

**Socioeconomic Implication of the Circular Economy:
A Preliminary Study of The Impact on Employment and Local Economy
in the United States**

by

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ABSTRACT

A circular economy is an economic system with the goal to minimize resource input and waste, emission, and energy leakages. It has gained momentum in the last decade as an increasing number of businesses have adopted some circular strategies in their sustainable development roadmap. Economic and resource efficiency have predominated studies of the circular economy's benefits, while on the other hand, there are scarce studies of the circular economy's impact on jobs and employment, which are often limited to ambiguous perspectives surrounding job creation. Employment, however, plays a critical role that has a direct impact on social sustainability, and therefore needs to be reviewed through factors such as employment opportunities, skills, wages, earning quality, job security, workplace risk, work schedule and social dialogue, etc. This study examines two sectors connected to the circular economy with the highest potential for employment growth: 1) the waste sector, and 2) the reuse sector. The impacts of the circular economy on these areas were examined through semi-structured interviews with experts and stakeholders ranging from businesses, foundations, municipalities, academia and labor unions in the United States. In addition, this study examines how COVID-19 has changed the workforce in the last two years. The findings of this study reveal issues and vulnerability of work that are most relevant to the circular economy. In the waste sector, workers work longer hours under high risk environments. In the reuse sector, the work is often manual and involves some informal workers who are less protected by labor law. In addition, the study shows that COVID-19 has changed the workforce drastically. The vulnerability of the workforce presents the need for institutional actors to approach the circular economy systemically with the goal to achieve strong sustainability and to establish policymaking and better governance framework to keep the transition of zero waste and the circular economy resilient and equitable for society.

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1. BACKGROUND

When the pandemic hit the world in 2020, globalization encountered a never before seen shock due to nations' closure of borders and a sudden halt of international transit. Substantial economic disruption and social inequality exposed weak social and job protection for frontline workers in healthcare, sanitization and waste management and hospitality industries. On the other hand, what is complicating the recovery from the pandemic is extreme weather patterns that have displaced more than 30 million people in the year of 2020, in order to prevent the temperature from a 2 degrees celsius increase, scientists and nations experienced the most impact from global warming are demanding proactive actions from high income nations which are accountable for the majority of greenhouse gas emission (GHG).

The plan of adopting the circular economy varies among nations, the motivations behind it are often driven by the economic benefits and will come along. For Germany, where resource-heavy industries are dense, the drive substantially comes from the motivation to become more resource efficient amid the growing energy crisis.

1.1 The Rise of the Circular Economy

In response to the surging urgency to stop global warming and to mitigate environmental, economic and social crisis brought on by climate change, intergovernmental agencies and multinational agreements have emerged over the last centuries to unify member nations with the collective responsibility for tackling the climate and energy crisis. As the population is projected to continue the growth, human activities and development have been relying on resource extraction, manufacturing and consumption which all generate waste in the current economic system.

In the latest data published in 2017, the world was consuming the average of 1.75 times as much resources and waste as the regenerative capacity of biosphere – collectively defined by nine planetary boundaries (Steffen, Rockström & Costanza, 2011) – and this trend of consumption was projected to grow by the time (Figure 1-1). When breaking this number down into regions, this number is almost 1.58 times for Europe, 2.32 times for China, 1.63 times for Latin and Caribbean America, -0.77 times for Africa and 5.03 times for North America (Global Footprint Network, 2020).

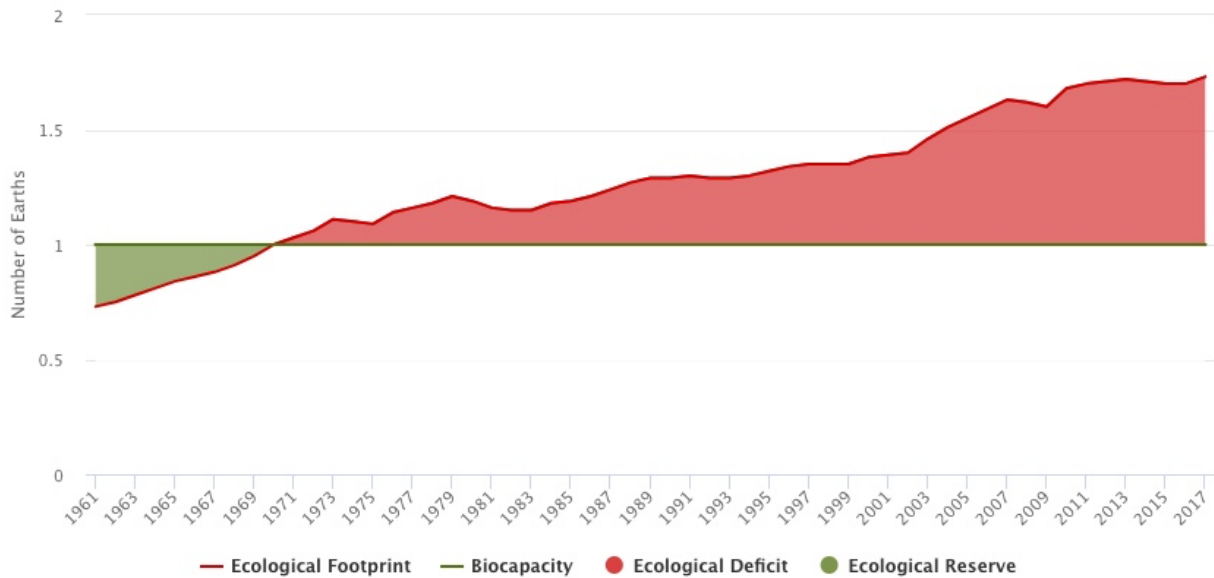


Figure 1-1. The consumption speed of humanity will require 1.75 earths in 2017. (Global Footprint Network, 2020)

This trend directly results in major environmental issues such as waste, pollution and deforestation, as the energy required to support and digest the consumption has produced high amounts of GHG that cause global warming. In the European Union (EU), many member countries seeking to decouple economic growth from resource consumption have set goals to keep the development of the economy within planetary boundaries. When it comes to finding approach to reach these goals, the concept of the circular economy, which has a relatively huge focus around resource efficiency, have become the greatest appeal to both policy makers and private sectors, given its seemingly straightforward strategies which enable outcomes generated in a short-term time frame, especially at a microscale (Geissdoerfer et al., 2017). The EU describes the circular economy as a prerequisite for achieving EU's 2050 climate neutrality target, meanwhile pointing out the economic benefits by indicating that "making the circular economy a priority as it will contribute to reducing negative environmental impacts while simultaneously contributing to higher employment levels" (Cambridge Econometrics et al., 2018).

At a high level overview, the circular economy is an economic model that aims at closing the energy and material loop so that any waste will be eliminated (Ellen Macarthur Foundation, 2021). The concept itself is not a new idea, but it has grown into a systemic vision by integrating multiple environmental approaches such as industrial

ecology and biomimicry which have particular emphasis over environmentally friendly productions and business models (Bocken et al., 2016). Over the last decade, strategies and reports about the circular economy were regularly published by large consulting firms and policymakers have also used Circular Economy as an umbrella term to communicate the vision behind any major reformation of economic and urban development (European Commission, 2018). The European Union has established plans with clearly-defined goals to encourage member nations to become more circular on a mezzo scale (Geissdoerfer et al., 2017; Kirchherr et al., 2017; ReLondon, 2017). In the context of economic development and policy, a circular economy has been frequently referred to as a solution for environmentally sustainable growth because of its promise of decoupling the economy growth from resource consumption (Ellen Macarthur Foundation, 2021; Ghisellini et al., 2016; Kirchherr et al., 2017).

On the other hand, the academic interest for the circular economy has also accelerated over the last three years. This can be observed through a search with keyword "Circular Economy" in Science Direct, the amount of peer-reviewed literature has tripled between 2019-2020 (+60%) compared to the growth in previous years 2018-2019 (+20%). Academic interest in the circular economy focus greatly on collecting quantitative data to validate the assumption and clarifying the scope and its contribution to the sustainable development goals (Ghisellini et al., 2016; Geissdoerfer et al., 2017; Kirchherr et al., 2017; Korhonen et al., 2018).

The circular economy started to gain greater international appeal and momentum outside of European countries in 2019, following the European Commission's revision of the action plan for CE. Following the launch of the plan, with the help from the United Nations Environment Programme (UNEP), the EU established the Global Alliance on Circular Economy and Resource Efficiency (GACERE) to address activities associated with the transition toward a circular economy internationally. There are eleven countries that joined this alliance besides the EU. In 2021, UNEP made a public announcement to strengthen the role of the circular economy in achieving sustainable consumption and production (SDG 12).

Just like sustainable development, any transition into a green economy requires setting measurable proxies to track progress and hold stakeholders accountable for the promise they made. Tracking the outcome also helps policymakers validate the efficacy of the policies and allocate budget to accelerate the transition according to the trend of data. A good example is the European Circular Economy Action Plan, which is

accompanied by the adoption of a monitoring framework that comprises a set of key indicators published in 2018 (European Commission, 2018). These indicators track the progress across four major dimensions ranging from Production and consumption, Waste management, Secondary raw material and Competitiveness and innovation - the last category monitors innovation based on the number of filed patents associated with recycling and secondary raw materials. One of the indicators tracks the usage of input and output of resources, its record of rising rate of adopting circular material since 2017 implies an increase in market interest on integrating some circular economy strategies in the business (Eurostat, 2018).

1.1.1 Health and Environmental Issues of Waste

The motivations behind adopting some circular economy strategies come from the need to phase out solid waste and to treat waste as an economic opportunity to generate new value. According to the report of the World Bank, an estimated average of 2.01 billion tonnes of municipal solid waste was generated across the world in the year of 2016. This number will only likely to double in another thirty years especially in Sub-Saharan Africa, South Asia and Middle East North Africa regions. Currently, half of the municipal waste generated by high income countries consists of recyclables such as paper, plastic, metal and glass (Kaza et al., 2018). Across the United States, a total of 292.4 million tonnes of waste was generated in 2018, almost 50% of this waste went to the landfill, and only less than one third of the materials were recycled and composted. Even though the United States is currently accounting for 4% of the world's population, an average of 5 pounds of waste was generated by one person everyday in 2018, accumulatively equals to 12% of the world's solid waste (O. US EPA, 2016).

For a long time, high income countries – accounting for 16% of the world population – rely greatly on exporting to remove excessive amounts of waste that would otherwise end up in the landfill; These solid waste end up mostly in countries where poor or no regulation existed to properly and safely handle the waste. Countries that rely on exporting municipal solid waste have also decreased their capacities of collecting, sorting, and processing solid waste materials as the cost of exporting waste was significantly lower than the cost of managing the waste domestically. Exporting waste was initially and frequently used as a strategy to optimize transportation efficiency of returned shipment from countries importing goods from China.

Due to growing concern over the health and environmental risks brought by waste collection, China gradually banned import of different categories of waste. In 2018,

China made an announcement to stop importing unprocessed waste exported from other countries in order to circulate domestic resources and lighten the environmental toll from dealing with the waste. Since this new regulation hit the road, other countries in Southeast Asia also followed along with some amount of restriction on importing waste like plastic, mixed paper and some other scrap (Chaudhuri, 2019). Some countries channel the investment on specialized middlemen and remanufacture facilities to eventually turn waste into new items with economic value, while others just let the waste sit around wishing for a new waste stream open up for redirection instead of building infrastructure for waste management (Agarwal, 2019; Chaudhuri, 2019). It is unlikely that the restriction of plastic export will ease given growing awareness of environmental justice. Facing more close-down of overseas destinations of waste collection (Figure 1-2), high-income countries often lack the capacity for proper waste management even though there are growing studies indicating potential economic benefits brought by it (ILO, 2018b; O. US EPA, 2016).

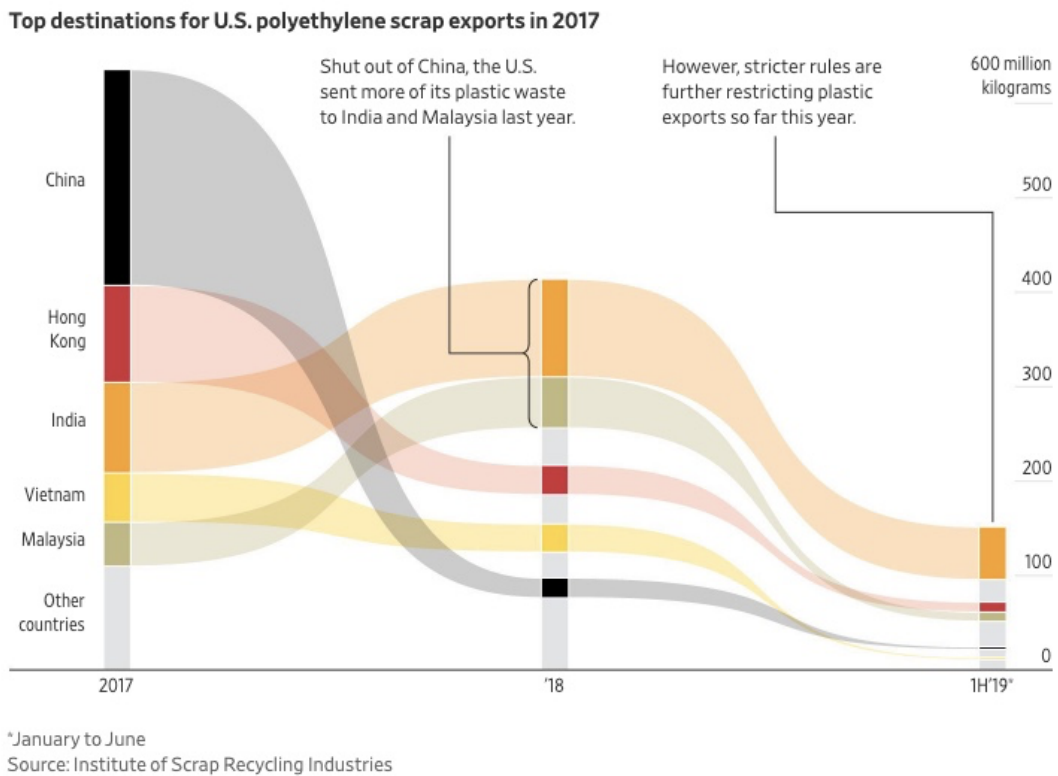


Figure 1-2. Export of recycled materials from the U.S. has shrunk significantly since 2018. (Source: Institute of Scrap Recycling Industries)

