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VALUE IN THE WARDROBE

A CASE STUDY OF THE TRANSITION TOWARDS A CIRCULAR ECONOMY CLOTHING INDUSTRY IN THE AMSTERDAM METROPOLITAN AREA



Amsterdam Economic

Board

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Abstract

The clothing industry accounts for 5% of the global CO₂ emissions as it is grounded in the linear economy. The circular economy is proposed as a sustainable alternative. However, regions struggle to find strategies to implement the circular economy. The aim of this research is therefore to find out which agency strategies support a transition towards a circular clothing industry. By employing a mixed method research approach using interviews and desk research, the case of the Amsterdam Metropolitan Area is studied. Results show that industrial change led to a constraining condition for circular clothing production, but enabling for circular clothing design. Policy instruments enabled the transition, while fragmentation constrained it. Also quadruple helix interactions engaged regional actors in the transition. Taking these regional conditions into account, agency strategies which are based on regional capabilities, systemic impact and complement current strategies support the transition. This includes intermediaries setting up multistakeholder partnerships, educating public officials by a NGO or providing digital solutions by innovative firms.

Table of contents

Abstract	2
Chapter 1: Introduction	5
Chapter 2: Theoretical framework	8
Section 2.1: The circular economy in innovative regions	8
Section 2.1.1: The circular economy	8
Section 2.1.2: Regional innovation systems	10
Section 2.2: Regional strategies for transitions	14
Section 2.2.1: Agency	14
Section 2.2.2: Intermediaries and niche management	14
Chapter 3: Case study context: the Amsterdam Metropolitan Area and the clothing industry	16
Section 3.1: Regional characteristics	16
Section 3.2: Industrial characteristics	
Section 3.2.1: The fast fashion industry	
Section 3.2.3: An alternative: circular fashion	20
Chapter 4: Methodology and data	22
Section 4.1: Research Design	22
Section 4.2: Qualitative data collection and analysis	22
Section 4.3: Quantitative data collection and analysis	23
Chapter 5: Results	25
Section 5.1: Conditions of the regional transition	25
Section 5.1.1: The industrial subsystem	25
Section 5.1.2: The policy subsystem	27
Section 5.1.3: The knowledge subsystem	28
Section 5.1.4: Quadruple helix interactions	28
Section 5.1.5: Socio-institutional context	29
Section 5.1.6: The RIS visualization	29
Section 6.2: Barriers, solutions and agency	31
Section 6.2.1: Industry organization barrier	31
Section 6.2.2: Policy barrier	32
Section 6.2.3: Knowledge barrier	33
Section 6.2.4: Culture barrier	34
Section 6.2.5: Strategy implementation	35
Chapter 7: Conclusion	
Chapter 8: Discussion and reflection	40

References	42
Appendices	47
Appendix A: Interview list	47
Appendix B: Code tree Nvivo	48
Appendix C: Dataset involved actors AMA circular clothing	48

Chapter 1: Introduction

Science and policy rapports in the last decades have alarmed mankind for the consequences of its activities on natural systems (Masson-Delmotte et al., 2018; Stahel, 2015; Rockström et al., 2009). Through greenhouse gas emission and pollution, mankind causes biodiversity loss, melting glaciers, ocean acidification and extreme weather patterns. At the same time, the global population is growing and now amounts to 7.8 billion people (United Nations, 2021). Industrial activities are necessary to provide these people with goods and food. However, to produce these goods, industries 'extract-produce-use-dump material' (Korhonen, Honkasalo & Seppälä, 2018). Industrial organization poses an existential threat to mankind and demands an alternative. Therefore, scientists and policymakers increasingly recognize the circular economy concept as a suitable alternative (Masson-Delmotte et al., 2018; Kirchherr, Reike & Hekkert, 2017). The concept aims at minimizing resource use, extending lifespan of products and maximizing resource re-use. By doing so, it switches to renewable resources and demotivates raw material extraction. As consumption is decreased, emissions and pollution as well.

While promising, only 8.6% of the global economy is organized following the model (Circle Economy, 2021a). The clothing sector remains one of the sectors lagging behind in circular implementations. The industrial production of clothing accounts for 5% of the global CO₂ emissions in 2021 and is predicted to account for 25% if it does not change its production and consumption model (Remington, 2020; World Economic Forum, 2021). Producers manufacture low quality clothing at mass, while consumers dispose and overconsume them (Jin & Jun, 2014). A circular economy approach suggests to make durable clothing from recycled material, for instance, thus providing a sustainable alternative.

Enhancing the implementation of the circular economy model, especially for the clothing sector, is necessary. However, the model is geographically dependent on its local environmental, social, economic, political and cultural context (Bacova et al., 2016). For example, a region with an efficient waste collection system is better able to recycle materials than a region struggling with waste collection. Also regional actors hold the most know-how of their places (Ranta et al., 2018). Organizing the circular economy is therefore most effective at the regional scale. Successful practices can then also be implemented in other regions (Acuto, 2013). However, current scientific research lacks an understanding of regional strategies to implement the circular economy model in its industries (Vanhamäki, Virtanen, Luste & Manskinen, 2020). This research aims to explore those strategies, using a case study on the clothing industry in a metropolitan region.

It draws on several economic geography theories to investigate the region on its favorability of innovating in the circular economy. Regional innovation system [RIS] literature helps study regions as Silicon Valley on their innovativeness and provides innovation strategies (Feldman & Kogler, 2010). A RIS can be defined as the systemic functioning between the industrial, policy and research subsystems in regions (Wintjes, 2016). Triple helix literature also analyzes the interactions between universities, businesses and governments (Etzkowitz & Leydesdorff, 2000). Regions differ in the organization of their RIS and triple helix networks, which leads to differences in innovativeness between regions. Literature of Boschma, Coenen, Frenken & Truffer (2017) and Trippl, Baumgartinger-Seiringer, Frangenheim, Isaksen & Rypestøl (2020) theorize that agents in these regions are able to steer the RIS to be more supportive of innovations in sustainable industries. These agency strategies include innovative entrepreneurship, for example. That process occurs when a firm innovates, leading to firm growth in the region. As an example, the Photovoltaic industry in the Oslo region, Norway, resulted from a research and development [R&D] innovation by Elkem. It then spun-off multiple companies, which started the growth of the regional

industry into renewable energy. Moreover, strategic niche management [SNM] literature provides insights why certain niche innovations, such as circular economy, become successful or fail (Schot & Geels, 2008). Socio-technical regimes present preferences of society towards certain products, technologies or practices. These preferences are maintained by industrial, cultural, policy and other dimensions. Hence, it is a useful lens to analyze why circular economy implementation remains low in regions.

Few studies applied these theories on strategies for regional circular economy transitions (Truffer & Coenen, 2012). There are few empirical examples on these transitions as well (Vanhamäki et al., 2020; Trippl et al., 2020). This research therefore explores the applicability of the mentioned theories on a metropolitan region. Metropolitan regions are defined as areas centering around an urbanized area (Bennett, Borders, Holmes, Kozhimannil & Ziller, 2019). Trippl et al. (2020) expect metropolitan regions to transition more easily than non-urban areas. This research, in collaboration with the Amsterdam Economic Board, investigates the case of the transition towards a circular clothing industry of the Amsterdam Metropolitan Area [AMA]. It aims to find out which regional strategies could support the transition. First, it assesses the current supportive environment of the region for the transition. Second, it explores which strategies by whom could help overcome barriers in the transition. The central question therefore poses:

Which agency strategies support the AMA in a transition towards a circular clothing industry?

The question is answered by the following two subquestions:

Which regional conditions were enabling or constraining for the transition towards a circular economy clothing industry in the AMA?

Which strategies of regional agents could overcome current barriers in the circular clothing transition in the AMA?

The first question uses RIS literature as a lens to find out whether the region enables or constrains the circular transition. As a RIS consists of different subsystems, it follows the structure of the subsystems. It draws on both qualitative and quantitative data from primary and secondary sources. This mixed method approach helps contextualize and substantiate qualitative data.

The second question explores how the transition in the AMA can be supported by actions of regional agents. It expects agency strategies to be important. Qualitative data via interviews with regional actors help reveal which strategies are useful for the AMA. These are as well substantiated with secondary material such as policy documents.

This research expands the current stock of scientific knowledge. First, the circular economy requires a spatial approach, but studies combining economic geography and the circular economy are rare (Binz et al., 2020). Multidisciplinary research helps tackle holistic issues as climate change and systemic social inequities (Rustad, 2008). This research contributes by employing the RIS conceptual lens. Second, the RIS and agency frameworks need more empirical analyses and data to further refine the framework as stated by Trippl et al. (2020). They argue that a qualitative method is more suitable due to the complexity of a RIS and agency. Dawley (2014) similarly proposes that economic geography research requires a better understanding of the motivations and practices underlying regional development.

This research generates insights on how regions could further enhance their transition to a circular economy, which is in line with the policy targets set to reach a 50% circular economy by regional and national level (Gemeente Amsterdam, 2020). The results chapter contributes to reach this target by

formulating different strategies and giving advice on strategy implementation. These recommendations are useful for regional actors which are involved in the transition. Moreover, this research gathers a collection of primary and secondary data, which are available for further research on the AMA and the circular clothing transition.

First, the paper discusses the theoretical framework in chapter 2. Chapter 3 describes the regional and industrial context. It then explains the methodology in chapter 4. Chapter 5 shows the results, including strategy implementation in the AMA. At the end, chapter 6 concludes and answers the research questions, and finally chapter 7 discusses the paper.

Chapter 2: Theoretical framework

Economic geography is a dynamic scientific field. Over time, the field evolved and turned through the influence of other disciplines. It took a cultural, relational and evolutionary turn (Barnes, 2001; Boggs & Rantisi, 2003; Grabher, 2009). Now it is prevalent that it is taking a sustainability turn with the publishment of several economic geography papers researching sustainability transitions (Hansen & Coenen, 2015; Boschma et al., 2017; Asheim et al., 2020). This chapter discusses recent scientific and policy knowledge of the circular economy and innovative regions in section 2.1. Theories and examples of regional strategies to support transitions are discussed in section 2.2.

