SUSTAINABILITY TRANSITIONS, POLICY-MAKING & CIRCULAR ECONOMY

A STUDY ON THE EFFECTIVENESS OF THE EUROPEAN AND DUTCH POLICY-MIXES AIMED AT IMPLEMENTING A CIRCULAR ECONOMY IN THE DUTCH AGRO-FOOD AND CONSTRUCTION INDUSTRIES.

Sustainability transitions, policy-making and circular economy: a study on the effectiveness of the European and Dutch policy-mixes aimed at implementing a circular economy in the Dutch agro-food and construction industries.

by

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Summary
Sustainability transitions are becoming increasingly important in policy-making, but due to the novelty of these transitions a lot is yet to be discovered about how both sustainability transitions and policy-mixes aimed at stimulating sustainability transitions (should) function. The transition aimed at creating a more sustainable economic model for production and consumption is called circular economy and the same story applies: the implementation of strategies aimed at creating a circular economy are growing explosively, yet there is still a lot left to be discovered about how circular economy is successfully introduced in a society and what policy-mixes are best suited in order to facilitate this transition. The aim of this thesis is to shed some light on the functioning of circular policy strategies in practice and whether or not they are successful in taking away barriers for sustainability transitions. In order to do that I have analysed the EU and Dutch circular economy policy documents aimed at the Dutch agro-food and construction industries. The results of this analysis were combined with the experiences of Dutch circular businesses in the aforementioned sectors on the barriers they encounter in their day to day operation. By placing these experiences in the failures framework for sustainability transitions designed by Weber and Rohrarcher (2012), I was able to provide an answer to the following research question:

How well are the European and Dutch policy mixes aimed at introducing a circular economy capable of tackling barriers of sustainability transitions in the Dutch agro-food and construction industries?

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Introduction

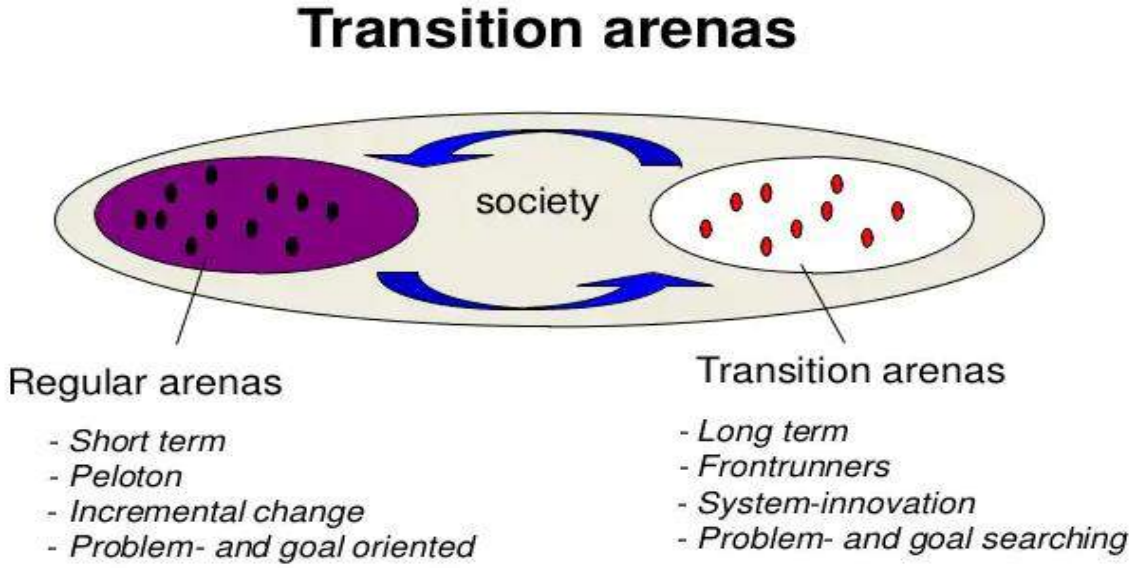
'The shift from resource-intensive socio-economic systems, to ones that function within planetary boundaries requires a socio-metabolic transition that fundamentally rethinks the role of material well-being, value, consumption, markets, user-practices, technologies and institutions. While the competition for scarce resources is promoting experimentation with new technologies and business models, the systemic and disruptive changes required for such a transition will not take place without significant changes in existing regulatory structures' (Kautto and Lazarevic, 2020; p. 207).