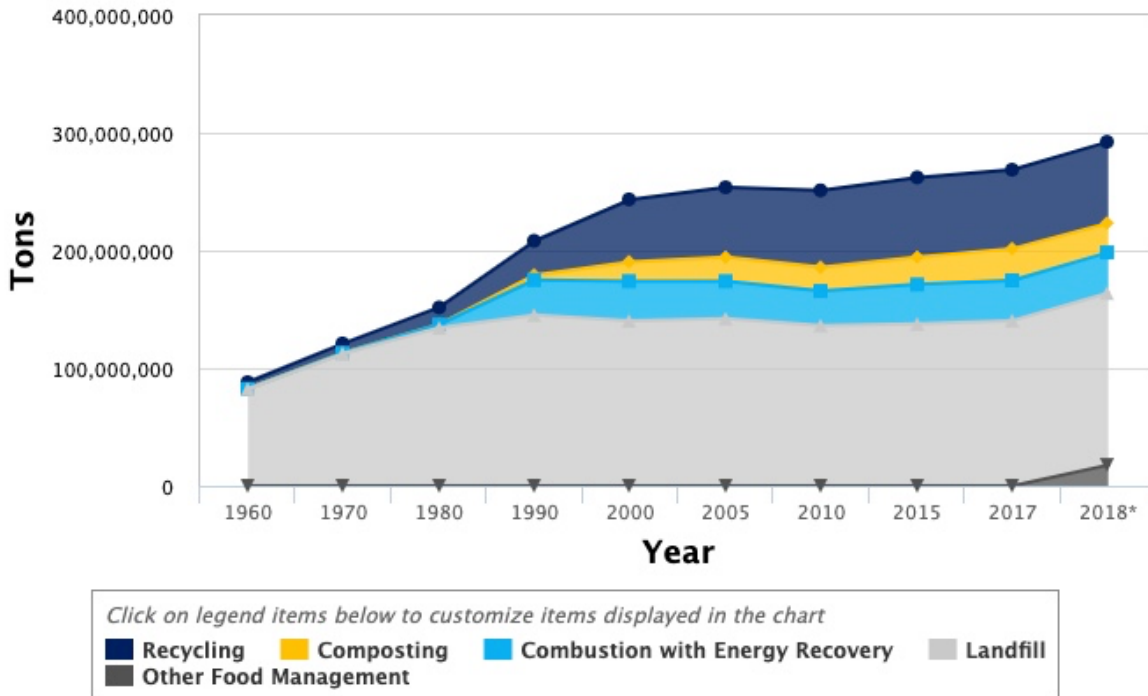


Figure 1-3. Municipal solid waste generation, compared to 268.7 million tons of the municipality's solid waste in 2017, it grew by 10% in 2018 (O. US EPA, 2016)

1.1.2. Reforming How We Utilize Materials and Energy

Increasing adoption of the internet and free trading between countries have broadened our access to information across the world, and accelerated the globalization that is particularly prominent in the manufacturing business (WEF 2014). Goods went through different countries throughout the entire production process – The extraction of raw materials would happen in one country but the manufacture and assembly of goods may take place in different countries where they provide both required expertise and competitive production cost.

The economic model of such involves the inflow and outflow of materials stocks, assuming the resources from nature is infinite and constant, this summarized what is often called a "Linear Economy" (W. Stahel & Clift, 2016). The goal of a linear economy is to generate more value from per input of resources, which was mostly achieved through lowering the cost of input and production as a strategy to maximize the marginal profit (Llorente-González & Vence, 2020). In a linear economy, the major economic growth relies on extraction of resources, manufacturing and consumption.

When the costs of workers, production and material supplies continued to grow in high income countries, businesses in these countries turned to oversea manufacturers, mostly those in lower income countries where the cost of living is considerably lower, to deliver competitive pricing to the market. Linear economy therefore has become contingent on a globalized supply chain network.

As opposed to a linear economy, the circular economy reforms the way how resources will be utilized (Geissdoerfer et al., 2017). Originally inspired by the natural ecosystem in which nutrients will be distributed and circulated to create value for different stakeholders in different stages, it inherits practices from multiple schools of thought, including Industrial Ecology, Cradle to Cradle, Biomimicry and Performance Economy (Ellen Macarthur Foundation, 2021), in hope of solving the environmental unsustainability around waste issues brought by a linear economy. A majority of this concept originates from architect McDonough and chemist Braungart's Cradle to Cradle (C2C) Methodology, which proposed that the usage of safe materials and chemicals is the foundation for prospering the economy, lands and people (McDonough & Braungart, 2002). Another major branch of thoughts that pave the foundation of a circular economy today is Industrial Ecology, which put emphasis on leveraging symbiotic relationships between entities to conserve and optimize the utilization of resources (Blomsma & Brennan, 2017). Together, these precedents fused the vision of a more efficient and circular economic system, in which features a closed-loop symbiotic relationship between the industrial cycle and the biological one. In the industrial cycle, energy should be preserved by keeping the material in service for as long as possible; Any energy and resources that enter the biological cycle as composts or byproducts should be safe so it can become the nutrition of the natural ecosystem (Blomsma & Brennan, 2017; Ellen Macarthur Foundation, 2021; European Commission, 2018; W. Stahel & Clift, 2016).

This concept around maximizing the utility of resources to reach resource efficiency was later reinforced by Stahel, who proposed the concept of Performance Economy that centers around the idea of material input per year of service (W. R. Stahel, 2006). Performance economy has inspired major business models and innovations that support the development of a circular economy including Share Economy and Product-Services System (PSS). which refers to the business model that generates revenue from selling a combination of material goods and services with lower resource consumption (W. R. Stahel, 2006), provided an alternative source of economic opportunity through selling knowledge-intensive activities.

1.2 The Concept and the Scope of the Circular Economy

To date, the circular economy has been a broad economic concept that covers heterogeneous applications and business models, similar to many other green economic concepts (Bocken et al., 2016; Kirchherr et al., 2017). The major developments of a circular economy was shaped and practiced by industry stakeholders such as policymaking and private sectors who were attracted by the promise of achieving resource efficiency before much scientific validation (Blomsma & Brennan, 2017; Kirchherr et al., 2017; Reike et al., 2018).

Perhaps, the most commonly adapted definition for the circular economy comes from one of the prominent advocate for it, the Ellen McArthur Foundation (EMF), which described a circular economy as a system solution framework that seeks to 1) eliminate the waste and pollution from intentional design, 2) preserve value by circulating products, 3) regenerate natural system. EMF's circular strategies often center around product and design, as it claims that 80% of the waste and pollution is created in the design stage and thus the principles of solving these issues are driven by design (Ellen Macarthur Foundation, 2021). The foundation has been actively engaging in policymaking and helping businesses become more circular.

Among its broad set of focuses, most governmental agencies selectively chose to focus on tackling waste issues given its great economic potential from recycling and manufacturing secondary materials more than any other principles of CE. Private sectors aim to increase their circularity also put great emphasis on circular strategies, often represented with "R" strategies including but not limited to reuse, repair, remanufacture, recycling, etc., that prioritize business opportunities at a microeconomic level, such as adopting recycled or circular materials and deploying recycling programs to take back products despite the fact that very few business has the facility and capacity to process recycled products (Ellen MacArthur Foundation, 2017).

Aside from the industry, there has been growing academic interest in understanding the impact of the circular economy on top of the proposed environmental benefits a circular economy can potentially bring about, the concerns about CE's impact on the society and the environment can also be found in multiple well-regarded literature.

For example, social scientists questioned whether or not the circular economy may perpetuate inequality given the its predominant popularity in private sectors (Geissdoerfer et al., 2017; Llorente-González & Vence, 2020); some worried the

ambiguity of the concept lack the supporting data to demonstrate long term sustainability may hinder the success at its destined macroeconomic scale (Kirchherr et al., 2017; Korhonen et al., 2018); there are also concerns over selective adoption of circular principles, arguing that such approach will risk sidelining the need of establishing strong socioeconomic mechanisms required to stabilize social sustainability (Geissdoerfer et al., 2017; Ghisellini et al., 2016; Wegmann, 2017).

For the purpose of investigating the sustainability of a circular economy down the road, this thesis thereby defines the scope of the circular economy by including the standard of strong sustainability. The scope is defined with three elements, Principles, Scales and Long-term Impact, by referring to top-cited literatures selected from Journal of Cleaner Production, Resource Conservation and Recycling, Industrial Ecologies and Ecological Economics ([Appendix 1](#)). The scope of a circular economy is defined below:

The circular economy describes an economic concept which evolves around business strategies and models intended to eliminate negative environmental impacts (waste and pollution) caused by economic activities.

Principles

Replace the 'end-of-life' concept with reducing, alternatively, reusing and recovering materials in production/distribution and consumption processes to achieve circularity.

Scales

These strategies are operated at the micro level (products, business models, consumers), meso level (regional, like eco-industrial parks) and macro level (national and beyond).

Long-term Impact

Aim to accomplish sustainable development, which implies a systemic shift of the current economic system to create environmental quality, economic prosperity and social equity, to the benefit of current and future generations.

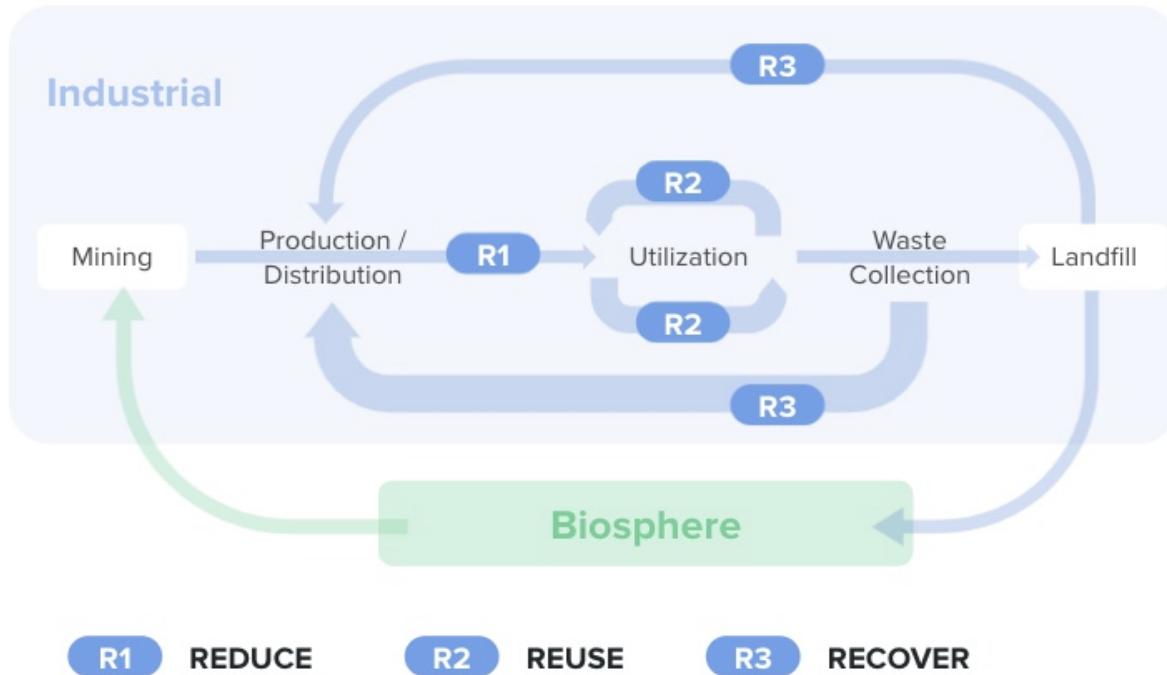


Figure 1-4. Resource and energy loop of the circular economy. Strategies to conserve and recover energy and resources is the foundation of the circular economy, thus requiring multi-stakeholders to collaborate to enable its benefits and long term sustainability.

Very often, R strategies, which are the core of waste management before the circular economy emerged, are used very commonly to represent the concept, even though they are not the only circular strategies a part of the bigger picture of a circular economy which requires a ecosystem bigger than individual businesses to deliver its intended impacts (Figure 1-5). In addition, there has not been an unified perspective toward the granularity of R strategies (Reike et al., 2018), which are often jointly performed and manifested through different business models and stakeholder interactions.

In addition, according to the systemic approach, the value of a circular economy is delivered and observed through the entire ecosystem instead of through one single R strategy (Kirchherr et al., 2017). Therefore, this thesis simplify the use of R strategies stated in the principle into three foundational ones: 1) Reduce, which is realized also through reuse and recover; 2) Reuse to preserve value of a products by keeping it in use for as long as possible (repair and resell); 3) Recover to create value from the products and materials that are discarded (recycling and material recoveries) (Figure 1-6).