Section 2.1: The circular economy in innovative regions

This section elaborates on the theories of circular economy, RIS and triple helix as stated in the introduction.

Section 2.1.1: The circular economy

The circular economy concept is actively being researched, where it build on earlier concepts of industrial symbiosis and industry eco-parks (Hobson & Lynch, 2016). Through re-using materials and centralizing waste management, industries decreased their waste costs. Currently, it has a broader scope applicable for value chains. Kirchherr et al. (2017) propose ten R-strategies to implement the model, shown in figure 1. They range from strategies which decrease consumption, to extending lifespans of products and then reusing discarded material. Consequently, resources are used in cycles. Therefore, being more circular means putting less pressure on the environment.

Strategies lower on the R-hierarchy, such as R9 Recover, are lower in circularity as they less resources are kept in the cycles. Incinerating material leads to both emissions and resource loss. Currently, circular economy discourse highlights technological solutions low at the R-hierarchy. However, strategies higher on the R-hierarchy are more socio-culturally aimed, such as sharing products or refusing consumption. For society to become more circular, they should thus focus on R-strategies high in the hierarchy (Hobson & Lynch, 2016; Kristensen & Mosgaard, 2020).



Figure 1: R-strategies framework. Source: Kirchherr et al. (2017).

economy

The circular economy model can be viewed from the environmental, social and economic dimensions (Kristensen & Mosgaard, 2020). Decreasing emissions and pollution, as stated earlier, relates to the environmental dimension. The social dimension concerns employment and social equality. Both policy and science research note the beneficial employment opportunities of the circular economy (Rivera, Russo-Garrido & Merveille, 2020; Rood & Hanemaaijer, 2017). They expect that the circular economy could create over fifty thousand jobs for The Netherlands if fully implemented. EHORE (2017) explains that it concerns core, enabling or supportive jobs. Core jobs are directly involved with the circular economy, for example solar panel installers or recycling operatives. The core jobs require enabling jobs to fulfill their work, such as designers or managers. Indirect circular jobs support circularity such as teachers. As a result, a transition requires different types of skilled employees. Skills as repair, procurement and industrial cleaning are necessary for a transition towards a circular textile industry (Circle Economy, 2021b). Therefore public and private stakeholders, from academia and policymakers to businesses, need to communicate and collaborate to anticipate this change. The economic dimension concerns several aspects (MacArthur, 2013). For industries, the model saves material costs, mitigates resource volatility, reduces negative externalities and helps build a resilient economy. For consumers, they can access products of higher quality which are more user-oriented.

Moreover, transition studies helps understand why the circular economy model is not implemented across the entire clothing industry (Murphy, 2015). The SNM literature analyzes the relation of niche innovations to the current socio-technical regimes. These niches concern experimental technologies, practices or products, which are developed in protective spaces such as R&D labs (Schot & Geels, 2008). As these innovations require further development to become competitive to current technologies, practices or products, they require protection. Society must also co-evolve in aspects as culture, politics and regulations for the innovation to become successful. These aspects of society represent the sociotechnical regimes. These are dominant cognitive routines, technology preferences, norms and regulations of policymakers, scientists, consumers, industries and other groups. As a hypothetical situation, recycled clothing innovation needs protection to become mainstream. As policymakers recognize the potential of it, they protect them with subsidies. After successfully experimenting, it becomes the preference for businesses because of lower costs. Then, it becomes mainstream a mainstream product. Figure 2 visualizes the theory. It also shows the exogenous effects on socio-technical regimes, such as the increasing global temperature caused by climate change. These effects also create 'windows of opportunity', as it demands a reaction of the socio-technical regime. Niches as circular clothing can then use those opportunities.



Figure 2: Multi-level perspective on transitions. Source: Gaziulusoy, 2011.

Section 2.1.2: Regional innovation systems

RIS literature, part of the geography of innovation discipline, helps explain why regions enable or constrain transitions by analyzing innovative environments (Trippl et al., 2020). Innovation can be defined as: *"Innovation is the ability to blend and weave together different types of knowledge into something new, different and unprecedented that has economic value"* (Feldman & Kogler, p. 384, 2010). This definition shows the underlying logic of innovation being a recombination of existing knowledge. Products, processes organizations and markets are improved as entrepreneurs recombine knowledge, described as 'creative destruction' by Schumpeter (Wintjes, 2016). This thinking forms the base of the RIS literature.

It also build on evolutionary economic geography, as innovation results from a radical change in routines and habits (Wintjes, 2016). Firms being able to change these in their business models therefore have a higher absorptive capacity: they can better apply innovations in their organization. Policymakers support innovation by creating conditions for firms to increase absorptive capacity and stimulate creative destruction. However, there are no best practices for all regions to do this due to differences between regions. It therefore requires a place-based approach (Asheim, Isaksen & Trippl, 2020). These theories led to the conceptualization of the RIS, defined by Lau & Lo (2015) as:

"a set of networks between public and private agents that interact and give mutual feedback in a specific territory by taking advantage of their own infrastructure to adapt, generate and extend knowledge and innovation (Yam et al., 2011, Cooke et al., 1997; Braczyk et al., 1998).

This definition shows the importance of interactions across different actors with the aim to innovate. The actors and interactions are visualized in figure 3.



Figure 3: Schematic diagram of regional innovation conceptual framework. *Source: Wintjes, 2016.*

Thus, there are different subsystems within a RIS. The concept analyzes the interactions and organization of these subsystems. It also shows that the subsystems are inherent to the socio-institutional factors, such as the regional's culture and demography. Furthermore, the figure demonstrates that the RIS functions as an open innovation system, through interacting with other regions, national innovation systems and supranational organizations (Asheim, 2020).

Similarly, the relations between the subsystems can be analyzed through communication, collaboration and linkages between academia, businesses and governments (Etzkowitz & Leydesdorff, 2000). Innovative high-tech regions as Silicon Valley and Boston are explained with this theory (Etzkowitz & Zhou, 2017). Innovative interplay between roles of the government and industries lead to more innovative institutions. The university becomes industry as an entrepreneurial university with an incubator program, for instance. Due to criticism for public exclusion, research also proposes a quadruple helix approach including the public (Carayannis & Campbell, 2010).

Truffer & Coenen (2012) state that regional studies fail to explain why sustainable innovations emerge or refrain in certain regions. However, Trippl et al. (2020) show that the RIS or quadruple helix interactions in regions can enable or constrain innovation. That depends on characteristics of the subsystems.

Future economic development is determined by the historical economic development (Neffke, Henning & Boschma, 2011; Martin & Sunley, 2006). This refers to the concept of path dependency, where regions

enter new activities based on the routines and capabilities built up over time. Regions having more related industries, technologies or other economic activities are better able to incrementally innovate or grow firms than regions having diverse activities (Neffke et. al, 2011). However, radical innovation often results from having diverse activities (Caragliu, de Dominicis, & de Groot, 2016; Castaldi, Frenken & Los, 2015). Due to the variety of ideas, knowledge is recombined and rapid economic development is possible. Balland et al. (2017) combine these insights. Related development strategies are low-risk, while unrelated strategies are high-risk. This helps to understand whether a regional industrial subsystem has an enabling or constraining condition for a new activity, such as the circular economy.

The policy subsystem provides conditions for innovation through policy instruments as funding, subsidies or innovation policies. If favoring a circular activity or technology, it helps diffuse and embed it in the region (Trippl et al., 2020). When the regional policy is connected with higher level policy, such as a national innovation system or supranational body as the European Union [EU] it also enables innovations. However, contested visions and intermediation struggles underpin urban and regional policy (Hansen & Coenen, 2015). This means that there is no consensus between stakeholders, which constrains a transition. Policymakers with vested interests in non-sustainable industries also constrain transitions (Boschma et al., 2017).

The knowledge subsystem generates knowledge through R&D, educating academia or brokering knowledge. Hansen & Coenen (2015) state that role of knowledge institutions in tackling sustainability challenges in their region should be further researched. The presence of sustainability oriented NGO's researching and addressing the circular economy enables regional transitions as well (Trippl et al., 2020). If researching, they function as a public research organization performing R&D.

Socio-institutional factors condition sustainable innovation as well (Trippl et al., 2020). Formal regulations enable the environment for sustainable innovations. Providing subsidies or incentives, or a flexible regulatory environment, promotes innovation. At the same time, they could also hamper innovation if favoring unsustainable practices.

Informal institutions including values, visions and attitudes could enable the environment for sustainable innovations. Sustainable innovations emerge, among other things, due to changing preferences to the new technology (Hansen & Coenen, 2015; Schot & Geels, 2008). The socio-cultural aspects of the regional population could result into a large market for green products, or promote educational innovation through the availability of environmentally conscious students (Trippl et al., 2020). Having proximate, engaged consumers also allows firms to receive feedback to develop sustainable innovations (Hansen & Coenen, 2015). However, it could as well constrain the environment when the population does not prefer sustainability or is aware of it.

 for innovation related to the circular economy. These finding are summarized in table 1 below.

 RIS subsystem
 Enabling or constraining condition

 Industry subsystem
 Related or unrelated capabilities, knowledge or skills (Neffke et al., 2011; Castaldi et al., 2015)

This section showed the current knowledge surrounding RIS and their enabling or constraining conditions for innovation related to the circular economy. These finding are summarized in table 1 below.

Knowledge subsystem	Sustainability oriented NGO's (Trippl et al., 2020)
Policy subsystem	Policy instruments (Trippl et al., 2020)
	Higher level policy connection (Trippl et al., 2020)
	Policy consensus (Boschma et al., 2017)

Socio-institutional context	Formal institutions (Trippl et al., 2020)
	Culture (Hansen & Coenen, 2015; Schot & Geels, 2008
	Proximate, engaged consumers (Hansen & Coenen, 2015)

Table 1: enabling or constraining conditions per RIS subsystem. Source: author.

Section 2.2: Regional strategies for transitions

This section discusses strategies of regional agents with economic geography and transition studies literature.

Section 2.2.1: Agency

In research on regional economic development, the concept of agency is increasingly seen as important for regions to enter new industrial paths (Boschma et al., 2017). Regional actors are able to steer regions into new activities. The concept of agency is defined as 'action or intervention by an actor to produce a particular effect' (p. 193, Trippl et al., 2020). Asheim et al. (2020) categorize agency in two different levels: system-level agency and firm-level agency.

