incentives

- Explore reducing the tipping fee for clean segregated CRD materials and eliminating the contamination penalty to incentivize more CRD recycling at the City of Guelph facility.
- Pilot grants and loans to support home renovation waste diversion as part of proposed city-run energy efficiency programs.



Update policy

- Re-examine a cost-recovery framework in the municipal waste industry to include a holistic analysis accounting for externalities and the economic potential of a regional circular economy.
- Leverage a quality-based selection process for the public procurement of architectural and engineering consulting services to create opportunities for high performance and circular buildings in Guelph-Wellington.
- Explore updating the demolition bylaw to require or incentivize deconstruction, source separation, and recycling of building materials before a certain age (e.g. 1950) to capture the most value based on local building types, materials used and frequency of demolition.
- Study engineering data from existing case studies to inform the piloting of procurement provisions for recycled content in municipal roads and buildings.



Shift operations

- Provide supporting labour and infrastructure to encourage clean loads, such as piloting city-owned segregated CRD bins service. Got a small reno, we'll pick it up!
- Leverage behavioural analysis to redesign City Waste Resources Innovation Centre signage and advertising of CRD recycling. By putting human behaviour at the centre of the approach, it can help nudge the public and private sector from information to action.
- Explore phasing in a zero waste objective for new and renovated city buildings and the deconstruction of municipal buildings. Municipal leadership can help foster new businesses, strengthen supply chains, and embolden private sector participation.
- Building off of municipal leadership, develop a coalition of regional corporate leaders in the building industry to phase in zero waste in their operations, similar to Total Resource Use and Efficiency (TRUE) certification.
- Explore incorporating embodied carbon consideration into property management analyses (impacting materials choices and demolition and construction activities) and circularity into building operations (e.g. use of product as service, product-life extension, and circular supplies) to increase sustainability of city buildings.



Develop standards

- Understand how various Ontario municipalities have incentivized green building standards for new mid- and high-rise and city-owned developments and explore setting targets for diversion, deconstruction, design for durability/deconstruction, and the use of circular building products (e.g. reclaimed/recycled materials). *
- Explore working with private sector building certification organizations to incorporate circular building design methodologies into existing certifications, training, and advocacy.



Create market demand

- Offer free promotion through city channels (e.g. section on building permit application portal) for CRD businesses that support zero-waste construction objectives (e.g. waste haulers that source-separate).
- Explore issuing a Zero Waste Construction Guide for residents that highlights recycling options in the area and CRD companies committed to low-waste construction practices.
- Offer residents lawn signs indicating to neighbours that they're committed to a "Low Carbon, Zero Waste Renovation" as part of development approvals that meet particular diversion requirements.
- Explore developing a city-supported upcycling and deconstruction hub. The hub would be space to process materials back into reusable building materials and upcycled into new products. It would be a one-stop-shop to incubate new businesses and provide experiential learning and ready-to-use reclaimed materials.



Advocate and collaborate

- Collaborate with the provincial government to expand the reach of O.Reg 103/94 Industrial, Commercial And Institutional Source Separation Programs to include more sites and to require recycling.
- Develop support for a landfill ban on clean wood and concrete. Bans are used in other jurisdictions to increase diversion and recycling of specific products.
- Participate in the process to develop building standards, guidelines and code changes to support the use of reclaimed and recycled content building materials.
- Collaborate with other municipalities and private-sector partners to explore how municipalities can improve data collection and usage in the built environment especially for smaller and rural municipalities.
- Advocate to the provincial government to provide collected data from private waste facilities as part of the private facilities' Environmental Compliance Approval reporting requirements.
- Advocate for the updating of Ministry of Transportation highway specifications to increase the use of recycled asphalt and concrete aggregate.

* Green standards may no longer be available because of recent provincial changes.