Over the course of the last fifty year, people have increasingly become more aware of the negative effects that human economic activity has on the environment, on other life on the planet and on ourselves. There is growing awareness that when we keep producing and consuming the way we do now, we will in due time make the planet uninhabitable for generations to come. In academic circles, this doom scenario has stimulated the creation of alternative models for production and consumption, which are captured by the overarching term sustainable development. Sustainable development, or sustainability, is a term that has grown in popularity since the 1980's and has now become a central theme in public discourse and political circles alike. Many different definitions exist for the concept, but a famous report by the UN World Commission on Environment and Development describes sustainable development as *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'* (United Nations, 2021). This report from 1987, which is nowadays better known as the Brundlandt report, was the first modern mainstream publication that interpreted development as something that goes beyond mere economic growth. With the publication of this report and the following UN Conference on Sustainability and Development in 1992 the term was globally adopted by scientists, think-tanks, national governments and international organisations.

This attention has led to the creation of very promising alternative models for our current linear economic system that has been dominant ever since the Industrial Revolution. These models have also captured the attention of policy-makers who are actively adopting policies and legislation in order to help societal systems transition to more sustainable alternatives. These so-called sustainability transitions are an entirely new field for policy-making and they present new political dilemmas, governance challenges, tensions and paradoxes (DRIFT, 2021). This is because sustainability transitions in terms of policy-making function very differently from 'normal' policies. First of all, sustainability transitions are processes that take place over a relatively long period of time; it usually takes around 25 to 50 years for a transition

to be completed in any given system (Vandermoere, 2018). This means that of the sets of policies that are now being implemented, the results will not be noticeable until years later. Making it difficult to assess whether they are working or not. Secondly, multiple actors (institutions, consumers, producers etc.) from multiple systems (economy, culture etc.) are involved in any transition. This means that when policies are created to stimulate sustainability transitions, they need to address multiple actors from different fields all at the same time. This makes policy-making for transitions far more complicated than 'regular' policy-making since the policies are more interlinked and are also capable of influencing each other, making the set of policy-mixes in place overall more complicated and unpredictable. Third, sustainability transitions contain a value judgment. Policies for sustainability transitions actively push towards a pre-specified direction and any delineation from that roadmap is considered to be undesirable. This is different from our current understanding of innovation and progress in which it does not matter what is being invented, since progress is progress (Paredis, 2010). This means that more than in other policy-mixes, policy-makers explicitly lay down the goals and ambitions of their proposed strategies.

Figure 1: Regular and sustainable policy-making compared.



Source: DRIFT, 12-12-2013.

There has been a high rise in policies being published related to sustainability transitions all over the world. From the local to the national level to supranational organisations, sustainability is increasingly becoming one of the most-published policy topics. At the same time, from a theoretical point of view researchers and scientists have in comparison little understanding of how sustainability transitions works in practice. The oldest sustainability transition, the energy transition, has only been going for around 10 to 15 years and is far from

complete (Diji, 2019). This means that there is no example of a finished sustainability transition that we can learn from and the sustainability transition field has mostly been built on frameworks and theories developed in order to study innovation and technological transitions (de Haan and Rotmans, 2018). There is currently a huge gap between the importance of sustainability transitions on one hand and our understanding of their functioning on the other.

One of these promising sustainability transitions that has become popular among policy-makers is circular economy. The European Commission describes circular economy as follows:

'A circular economy aims to maintain the value of products, materials and resources for as long as possible by returning them into the product cycle at the end of their use, while minimising the generation of waste. The fewer products we discard, the less materials we extract, the better for our environment' (Eurostat, 2021).

Circular economy provides an alternative model for our current economic system and replaces the 'take-make-dispose' model by a 'reduce-reuse-recycle' model. This goes further than just recycling our waste for example. Circular economy rethinks the way we produce and consume in every aspect of our lives. Its goal is to decouple economic activity from the consumption of finite resources (PwC, 2019). As of now, circularity is the most used model by policy-makers in order to replace our linear economy with a more sustainable alternative (George et al, 2015). Among others Austria, Brazil, Canada, China, Denmark, the EU, France, Germany, Italy, Japan, The Netherlands, Slovenia, the UK and the US are making efforts to introduce circular principles and ambitions in their policies (Iles, 09-07-2018). The biggest issue with circular economy is the same as with sustainability transitions in general: few is known about its functioning in practice and even less is known about how circular economy should be implemented in policy-making.