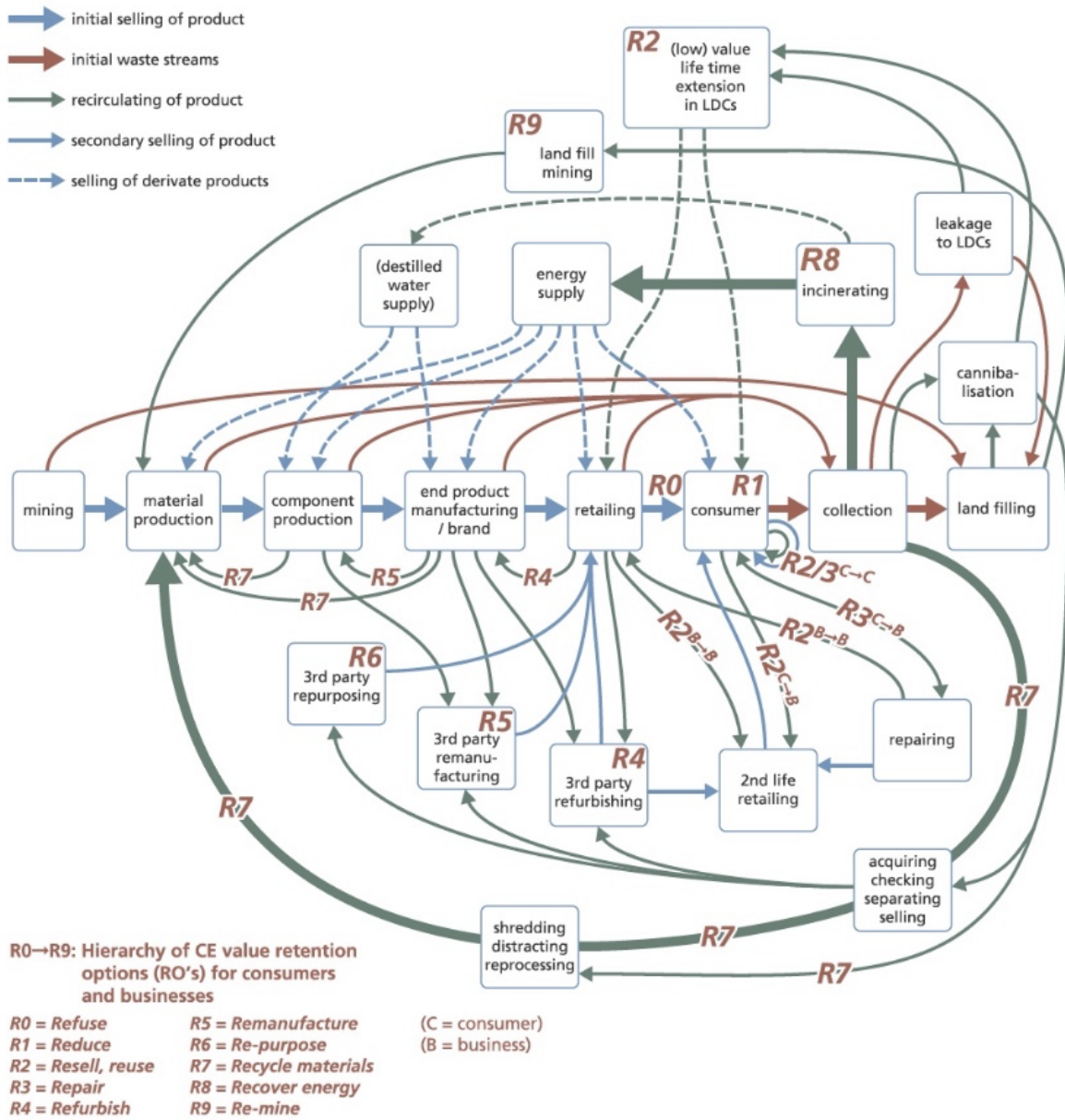


Figure 1-5. Circular strategies are mostly performed jointly to create dynamic business models (Reike et al., 2018).

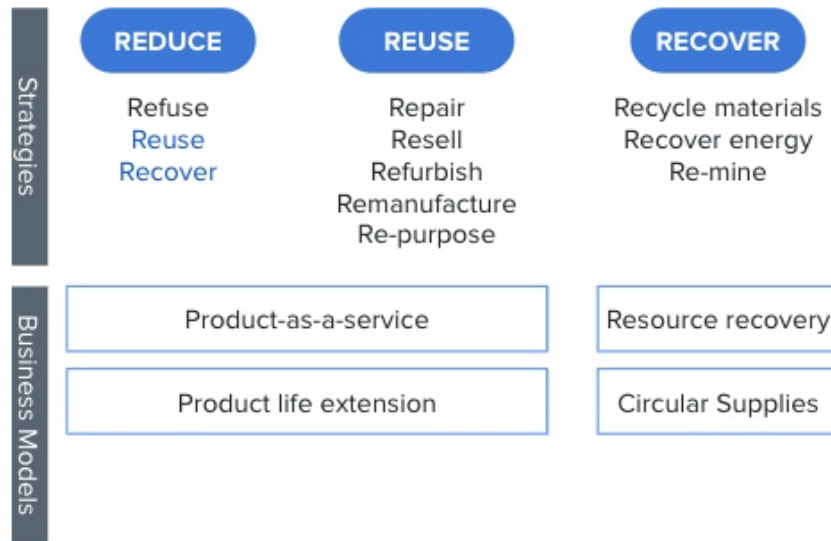


Figure 1-6. Common R strategies (Reike et al., 2018) and how they are combined and simplified into three in this thesis.

2. APPROACH

2.1 Thesis Objective and Outline

As defined in the Background chapter, the rise of the circular economy steers the research questions this thesis is asking. Many believe that following the circular approaches will help keep global warming below 2°C as agreed in the 2015 Paris Agreement. But because the circular economy did not originate from a single field, it is used commonly as an umbrella term to bundle waste management strategies along with some business models. Therefore, it was helpful to define the scope of a circular economy before any further investigations since it serves three important goals: (1) guiding the selection of case studies, (2) identify experts to reach out, and (3) defining a research question going forward.

Advocates often regard the circular economy as the answer to decoupling economic growth from resource extraction and formulating a better economy for the people and the planet (Ellen Macarthur Foundation, 2021). To date, the first assumption still requires more quantitative data to prove its long term trend. This research attempts to investigate the second assumption through the perspective of work and employment, which is considered an critical factor that stabilizes strong sustainability, through a

combination of human-centered approach and inductive research process given the scarcity of research on this topic.

2.2 Research Methodology

This thesis intends to provide a blanket overview of some internationally-recognized social factors concerning work that can potentially hinder what the circular economy tries to achieve in the current globalized economy by presenting the environmental issues that led to the adoption of the circular economy and how recent transformative events (e.g., COVID-19 pandemic) impact the circular economy.

The research is broken down into two parts: the first part is a broad literature review on relevant concepts and assumptions; and the second part is the interview and the data collection to explore existing assumptions and bring in new perspectives.

2.2.1 Literature Review

1) The literature review first starts with a broader overview of the definition of strong sustainability, which is the ultimate vision that a circular economy that is defined in this research is trying to achieve.

2) Second, the review proceeds to look at assumed benefits proposed by advocates of the circular economy, including data that both support and challenge these assumptions. This review reveals the need to further define the indicators of work that support sustainable development goals.

3) Thirdly, framing the dimension of work through internationally recognized agendas within the policy and socio-economic arena.

The work that inspired the literature review comes from Ashford & Hall's definition of employment in Technology, Globalization, and Sustainable Development: Transforming the Industrial State, which includes seven dimensions: 1) Skills, 2) Wages, 3) Purchasing Power, 4) Job Security, 5) Health and Safety, 6) Job Satisfaction, 7) Numbers of Jobs (Ashford & Hall, 2018). This section reviews academic papers, industry and government reports to find out why work is an important factor that stabilizes the economic and social wellbeing in strong sustainability, along with how multiple frameworks define the indicators that inform the future of work.

2.2.2 Data Collection and Interviews

This part of the research process focuses on the United States given fast growing waste and growing adoption of a circular economy in a few regions. The investigation aims at confirming the assumption listed in the literature review. Furthermore, the goal is to identify how the perception and expectation for work impacted by current events may shape the circular economy in the States. Both a top-down and a bottom-up approach were used throughout this part of the research:

- 1) "Top-down" approach started with running unstructured interviews with experts and advocates of the circular economy. The aim of the interview is to access relevant documents and statistics, to elicit experts' opinion on the impacts of a circular economy on employment and local economy, as well as their engagement for assessing and critiquing the approaches of the cases and the outputs of the study.
- 2) The "bottom-up" approach includes data collection from industry reports, news and semi-structured interviews with relevant stakeholders. Interviews aim to collect perspectives and first-hand experience, so the interview questions ([Appendix 4](#)) were generated to guide the overall direction of the interviews, while leaving room for unstructured conversation that developed naturally whenever there is a necessity to dive deeper. In order to obtain consistent responses from the interviewees, a number of visual diagrams and tables with clear definition of the scope of the circular economy will be presented when inquiring responses.

3. LITERATURE REVIEW

3.1 The Concept of Strong Sustainability

In 1987, the World Commission on Environment and Development (WCED) was appointed by the United Nations (UN) to establish proposals to address the global challenges and to work toward long term sustainable development. In Brundtland, the initiative defined sustainable development as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." (UN Brundtland Commission, 1987).

Sustainable development is defined as "our ability to meet the needs of the present without compromising the ability of future generations to meet their own needs." - the

definition for strong sustainability was coined by the United Nations Brundtland Commission in 1987. In order to achieve this statement, the agenda addressed importance for economic and social development to focus on reaching long term sustainability. In fact, strong sustainability is also reiterated by Elkington's proposal of Triple Bottom Line (TBL), an economic accounting framework that emphasizes the focus on People and Planet is as important as the focus on profit in the economic development (Elkington, 1998).

In the past, green measures seeking to create positive environmental impacts were treated as a sacrifice of social and economic wellbeing until more studies reflected that societal wellbeing and environmental wellness is instead a reciprocal relationship. The International Labour Organization (ILO) found out that nearly all countries which are sustainable from the point of view of the environment, have very high rates of working poverty. Previous development models suggested that moving these people out of poverty necessitates an increase in the ecological footprint, but this will result in environmental degradation that is also likely to destroy jobs and incomes, with the impact most felt among particular groups whose economic stability is dependent on the health of the environment (ILO, 2017).

3.2 Circular Economy Impacts on the Socioeconomics

Some examples of the major economic activities that are core to the circular economy are repair businesses that restore the utility of a product; resell and reuse businesses, that perform activities ranging from collecting and sorting products for thrifting and renting; re-manufacturing businesses that perform activities ranging from collecting and sorting materials into recyclables; and last but not least the renewables that enable circular business to run with lower carbon emission and recover energy from waste management process.

The human capital required to maintain these businesses also provides social and economic opportunities, as Ellen MacArthur Foundation argued that the transition into a circular economy will provide new jobs in industries of renewable energy and manufacturing of secondary materials, meanwhile replacing high risk jobs with safer working conditions (Ellen Macarthur Foundation, 2021).

ILO estimated that more than 50% of growth in employment will be found in renewable and waste sectors (ILO, 2018b). In the transition to green economy, adopting the circular economy will create 6 million new employment opportunities, sufficient to

cover the job losses (Figure 3-1) that accounted for only a quarter of the jobs creation throughout the transition (Cambridge Econometrics et al., 2018; ILO, 2018b). The potential of employment growth in the waste sectors is also reflected by United States Environmental Protection Agency (USEPA), based on solid waste data collected in 2012, USEPA estimated that 1.17 jobs, \$65,230 wages and \$9,420 tax revenues attributable for every 1,000 (US) tonnes of recyclables collected and recycled. Among all, the employment opportunities in the reuse sector is estimated to be 8 times more than those in recycling (O. US EPA, 2017).

Most of the reports created by consulting firms and policymakers primarily focus on job growth under the adoption of a complete circular economy (Geissdoerfer et al., 2017). Despite widely documented data of potential growth and depletion of jobs in specific industry sectors, the impact of adopting the circular economy on the quality of work still remains under-studied, the [appendix 2](#) presents the literature that guided this part's investigation of how circular economy impacts the dimension of work. It is especially evident when looking at the EU's Circular Economy Action Plan, the progress tracking indicators do not include any that tracks the contribution to any social SDG goals that concern societal wellbeing, poverty, equality and work (European Commission, 2020).

In 2020, during the presidential election in the United States, Biden of the democratic party drafted a plan to tackle climate change and to expand the infrastructure of renewable energy as a part of the Green New Deal. The plan is said to create new jobs, to which workers who used to work in mining and fossil fuel related industries can transition. There was a clear dissonance from the workers as Unions were skeptical about the simple equation of the idea that workers from one industry can be moved to another simply. Many unions argued that the outlook of positive impacts from new job opportunities and skills shifts may not be preferable choices for million workers who currently work in petroleum intensive industries (Davenport et al., 2021).

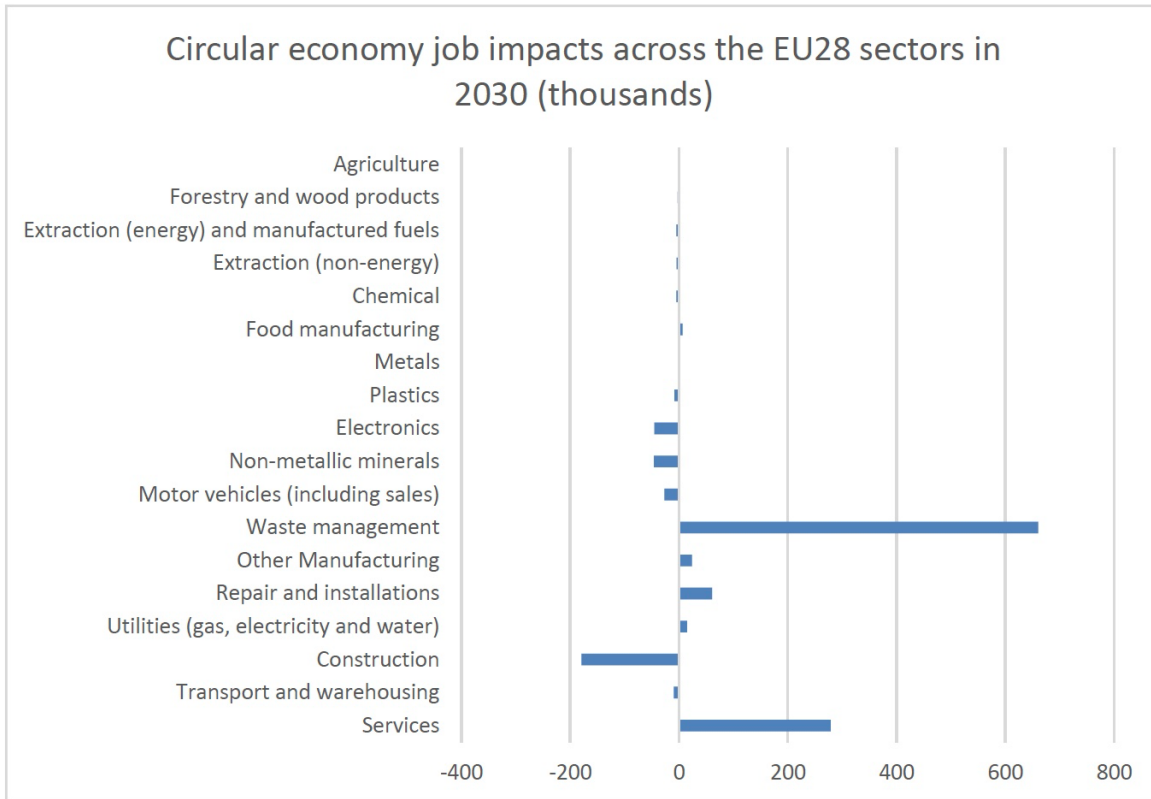
This reflects a problematic aspect of economic accounting that compensates job losses with job growth with a simple equation. The statement from the union unveils asymmetric aspect of work under a green transition, this is also going to be the story across the global job market, since the economic structure and share of industries vary greatly between nations, thus the job loss will be evident in countries that rely primarily on material extraction and manufacturing (Laubinger et al., 2020).