At firm-level, firms change the industrial subsystem through innovative entrepreneurship. Innovations coming from firms could start new industries. Entrepreneurs challenging regional routines and deviating from the socio-technical regimes are key actors (Wintjes, 2016; Schot & Geels, 2008). However, other firms or entrepreneurs need to follow these entrepreneurs in engaging with the innovation. For example, a shipbuilding company in South-Western Norway innovated with unique fuel cell technology adapted for maritime use. Other companies in the region started implementing the technology, changing the industrial base to use the innovation. If no firms follow, the regional transition is limited to one firm.

At the system-level, agency creates conditions which diffuse innovations or support innovative entrepreneurs. First, place leadership by policy or state actors creates windows of opportunities, such as setting up sustainability-oriented incubators at universities, providing city labs for experimentation or adapting policy (Trippl et al., 2020). In the fuel cell example, regional and national policymakers supported this innovation with place leadership. They established a cluster project to further attract and grow firms. Second, institutional entrepreneurship changes the regional institutions by actors with resources, power or competences (Boschma et al., 2017; Asheim et al., 2020). Firms or authorities can lobby to change formal institutions to support a transition. These three strategies are summarized in table 2 below.

Agency	Process	Level
Innovative	Entrepreneurs establish new	Firm level
entrepreneurship	innovative companies or	
	firms diversifying into	
	innovative activities	
Place leadership	State actors or public policy	System level
	create innovative	
	environment	
Institutional	Actors use resources,	System level
Entrepreneurship	competences and power to	
	create new institutions and	
	transform existing ones	

Table 2: Processes of agency per level. Source: compiled by author, based on Trippl et al., 2020.

Section 2.2.2: Intermediaries and niche management

The quadruple helix theory and SNM literature also provide regional strategies to support transitions.

The linkages between academia, businesses, governments and the public not only explains innovation, but also helps to set up innovation strategies in a RIS (Asheim, 2020). A lack of collaboration or communication between two or more quadruple helix actors forms a barrier to innovate (Etzkowitz & Zhou, 2017). This also applies for sustainable innovation (Trippl et al., 2020). Re-organizing universities to support entrepreneurialism in a sustainable industry is a policy strategy, for example.

The agency strategy in this case is to connect actors. Hansen & Coenen (p.97, 2015) analyze the role of intermediaries in this. They argue that, if quadruple actors are not producing the required sustainable innovation, intermediaries should *'produce outcomes that would not have been realised without their involvement'*. Barrie, Zawdie & João (2017) confirm this for triple helix intermediaries. Also, they elaborate the role of intermediaries to connect dispersed niches. This argument is based on SNM, where they propose that niche actors should be connected to socio-technical regime actors. It helped to nurture niches through expanding their network, creating a shared expectation of the niche's success and improving learning processes in the experimentation phase. Boschma et al. (2017) also state that transitions require different kinds of actors to support the niche. Different quadruple helix actors provide complementary resources. The intermediary therefore functions as a broker, similar to mediating organizations in the knowledge subsystem of the RIS. This is also explained by Cramer (2020) on triple helix intermediaries, which should function as transition brokers. However, this is not included in the agency research yet.

This section showed the potential of intermediaries to support regional transitions out of a SNM perspective. The theoretical framework is applied on a case study, discussed in the next chapter.

Chapter 3: Case study context: the Amsterdam Metropolitan Area and the clothing industry

This section summarizes the available information on the case study. It gives information about the region and the clothing industry their characteristics. This helps other researchers compare the context to reproduce the research method or results. It focuses on the clothing industry because it lags behind in implementing the circular economy, while being an industry with high emissions and pollution. In the AMA, multiple parties are active in supporting the circular clothing transition, therefore it is also a practical case to study.

Section 3.1: Regional characteristics

The AMA is an economically developed and diverse region consisting of 35 different authorities in The Netherlands, shown in figure 4. That includes 32 municipalities divided over seven sub-regions, two provinces and a transport authority (Gemeente Amsterdam, 2018). The region is characterized by having both urban and rural land coverage (Metropoolregio Amsterdam, 2021). It is connected through two airports, multiple seaports, highway connections and public transport which includes international train networks. Moreover, it hosts financial and creative clusters in multiple sectors. In total, around 2.5 million people inhabit the AMA. Its economy accounts for 1.5 million jobs and 18.4% of the national GDP. The region has multiple businesses and educational institutes in the clothing industry (Amsterdam InBusiness, 2021). It is also internationally known for its Amsterdam Fashion Week and fashion designers.



Figure 4: The governance of the AMA. Source: Gemeente Amsterdam, 2018.

The AMA is an informal region without an official administration. There is, however, the Metropoolregio Amsterdam partnership which facilitate cooperation between the authorities (Metropoolregio Amsterdam, 2021). Membership and participation is not mandatory for the local authorities. The aim is to strengthen the regional economy, improve the connectivity, provide housing and transition to a sustainable society.

The region is centered around the city of Amsterdam. The city's municipality focuses on social and environmental sustainability by implementing the Doughnut economy model of Kate Raworth (Raworth, 2012; Gemeente Amsterdam, 2020). The model proposes that there is a minimum and maximum level of operating space of the city. If the economy is not developed to the minimum, it falls short of a social foundation. Scarcity, poverty and inequality occurs. If an economy is developed too much in an unsustainable way, it overshoots the planetary boundaries leading to effects as biodiversity loss, ocean acidification and pollution (Rockström et al., 2009). The ideal situation is a balanced economy, which sustains the environment, social equality and economy. It then functions inside the doughnut ring and provides a safe and just space for humanity, as shown in figure 5 (Raworth, 2012). Amsterdam sees the circular economy model as the tool to reach such an economy. Amsterdam was the first urban municipality which implemented it in policy (Climate-KIC, 2018).





To function in the doughnut, the municipality set the concrete goal to reduce virgin resource usage to 50% by 2030 and reach 100% circularity in 2050 (Gemeente Amsterdam, 2020). They target several sectors, where the clothing industry is part of the textile group. The local government has several tools to increase the regional circularity. First, through circular public procurement, the government is able to lead by example and decrease material usage. Second, they stimulate to increase the life cycles of products

and consuming less products by supporting circular initiatives and creating awareness around its population. Third, the local government aims to upcycle consumer goods which cannot be repaired anymore. The textile industry, including clothing, is a focus material flow. The government improves the quality of the waste collecting and processing, which is performed by the Afval Energie Bedrijf, the waste company of the local government. In 2020, the municipality started project Reflow together with five other EU cities to transition to a circular economy. Amsterdam aims to decrease textile waste by finding collaborations between designers, manufacturers, textile collectors, policymakers and citizens.

Moreover, there is a regional Green Deal Circular Textile aiming to decrease the amount of textile incineration (Amsterdam Economic Board, 2020). It is set up as a three year public-private agreement between triple helix parties, led by the Muncipality of Amsterdam, the Amsterdam Economic Board and the Metropoolregio Amsterdam partnership. It is set up due to the opportunity the COVID-19 crisis offers for a sustainable transition. Programs related to the deal focus on scaling business to business repair, recycling innovation, circular principles in education and research, sustainable purchasing and awareness campaigns.

Section 3.2: Industrial characteristics

This section discusses the organization of the fast fashion industry, thereafter the transition towards a circular clothing industry.

Section 3.2.1: The fast fashion industry

This section describes recent developments of the clothing industry. It first discusses how the industry is organized, thereafter the recent alternative of circular clothing.

Since the 1990s, the clothing industry radically changed (Bhardwaj & Fairhurst, 2010). The mass and speed of clothing production and consumption increased, as well as the amount of fashion collection releases known as 'seasons'. In the 1980s, fashion seasons meant spring-summer-winter-autumn seasons. Since 1990s, fast fashion firms added in-season collections within the four seasons for higher sales. Consumers preferred this as new collections meant fashionable clothing (Bhardwaj & Fairhurst, 2010). Therefore firms aimed to respond fast to market changes. They design, produce and retail a new collection within three weeks. The fast market responsiveness meant a loss of quality and short lifespan of clothing. Consumers bought clothing more impulsively due to the low prices. Firms aimed at producing clothing faster and cheaper due to competition. This led to a culture of disposal and overconsumption, where consumers buy large amounts of clothing and then wear them rarely (Jin & Jun, 2014).

To put the production of fast fashion in a spatial perspective, it is a globally dispersed economic activity. Its value chain is characterized as being buyer-driven, which means that retailers, marketers and brand manufacturers drive where and how production networks are organized in different countries (Gereffi & Memefovic, 2003). These networks are also highly competitive and decentralized. Companies which design products have large control over the location, quality and operations of the production processes.

Figure 6 schematically displays the global value chain of clothing. It shows the various segments of the production network. Clothing in this model uses natural or synthetic fibers to grow clothing. Natural fibers are processed into a material by textile companies, such as spinners, weavers and knitters. They add synthetic fibers from chemical companies to make the clothing wearable. Apparel manufacturers then process the fabrics into specific designs with different types of buttons, cuts, sewing or ironing needed. Afterwards, they are sent to the retail or trade firms in export networks. Finally, the clothing is bought at stores, online shops or outlets. In the linear model, the worn textile is then incinerated.

Figure 6: Schematic of the global value chain of clothing. Source: Gerrefi & Memedovic, 2003.



Figure 7 applies this value chain model to the geographical distribution of production and consumption in 2020. It shows that the fiber production, including cotton, concentrates in China, India and the EU (UNEP, 2020). The yarn and production segment, which requires labor-intensive spinning, knitting and weaving, is located at peripheral or semi-peripheral countries. Textile manufacturing or production is located in China, the EU, Pakistan and Turkey. Assembly is dispersed across China, India, Bangladesh, Vietnam and other countries. In total, the industry employs more than 300 million people (Circle Economy, 2021b). The consumption market is the largest in the EU, where North-America follows and then Asian countries.



Figure 7: geographical distribution of the global clothing value chain. Source: UNEP, 2020.

