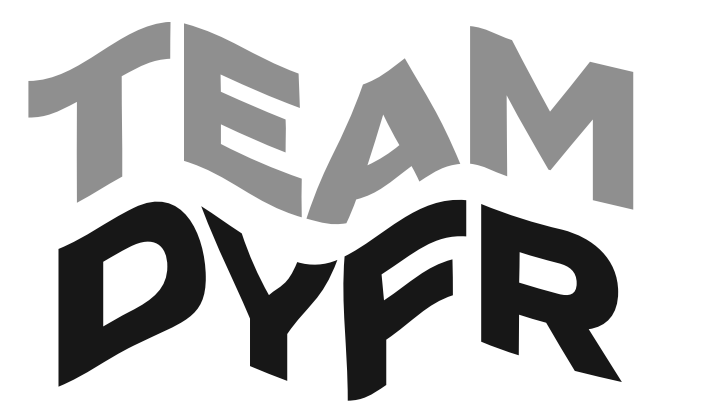


Project Proposal



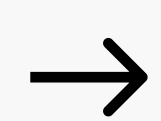
Problem Statement

Construction waste is currently the **most prominent waste stream** globally at around **3 billion tonnes a year**. Additionally, with over 3 billion square yards of landfill with Construction and Demolition waste (CDW), this poses a significant threat to the environment. With increasing modernization and urbanization, we expect this problem only to grow. Thus, we need to **find efficient** and **creative ways** to deal with the Construction and Demolition waste.

Framing the Design Challenge

Research Question

How can construction waste become **less damaging** to the environment and **more valuable** to business through cyclic systems and reverse logistics?



How can construction and demolition become:

1. **Less damaging** to the environment.

(in terms of material consumption, waste production, and harmful pollution)

2. **More value** to businesses.

(in terms of creating financial value, material value, and process efficiency)

Impact/ Expected Outcomes

Construction may not be the most attractive topic, but we found it an area full of **incredible opportunities**. When one typically thinks of waste production, the focus turns to plastic and consumers instead of the **significant threat** construction and demolition poses to the planet. We hope to take a decisive step forward to help save resources, money and prevent further environmental damage.

Secondary Research

Experts predict that 60% of the cities of 2050 do not even exist yet, which means that a substantial amount of new infrastructure and construction will emerge in the decades to come.

(Gyebnár, Radovics & Szabó, 2018)