Meanwhile, the assumption that adopting the circular economy will result in a safer workplace was also challenged by scholars given the scarcity of supportive data and evidence (Geissdoerfer et al., 2017; Ghisellini et al., 2016). In fact, business models that evolve around reusing and recycling materials were found to be more labor-intensive compared to landfilling (Llorente-González & Vence, 2020; Wegmann, 2017).

Some concern that a disproportionate amount of the circular economy plans focus on zero waste, recycling and adopting recycled materials, whereas the effort put on supporting people who are affected the most in this transition is not as equivalent as the effort put on the economic development plan. Moreover, increase in recycling is not mirrored by a significant increase in jobs (Wegmann, 2017). This picture changes drastically when taking the informal sector into account. It is estimated that up to one million people in Europe are occupied in the informal recycling and reuse economy (ILO, 2018b).

There are growing voices that are raising concerns for the adoption of a circular economy without providing a plan to help workers transition. In fact, a lack of considerations over the social impacts is also reflected in the EU's circular economy progress tracker, which shows the development of a circular economy has not yet contribute to three SDGs that closely tied to social sustainability (Figure 3-2).

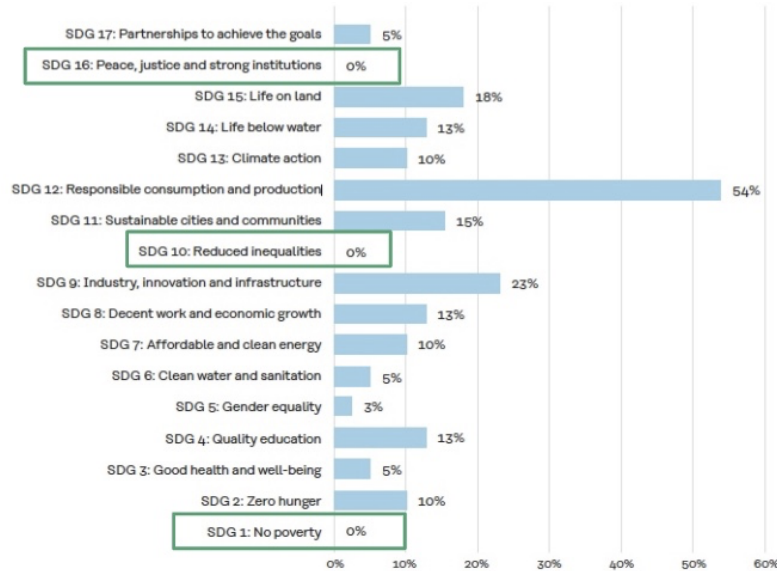
On the other hand, what lies at the center of a circular economy is reuse, which refers to preserving and extending the value before a complete loss of utility. Two most common ways to extend the service life of second-hand goods are through donating to charity and reselling. Collecting and reselling second-hand goods domestically has the potential to benefit the local economy and create jobs. It is estimated that more than 50% of the employment and firms concentrate in low wage and labor intensive activities of repair and reuse (Llorente-González & Vence, 2020). This led to the concern of socio-economic inclusion over the EU's plan and progress tracking framework. It will be important to adopt a monitoring mechanism to meet the work conditions framed in Decent Work Indicators proposed by ILO.



possible to become more resource efficient and increase employment at the same time.

Figure 3-1. How each industry sector benefits from or negatively impacted by the transition toward the circular economy (Cambridge Econometrics et al., 2018).

Finally, as a large portion of donated goods are often redistributed to low income countries that are trying to develop manufacturing capacity and local business. This can cause unintended impacts to their economies and the development of local industries due to inability to compete with the low price of imported second-hand goods. Though the issue can be more complex than banning import of low-price used goods, without policies to support the transition, banning second-hand retail and distribution can be a premature decision that leads to job loss in regions where the manufacturing capacity is not ready to serve the demand (Freytas-Tamura, 2017).



Figurer 3-2. In fact, the circular economy based businesses have made great contributions to responsible consumption and production among European Nations. However, the progress and strategies to improve and achieve social sustainable development goals are often missing (Source: Sitra, 2021).

3.3 The Future of Work and Sustainability

Ashford and Hall argue that the quality of work, however, directly impacts the stability of social sustainability, and argue that employment should take the third dimension of sustainability because work directly impacts economic sustainability, environmental sustainability and social wellbeing. In addition, employment is at the center of the government's concern that demonstrates direct socio-economic value to the citizen, especially the three-dimensional sustainability agenda should take into account cultural differences in order to create a well-rounded policy that serves relevant stakeholders (Ashford & Hall, 2018). Work and the environment share a tight linkage which has a direct impact on economic sustainability. Resource depletion caused by unsustainable consumption not only leads to but also causes greater instability of jobs in many sectors that greatly rely on natural resources (ILO, 2018b).

One of the most commonly claimed social benefits of the transition to a green economy is the amount of jobs created by new businesses in the green industries, where safer and healthier jobs can be expected (ILO, 2018b). Even though job growth communicates merely a small part of socioeconomic health, it is predominantly represented as the sole social benefit in most economic improvement plans, without considering what

ecological effects are implied by the job growth. In fact, since society today has evolved around paid employment and a linear economy, working more reinforces the cycle of work and consumption (Schor, 2008; Oh et al., 2012; Hoffmann and Paulsen, 2020). This is especially evident from looking at the positive relationship between work hours and carbon emission in the States between 2007-2013 (Fitzgerald et al. 2018).

In the sustainable development agenda, Decent Job and Economic Growth (SDG 8) is one of the goals which promotes healthy and safe workplaces and labor rights, emphasizing that high quality jobs are required as they offer stability, fulfillment and opportunities for personal growth, which are critical for the society to build upon long term sustainability (UN, 2015):

- Needs to pay well, pay people what they deserve to pay.
- Work builds into a long term career, educationally, union membership, and benefits the community that needs it the most.
- Young people can be trained and ready to serve
- 50% of climate corp should focus on the community they are impacted the most.

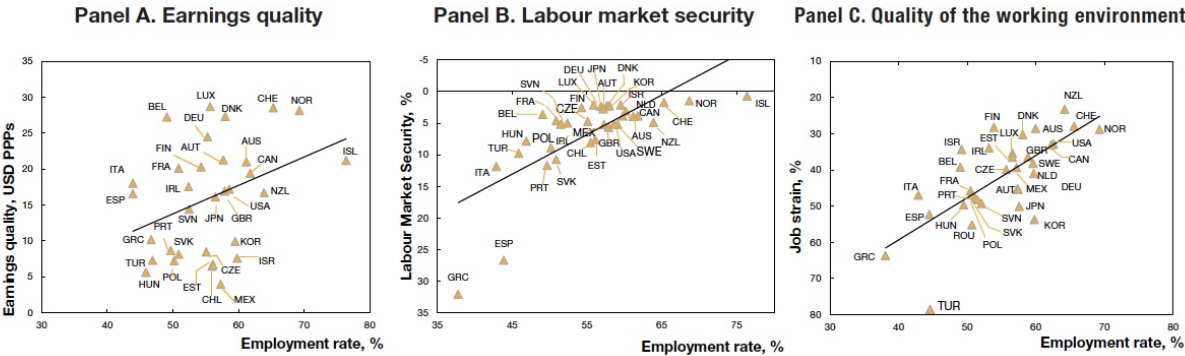
However, the circular economy has not made a prominent contribution to SDG 8, nor was it able to prove that the transition imposed no negative impacts on the development of Decent jobs. On top of this, the sub-goals included under SDG 8 have a heavy focus on economic prosperity and only 20% relates to the decency of work, an alternative set of sub-goals were needed to better align SDG-8 with the UNDP 2015 framework on sustainable work (Kreinin & Aigner, 2021; UN, 2015).

In the new sub-goals proposed by Kreinin & Aigner ([Appendix 3](#)), the indicators of the sub-goal, Decency of work, were designed to support positive social outcomes that embody strong sustainability. It added important indicators that center around workers instead of economic growth. The three key indicators are: 1) domestic working condition that includes workplace safety and freedom of association, which inherit the original SDG 8.8 indicator; 2) the perceived value of work, is an indicator that is based on workers' subjective perception and feedback; 3) Amount and distribution of paid and unpaid working time including its distribution between gender and other socio-economic groups.

The last indicator is also pretty relevant to understanding work in a circular economy, as it may help comparing between the industry like manufacturing that requires high

energy per hour of work and the industry like repair and reuse that consume lower energy but require intensive labor.

In addition, it appears that job quantity and job quality are not at odds, and in fact, the data shows better quality of job may also increase the employment rate (Figure 3-3). Especially in emerging economies, there is often no lack of employment opportunities, but many laborers were employed in jobs with extremely low pay, and it leads to issues like labor market insecurity and inequality (OECD, 2016). The emerging market also features a great number of workers in the informal sector, which has relatively low job quality compared to those in formal employment (OECD, 2016). This is another great example that illustrates the issue of measuring only job growth in the transition toward a green economy.



Figurer 3-3. Correlation between job quantity and job quality implies positive reinforcement between two (OECD Job Quality Database, 2016).

In order to better measure the job quality, OECD developed a framework to help nations keep track of relevant indicators. Job quality as defined by OECD includes three major indicators: 1) Earning quality, 2) labor market security, and 3) quality of the working environment. OECD consider earning quality a factor to understand how earnings contribute to workers' well-being; labor market security focus on the insurance in place for unemployment, which includes coverage of the benefits and the generosity of the coverage; quality of the working environment captures the relationship between how demanding the work is and the amount of resource provided to support the job, in this case, mental and physical demand of the job and flexibility of work schedule are counted as demand, meanwhile the ability for work to provide skill upgrades and opportunities for personal growth are considered resource.

4. Data Collection and Interviews

4.1. Regional Circular Ecosystem

4.1.1 Zero Waste Movements in the U.S.

In the U.S, the concept of Zero Waste is used primarily over the circular economy, even though it covers many principles core to the circular economy. The definition of Zero Waste provided by USEPA, implies that it goes beyond recycling and composting, and marked the importance of considering the entire product lifecycle from product design to energy recovery.

Zero Waste was therefore defined as a series of principles that manage the waste in a hierarchical manner (Figure 4-1), from the most favorable action of reduction to the least favorable action which is landfilling disposal, the hierarchy is visualized in a pyramid to communicate the weight of each preference (R. 09 US EPA, 2016).

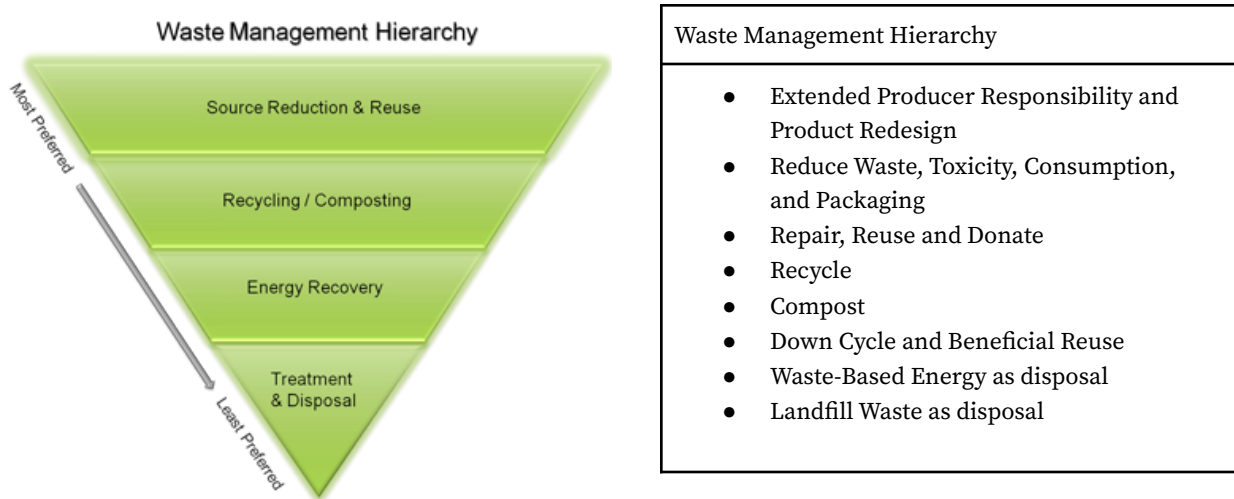


Figure 4-1. US EPA's definition of zero waste recognizes waste management as a hierarchy with the most preferred to the least (Source: US EPA).

4.1.2 Municipality-led Transitions

Austin, Texas

"Circular economy is a huge transition we are talking about, it's not just about the ecological component, but a totally different way of having our economy function, it's a systemic change."

– Natalie Betts, Program manager of Circular Economy Initiative of Austin

When the City of Austin adopted a zero waste goal in 2009, it set the target to achieve 75% waste diversion by 2020, and 90% by 2030 (TXP Inc., 2020). By the time the goal came out, Austin quickly recognized the city only had control over 15% of the waste stream as merely a hauler, it quickly realized that it needs to improve the understanding of the waste behavior of the city. Soon after this awakening call, the Circular Economy Initiative was established to create a robust approach to drive the market of processing waste. Austin is an unique example of government-led circular transformation in the States, operating at a mesoeconomic scale which highly focus on driving local economic opportunities and circular ecosystem, it aimed at forming strong partnership with residents, nonprofits and private sectors, which includes but not limits to local haulers, recycling and composting service providers beside retails (R. 09 US EPA, 2013).

In the economic development plans of Austin, "zero waste, reuse and recycling" have been specifically written into the plan, which implies that the city recognizes that the circular economy is not a stand-alone environmental project, but needs to be implemented along with other development plans in the municipality. It also explains the top-down effort that was put into place to support the execution of the plan as the city's Department of Resource Recovery and the Department of Economic Development have been jointly advising the high level vision and economic goals of the projects, which were then put into action by the Circular Economy Initiative. Being included in the economic development plan also helps the initiative obtain ongoing financial and marketing support to run campaigns to raise awareness.