Section 3.2.3: An alternative: circular fashion

Due to the increasing awareness of the negative effects of the clothing industry, the concept of circular clothing gained attention since 2012 according to Wagner & Heinzel (2020). In 2015, the product group got introduced in EU policy in the EU Commission's action plan for a circular economy (Koszewska, 2018). Kim, Jung & Lee (p.2, 2021) define circular clothing as:

"In other words, it refers to a regenerative system that takes resource efficiency, non-toxicity, biodegradability, longevity, and recyclability into account from the time the fashion product is designed to when it is disposed so the lifecycle of products does not result in socio-economic loss or environmental damage."

Circular clothing thus uses sustainable materials aimed at decreasing the environmental impact, which are processed with the least harmful external effects for society and which are used for the longest time possible. After usage, materials should be maximally re-used. The R-strategies provide a useful framework to apply the circular economy model. Reflow (2021) visualizes the implementation for circular textiles in

figure 8. As clothing is made of textile, it applies to the clothing industry as well. The chain starts at the top, when clothing is discarded by consumers. After collection, sorting companies divide the textiles between wearables ready to be reused and non-wearables fit for recycling. Wearables which do not sell, are exported to secondhand markets. The non-wearables are sorted again, but now based on their fiber, color and material composition. The buttons and zippers are removed in the cutting and cleaning process. The clean and sorted material are ready to be recycled either chemically or mechanically recycling or extruded. Then, the regular steps of the value chain follow including spinning, producing and manufacturing the clothing. R-strategies to extend the lifespan of clothing are performed in the retail, usage, laundry and maintenance step. Extending the life of clothing by nine months generates a '20–30% annual reduction in the carbon, water, and waste of clothing' (p.2, Diddi & Yan, 2019). Also second hand resell and rental models decreases consumption. Fashion design can also reduce resources and harmful toxins through selection of circular materials, as well as design the clothing for longevity and recyclability.



Figure 8: The circular textiles value chain. Source: Reflow, 2021.

Chapter 4: Methodology and data

To ensure the validity and reproducibility of this research, this chapter explains the motivations behind the choices made in the methodological approach. It first discusses the research design, then the qualitative and quantitative data collection and analysis.

Section 4.1: Research Design

This research aims to find out which regional strategies could support the transition towards a circular clothing industry in the AMA, by posing the following central research question:

Which agency strategies support the AMA in a transition towards a circular clothing industry?

To answer this question, the research first analyzes the constraining or enabling conditions and important agents in the transition towards a circular economy clothing industry in the AMA. Then it analyzes current barriers in the RIS and agency solutions. The following two subquestions adhere to this aim:

Which regional conditions were enabling or constraining for the transition towards a circular economy clothing industry in the AMA?

Which strategies of regional agents could overcome current barriers in the circular clothing transition in the AMA?

This research adopts a case study approach. As it studies the 'how' of supporting transitions, a case study approach is suitable (Yin, 2018). It also studies the ongoing transition and economic development in the AMA. Case studies are fit to study these contemporary phenomena (Yin, 2018). Collecting and analyzing data on the research questions requires a mixed method approach using interviews and desk research. The desk research helps to explain and support findings resulting from the interviews. While most economic geography studies employ quantitative methods, there is also a strain of literature using qualitative or mixed methods. A qualitative method was chosen as it helps to analyze regional development and agency out of an 'inside' perspective and move beyond quantitative methods (Dawley, 2014; Steen, 2016; Boschma et al., 2017; Trippl et al., 2020).

The first subquestion analyzes the historical and current functioning of the RIS from 1970 and onwards. Data availability is the reason for this timeframe. To find out whether regional conditions were enabling or constraining, historical information is gathered through desk research and further substantiated by interview data. The second subquestion explores strategies to overcome current barriers of the RIS hindering a transition. It uses interviews to find out which barriers hinder the transition according to regional actors. Scientific and policy documents are used to substantiate their arguments. This helps to build an understandable framework of perceived barriers.

Section 4.2: Qualitative data collection and analysis

The qualitative data is collected via eleven semi-structured interviews. These were conducted online via Zoom due to COVID-19 circumstances. The interviews were structured following the theoretical framework to ensure validity. However, the researcher also deviated from structure to explore new phenomena. First, the interviewer introduced the topic. Questions concerned the topic of circular clothing and the relation of the respondent to circular clothing. Second, the researcher questioned the respondent about their functioning of the RIS and if it affected it the respondent negatively or positively. Third, the researcher asked the respondent to imagine an ideal RIS for circular clothing. Then the barriers, solutions

and strategies for reaching that future were questioned. Appendix A shows the corresponding interview questionnaire in English. Most interviews were conducted in Dutch besides one in English.

Respondents were selected on the base of the researcher's network and interviewee recommendations. Actors active in different subsystems of the RIS were interviewed. Interviewees were required to have more than two years' involvement in circular clothing activities. After eleven interviews, it was clear that interviews did not lead to new insights and the data saturation point was reached.

Company type	Abbreviation
Recycling business 1	RB1
Recycling business 2	RB2
Designer 1	D1
Policymaker 1	P1
Policymaker 2	P2
Knowledge institution 1	К1
Marketeer 1	M1
NGO 1	N1
Intermediary 1	11
Industry Association 1	IA1
Investor 1	IN1

In total 93 pages of interview data was collected. The interviewees are referred to by an abbreviation of their category and a unique number, such as B1 referring to business 1, shown in table 3.

Table 3: Interview actor list. Source: author.

In order to conceptualize the raw data collected via interviews, we make use of coding in NVivo. Open coding at first allows the researcher to recognize themes and concepts in the textual data through careful reading (Khandkar, 2009). Axial coding afterwards connects and compares the concepts between each other and find general patterns to inductively theorize. Selective coding finally determines broader themes. The themes structure the results section. Several thinking strategies support the researcher to successfully perform grounded research, such as asking critical questions to the self while analyzing the data and comparing data to find unusual, challenging or odd observations (Corbin & Strauss, 2008). The axial coding resulting into 336 codes, which resulted into different themes concerning the research questions. Appendix B shows the full coding tree list.

Section 4.3: Quantitative data collection and analysis

Due to the lack of data and insights on the current size and actors of the circular clothing industry in the AMA, this paper includes a dataset and visualization of the involved actors in the RIS. It provides an open access dataset, therefore adding to the reproducibility of the research.

Actors are manually researched for their involvement in the circular clothing RIS of the AMA and then added to a dataset on Excel. The following characteristics are noted: Name, Type, RIS, Founded in and website. Type is based on the organization's involvement in the transition. RIS choice is based on the different RIS subsystems. Founded in refers to the place it was found, based on website information. The website is added for those interested in involved companies. The dataset is analyzed in the results section by showing the amount of organizations per category. The dataset is also visualized in the form of a pie diagram, organized by the categories.

It is important to highlight the limited reliability of the quantitative analysis. As organizations play multiple roles in the circular clothing industry, they are aggregated to larger categories. Most businesses are confined to the brand type, while performing maintenance as well, for example. Also policy actors might be involved in collection and processing, as another example. Moreover, these organizations do not cover all circular clothing activities in the region, because of the large efforts required and limited time to gather the data. Most companies were selected due to engagement with the researcher's network. However, it should be seen as an explorative analysis.

Chapter 5: Results

To find out which strategies support a transition in the AMA, this chapter discusses the results derived from the data collection and analysis. These results help answer the research question and provide the base for the discussion.

Section 5.1: Conditions of the regional transition

This concerns the first research question, structured along RIS subsystem functioning.

Section 5.1.1: The industrial subsystem

Since the time of industrialization, the 18th century until the 1960s, the city of Amsterdam hosted a textile industry and market (Sierman, 2011). With the presence of shops selling sewing machines, buttons, zippers and cotton, it represented a localized economy. Some renowned retailers of today were established during this period, such as De Bijenkorf and C&A. Besides Amsterdam, the clothing and textile industry located in other areas in the Netherlands, for instance Twente and Midden-Brabant (Roso, Atzema & Visser, 2005). After 1970, the textile industry gradually declined and got outsourced to Asia, shown in figure 9 (CBS, 2004). The textile industry accounted for 23% of the industrial employment in The Netherlands in 1970, while it accounted for 2.6% in 2002.

Figure 9: The decline of the Dutch textile industry employment and increase of general employment in The Netherlands, 1970-2002. *Source: CBS, 2004*.



Since 2007, as table 4 shows, the total amount of clothing industry firms in The Netherlands increased with 38%. However, the increase comes most from self-employed firms. The amount of larger industrial firms decreased, except for firms with 2 employees. Industrial employment thus decreased since 2007. Retail firms, as shown in table 5, did decrease. Every category of firms per size decreased, so employment decreased as well. The clothing industry in the country thus decreased from 2007 until 2021.

Year	Total	1	2	3 to 5	5 to 10	10 to 20	20 to 50	50 to 100
	firms	employee	employees	employees	employees	employees	employees	employees
2007	1685	1335	175	65	55	35	20	0
2021	2320	2005	185	60	35	30	10	0

Table 4: Amount of clothing industry firms in The Netherlands between 2007-2021. Source: CBS, 2021.

Year	Total	1	2	3 to 5	5 to 10	10 to 20	20 to 50	50 to 100
	firms	employee	employees	employees	employees	employees	employees	employees
2007	10145	4475	2620	1615	870	290	140	55
2021	8170	3835	2030	1330	585	195	90	45

Table 5: Amount of clothing retail firms in The Netherlands between 2007-2021. Source: CBS, 2021.

However, when zooming in on the AMA, firms and jobs increased for the clothing industry between 2014 and 2019 as table 6 demonstrates. The municipality of Amsterdam increased more than the aggregated other AMA municipalities. It shows a revival of the industry, concentrating in the city.