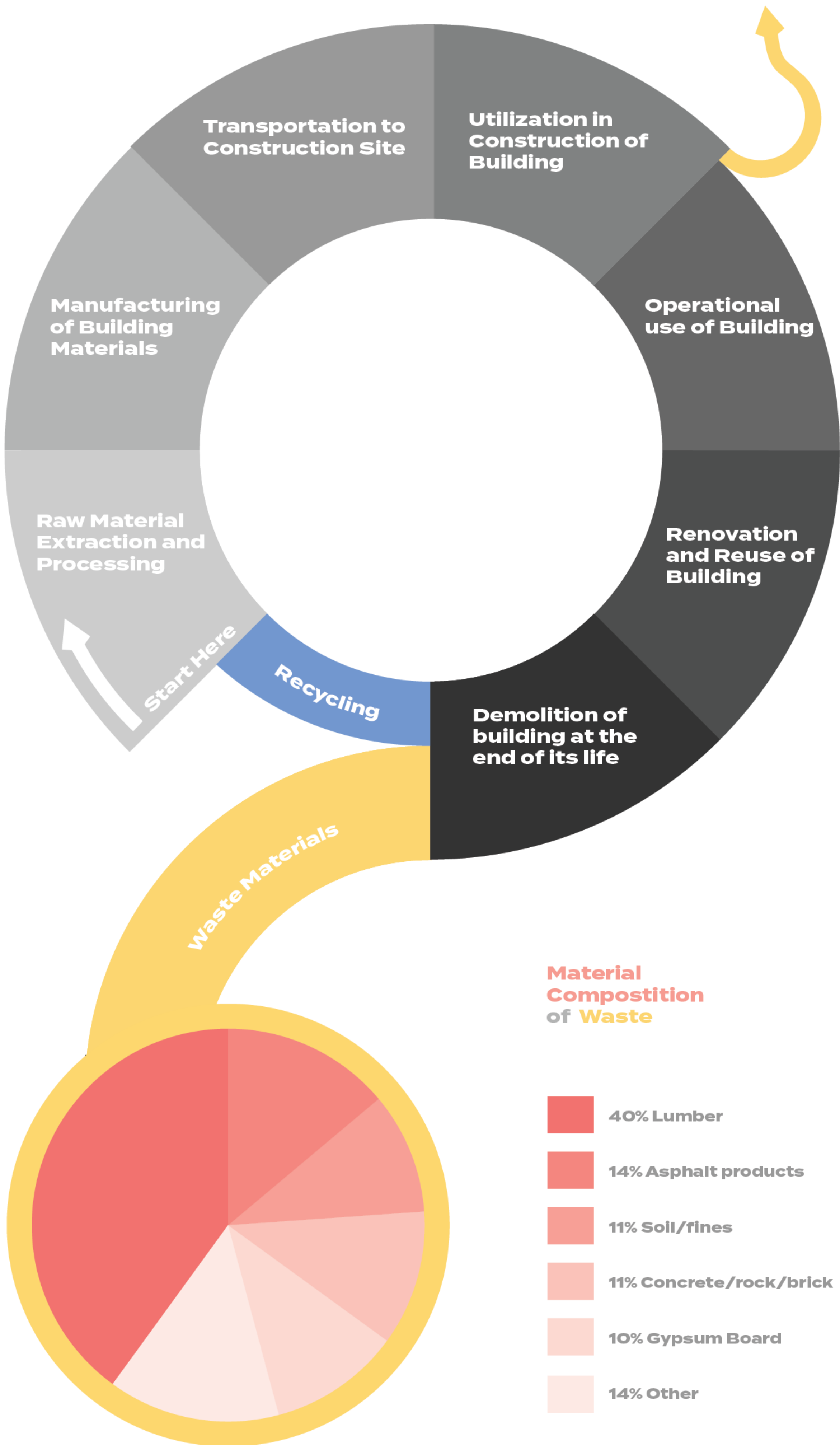
Construction is responsible for 50% of all non-renewable resources we consume yet constitutes only 17% of US GDP. On the other hand, Green construction can have a cost premium up to 30%.

(Freedman, 2016)