To help residents and businesses in Austin locate useful resources, the initiative also created a network map of living circular directory in Austin using kumu.io (Figure 4-2), a handy web-based application for mind mapping. The information of the map comes from the survey that the team used to collect information from the entities they have

known from previous events, and from entities that wanted to be included voluntarily. This map defines six dimensions of meaningful circular participation ranging from, and visualizes the domestic ecosystem of how public and private entities around Austin are taking part in six dimensions with their products or services.

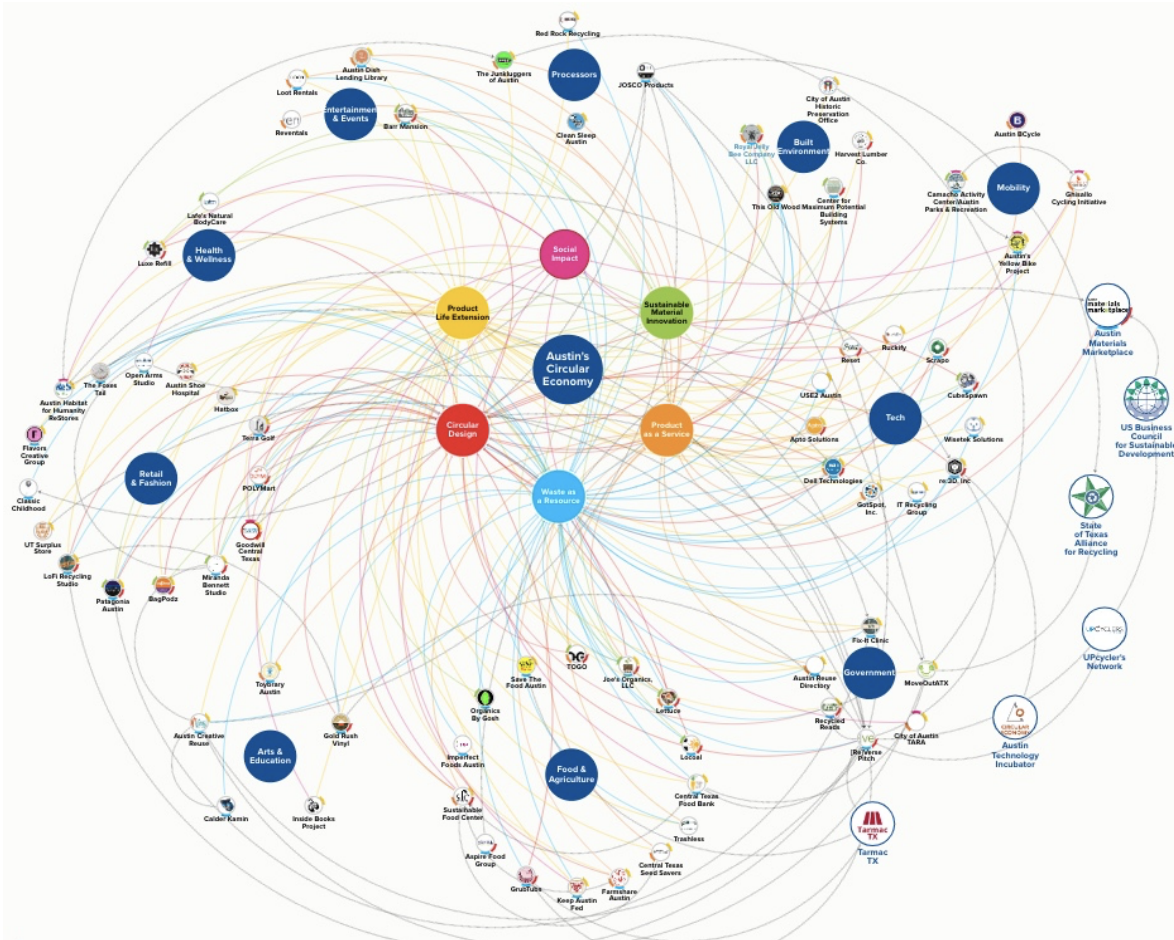


Figure 4-2. [Austin Circular Economy Map](#) that visualizes the interaction between different stakeholders and business entities to form the circular economy in Austin, TX. (Source: TXP Inc., 2020)

Another major goal of the plan beside reaching zero waste, is to foster capacity for long term innovation and economic opportunities at the local level. One of the most successful activities in Austin's circular ecosystem is its annual event, Reverse Pitch Competition, which has been running for seven years. Reverse Pitch encourages local residents to become innovators and entrepreneurs that help preserve and circulate the value of disposed materials locally.

In addition, the report commissioned by the City of Austin to investigate current local economic impact from recycling and reuse-related activities, has included data that tracked the employment opportunities created across relevant industry sectors, tracking this data help the program proactively proof that resource recovery and reuse-related business have contributed to the positive growth of economic opportunity (Rosengren, 2019). It shows a strong job growth in sectors of recycled material merchant, used merchandise store and solid waste collection, which contributes to the majority growth of total payroll from these activities (Figure 4-3).

NAICS	Industry	2013	2018		
		Employment	Employment	Payroll	Receipts
3219	Wood Container and Pallet Manufacturing	89	78	\$3,944,462	\$19,220,914
3222	All Other Converted Paper Product Manufacturing	60	319	\$27,609,806	\$128,743,289
32615	Urethane and Foam Product Manufacturing	64	106	\$6,473,335	\$47,804,090
32629	Other Rubber Product Manufacturing	46	41	\$1,535,274	\$9,404,407
327215	Glass Product Mfg. (Using Purchased Glass)	30	18	\$536,796	\$2,757,143
3311	Iron and Steel Mills and Ferroalloy Manufacturing	76	59	\$2,557,802	\$30,907,154
42314	Motor Vehicle Parts (Used) Merchandise Wholesaler	172	28	\$959,199	\$6,719,399
42384	Industrial Supplies Merchant Wholesalers	36	124	\$14,742,846	\$49,166,892
42393	Recyclable Material Merchant Wholesalers	501	491	\$28,902,864	\$96,390,071
4533	Used Merchandise Stores	1,044	1,117	\$32,541,561	\$98,436,427
562111	Solid Waste Collection	447	599	\$34,726,069	\$162,122,984
562112	Hazardous Waste Collection	30	25	\$1,520,191	\$7,097,202
562920	Materials Recovery Facilities (MRFs)	102	70	\$3,072,069	\$21,583,995
811211	Consumer Electronics and Repair	56	50	\$1,657,500	\$4,860,239
81143	Footwear and Leather Goods Repair	30	33	\$1,044,615	\$3,558,773
Total		2,670	3,156	\$161,824,391	\$688,772,980

Figure 4-3. Austin MSA Direct Recycling and Reuse-Related Activity (2013 & 2018) (TXP Inc., 2020).

Charlotte, North Carolina

Another example of the municipal-led transition toward the circular economy is Charlotte in North Carolina. Though the plan was only released in 2018 in collaboration with a consultancy, and the execution of the plan is still in its very infant stage, the plan is the first circular city development in the States.

For a long time, Charlotte has had a greater share of banking, manufacturing and logistica, in addition, it features fast growing environmental advocates and green innovations. Due to the blooming of high-tech industries, the city has become one of the fastest growing urban areas favored by the millennial population (Thomas, 2018). Meanwhile, Charlotte has also been one of the top fifty large metropolitan areas in the States that has a long standing issue of income and wealth inequality. The boom of population and high-tech industry is seen by the city as an opportunity to reform its economic structure and improve economic mobility (Gladek et al., 2018). In 2018, leading by Evision Charlotte, a public private group that leads most of the sustainability projects for the City of Charlotte, the first circular economy plan was released to show its commitment to become a circular city, the report presents not only just vision and implementation roadmap but also key statistic and key indicators that need to be tracked along the path of working toward its circular ecosystem (Gladek et al., 2018).

There are four visionary themes in the circular economy plan, and each vision comes with a concrete set of indicators to help the city stay on top of the progress, 1) Zero waste city, 2) Resilient and healthy city, 3) Innovative city of the future, 4) A city with opportunities for all. The plan has acknowledged the importance of stakeholders' participation in this transformative process in order to better serve the needs and priorities of the community. Visions and roadmap was not designed in a silo process, instead, the team went through a series of co-creation workshops with regional industry stakeholders including but not limited to city representatives, entrepreneurs, universities and, etc.

With continuous help and input from the stakeholders and the communities, the vision is presented in a holistic comprehension of the reciprocal relationship between circularity and a resilient and equitable society (Figure 4-4). Therefore, the city defined its vision for the circular economy in Charlotte to be "*a new economic model for addressing human needs and fairly distributing resources without undermining the functioning of the biosphere or crossing any planetary boundaries*" instead of a combination of approaches for resource utilization.

The newly built circular hub for hosting activities to accelerate the collaboration between different stakeholders, Innovation Barn, was finally opened in September 2021. Innovation Barn will be a physical directory that residents gather for learning about the circular economy and how they can contribute to, it will also incubate new businesses with circular business models, in addition, it will host an experiment on the circular system that connects biological and industrial loops (Figure 4-5).



Figure 4-4. The scope of progress tracking and associated KPIs defined for achieving the forth vision "City with opportunities for all" (Gladek et al., 2018).

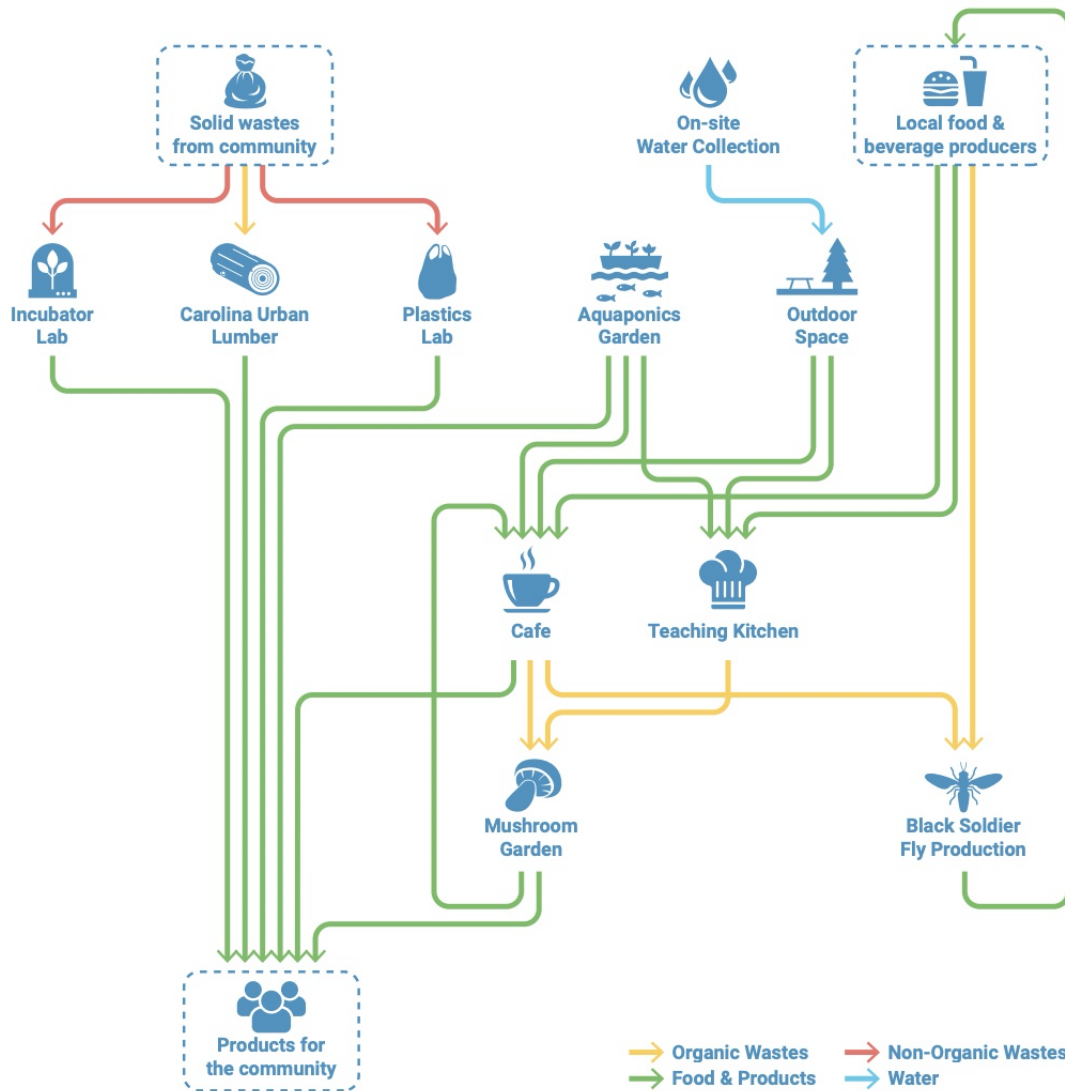


Figure 4-5. Circular Charlotte's Innovation barn will be the center of the ecosystem for local circularity. (Gladek et al., 2018).

Phoenix, Arizona

Phoenix is one of the fastest-growing cities in the country, the fact has driven the city to make waste management a priority. In 2013, a city-led initiative, Reimagine Phoenix, laid out a goal of 40% diversion by 2020 and to achieve zero waste by 2050.

The majority of the circular strategies are led by Reimagine Phoenix Initiative, which plays an important role in outreaching and educating both individuals and business on give pillar strategies ranging from reduce, reuse, recycle, reconsider and reimagine.

Reimagine Phoenix established the Resource Innovation Center (RIC) next to a landfill that provides 50 acres of city-owned land available for development opportunities. The campus serves as a circular economy hub and test bed dedicated to the creation of valuable public-private partnerships and growth of circular startups and mature companies. Through the partnership with Arizona State University (ASU)'s innovation incubator, Resource Innovation and Solution Network (RISN), RIC has provided business access to material resources, the proximity to materials means companies can learn and experiment with materials easily to ensure the marketability of products created from these recyclable materials.

Phoenix also works with different categories of waste stream to test the feasibility and stability of the resource recovery market constantly, its partnership with Goodwill Arizona on textile collection (Rosengren, 2019).

4.1.3 Regional Charities

Goodwill, a leader in secondhand trading, is a nonprofit organization that relies on items people discard or donate to provide jobs and skill training in the local communities. Across North America, Goodwill runs 3,300 retail stores and collection points to collect donated items and resell them. In 2020, Goodwill diverted approximately 1.5 million tonnes of used items from the landfill (Goodwill, 2020). As a big player in reuse, Goodwill follows along the principles of triple bottom line, converting the value generated from second-hand goods into investment on people who have otherwise little access to skill training. Goodwill has also become an upstream reused items provider for technology companies like Dell and Google.