	Firms	Jobs	Firms	Jobs	Increase firms	Increase jobs
	2014	2014	2019	2019	2014-2019	2014-2019
Amsterdam	159	311	284	509	179%	164%
AMA	181	309	209	327	115%	106%
Total AMA	340	620	493	836	145%	115%

Table 6: Increase firms and jobs in the clothing industry in the municipality of Amsterdam and aggregated AMA municipalities. *Source: CBS, 2021.*

Besides industrial companies and retailers, Amsterdam hosts over one hundred headquarters of fashion businesses, including global firms as the PvH group and Chanel, as well as innovative firms as Patagonia (Amsterdam InBusiness, 2021). The denim jeans segment is unique in Amsterdam, states the marketeer (M1). Multiple jeans brands originated in Amsterdam, such as G-Star, Gsus and Kuyichi (Amsterdam InBusiness, 2021). According to three respondents, the region is both attractive for large firms as for innovative startup firms (I1, N1, M1). Firms benefit from the central location, tax policies and innovativeness, demonstrated by the following quote:

'Back then [thirty years ago] Amsterdam and The Netherlands, was a place of testing for international companies. So if you wanted to experiment with your innovations, you went to The Netherlands.' Respondent of triple helix intermediary

These headquarters include clothing design departments. Historically, fashion design started since the 1930s, focusing on women's clothing (Sierman, 2011). In 1994, the amount of fashion designers in the larger area of Amsterdam was 600 (Roso et al., 2005). That number multiplied four times to 2485 in 2004. In 2005, 26% of all Dutch fashion designers located in Amsterdam, while only having 8% of the Dutch inhabitants. Wenting, Atzema & Frenken (2008) define it as a cluster on the base of figure 10. Their research concluded that the designers located in the area due to the availability of urban amenities and business networks. Network access of designers led to higher income levels. Locating in Amsterdam without accessing those networks as a designer, meant a lower income. Therefore, urban amenities and network access drove the designer cluster.

Figure 10: The spatial distribution of fashion designers in The Netherlands (N = 275). *Source: Wenting et al., 2010.*



Over time, entrepreneurs involved in clothing increasingly addressed sustainability issues. The industry association states that from 2010 and onwards, multiple congresses about sustainability were being held (IA1). Motivations for the industry's engagement were decreasing availability of resources and shocking events in outsourced clothing factories. Moreover, the Fibersort machine innovation of Wieland Textiles, occurred in the AMA in 2018 (Wieland Textiles, 2021). The machine uses an optical lens to scan textile waste on color, structure and composition. As a result, the automatized sorting process is more efficient and precise than sorting manually. This created unique opportunities for brands in the region to use textile waste as a circular resource (RB2, P1, M1).

These findings show a decrease in textile production businesses and increase in clothing designers and business headquarters. With the loss of production, manual labor skills were also lost, according to a knowledge institution (K1). Therefore capabilities, knowledge and skills were lost, relating to circular clothing activities in circular clothing production. With urban amenities and cluster networks, the region did build up capabilities, knowledge and skills for designing and headquarter operations.

Section 5.1.2: The policy subsystem

As described in the case study context, the city of Amsterdam uses the doughnut framework for policymaking.

'Yeah, well, I think the region of Amsterdam as a whole is very prone to innovation, and I think if you look on one hand to already to the to the government and the new doughnut framework being established as kind of the guiding kind of star for here for developing a sustainable and circular cities.'

Respondent of NGO

Moreover, from 2023 and onwards, Extended Producer Responsibility is applied to the textile product group. Businesses in the Netherlands are then responsible for their collection and recycling of materials, as well as the application of these recycled materials, leading to positive reactions:

'And that dynamic, I've heard it all these years, with all those different terms, with all those discussions, all those support groups. I missed action. But now something is seriously going on. That pleases me.' Respondent of recycling business

The Extended Producer Responsibility for textiles means producers are required to organize take back systems, therefore allowing their consumers to return their clothing after usage. Therefore it has a sudden positive change for circular businesses. It creates a momentum (RB2). According to a regional policymaker, policymakers themselves are in the position to lobby with national or EU authorities for these kind of changes (P1).

As the region is set up as an informal partnership, visions and policies of the 32 municipalities differ. They organize activities individually such as public procurement i.e. purchasing goods by the government. One respondent highlights a negative event:

'Well, this ... municipality just procured with only addressing money. They pay 21 cents for their textile. Nothing happens and it contradicts everything we stand for with everyone. Still, it happens with those AMA municipalities.'

Recycling business 1

Two other respondents agree with this (RB2, IA1). The quote shows that differing visions and policies may lead to fragmentation between authorities.

These results show that instruments such as policy frameworks and regulation have high impact on creating favorable environments for transitions. Lobbying with higher level authorities helps achieve this for regulation. Policy fragmentation constrained the transition.

Section 5.1.3: The knowledge subsystem

Knowledge institutions, both public and private, offering education for the clothing industry have been around since the 1950s (Jeans School, 2015; Academie Artemis, 2021; AMFI, 2021; ROCva, 2021). They educate students for a profession in the clothing industry, as well as perform research to adapt the industry to the latest scientific insights. These institutions also have close industry connections by connecting students for internships (K1). In 2010, the Jeans School, a unique knowledge institute educating students for a sustainable denim jeans industry, was established. It attracts denim experts from abroad, such as Turkey, to give lectures (M1). The presence of this and other institutions contributed to the innovational character of the region, according to four respondents.

These findings show that knowledge institutions educate skilled workers with knowledge of sustainability, as well as diffuses knowledge to the industry through internships. Also attracting international lecturers helps access external knowledge into the RIS.

Section 5.1.4: Quadruple helix interactions

There were agreements made by consortia of companies, industry representatives, governments and NGO's addressing sustainability issues of regional businesses. This includes the international agreement on Sustainable Garments and Textile internationally in 2016 forced Dutch firms to address social and environmental effects in outsourced production facilities (Cramer, 2020). Of the 57 researched firms, 63% achieved these goals. According to the respondent of the industry organization, it was an important moment in the transition, just like the recent Extended Producer Responsibility (IA1):

'And what now, as the agreement forces companies to really think about their due diligence, their risks in the chain and investigate those and do something there. Now there is the extended producer responsibility, big

drivers behind the whole circularity thinking.'

Respondent at industry association

The quadruple helix interaction therefore helped businesses to reorganize their operations. It activated companies to engage in the transition.

Section 5.1.5: Socio-institutional context

Formal institutions support the transition, as shown in section 5.1.2. As for informal institutions, the case study context described the AMA as a developed region with high consumption. There is also a culture of disposal, substantiated by one respondent:

'When you wore it (clothing) three times and throw it away, it is useless. Clothing in The Netherlands is worn five time on average in only six months'

Respondent at recycling business 1

Other answers of the questions concerning the socio-cultural context include entrepreneurial (D1) or international descriptions of the region (M1, P1). However, findings of the constraining or enabling conditions of the socio-institutional context are limited.

Section 5.1.6: The RIS visualization

This section shows the data analysis and visualization of the involved actors in the circular clothing transition in the AMA. The quantitative data, resulting from desk research, shows that 75 organizations in the AMA are involved with circular clothing activities. This includes different types organizations, as shown in table 7. Of those 75 organizations, 47 businesses are directly involved with the circular clothing transition at the moment, shown in table 8.

Using the ecosystem innovation pie diagram, businesses and supportive organizations are visualized in figure 11. The visualization shows a vibrant regional innovation ecosystem with a large amount of homegrown circular businesses. It also reveals the diverse supportive environment enabling innovations.

Туре	Organizations
Brand	37
Collector & processor	6
Knowledge institution	7
Maintenance	3
Non profit	8
Media	1
Network	4
Policy	6
Investment	3
Total	75

RIS	Organizations
subsystem	
Business	47
Knowledge	7
Policy	6
Support	15
Total	75

Table 8: organizations per RIS subsystem. *Source: author*

Table 7: organizations per category type. *Source: author*

Figure 11: Regional innovation system diagram. Source: author.



Regional Innovation System

miro

Section 6.2: Barriers, solutions and agency

This section explores which four barriers prevent the region from transitioning and which solutions could remove the barriers. It then discusses which agents are expected by the respondents to take action. It is structured by barrier properties recognized in the qualitative data analysis, substantiated with desk research.

Section 6.2.1: Industry organization barrier

Transitioning is difficult due to the industry organization. There are three related themes recognized in the qualitative data: competition, vested interests and value chain complexity.

First, fast fashion businesses outcompete startups and other firms with circular business models. They offer lower prices for their clothing, according to four respondents. They are also wary to collaborate with startups, which is constraining for circular startups, as the following quote shows.

'Big risk in the fashion industry if you look at this, is that startups are the most innovative and every fashion firm wants to pilot with these startups. However, they only want to pilot with them for a year or another pilot, and then don't know what they want. It's a toxic environment for startups and that's why they don't make it.'

Respondent at investment company

This is also explained by Cramer (2020). Fast fashion firms offer little room for experimentation in their operations and circular business models are risky investments for investors. This is a reason for most startups to fail before becoming successful, showing the 'Valley of Death' (Bauwens et al., 2020). Demand for affordable clothing is high as well while demand for sustainable clothing is low. Due to the size and efficiency of fast fashion companies, circular companies struggle to compete.

As startups have the potential to challenge fast fashion businesses in radical circular business models, supporting them is a solution (IN1). The regional government could proactively support them to find access to housing and funds, which is proven to be successful according to the industry association (IA1). Research of Bauwens et al. (2020) also shows that startups accelerate circular economy transitions. Their business models focus on strategies high on the R-ladder which are more circular. Alternatively, instead of supporting startups to compete with fast fashion firms, collaborating with them through multistakeholder partnerships is another solution (P1, N1). Bauwens et al. (2020) substantiate this, by arguing that facilitating business networking between the two is a useful strategy. Moreover, increasing the price of virgin material or decreasing circular strategy prices is another solution. According to a regional policymaker, regional lobbyists are pursuing a tax shift. The Ex'Tax solution proposes to increase resource taxes and decrease labor or circular material taxes (The Ex'Tax project, 2021). As a result, circular activities pay less taxes. Another solution is scaling up recycling innovations to decrease recycling costs per clothing piece. To support this, bold and courageous investments from public and private investors are necessary (M1).

Second, large and dominant firms change their operations slowly because of their size and age, leading to cautious firms which lack courage (I1, IN1). Their headquarters are located far away, which slows down decision making processes (IN1).