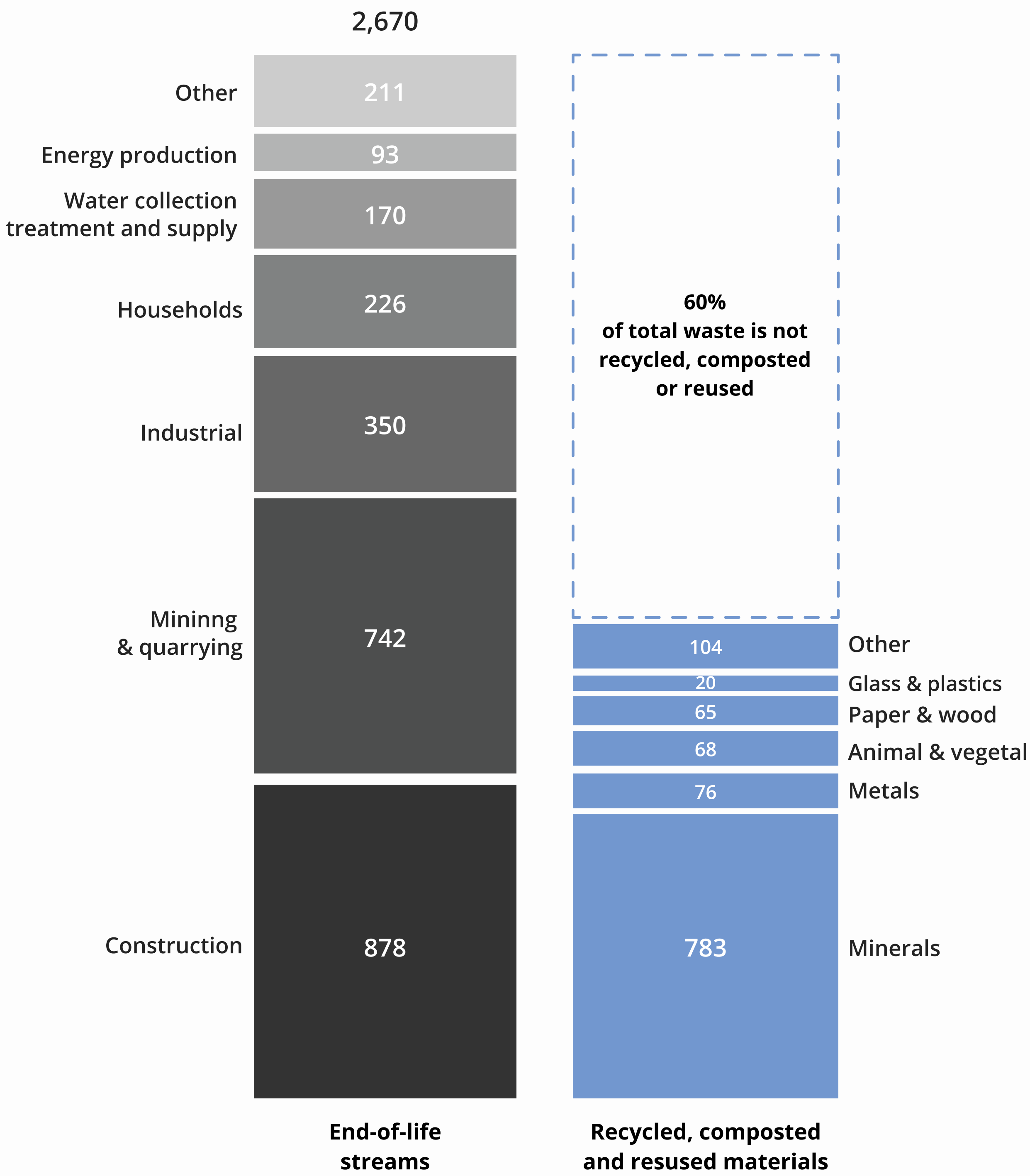
The annual production rate of construction and demolition waste from the whole planet is around 3 billion tonnes

(Gyebnár, Radovics & Szabó, 2018)

The Life Cycle of Construction and Demolition Waste



Source: Ellen MacArthur Foundation; World Economic Forum; The Boston Consulting Group



We are still losing enormous tonnages of material
Million tonnes, EU27, 2010E

("Towards the Circular Economy", 2013)

Construction industry is the biggest waste stream in the world, constitutes 25-30% of all EU waste.

(Bigagli, Alarcon & Abboud, 2020)