Another foundation that connects the reuse value chain with greater social goods is Habitat ReStore, which is a reuse store run by nonprofit organization, Habitat for Humanity. Up till 2021, Habitat ReStores have international presence in 6 countries with a total of 1,023 locations to collect all kinds of homegoods and construction materials that would otherwise end up in the landfill. The proceeds of ReStore goes to improving local communities, working with families in need to build affordable homes, and running repairs for houses.

In cities like Austin which features a long history of Do-It-Yourself culture fueled by its large creative souls and artist communities, residents often share their passion and commitments for supporting their neighbors and buying from local businesses. This crafty spirit helps Austin become an incubator for reuse. Habitat ReStore on Ben Boulevard in Austin has grown to become the "superstore of the nonprofit world", said by William Stockton, Vice President of Retail Operations at the branch of Austin. This location offers more than what a thrift store would typically offer. It comes with merchandise that support a one-stop shop experience for customers who were there looking for materials for house improvements.



Figure 4-6. Staff of Habitat ReStore Austin helping the drop-off of furniture in the parking lot.

The staff reached out a lot to local business and construction sites to collect unused or gently used materials that were to be discarded otherwise, and send drivers to pick them up. This process is not always robust, but it's important for the community. "I reach out once a while, or these businesses would call me to ask for the availability of materials they can use for renovation projects." said William, they also have workers working with people who drop off items at store parking lots.

Most of the employees at ReStore now are full-time, but there are also some volunteers who come and go to help with the work in material processing or repackaging. The warehouse is a large space that comes with material processing equipment, hand tools and packaging equipment such as a label makers that allow William and his team to process, repair or remanufacture gently used items to restore items' value for sale. For example, when they have gotten cans of donated paints, they mobilize the volunteers to come help merge these paints and repacked them into a full can to sell.

4.1.4 Grassroots Activities

"There is not much investment and money available for the reuse sector. I'm also hesitant to obtain capital from others because the expectation might hinder my vision and original intention of the circular economy."

- Sarah Bird, Owner of USE2

In order to shorten the energy loop of product lifecycle favored by the circular economy, the shorter distance the products travel, greater value and energy can be preserved at the local level. The players that close these last-mile value chains in the circular economy are grassroots organizations and businesses, such as community-based thrift stores and repair shops that feature very little capital and rely on the support of residents from the close-by neighborhoods. They often focus on specific types of goods that they can collect from partnering with institutions like churches and schools in the neighborhood, from sources in the communi.

Reuse businesses like these rely on the supplies and demands of the local communities, have relatively smaller margins, and are mostly operated solely by the owner of the business with part-time helpers or volunteers from passionate locals. Once pre-owned products were dropped off, the staff examined the items and classified items first by its condition then by its popularity, and their experience with the interest of the communities. In addition, they may source reuse inventory from unwanted recyclables or overstocked commodities of large consumer retailers and excessive donations sold by international or regional charities like Goodwill. The work is labor intensive because obtaining these types of supplies involves a lot of negotiation especially to persuade retail to sell unwanted goods and arranging the shipment for the goods. Most of the people have really little idea about the value chain beyond the donation to the charity and recycling programs behind large retails, yet oftentimes foundations that work with reselling donation focuses on harvesting value and charity works instead of the circularity, if the items have no value, they will be discarded.

These reuse stores sometimes become the distributor of massive material supplies to local events. For example, a reuse store in Austin works with floral shops around the neighborhoods to divert leftover materials of wedding flower arrangement from the

landfill, these materials were re-distributed to be reused by restaurants, cafes and places with needs of decorative works.



Figure 4-7. Community based reuse center becomes the go-to shop for locals looking for toys and games for kids.

"I often tell my customers, it's good that you are supporting the market of pre-owned goods and donating things instead of discarding them, but I also ask them whether or not they buy products with better qualities? not those cheap stuff made in China." One of the reuse store owner said, she thinks the responsibility of a reuse store is to raise the awareness of customers and encourage them to shop products with good quality, "because then you see, what will end up in this inventory ultimately will just be cheaply made, low quality items that go nowhere" She couldn't refrain her excitement about the fact that the younger generations are thrifting instead of buying new, but also expressed her concern about people's attitude toward where they shop for brand new products and whether the quality of them may hold the value in their second life.



Figure 4-8. Items are sorted into different categories and displayed in boxes labeled for sale in the community-based reuse shop.

Running a community based reuse business like this also requires creativity to increase the exposure of the store and revenue stream. Business owners would use online marketplace as another point of sale or as a marketing tool to attract people to the store, such as facebook offers great audience share from residents of close by communities. People stay up to date with the status of the pre-owned inventory.

Some other grassroots businesses running circular-related activities have some type of social enterprise model that focus on eliminating employment barriers for individuals, a really similar mission to Goodwill. A great example is Open Arms Studio, the nonprofit social enterprise run by Multicultural Refugee Coalition, operates a textile manufacture shop that cut and sew quality soft goods for designer brands in the States (Open Arms Studio, n.d.). The studio offers training of textile cut and sew skills to women of the refugees as well as provides employment to them at a fair wage. Even though they are not exclusively a circular economy company, its presence revives local manufacturing capacity that indirectly benefits the development of the circular ecosystem at the local level. It also demonstrated how a localized manufacturing shop can benefit the disadvantaged population through high quality dignified jobs with fair wages and skill training for personal growth and career opportunity.

Enterprise like this can be a hidden story behind the digit of job growth, that reveals nothing more than a digit. It is through the mapping done by Austin Circular Initiative (Figure 4-2), the stories and the impacts of these activities were revealed and connected with other actors to form the ecosystem.

4.2 Changing Landscape of Work during COVID-19

Manufacturing Business demands Job security

In proposed strategies to achieve the circular economy, how products are designed and manufactured plays a huge role. Multiple studies stated the potential to create new jobs from remanufacturing of recycled materials (Ellen MacArthur Foundation, 2020; TXP Inc., 2020). In an industry like fashion which relies majorly on globalized supply chains, its upstream manufacturers had experienced severe chain reaction from a drop of demand during COVID-19 lockdown in 2020, given the non-essential nature of fashion which becomes less needed when people spend a massive amount of time working from home. When the pandemic forced nations to lock down cities and shut down borders, many manufacturing facilities had to scale back the production and layoff workers to cope with the uncertainty and global logistic interruption. Such job insecurity under the pandemic reflects the susceptible nature of these upstream jobs overseas, where the absence of adequate policies to protect and guarantee job security during an unforeseen crisis.

Brands and retailers in Europe and North America, two major markets for the sector, canceled massive orders that left low-paid textile manufacturers with great uncertainties. A good example that illustrates how job security of manufacturing business can be impacted by abrupt cancellation of orders can be seen from the story of a garment industrial park in Hawassa, Ethiopia. More than one third of workers at Ethiopia's garment industrial park, Hawassa, had trouble finding other job opportunities when they were put on leave (Meyer et al., 2021). This case is not uncommon throughout the global value chain of garment industry, as the upstream supply chain of ready-made garment (RMG) which typically located in low income countries, has experienced significant amount of job-loss and labor displacement follow the cancellation of orders due to a declined demand of clothes under work-from-home orders (Meyer et al., 2021).

Waste Management Demands Workplace Safety and Respect

Although adopting the circular economy directly benefits employment growth in waste management as predicted by US-EPA, it is important that these new opportunities offer good quality work that takes care of workers' needs. However, according to the U.S. Department of Labor's Bureau of Labor Statistics (BLS), waste management services involving work such as waste collection and operating material recovery facilities, ranked the fourth fatalist work in the US in 2019.

In big metropolitan areas like New York City, the Department of Sanitation requires commercial entities to contract private haulers to collect and manage solid waste according to strict regulation. As more population is working from home compared to pre-pandemic time, there has been growing residential solid waste along with disposable protective equipment generated to prevent the virus from spreading (Cardine, 2021). Amid growing efforts to meet the climate neutrality goal of 2050, several countries and municipalities lift the ban on the usage of disposable plastic to avoid potential health risk of spreading COVID-19. In addition, many hospitality services switch to disposable tablewares in response to the shortage of sanitation workers.

According to the World Bank's report published in 2018, the world waste is projected to reach 3.4 billion in 2021 (Kaza et al., 2018), meanwhile Circle Economy reported world's consumption of natural resources hitted 100 billion tonnes in 2020. But as more companies continue to postpone the plan of bringing employees back to the office, waste collectors have seen more waste from the household ending up on curbsides (Figure 4-9).

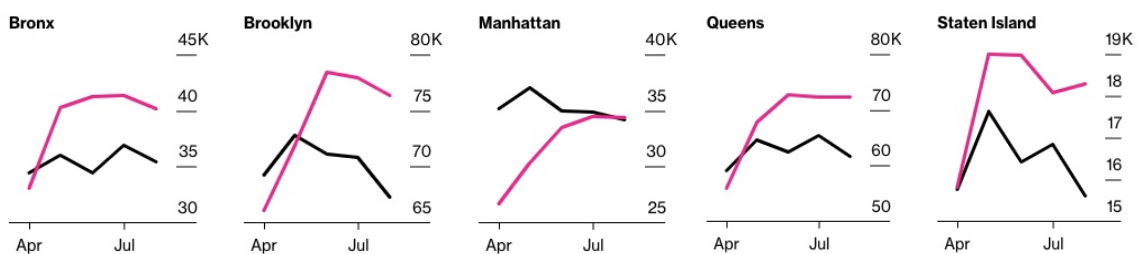


Figure 4-9. The comparison of waste tonnage surged between 2019 (black lines) and 2020 (red lines). (City of New York Department of Sanitation, 2020)

As one of many essential sectors that were not able to perform their work from home, sanitation workers and waste haulers work at the frontline, confronting explosive

amounts of waste. They are essential because of their work that helps keep the city clean when the majority of the population is working from home. Without the help from them, piles of trash would lie on the street for days, increasing the risk of health diseases and lowering the living quality of a neighborhood. Amid labor shortages in many cities in the U.S., the rest of the sanitation workers had to work for longer hours just like others who are considered as essential workers, many of them had to work with protective equipment of poor quality (Porter & Holder, 2020).

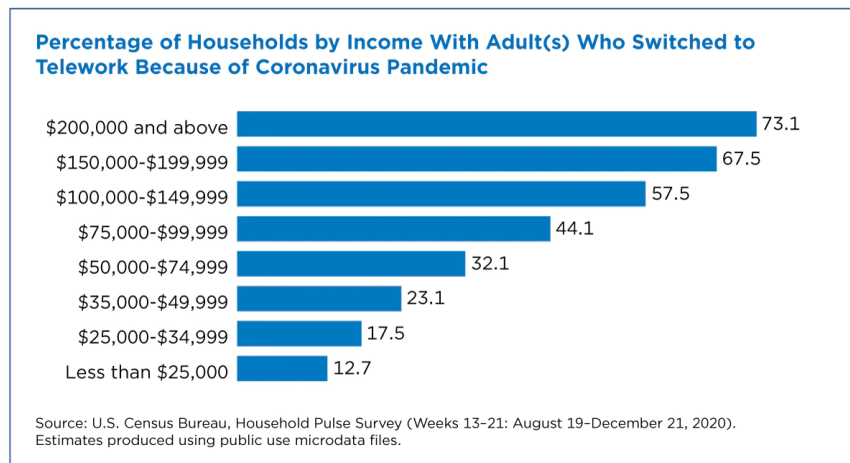


Figure 4-10. The share of households with workers who switched to telework during the pandemic is closely related to the level of household income (U.S. Census Bureau).

The pandemic has revealed the vulnerability of workers in the waste and material processing industries that are expected to benefit from the adoption of a circular economy. However, adopting the circular economy under the pattern of growing consumption means the capacity to collect and to sort materials needs to increase, so do the workers. When workers are not entitled to essential protection on work, the growth of jobs in these industries will only remain an unsustainable projection.

Informal Workers Demand Job Security

During the lockdown, service workers keep the city running behind the scene, yet still, they are the most vulnerable group of workers. In the U.S., economic uncertainty during COVID-19 lockdown reduces employers willingness to hire full-time employees. In Indonesia, it was workers in informal sectors that collected waste and litter to keep the city free from accumulating plastic waste.

The International Labor Organization (ILO) defined informal workers as people engaged in economic activities that are not covered or insufficiently covered by formal arrangements. Currently, more than 2 billion people around the world work as informal workers (ILO, 2018a), who became extremely vulnerable during the pandemic due to a lack of job security and health protection in the first place, meanwhile most of these informal activities could not be done remotely at home (ILO, 2020; Hughes, 2020).

In addition, another group of emerging workers that may be subject to different coverage of protection by labor law are those in the gig economy and the sharing economy; Powered by the rise of digital platforms, which decentralize the learning of a new skills and increase the accessibility to the types of work that were not historically available otherwise, this led to a distributed workforce across the regions and the world (ILO, 2019). The sharing economy has also become a growing business model in the circular economy given its goal of maximizing the utility of goods through sharing goods to maximize resource utility. Both of these two economies present opportunities and risk under the impact of COVID-19, what is more important is, these two economies feature a great share of informal workforce composed of the part-time and contract workers.

Emerging Needs Revealed by the Great Resignation

In the United States, the rate of workers quitting their jobs in 2021 broke the record since the last decade (Figure 4-11). After the outbreak of global pandemic, companies that were not able to adapt quickly to address the the wellbeing and the safety of workers have been seen to experience greater labor shortage, controversies heated over job security as more labor unions stand up for workers to demand reformation for work schedule, wages and workplace safety from publicly traded companies.

This phenomenon of massive numbers of people leaving their jobs voluntarily after the COVID pandemic ends, is now called "The Great Resignation", an idea proposed by Professor Anthony Klotz of Texas A&M University (Chugh, 2021). The switch to telework has saved the time wasted on commuting to work, employees were able to reprioritize their family and personal wellbeing. Unemployment benefits lift the burden of staying unemployed, which in return provides people decent "paid time" to explore new career paths and skills (Casselmann, 2021). As mentioned in the previous section, the data that presents a close linkage between income and the percentage of teleworkers reveals a hidden injustice for workers that are paid with lower income to take on in-person work. Many of those who felt exploited by their employers during the labor shortage in the

health crisis reported having to work for longer hours without decent pay and the protection of sufficient safety precautions (Chaturvedi et al., 2021). This underpinned the need for a just and equitable approach in the attempt to build a resilient economy aside from curbing global warming.