To remove this barrier, putting pressure on firms is necessary (IN1). For example, a government strategy is to force companies to only use monogamous textile in their products. Most clothing is made of blended materials, such as cotton and elastane (Franco, 2017). Current technology is hardly able to separate these

materials, and if successful, the quality is downgraded. Therefore forcing companies to use pure materials in their clothing helps the recycling process (P2). Instead of focusing on large and slow firms, it is also possible to make the region attractive for innovative, new firms (I1). Positioning the AMA as an experimental hub is possible through negotiating with these innovative firms in changing the laws or regulations in favor of desirable firms. This change of regulation solution is also proposed by the Gemeente Amsterdam (2020), who state that they lobby for frequent adaption of laws and regulations to accelerate the circular transition.

Third, due to the complex value chain of the clothing industry, it is hard to implement the circular economy model. Supply and demand of recycled materials need to match (M1). Scaling up recycling facilities is as well hard to organize. To decrease the complexity of the value chain, the marketeer has a proposition:

It is a business development project, to connect entrepreneurs at the end, such as a Wieland Textiles with the Fibersort machine, with entrepreneurs at the start of the value chain in Turkey, who grind our waste to cotton fluff and blend it with virgin cotton to make a jeans. You literally need to let people meet.

Marketeer

It shows that business developers in this case could drive the industry's transition, however not at the regional level but industry-wide. This helps create a circular value chain. The barriers and agency solutions are summarized in table 9.

Regional transition barrier	Barrier properties	Solutions	Agency
Industry barrier	Competition	Support startups	Regional government
		Stimulate collaboration	Multistakeholder
			partnerships
		Ex'Tax	Lobbyists
		Fund recycling innovations	Investors
	Vested interests	Forcing organization change	National government
		Stimulate innovative firm	Intermediary
		creation	
		Create experimental region	Regional government
	Complex supply chain	Business development	Businesses

Table 9: Industrial barrier. Source: author

Section 6.2.2: Policy barrier

For policy, we recognize two properties of the regional policy which constrain the circular clothing transition.

First, policy is slow and 'bureaucratic' according to three respondents (P1, P2, RB1). One policymaker explains the careful character of policy, as increasing regulation could lead to more corruption (P2). More rules and interactions between bureaucrats and firms may cause corruption under certain circumstances (Dunlop & Radaelli, 2019). Also implementing a regulatory change as a tax shift is complex, as the financial flows need to be redirected at a precise and honest way (P1, IA1). Moreover, the fragmented visions and politics between municipalities slows down policy changes as shown in section 5.1.2.

There is a need for more and better educated policymakers to enforce new regulations and prevent corruption. NGO's provide tools (N1). Also knowledge institutions could research solutions as Ex-Tax to decrease the uncertainty. Moreover, aligning visions within the AMA through the AMA partnership could

improve political cohesion in the region. This is an active goal of the AMA partnership and thus being carried out.

Second, the policy targets set by the local, regional and national government are unsubstantiated by industry experts. Setting a percentage for minimum recycled material usage in certain products is unrealistic. This leads to unreachable targets.

Better communication with the industry improves the reachability of these targets through policy cocreation (N1). Multistakeholder partnerships, as explained by the NGO below, help communicate:

'I think that the Green Deal initiatives that are kicking off at the moment where you bring multistakeholder partnerships together, where you connect industry kind of private business partner here and you really bridge those discussions of the needs that each one of them have and the funding available to implement and test the innovations is actually a really good opportunity and hopefully a solution for the future.'

Respondent at NGO

Building these partnerships is suitable for an intermediary or regional government, which set up the Green Deal Circular Textile. One of these actors need to take the lead, which requires process funds in turn. These strategies are summarized in the table 10 below.

Regional transition barrier	Barrier properties	Solutions	Agency
Policy barrier	barrier Slow organization Educate government officials		NGO
		Research regulation	Knowledge institutions
		implementation	
		Collaboration between AMA	AMA partnership
		municipalities	
	Unrealistic targets	Industry collaboration	Multi-stakeholder
			partnerships

Table 10: Policy barrier. Source: author

Section 6.2.3: Knowledge barrier

There is also a knowledge barrier for the circular clothing transition, with the properties of lacking transparency and skilled workers. First, the lack of transparency comes in the form of missing product information and greenwashing. For example, producers do not show the full product story, as a designer explains:

'regulation for transparency is important as people can have an honest opinion about clothing. Then people can ask their friends: why are you wearing clothing which was transported across five continents? It is nonsense.'

Designer

Instead of giving transparency, companies greenwash their unsustainable operations. Brands use incorrect circular strategies to sell more clothing, which adds to the initial problem (N1, P2). Also, certifications are bought as they are cheaper than actual sustainable materials (RB2). This causes unsustainable firms to greenwash their operations as well.

One solution is to make reporting mandatory by the national government (IA1). To monitor the reporting, NGO's or knowledge institutions could educate public officials. Another government agency solution is creating a green consumption guide. They then select trustworthy, impactful companies which helps consumers make sustainable choices which constrains unsustainable firms (IA1). Another solution is a digitally enabled region with data driven solutions (IA1, N1). It helps track material flows and product life cycles. A policymaker expects large firms, which have more data than small ones, to come with these

innovations. In contrast, the NGO sees smaller firms, more innovation oriented, to come with this solution.

Second, there is a lack of skilled workers. Digitalization helps to track materials. However, there is a supply of workers in digital industries necessary for that (IN1). Also circular strategies require textile techniques which have disappeared along with the decline of the textile industry, according to a respondent at a knowledge institution (K1). The NGO agrees and elaborates that vocational training has also been disappearing, leading to a skills gap (N1).

To solve this, more students and teachers are needed to bridge the skills gap (N1). Collaborating between knowledge institutions and companies could help build up human capital through internships and office visits, set up by an intermediary (K1). These agency strategies are summarized in table 11.

Regional transition barrier	Barrier properties	Solutions	Agency
Knowledge barrier	wledge barrier Lack of transparency Digital enabled region		Innovators
		Green buying guide	Regional government
		Mandatory reporting	National government and
			knowledge institution
	Lack of skilled workers	Knowledge institution –	Intermediary
		business collaboration with	
		internships	

Table 11: Knowledge barrier. Source: author

Section 6.2.4: Culture barrier

There are two themes in the qualitative data relating to culture which form barriers. First, consumer behavior hampers the transition. Preferences, perceptions and traditions play a role. Consumers prefer cheap clothing, whereas circular clothing are often more expensive (K1, P1). The Netherlands also has a high consumption per capita (N1). Moreover, the Euro 2020 football championship is an example of how consumption is rooted in Dutch culture:

With every case of beer, you get a dress, but in three weeks we will be finished with the Euro 2020 and then you will see the clouds of smoke coming out of the incinerator again. How does the consumer feel about that? Do we all really want that or not?

Respondent of Industry Association

To remove this barrier, citizens need to become aware of their consumption and the negative impact of clothing. An awareness campaign by the government or knowledge institution towards citizens is a solution according to the NGO (N1).

Second, behavior of the industry needs to change. Used clothing is seen as waste, while it is a valuable resource (N1). It is difficult for people and firms to see this (M1). In contrast, the recycling business sees the economic valuing of waste in policy as a cause for ineffective policies. Also the tendency to make the economy 'smart' is an issue, as the intermediary poses:

'Intermediary: When it comes to making or repairing or activities that cannot be done on a very large process, then the interest also quickly disappears. So, it has to do with the costs on the one hand, and on the other hand people just don't think that it's sexy.

Researcher: Why isn't that sexy?

Intermediary: Because over the past 30 years we've learned that things have to be about data. Smart smarter smartest is important.'

Respondent of intermediary

According to the marketeer, changing the narrative concerning textile waste and craftmanship is a solution (M1). For example, framing The Netherlands as a cotton producing country helps companies see textile waste as a resource. Also revaluing manual labor and taking care of products support clothing repair activities. This can also be done by city marketing or awareness campaigns. These findings are summarized in table 12.

Regional transition barrier	Barrier properties	Solutions	Agency
Cultural barrier	Consumer behavior	Awareness campaigns	Regional government
	Industry behavior	Changing the narrative	Marketeer and regional government

Table 12: cultural barrier. Source: author

The different barriers are similar to the dimensions of the socio-technical regime (Schot & Geels, 2008). This section showed the possible solutions and agency to adjust these dimensions, opening up 'windows of opportunities' for the circular clothing niche. All three agency processes are recognized in the results. Innovative entrepreneurship is recognized by digital solutions coming from innovators, place leadership by startup guidance of the regional government and institutional entrepreneurship by regional lobbyists changing regulations. Also intermediaries play a large role as transition brokers in agency processes, by setting up networks and multistakeholder partnerships.

Section 6.2.5: Strategy implementation

While all barriers should be addressed and each solution could support a regional transition, resources to support transitions are scarce. A selection of strategies needs to be made. Therefore this section gives three recommendations to select strategies based on the theoretical framework and results. It then discusses which agency strategies are useful for the AMA. It helps select strategies on regional strengths, systemic impact and complementarity to current strategies.

Section 6.2.5.1: Regional capabilities

Implement strategies which leverage the regional capabilities. This prevents winner-picking strategies where a region is lacking in skills or technologies to build 'cathedrals in the desert' (Balland et al., 2019). Developing new activities which relate more to the skills, technologies or firms in the region decreases the risk of failure (Neffke et al., 2011). It prevents failures as mismatches between available and required labor. Nevertheless, regions could also use a strategy which is unrelated to the current regional capabilities. This sometimes leads to more radical innovation and new growth paths (Castaldi et al., 2015). The trade-off is that it has a higher risk of failure because of lacking capabilities.

As demonstrated in the first subquestion, a strong capability of the AMA is fashion design. Decisions made in fashion design impact the entire value chain, therefore the AMA is in the position to apply circular economy thinking across the global supply chain. With the abundance of global and European headquarters of companies, this research recommends to start partnership programs to promote circular design. The program could include making roadmaps for the involved firms to commit to a circular design focus in a specific timeframe. Agents setting up this partnership include intermediaries, industry associations or a NGO. The required resources are knowledge of circular design and the knowledge of explaining that to firms. By collaborating with a NGO providing circular knowledge tools to organizations, this could lead to increasing the amount and quality of circular R-strategies in their design process.