Less than 30% of the debris is recycled, even though 90% is recyclable

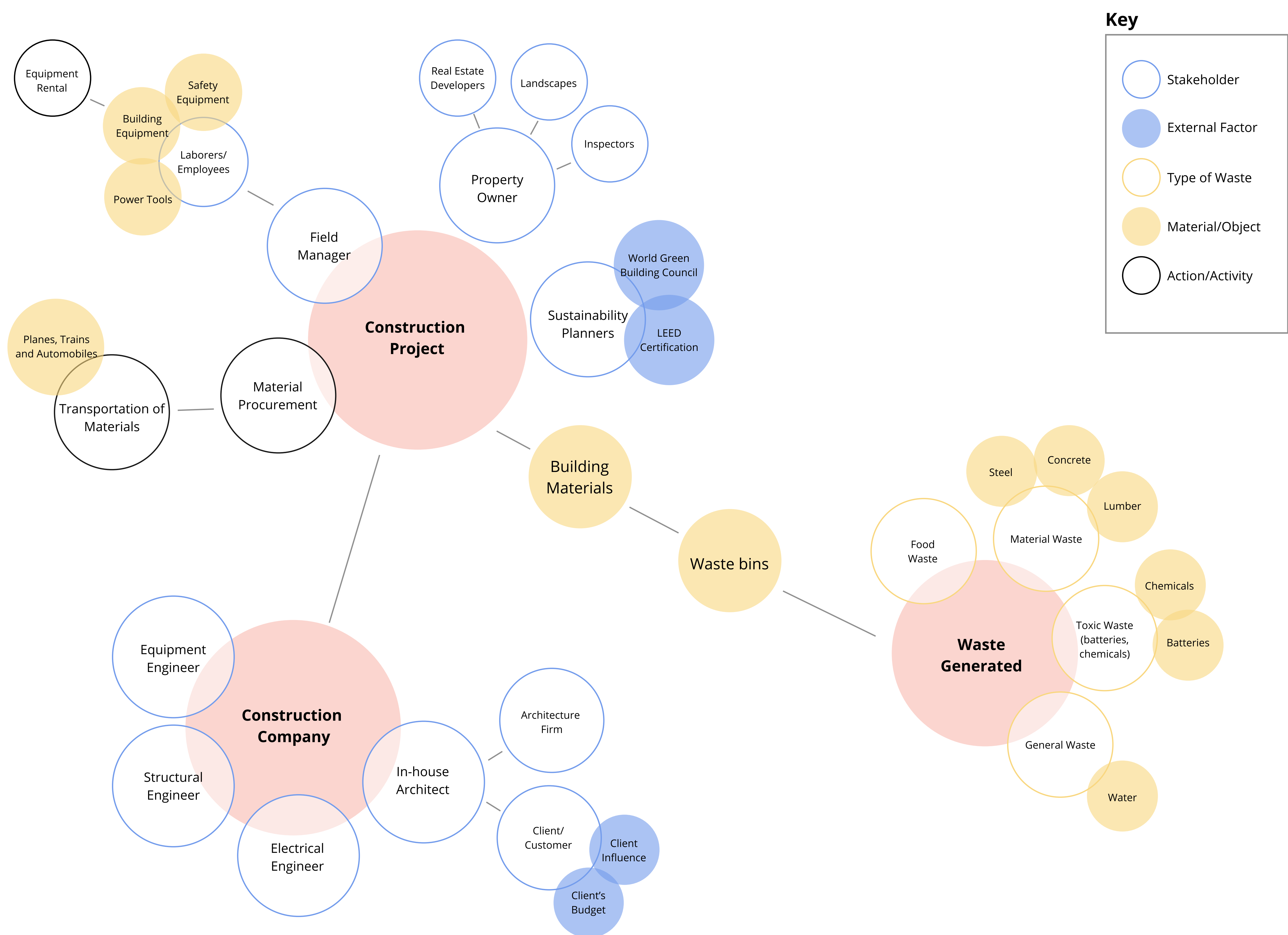
(Gyebnár, Radovics & Szabó, 2018)

What Materials Can Be Reused?

1. Easy-to-remove items like doors, hardware, appliances, and fixtures.
2. Wood cutoffs can be used for cripples, lintels, and blocking to eliminate the need to cut full length lumber. Scrap wood can be chipped on site and used as mulch or groundcover.
3. Brick, concrete and masonry can be recycled on site as fill, subbase material or driveway bedding.
4. Excess insulation from exterior walls can be used in interior walls as noise deadening material.
5. Packaging materials can be returned to suppliers for reuse.

("Sustainable Management of Construction and Demolition Materials | US EPA", 2019)

C&D System Map



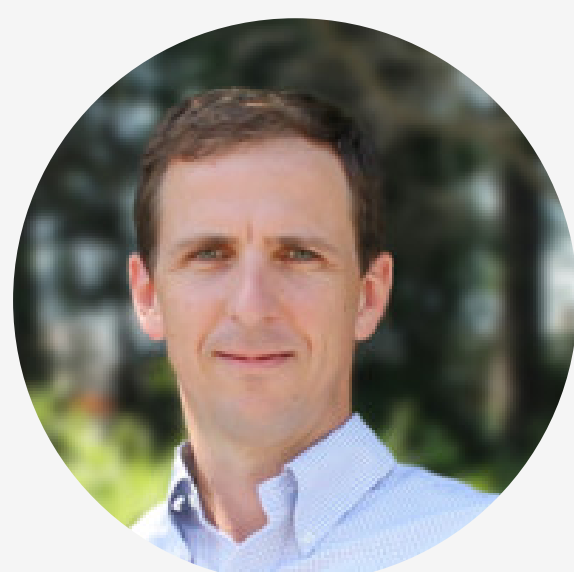
Primary Research

Word scoping down to our topic and creating a system map to understand the ecosystem within construction waste, we reached out to experts to give us a **deeper understanding** of the topic and to **identify opportunity areas** within the topic.