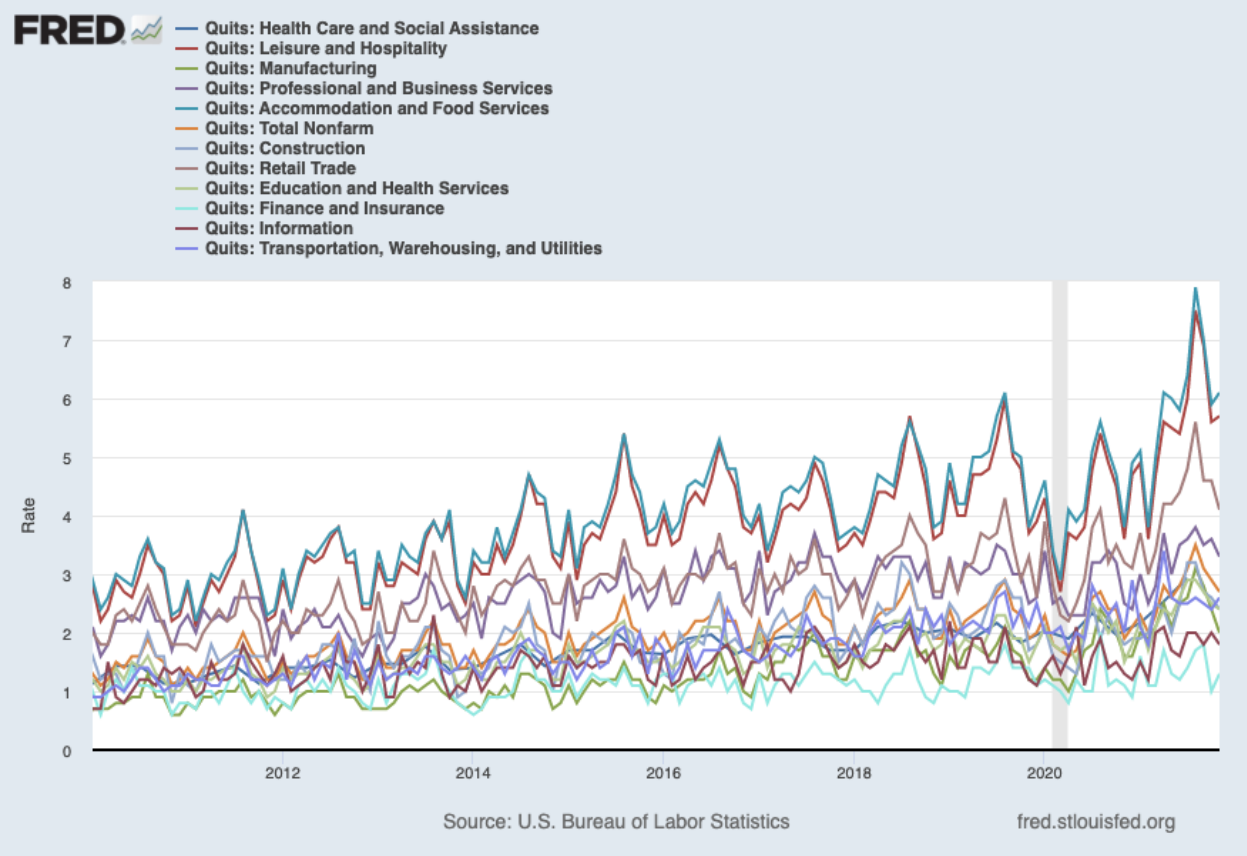


Figure 4-11. The share of workers who quit their jobs (U.S. Bureau of Labor Statistics, 2021).

5. SUMMARY

5.1 Implications

Missing association between the circular economy and sustainable work

In the United States, the concept of a circular economy has not been widely recognized, defined and internalized. Instead, the discussion around increasing recycling rate and creating a reuse economy are often listed as independent strategies to serve the goal of "Zero Waste." In the States, the circular economy is rather used as a modern term of zero waste without bringing in significantly different perspectives.

The scope of a circular economy has been constantly evolving to reflect the current global focus on climate issues and resource deficiency. The circular economy may be a relevant and recognizable concept to member nations of the EU and the United Kingdom given the EU's effort to promote the concept in the last decade. European scholars and consulting firms have also started to question the link between the circular economy and sustainability, with a growing emphasis on social responsibility and treating the circular economy as a system approach that requires multi-stakeholder collaborations.

The good news is, cities like Austin and Charlotte that think about adopting the circular economy as a future city development plan have demonstrated strategies and approaches from a systemic level, which help build a local ecosystem to drive circularity and social benefits. Figure 5-1 demonstrates the stakeholders involved and their ability to drive either circularity or social value.

However, multiple stakeholders also agreed that zero waste is a concept that is straightforward enough to explain to the public. However, the scope and the approaches for a zero waste system still follow a linear pattern embodied primarily by the preference of waste hierarchy over the circular economy that intends to create an economic ecosystem that requires integrated collaboration among stakeholders.

When institutional actors mix up the concept of the circular economy with zero waste, they will be less likely to approach it systemically. Without the consideration of the systemic quality that the circular economy embodies in its scope, it is harder for stakeholders to recognize the role employment and work might play in achieving the circular economy.

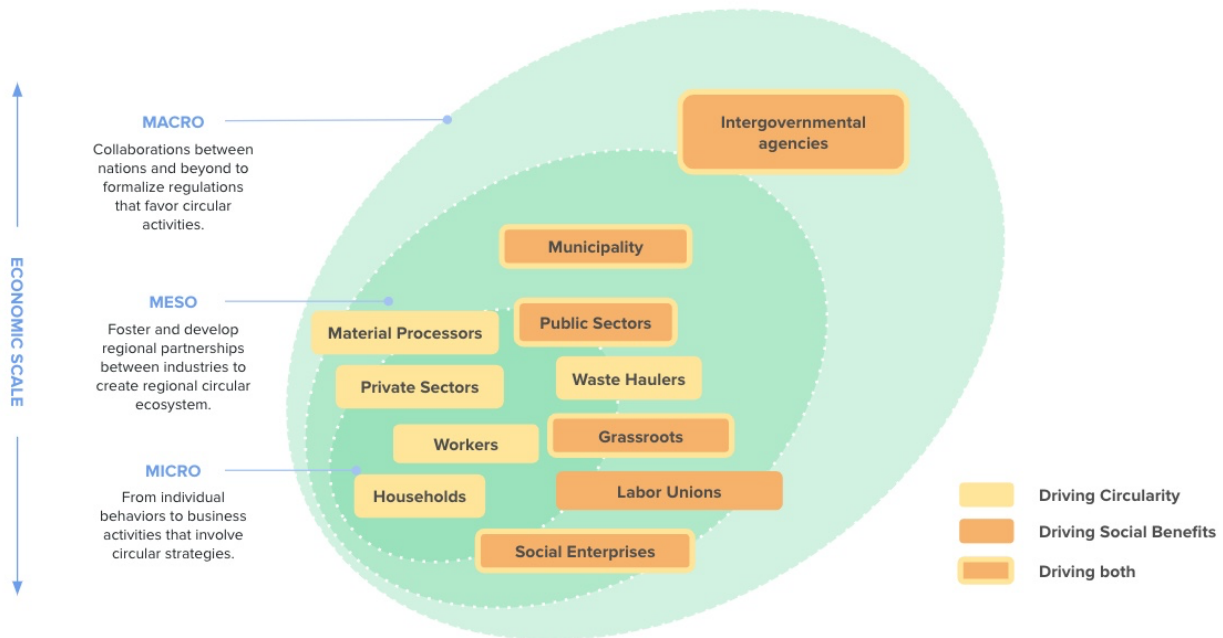


Figure 5-1. Circular value chains at scale illustrate how stakeholders drive circularity and social benefits across the circular ecosystem.

Businesses mostly recognize the importance of fair labor and fair trade, the kind of awareness brought in as the society scrutinizes corporate social responsibility. Throughout the interview with organizations, there were some comments about disassociation between improving job quality and increased circularity raised by interview participants. This was expected as the fundamental barrier for increasing circularity of a product at this moment is information barriers. When retailers have no access to ingredients in the packing materials they used, there is no way for them to recycle right, which directly blocks the path to circularity. Meanwhile, this implies that the current responsibility of correctly sorting materials for processing and recovery becomes the job of material processors, it will not be surprising that the bottleneck may appear in the downstream circular value chain, undermining the reliability of secondary material supplies.

It is understandable that business and innovation focus on solving the information and technology barriers at this moment, but this also comes with a big question of when will improving job quality become urgent to the circular economy. Perhaps it will be important for private sectors to incorporate responsible stewardship of sustainable work into governance of the business, similar to how sustainable businesses incorporate stewardship of lands and the forest.

In order to achieve a circular economy and reduce carbon emission at the same time, almost every circular plan has the intention to gradually bring oversea manufacturing back to locals and to preserve value in the local economy (European Commission, 2020; Gladek et al., 2018; TXP Inc., 2020). The fact that the supply chain is expected to become shorter and more distributed may reshape the distribution of manufacturing and recycling jobs on the spatial level. This validated again that job loss may be specifically evident in countries of upstream supply chain that rely greatly on the manufacturing industry, yet countries that benefit from this transition are generally high income countries where are less reliant on the manufacturing economy.

Work in the reuse sector needs better governance

Reuse is the most important economic activity in the circular economy to reduce resource consumption through activities such as repair, resell, refurbish, to extend the product life. The businesses and services built with reuse in mind usually perform a combination of activities ranging from repair, resell, refurbish, re-purpose and remanufacture. For example, at a reuse center run by either nonprofit or for profit, workers will work through the following steps:

- Collect items people discard or donate (centralized or through reuse drive)
- Sanitize or clean up items to improve the condition
- Sort and classify items by its condition to identify different revenue streams
- Repair some items which have higher value
- Repack items into bundle sets to increase marginal profit
- Break down items into parts for repairing or refurbishing other items

These works require manual labor that are not currently supported by automation. In the reuse retail businesses, the condition of pre-owned items is often inconsistent and the selection of what to keep relies on subjective judgment. Besides, retailers often try to fully maximize reusability of items collected, therefore the work will involve repacking, which is a common strategy used in the reuse of construction materials; it also involves repairing, which is often run by an independent shop with specialization in different types of consumer goods, but can sometimes be seen in larger reuse shops as well. The physical demand of the work and the work schedule in the reuse sector may be spontaneous depending on the condition of the items collected.

Reuse sector is also supported by a great presence of nonprofit charities, which rely on a portion of volunteers to operate. Work in this sector ranges from sorting out materials

for reuse and resell, running a reuse-drive, distributing food in the foodbank. It will be critical for policymakers to understand the economic impact generated by volunteer work.

5.2 Limitations

The circular economy is still at its infant stage especially in the States; therefore, some data may be inconsistent or scarce, plus the definition of success for the circular economy is an ongoing debate. Hence, the study chose to inherit the argument of the need for a sustainable circular economy. This broadens the scope of the research significantly, therefore increasing the complexity of data collection under a limited amount of time.

The research output is limited by methods I was able to deploy given time and covid disruption. I leveraged my years of experience working with human-centered design process in the approach of this thesis, instead of quantitative data analysis given the infant stage of exploring the social dimension of a circular economy.

The perspectives from the stakeholders are collected through qualitative methods, therefore the subjectivity and potential biases are unavoidable. The sample size for the primary study of this thesis is small (<15), therefore the results may not be used to generalize the majority of the circular economy workforce in other countries. The common finding shared among the conversations with the stakeholders is a lack of awareness of how circular economy may impact workforces. Therefore the findings of the study serve as an inspiration for policymakers, nonprofits and businesses to consider the nuances of work in an integrated manner while drafting the roadmap for the development of a circular economy. Future study should look at larger sample sizes in each industry relevant to the circular economy.

Under the impact of COVID-19 and rising protests from labor unions, interviews with workers from remote locations became challenging. And a few site visits could not be made due to tightening policies to reduce health risks, which significantly restricts the opportunity to conduct first-hand observation of the work in material processing. Therefore the research is restricted to mostly remote interviews and data from secondary materials.

Given the constraints on time and resource, this study chose to focus on stakeholders relevant to waste and reuse sectors which were found to present a higher amount of

available data and information in the context of the United States. The implications therefore put more weight on these two sectors.

5.3 Future Work

Due to the scope and time limitation, this thesis only focuses on an integrative overview of the current status quo and its implication to the future of work for a circular economy. It is important for future work to focus on creating a governance framework specific to the development of a circular economy to ensure that the workers are supported throughout the transition.

Furthermore, in order for municipality to develop better support for underserved communities in the circular economy development plan, future study should look at the impact of work through the spatial perspective as well, as the asymmetry effects on employment opportunities of the transition was stated in earlier study (Laubinger et al., 2020).

There are a lot of innovators of social enterprises and businesses that were not included in this research due to time and resource constraints. It will be helpful for future study to analyze the meaning of sustainable work for each business sector. For example, workers dealing with waste at the frontline may care a lot about whether they are treated with respect, which is different from those who work in manufacturing and remanufacturing businesses, where the concern concentrates on job security and the impact of automation.

Understanding the needs of the works by sector helps establish consensus and framework that clarify the definition of social sustainability a circular economy is to achieve. It is also important to conduct a collaborative research process that brings together workers and businesses in a conversation.

6. CONCLUSION

The Smithsonian and museums around the States are collecting artifacts and documents to document the pandemic, considering the year under the impact of the pandemic a life-changing year that we ought not to forget. 2020 is a transformative year, not only because it changes the way we interact with work, like where to work, how to work and what work is to our life, but it also reveals the vulnerability of the social system that we rely on everyday.

Today, the future of humanity is confronting great uncertainty as continuous growth of population along with our unsustainable consumption already exceed biosphere capacity to regenerate. Our current pattern of using resources will not be an option and revolutionizing this behavior will require collaboration across different stakeholders. When a circular economy has been regarded as a potential alternative solution of sustainable development, it is important to better understand whether it also has the potential to bring value to the society. Such contribution is important in order for the circular economy to sustain, that is why looking at the value creation across the entire value chain of a circular system is the focus of this thesis.