The first subquestion also showed a decline of clothing production and textile knowledge. With developing recycling technology, another strategy is to increase funds for recycled clothing production in the AMA. As demonstrated by Circle Economy (2021b), there is a lack of educated workers for circular

clothing activities. It therefore does pose a higher risk of failure. However, when starting to produce clothing in the AMA, companies can also educate their employees or attract skilled labor. Then it could lead to a start of a new industries and create jobs. Agents in this strategy include innovative companies active in recycling and clothing production, as well as a regional development agency to attract firms as spinners and weavers to locate more segments of the value chain in the region.

Section 6.2.5.2: Systemic impact

Regional transition barriers are interdependent. Fast fashion clothing exists due to the self-sustaining, systemic and intertwined barriers in this industry. For instance, cultural aspects are intertwined with the industrial organization. Consumers prefer affordable clothing and are unaware of the negative impact of overconsumption, thus the industry sees this as an opportunity to generate profit without taking negative effects into account. This also means strategies affect multiple barriers and should be selected on their systemic impact. It follows the logic of strategic niche management to challenge socio-technical regimes (Schot & Geels, 2008). Socio-technical regimes are based on the dominant policy, culture, technology and other dimensions of society. Due to the interdependency of these dimensions, selecting the right strategy could address multiple dimensions.

Analogously, the socio-technical regime presents a card house. While removing cards at the edges might cause few cards to fall, removing a card at the center allows the entire card house to fall. A more sustainable card house thereafter can be built, resembling a window of opportunity. Choosing a strategy based on systemic impact therefore addresses the entire socio-technical regime, creating a window of opportunity for circular clothing.

Through an awareness campaign, consumer preferences can be changed to favor circular clothing. As a result, it supports circular clothing companies with higher sales. This then removes the competition barrier and helps circular clothing to become mainstream. Moreover, regulating the industry by enforcing a minimum use of recycled material removes the vested interests barrier. Slow, mature companies then need to start using textile waste, which helps change the narrative of turning waste into a resource.

Both strategies are in development in the AMA. The Extended Producer Responsibility is a prime example of a systemic impact strategy, as it regulates the industry. However, it also provides a window of opportunity. Companies need to set up take back systems and reuse worn clothing. A potential strategy is to promote circular design through multistakeholder partnership, thus training companies on how to do that, anticipates this opportunity on reusing the worn clothing in their products.

For the AMA, this research recommends the awareness campaign, but also the education of government officials about circular clothing procurement. This helps overcome the barriers of slow government organizations and unrealistic policy targets. Namely, it improves the process of forcing change of large and slow firms through improved regulation enforcement. Also training government officials in sustainable public procurement helps to overcome the issue of policy fragmentation discussed in section 5.1.2. However, deciding to not participate in sustainable public procurement is also a political decision and therefore this solution is up for debate.

Section 6.2.5.3: Complementary strategies

Third, regions should implement complementary strategies. Most strategies noted in this research are in some way already implemented in the AMA. If current strategies are effective, additional strategies might have marginal impact. Therefore, the effectiveness and scope of current strategies should be evaluated, and 'blind spots' i.e. missing strategies need to be addressed.

The Green Deal Circular Textile addresses some barriers in the AMA, while respondents still argued that the barriers persist. Current Green Deal programs tackle different issues. Integrating circular principles for knowledge institutions organizes networks between knowledge institution – business and lets the parties learn about circular economy concepts. Recycling innovation and improvement of textile waste collection is also strongly presented in the Green Deal with two programs. Different experiment projects also add to positioning the region as an experimental region. One project created circular protective clothing for hospitals, which were highly demanded due to COVID-19, for example. An awareness campaign is also in development.

However, one blind spot in the Green Deal is digitally enabled solutions for the textile industry. It deals with the lack of transparency in the industry. Combining this with the strategy to set up circular design partnerships, it has a large impact potential. The AMA has a regional presence of ICT companies (Atzema, Goorts & Groot, 2011). The region also hosts multiple smart technology programs implementing artificial intelligence, such as Smart Health Amsterdam, demonstrating digital activity (Smart Health Amsterdam, 2021). Therefore it also relates to the regional capabilities logic. Starting multistakeholder partnerships including the government, digital companies and clothing companies, it could help in two ways. First, governments can increase their knowledge of their waste flows through better material tracking. It then helps predict how many textile waste is available for recycling, which information can be shared with companies. They can be stimulated to make use of this 'resource' stream. Second, through blockchain technology for example, designers can add 'smart labels' which enables customers to check the production. It helps users track the true story of their clothing, which enables resale, reuse and recycle because of correct transparancy.

Chapter 7: Conclusion

The aim of this research was to find out which strategies could support the circular clothing transition in the AMA. By researching the case study using a mixed method research design, it explored whether the region provided an enabling or constraining environment for circular economy initiatives. It then formulated which strategies are suitable to further support circular clothing initiatives. Answers of the subquestions help to answer the central question.

Which regional conditions were enabling or constraining for the transition towards a circular economy clothing industry in the AMA?

Based on the theoretical framework, this research expected the AMA to provide enabling conditions for the transition as it is a developed and metropolitan region. While the region has enabling conditions for design activities, it has constraining conditions for production activities. Policy instruments were found favorable for the transition, while policy fragmentation constrained it. Knowledge institutions provided knowledge diffusion between academia and business, as well as attracted external knowledge to the RIS. Quadruple helix interaction helps engagement in the transition. The socio-cultural context provides both enabling and constraining conditions, which need to be further explored.

What different strategies of regional agents could overcome current barriers in the transition?

The interviews helped to explore strategies, with expecting the agency processes in the literature to be useful. The results showed an industry, policy, knowledge and culture barrier constraining a transition towards a circular clothing industry, completely shown in table 13. Multiple strategies are possible to overcome these barriers by innovative entrepreneurship, place leadership, institutional entrepreneurship and transition brokering. Selecting strategies should be done on the base of regional capabilities, systemic impact and complementarity to current strategies.

Which agency strategies support the AMA in a transition towards a circular clothing industry?

This case study explored a diversity of strategies able to support the transition. Taking the RIS enabling and constraining conditions into account, this research reveals three agency strategies supporting a transition. First, intermediaries, NGO's or industry association support a transition by setting up multistakeholder partnerships to promote circular design for a low risk strategy. For a high risk strategy, innovative companies or regional development agencies enable a transition by developing circular clothing production in the region. Second, an awareness campaign or educating public officials in public procurement helps the transition by changing consumption patterns and supporting circular initiatives, set up by a regional government or NGO. Third, adding the strategy of developing digitally enabled solutions for the textile industry helps predict material flows and track clothing across their lifespan, executed by an innovative firm.

Regional transition barrier	Barrier properties	Solutions	Agency
Industry organization barrier	Competition	Stimulate collaboration	Multistakeholder
			partnerships
		Ex-Tax	Lobbyists
		Fund recycling innovations	Investors
	Vested interests	Forcing organization change	National government
		Stimulate innovative firm	Intermediary
		creation	
	Complex supply chain	Business development	Businesses
Policy barrier	Slow organization	Educate government officials	NGO
		Research regulation	Knowledge institutions
		implementation	_
		Collaboration between AMA	AMA partnership
		municipalities	
	Unrealistic targets	Industry collaboration	Multi-stakeholder
			partnerships
Knowledge barrier	Lack of transparency	Digital enabled region	Innovators
		Green buying guide	Regional government
		Mandatory reporting	National government and
			knowledge institution
	Lack of skilled workers	Knowledge institution –	Intermediary
		business collaboration with	
		internships	
Cultural barrier	Consumer behavior	Awareness campaigns	Regional government
	Industry behavior	Changing the narrative	Marketeer and regional
			government

Table 13: An overview of all barriers, properties, solutions and agency. *Source: author*.

Chapter 8: Discussion and reflection

This research contributed to the current stock of knowledge of circular economy in economic geographical research with several findings. For the RIS literature, it showed how economic development of a region affects its ability to enter a transition with a skills gap resulting from the disappearing of textile manufacturing, which is in line with evolutionary logic (Neffke et al., 2011; Castaldi et al., 2015). Also vested interests in this case study formed a barrier in the transition, thus extending the argument of Boschma et al. (2017). Trippl et al. (2020) noted the support of policy instruments as important in a transition, which is confirmed by the enabling condition of the Doughnut framework of the city of Amsterdam. The fragmented visions in the AMA formed a constraining condition, as proposed by Hansen & Coenen (2015).

Also the results show different roles for universities or knowledge institutions in transitions, which was unclear according to Hansen & Coenen (2015). They can educate skilled workers to close the skills gap and attract external knowledge, to be diffused afterwards. As for NGO's, they do not only function as a public research organization, but also as a trainer for all regional organizations to improve circular implementation, which further specifies the enabling condition of NGO's proposed by Trippl et al. (2020).

Theories suggested socio-institutional factors to play an important role in the RIS (Hansen & Coenen, 2015; Schot & Geels, 2008). For formal regulations, the effect of regulatory changes were positively received by respondents, thus supporting the transition. This research did found marginal evidence for socio-cultural aspects specific to the region. The cultural barrier for transitions is a national and global issue, rather than a regional one. However, this needs further research.

This research also contributed to the agency theory. While recognizing the three agency processes, the transition broker process of intermediaries could be considered as the fourth. In a competitive industry as the clothing industry, collaboration rarely occurs as shown in the results. Therefore, multistakeholder partnerships set up by these intermediaries increases knowledge diffusion and enables a transition, similar to findings of Cramer (2020).

It also contributed to generate practical insights in how to form strategies for regional transitions, as discussed in section 6.2.5. While giving three suggestions, they should be debated before implemented. Choosing a strategy based on regional capabilities depends on whether regional strategists have the resources to implement a high risk strategy, for example. Also educating government officials for public procurement could possibly not resolve the issue. Politics play a large role in this, so that should be taken into account. However, due to the increasing alarms of nature and society for a more sustainable clothing industry, action should be taken swiftly. On a final note, regional actor can also view potential network partners in the data visualization in section 6.1.3 and added dataset in Appendix C.