Lonnie Coulter Industrial Design professor at SCAD, CNC programmer at Coastal Millworks

1. Larger companies struggle with cyclic procedures because they focus on a task that's too large to take on. Instead, companies should start with things they know they can accomplish.
2. The most difficult part of recycling materials is finding out a.) what locations in your proximity will actually recycle them, b.) how much it will cost, and c.) How many materials you have that can be recycled in your area.



Kirk Gilbert Division Manager and VP of Choate Savannah

1. Construction hasn't evolved in over 100 years in terms of procedures
2. Thought diversity in the realm of construction is hard to come by, because most people in high positions have been there for a long time doing the same things
3. Even if materials can be sourced locally, it's cheaper overseas because of trends, processes, and labor cost



Sungsoo Han Consulting Architect

1. There is a lot of potential for construction waste being reused in different ways. However, the reason this is difficult is because there is no system that allows to store construction waste and reuse it.
2. The topic is relevant since so much waste has been produced from just construction. Being able to find the material that can be reused within construction waste and creating an applicable system to implement may be something to look into.

Trends

1. The construction industry is decentralized and hyper-fragmented (multiple stakeholders).
2. Construction is a “horizontal” industry serving all industry verticals with scope for industry symbiosis.
 - Concrete furniture - The furniture industry is embracing closing the loop in the construction industry.
3. The initial selection of building materials has a huge downstream effect for the quality and safety of materials in the circular loop.
 - Safe materials used at the beginning of the construction work cycle ensures that safer materials can come back into the loop at the end of the building's life cycle.
 - Asbestos has been outlawed in many countries as a construction material, and construction companies are increasingly motivated to ensure that the living and work environments that they create are ergonomic.

Opportunities

1

CDW has a high potential for re-use and recycling, since some of its components have a high resource value and/or can be readily recycled. Thus there needs to be a change in mindset from viewing these as 'resources' and not 'waste'.

2

Value therefore lies in improving the quality of construction and materials used, in contributing to a healthier indoor environment, increasing its sustainability and reducing its cost.

3

The circular economy should be present in manufacturing, the use of construction materials, and in the maintenance of infrastructure. Our biggest challenge lies in increasing the utilisation and energy efficiency of existing building stock, as well as rehabilitating aging buildings.

Link to our Miro Board

We dare you to check out our nebulous research and process... hop in to our miro!

<https://miro.com/welcomeonboard/bkRjB1IDtp00msuThdB5jkXshQQL8ljz1pR4zvvOLDQpiWmCYgUpzrOZzLkytNjf>

References

Bigagli, T., Alarcon, L., & Abboud, S. (2020). The Trends Shaping the Construction Industry in 2020. Retrieved 29 January 2021, from <https://www.pluginplaytechcenter.com/resources/trends-construction-industry/>

Freedman, B. (2016). Chapter 13 ~ Non-Renewable Resources. Retrieved 29 January 2021, from <https://ecampusontario.pressbooks.pub/environmentalscience/chapter/chapter-13-non-renewable-resources/>

Gyebnár, D., Radovics, K., & Szabó, I. (2018). Retrieved 29 January 2021, from <https://www.pwc.com/hu/en/kiadvanyok/assets/pdf/Closing-the-loop-the-circular-economy.pdf>

Sustainable Management of Construction and Demolition Materials | US EPA. (2019). Retrieved 29 January 2021, from <https://www.epa.gov/smm/sustainable-management-construction-and-demolition-materials>

Towards the Circular Economy. (2013). Retrieved 29 January 2021, from <https://www.ellenmacarthurfoundation.org/assets/downloads/publications/Ellen-MacArthur-Foundation-Towards-the-Circular-Economy-vol.1.pdf>