This thesis argues that work is an important factor that sustains a green economy like the circular economy, but throughout the research, it became obvious that net job growth is used overwhelmingly as the only indicator to demonstrate the potential of green transition. Yet the interview and data collection also reveals hidden concern over a lack of evidence that a circular economy is capable of improving work quality.

Therefore, this study urges any circular initiatives to actively include missing perspectives of work in the indicators that track circular economy progress and to encourage stakeholders at different scales to act.

Finally, I recognized the scarcity of previous works that investigate the quality of works that will experience growths under the adoption of the circular economy, therefore, instead of trying to validate the argument with small amount of data points, the study constantly cross-compared assumption between top-down and bottom-up perspectives from stakeholders across the circular value chain, especially the perspectives and intentions that drive workers' willingness to work for an employer are changing under the influence of COVID-19, which directly reflect the reason why certain businesses are experiencing labor shortage. This will become a key to whether or not the circular economy can be sustained, as mentioned in chapter 3.3, that work directly impacts economic sustainability, environmental sustainability and social wellbeing.

What is certain is that the world cannot turn away from the waste issue today and in the future as there is no second earth for us to consume, no matter whether a circular economy is the umbrella terminology for the solutions or not, the solutions for the waste issues need not sidelines the need of building a supportive socioeconomic. With the help from supportive labor policies, stewardship and constant social dialogue at local level, the chances to build a more resilient economy may also be the chance to reduce poverty and inequality at the same time.

APPENDICES

Appendix 1. Key literature for the scope of the circular economy

Author	Title	Journal	Research Brief	Definition of Circular Economy
(Geissdoerfer et al., 2017)	The Circular Economy – A new sustainability paradigm?	Journal of Cleaner Production	<p>Extensive literature review to make comparison between Circular Economy and Sustainability by looking at their similarities, differences and conceptual relationships. The interest and motivation between sustainability and circular economy differ. In general, sustainability focuses on interest alignment between different stakeholders. Circular economy weigh responsibility heavily on the private sector.</p> <p>The author define sustainability as: "the balanced integration of economic performance, social inclusiveness, and environmental resilience, to the benefit of current and future generations."</p>	"a regenerative system in which resource input and waste, emission, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling."
(Kirchherr et al., 2017)	Conceptualizing the circular economy: An analysis of 114 definitions	Resources, Conservation and Recycling	<p>The authors analyzed the definition of circular economy through an inductive process which structured the coding framework to review 1) Circular principles (4Rs, waste hierarchy and systemic approach), 2) aims (sustainable development goals) and 3) enablers (business models and customer behaviors). Then combining the findings from all study samples, the authors of this paper concluded the definition of CE.</p> <p>The review included both peer-reviewed and non-peer reviewed articles in the analysis, as it recognizes a large portion of the development of the circular economy has been driven by non-academic works.</p>	"A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively, reusing and recovering materials in production/ distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (regional, like eco-industrial parks) and macro level (national and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations."

(Blomsma & Brennan, 2017)	The Emergence of Circular Economy: A New Framing Around Prolonging Resource Productivity	Journal of Industrial Ecology	In general, this literature has a great and clear overview of the major events that have shaped the development direction of the latest CE, it illustrates different stages of circular economy according to the characteristics of its development, and summarized with a uniform visual language to illustrate what circular economy could or should look like to different actors, including seminal thinkers, think tanks, advisory and legislative institutions, academics, and businesses.	"an emergent framing around waste and resource management that aims to offer an alternative to prevalent linear take-make-dispose practices by promoting the notion of waste and resource cycling. Strategies such as, but not limited to, reuse, recycling, and remanufacturing operationalize this concept."
(Korhonen et al., 2018)	Circular Economy: The Concept and its Limitations	Ecological Economics	<p>The author emphasized the importance of science's role in helping the circular economy become a more encompassing concept to achieve systemic sustainability proposed by WCED sustainable development, highlighting circular economy covers all three dimensions of sustainable development. A circular economy thus also includes the social dimension such as the link of circular economy innovation to employment.</p> <p>Suggest that ecological economy is an established scientific field to start the scientific groundwork for circular economy because of its long history studying relevant issues in recycling, it also stresses the role of cyclical materials flows and renewable energy sources for arriving at a circular economy.</p>	<p>Suggest definition of circular economy to be:</p> <p>Circular economy is an economy constructed from societal production-consumption systems that maximizes the service produced from the linear nature-society-nature material and energy throughput flow. This is done by using cyclical materials flows, renewable energy sources and cascading1-type energy flows. Successful circular economy contributes to all the three dimensions of sustainable development. Circular economy limits the throughput flow to a level that nature tolerates and utilizes ecosystem cycles in economic cycles by respecting their natural reproduction rates.</p>

Appendix 2. Key literature evaluate the circular economy impacts on employment

Author	Title	Journal	Industry	Key Impacts on Job
(Wegmann, 2017)	Waste Management in Europe. Good Jobs in the Circular Economy?	European Public Service Union (EPSU)	Waste Management & Material Processing	<p>The report highlighted that very little attention has been paid to workers operating essential waste services to keep society running and maintain a sustainable environment. The pay of workers in waste management is often low, working conditions hard and unpleasant and, on top of that, health and safety is often disregarded.</p> <p>Increase in recycling is not mirrored by a significant increase in jobs, but this picture changes drastically when taking the informal sector into account. It is estimated that up to one million people in Europe are occupied in the informal recycling and reuse economy.</p> <p>Far fewer employment opportunities are found in material recovery.</p>

(Llorente-González & Vence, 2020)	How labour-intensive is the circular economy? A policy-oriented structural analysis of the repair, reuse and recycling activities in the European Union	Resources, Conservation and Recycling	Reuse & Repair	<p>Repair, reuse and recycling are three practices prioritized by the European Commission, while the first two activities were found to be marginal activities.</p> <p>More than 50% of the employment and firms concentrates in low wage and labor intensive activities of repair and reuse,</p> <p>Concern of socio-economic inclusion over EU's plan and progress tracking framework, thus proposed the importance of monitoring work conditions framed in Decent Work Indicators proposed by ILO.</p> <p>The role of policymaking to be an enabler of labor intensive circular activities such as repair and reuse, suggested providing tax benefits to relevant sectors to improve the competitiveness and innovativeness.</p>
(Horbach & Rammer, 2020)	Circular economy innovations, growth and employment at the firm level: Empirical evidence from Germany	Journal of Industrial Ecology	Circular Innovation	<p>The circular economy innovations are positively linked to turnover and employment growth. The circular economy innovations in the case of Germany lead to growing demand for the innovators' products. In order to serve this growth of demand, firms expand production and had to hire additional workers</p> <p>No statistically significant impact on labor productivity</p> <p>Firms with the circular innovations show a significantly better financial standing.</p>
(Burger et al., 2019)	The heterogeneous skill-base of circular economy employment	Research Policy	Overview of all circular activities	<p>Divide circular activities into core and enabling. Core activities within circular economy employment – focusing on renewable energy, repair, re-use of materials; Enabling activities concentrate on sharing economy – from enabling activities, which are focused on management, design, and ICT-applicability.</p> <p>The study found that core circular activities generally require more manual and technological skills and labor work.</p> <p>Enabling activities, demand more complex cognitive skills.</p> <p>Highly educated and skilled people might be those who build the circular economy which may need to source employment somewhere else.</p>
(Laubinger et al., 2020)	Labor market consequences of a transition to a circular economy	OECD	Overview of all circular activities	<p>Most job loss is expected in material-intensive sectors, which tend to be relatively less labor-intensive.</p>

Appendix 3. Indicators for a new SDG 8 “Economic degrowth and sustainable work” (Kreinin & Aigner, 2021)

New Goal for SDG 8	Relevant Indicators
(1) Well-being	<p>(a) Wellbeing and provisioning of basic goods and services</p> <ul style="list-style-type: none"> - Subjective well-being measures, such as the Happy Planet Index (HPI) by gender, age, ethnicity - Objective well-being measures by gender, age, ethnicity, i.e. the social boundaries of the “Safe and Just Space framework” <p>(b) Wellbeing of non-human living beings</p> <ul style="list-style-type: none"> - Aggregate index of animal rights (i.e. “Animal Protection Index”) - Share of wilderness and protected areas of land (i.e. “Indicator for Wildness”) <p>(c) Stable and healthy environment</p> <ul style="list-style-type: none"> - Probability of living a life in a stable earth-system by age [NEW]
(2) Participation, democracy and autonomy	<p>(a) Participation and economic democracy</p> <ul style="list-style-type: none"> - Aggregate democracy index - Share of collectively run firms [NEW] <p>(b) Autonomy and time wealth</p> <ul style="list-style-type: none"> - Discretionary time (time not spend in paid or unpaid work) (hours) by gender, age, and ethnicity - Self-reported “time-wealth “ by gender, age, and ethnicity - Share of population in employment
(3) Dependence on economic growth	<p>(a) Dependence of households on economic growth</p> <ul style="list-style-type: none"> - Causality of household income on subjective as well as objective wellbeing in the respective society. - Share of income spent on basic goods and services, by age, gender, and ethnicity [NEW] <p>(b) Dependence of state/society on economic growth</p> <ul style="list-style-type: none"> - Gini and 10 to 90 percentile ratio of subjective and objective well-being and time prosperity - Share of basic goods and services (food, water, care, health, education, transport) provided by public institutions [NEW] - Dependence on economic growth for sustainable refinancing of state budgets [NEW] (The measure needs to be interpreted in combination with other wellbeing measures) - Causality of economic growth on unemployment rate - Index of prevalence of institutions that weaken the dependence on employment [NEW] <p>(c) Dependence of economic stability on economic growth</p> <ul style="list-style-type: none"> - Causality of firm bankruptcies and economic growth rates - Causality of firm growth (per employee and turnover) on firm bankruptcies
(4) Material and energy use, footprint and intensities	<p>(a) Material and energy intensity of domestic production</p> <ul style="list-style-type: none"> - Direct material input of biomass, minerals, fossil fuels, water (t or l) in economic production in total and per capita - Total energy use in final production (mj) in total and per capita - Share of renewable energy in total energy use in production (%) - Domestic value added per level of environmental impact (land, water, air) - Domestic value added of the globally ten most polluting sectors as a share of total domestic value added [NEW]
(5) Decency of work	<p>(a) Domestic working conditions (Current SDG 8.8)</p> <p>(b) Value of work. Perceived value of own work from workers perspective for different social groups</p> <p>(c) Amount and distribution of paid and unpaid working time</p> <ul style="list-style-type: none"> - Gini of time in paid work [NEW] - Share of labor force in paid work of more than 30 h/week [NEW] - Distribution of unpaid work between gender and other socio-economic groups (i.e. “International Classification of Activities for Time-Use Statistics (ICATUS)”)
(6) Material and energy intensity of work	<p>(a) Material and energy intensity of work</p> <ul style="list-style-type: none"> - Material (biomass, minerals, fossil fuels, water) and energy use per working age population capita, per worker, and per hour worked - Material (biomass, minerals, fossil fuels, water) and energy footprint per working age population capita, per worker, and per hour of free time.

(7) Dependence on indecent and unsustainable work	(a) Dependence of households on work - Index of de commodification [NEW] - Index of prevalence of institutions that weaken the dependence on employment [NEW] - Right-not-to-work index [NEW] including share of population without employment with access to social security [NEW]
(8) International harm on economy and society	(a) Material and energy footprint of domestic production - Secondary material and energy effects of goods and services exported – measure of ecologically unequal exchange (b) Social harm caused in other places by imported and exported goods - Number of weapons/harmful goods exported to other countries [NEW] - A measure of forced, indecent, harmful, and child labour inherent in goods consumed –i.e. “The labor footprint” framework

Appendix 4. Research Interview Questions

#	Question	Functions
1	Business and activities introduction	
1-1	<i>In this interview, the names of interviewees and their firms were pledged to be anonymized during the coding process and final presentation. We encourage you to respond openly and freely, providing as much details as possible.</i>	Narrative
1-2	Could you please give a short introduction of yourself, including your role in the organization?	Question
1-3	Could you please explain the business model (services) of your organization? What are the financial resources that power these activities?	Question
2	Approach to Circular economy	
2-1	The focus for this interview is Circular Economy, could you please share your current understanding of circular economy - - What problems does the circular economy try to solve? - What practices and solutions does the circular economy propose? - What impact is the circular economy trying to create?	Question
2-2	<i>In this research, the definition used for circular economy is: "A circular economy describes an economic system that is based on business models which replace the 'end-of-life' concept with reducing, alternatively, reusing and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (regional, like eco-industrial parks) and macro level (national and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations."</i>	Narrative
2-3	Taking this definition into consideration, what has your organization done on the implementation of circular strategies? Could you choose from the following list (10R framework) of the activities included in your circular economy implementation plan?	Question
2-4	What motivated your organization to adopt/focus on the Circular Economy?	Question
2-5	Which activities do your organization have the most success with?	Question
2-6	Could you share whether you've noticed any policies and regulations that are driving or hindering the adoption of CE strategies? (Federal/State/Municipality)	Question
3	Impacts on work	
3-1	My understanding is, reduction is an important practice that requires some behavior change of consumers, which is also emphasized lots by practitioners and leading non-academic forces. Several studies highlighted the importance of policy and regulations as enablers to encourage reduced consumption and re-usage (source), but how this may impact labor force remains mythical, there is	Narrative

	rare practical evidence and case studies about how these R strategies will be done in ways with inclusion of socio-economic.	
3-2	Could you share how the teams that work on Circular business activities are structured? (operation, financial, technology, r&d, design, business development) - full time/part-time/contracting?	Question
3-3	Could you share which of the following areas has your organization put emphasis on developing? (Number of jobs, Skills, Wages, Purchasing Power, Job Security, Health & safety, Job satisfaction)	Question
3-4	How do you monitor the progress of these programs? (Provide as much details of the steps taken as possible, including expertise that were involved) (*If nothing, ask 2-10 instead)	Question
3-5	Currently, a handful of studies show a great portion of what count as circular strategies rely greatly on informal and gig workers, few of them are protected by health insurance and the law practices. Studies have proven these workers are highly vulnerable under global economic shock.	<i>Narrative</i>
3-6	Can you share how has COVID changed your attitude toward work?	Question
3-7	Could you share how you would think of what would be a more relevant way for companies to incorporate a decent job framework? (Present new SDG 8 framework to them)	Question

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