Some limitations need to be addressed when interpreting these results. Assessing whether a RIS has constraining or enabling conditions for a certain industry is difficult with the qualitative method. Not every aspect, such as the socio-cultural context, has specific configurations for regions. In this case, that can be explained by the globalized character of the clothing industry. Therefore, questions in the interview about the region's specific socio-cultural context evoked global and broad responses. Including a citizen of Amsterdam would have completed the qualitative data in this respect. Moreover, the COVID-19 situation impacted this research and data collection. The functioning of a RIS is moved to digital environments rather than physical ones. Researching the effects of the pandemic were beyond the scope of this paper.

While the research shows the methodological steps for reliability, it cannot be guaranteed that repeating the research leads to the same results. For the quantitative data, there are multiple grey areas on organization selection, which is highlighted. For the qualitative data, qualitative research is prone to subjective biases. Repeating the interviews could evoke different responses. Still, the qualitative data is available to be researched again upon request and the methodology is fully explained. Moreover, it is difficult to generalize findings of this research to other regions and industries. However, it should be viewed as a useful narrative to build a systemic account of regional transitions.

The research provides suggestions for further research. This research focused on a developed, knowledge intensive region, similar to RIS and triple helix research (Asheim et al., 2020; Etzkowitz & Zhou, 2017). Further research should address developing, Non-Western economies to broaden the applicability of the framework. These economies increase their consumption patterns along their development. Therefore, implementing a circular economy model helps prevent high consumption levels and build sustainable economies. Different types of governments could also require different strategies. Centralized economies, for example, have different waste policies which need adjusted strategies. As earlier stated, a systemic analysis of different case studies across different contexts would be desirable to extend the framework of Trippl et al. (2020). Finally, the analysis could be improved by adopting a mission-oriented innovation system lens. It then also incorporates technological innovation systems and helps analyze transitions out of a mission-oriented perspective (Hekkert, Janssen, Wesseling & Negro, 2020). As a result, society generates relevant insights to transition towards sustainability.

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Appendices

Appendix A: Interview list

Introduction

- 1. Could you briefly introduce yourself and your organization?
- 2. What is the relationship between your organization, the circular economy and the clothing industry?
- 3. What do you understand by the term circular clothing?
- 4. Since when have you been involved in the transition to a circular clothing industry? Why?

Regional conditions and actors enabling or constraining

- 5. What is specific about the region with regard to the transition to a circular clothing industry? Why is that?
- 6. Which actors have contributed to the development of circular clothing initiatives in the region so far?

Barriers for the transition

- 7. Imagine a future vision of an ideal region in 2040 regarding a circular clothing industry. What does that one look like?
- 8. If you now think back to the current region. What obstacles exist in achieving that ideal region?

Innovation

9. Which innovations are needed to remove these barriers?

Agency / actors

10. Who do you expect this from? How could these innovations come about?

Closing

- 11. Which initiatives or organizations do you find exemplary in the transition to a circular clothing industry? Which one would you like to see less of?
- 12. Is there anything else you want to say that we haven't discussed?

Thanks!

Appendix B: Code tree Nvivo



Appendix C: Dataset involved actors AMA circular clothing

Name	Туре	RIS	Founded in	Site
Aarden	Brand	Business	National	https://aarden.space/
				https://www.abnamro.nl/nl/prive/index.htm
ABN Amro	Investment	Support	MRA	1
Amsterdam				
Economic				
Board	Network	Support	MRA	https://amsterdameconomicboard.com/
Amsterdam				
Fashion	Knowledge	Knowled		https://www.amsterdamfashionacademy.co
Academy	institution	ge	MRA	m/
Amsterdam				https://www.hva.nl/opleiding/amfi-
Fashion	Knowledge	Knowled		amsterdam-fashion-institute/amfi-
Insitute	institution	ge	MRA	amsterdam-fashion-institute.html
Amsterdam				https://www.iamsterdam.com/en/business/
InBusiness	Policy	Policy	MRA	setting-up/our-services/about-us
Amsterdam				
Transition	Knowledge	Knowled		https://www.amsterdamtransitioninstitute.n
Insitute	institution	ge	MRA	I/
	Knowledge	Knowled		
Artemis	institution	ge	MRA	https://academieartemis.nl/

Atelier				
Noterman	Brand	Business	International	https://ateliernoterman.com/nl/stores
Bijenkorf	Brand	Business	MRA	https://www.debijenkorf.nl/
Bomb The				
Brand	Brand	Business	MRA	https://www.bombtheBrand.nl/
BYBORRE	Brand	Business	MRA	https://byborre.com/
Circle				
Economy	Non profit	Support	MRA	https://www.circle-economy.com/
Clean &				
Unique	Network	Support	MRA	https://www.cleanandunique.com/
	Maintenan			
Cleanlease	се	Business	National	https://nl.cleanlease.com/nl/home
Curitas (De	Collector &			
Boer Group)	processor	Business	International	https://www.curitas.nl/
Daily		. .		
Mantra	Brand	Business	National	https://www.dailymantra.nl/
De Steek	Brand	Business	MRA	https://naaicursusamsterdam.com/nl/
Diva Power				
DP	Brand	Business	MRA	https://www.divapower-dp.com/
Ellen				
MacArthur	No	C	late and the set	https://www.ellengeseth.cf.co.detics.co.d/
Foundation	Non profit	Support	International	https://www.ellenmacartnurfoundation.org/
Exota (King	Brand	Business		https://kinglouio.pl/
Eoule)	DI di lu	DUSITIESS	IVINA	https://kingioule.n/
Good	Non profit	Support	MRA	https://fashionforgood.com/
Good C Star	Brand	Business		https://www.g.star.com/
Gomeente	DI di lu	DUSITIESS	IVINA	https://www.g-stal.com/
Amsterdam	Policy	Policy		https://www.amsterdam.pl/
Gemeente	Toncy	TOTICY		https://www.ansterdam.m/
Haarlem	Policy	Policy	MRA	ondernemers/
Gemeente		,		
Lelvstad	Policy	Policy	MRA	https://www.lelvstad.nl/Inwoner
Gemeente		,		
Zaanstad	Policy	Policy	MRA	https://zaanstad.nl/
House of				
Skills	Non profit	Support	MRA	https://houseofskillsregioamsterdam.nl/
	Collector &			
HVC	processor	Business	National	https://www.hvcgroep.nl/
InvestMRA	Investment	Support	MRA	Coming soon
J Label	Brand	Business	International	https://www.jlabel.com/
Kings Of				
Indigo	Brand	Business	MRA	https://www.kingsofindigo.com/
Lalaland	Media	Support	MRA	https://lalaland.ai/nl/
Leger des				
Heils	Non profit	Support	International	https://www.legerdesheils.nl/
Lena's				
fashion				
library	Brand	Business	MRA	https://lena-library.com/
Logocomo	Brand	Business	National	https://logocomo.com/about/
Loop.a Life /				
Brightloops	Brand	Business	MRA	https://loopalife.com/
Makers				
Unite	Brand	Business	MRA	https://makersunite.eu/

MakersUnit				
e	Brand	Business	MRA	https://makersunite.eu/
Marble				
Berriez	Brand	Business	National	https://marbleberriez.nl/
	Collector &			
Meerlanden	processor	Business	MRA	https://www.meerlanden.nl/
Meester	Knowledge	Knowled		
Koetsier	institution	ge	MRA	https://meesterkoetsier.nl/
MUD leans	Brand	Business	MRA	https://mudieans.eu/
MVO NI	Non profit	Support	National	https://www.myonederland.nl/
Now	Non pront	Support	National	https://www.httonedenand.ht/
Industrial				
Order	Brand	Business	MRA	https://pew-industrial-order.com/
New	Diana	Dusiness		https://new industrial order.com/
Ontimist	Brand	Business	MRA	https://shop.newontimist.nl/
Orthodovy	Brand	Business		https://shop.newoptimist.in/
Dakhuis da	Didilu	DUSITIESS	IVINA	
Pakiluis de	Non profit	Support		https://dogwijgor.pl/
Zwijgei	Non pront	Support		
Patagonia	Brand	Business	International	https://www.patagonia.com/home/
Ragnarok	.	. .		
Clothing	Brand	Business	National	https://ragnarok-clothing.com/nl/
Rambler	Brand	Business	MRA	https://ramblerstudios.com/
Reblend	Brand	Business	MRA	https://www.reblend.nl/
Reflow	Policy	Policy	International	https://reflowproject.eu/
Renoon	Network	Business	MRA	https://renoon.com/
	Maintenan			
Repaircafe	се	Business	MRA	https://www.repaircafe.org/
ROC van	Knowledge	Knowled		<u></u>
Amsterdam	institution	ge	MRA	https://www.rocva.nl/
SHIFT Invest	Investment	Support	MRA	https://shiftinyest.com/
SKOT	Brand	Businoss		https://skatfachion.com/nl/
Shor	Collector &	Dusiness	WINA	
n	processor	Business		https://www.spaarnelanden.nl/
	processor	Business		
Ssaar	Brand	Business	National	https://www.ssaar.ni/
Studio Jux	Brand	Business	MRA	https://studiojux.com/
Studio				
Miyagi	Brand	Business	MRA	https://studiomiyagi.co/
SuitSupply	Brand	Business	MRA	https://suitsupply.com/
Sustainable				
Apparal				
Coalition	Non profit	Support	International	https://apparelcoalition.org/
	Collector &			
Sympany	processor	Business	National	https://www.sympany.nl/
Tanatex				https://www.linkedin.com/company/tanatex
chemicals	Brand	Business	National	-chemicals-b-v-/
Ten Cate				https://www.linkedin.com/company/ten-
Fabrics	Brand	Business	National	cate/
The				
Fabricant	Brand	Business	MRA	https://www.thefabricant.com/
The				
Renewal	Maintenan			
workshop	ce	Business	International	https://renewalworkshop.com/
Tommy				https://www.linkedin.com/company/tommy
Hilfiger	Brand	Business	International	-hilfiger/

Unravelau	Brand	Business	MRA	https://unravelau.com//philosophy- overview
Upset Textiles	Brand	Business	National	https://www.linkedin.com/company/upset- textiles/about/
Waag	Knowledge institution	Knowled ge	MRA	https://waag.org/nl/project/textilelab- amsterdam
Ware				
Westen	Network	Support	MRA	https://www.warewesten.nl/
Westen	Network Collector &	Support	MRA	https://www.warewesten.nl/