Academic research on circular economy is as of now still in its infancy (Blomsma and Brennan, 2017). A relatively large portion of publications on the topic concern themselves with the conceptualisation of circular economy and the overall understanding of what it entails (Kirchherr et al, 2017). Most studies that provide a more in-depth analysis of circular economy either concern themselves with the social and economic dynamics of circular economy on the macro-level or on single-company experiences on the micro-level (Merli et al, 2018). However, when it comes to understanding sustainability transitions, the most important level to be considered is the meso-level, also known as the regime level (Geels, 2004). This is because external factors are important to consider when trying to paint a complete picture of the circular transition while at the same time being able to take into account more case-specific

technicalities. By focusing on the study of circular economy in the meso-level, this thesis contributes to a lacunae in current scientific research.

The study of how circular transitions function from a policy making perspective is also relatively new. Literature that specifically addresses the role of policy mixes in sustainability transitions has been steadily progressing in recent years. However, it has been pointed out on numerous occasions that academic literature on the relationship between sustainability transitions and policy mixes is still suffering from knowledge gaps (Mazzucato, 2018; Turnheim et al, 2020). Not only are policy mixes for these types of transitions difficult to study, the use of policy mixes aimed at promoting sustainability are also very new and no sustainable transitions have been completed so far. This means that the study of this type of policy making needs to learn the dynamics of these policies while the transitions are taking place.

This thesis aims to contribute to the academic debates on sustainability transitions and circular economy by shedding some light on the implementation phase of transitions and what we need policy-mixes aimed at stimulating sustainability transitions to look like in order to create successful transitions. The answering of the following research question will be the central focus of this thesis:

How well are the European and Dutch policy mixes aimed at introducing a circular economy capable of tackling barriers of sustainability transitions in the Dutch agro-food and construction industries?

The answering of this question is supported by the following sub-questions:

- What overall ambitions are there for circular economy among policy-makers in the EU and the Netherlands?
- How does the concept of sustainable development connect to the circular economy ambitions of policy-makers?
- What policy-mixes have been introduced by the EU and The Netherlands in order to stimulate circular economy in the Dutch agro-food sector?
- What policy-mixes have been introduced by the EU and The Netherlands in order to stimulate circular economy in the Dutch construction sector?
- What transition barriers are being encountered by Dutch circular businesses that operate in these two sectors?

In order to answer these questions, I have chosen two Dutch sectors (otherwise known as socio-technical systems) and analysed the sector-specific circular strategies from the European and national level for these sectors. The focus on sectors (or socio-technical systems) was chosen since the environment that businesses operate in is incremental to understand in order to understand what policy-mixes should help overcome. These challenges are different in each

sector which is why it is necessary to understand the functioning of these sectors before any conclusions can be drawn about the effectiveness of the introduced policy-mixes. I have chosen the agro-food industry and construction industry as the subject of my case studies. This is because time and time again, these two sectors come up as one of the most important ones that need to transition towards a circular economy in order to realise a more sustainable economic system: *'to achieve the EU's long-term sustainability goals, the core systems of our societies will have to change dramatically. That is especially true for the systems related to food, energy, mobility and construction'* (EEA, 2021).

The policy documents from both governance levels have been analysed through a document analysis so that I was able to put together the policy-mixes used to stimulate the implementation of circular economy. By interviewing Dutch circular business-owners and experts on the topic I was able to identify the barriers that these people encounter while operating a circular business. In order to properly assess these barriers, I make use of the failures framework for sustainability transitions as proposed by Weber and Rohrarcher (2012). The results of both these efforts have been combined in order to give some insight into the barriers that sustainability transitions encounter and whether or not policy-mixes used for in this case circular economy are successful in taking away there barriers.

The first chapter, the theoretical framework and literature review, lays down the conceptual and theoretical groundwork for the rest of this thesis. The chapter discusses the development of the circular economy concept and where we currently stand in terms of research. The same goes for sustainable development as this concept is responsible for laying down the raison d'etre of sustainability transitions. The chapter also discusses the study of these transitions and the theoretical frameworks used to analyse the results of this thesis. The second chapter sketches the general development of circular economy ambitions on the European and the Dutch level and the strategies created in order to realise those ambitions. The third chapter provides an in-depth analysis of the Dutch agro-food industry and discusses the three drivers of a sustainability transitions (actors, technological artefacts and institutions) to see whether or not they are capable of making the circular transition happen. The discussion of the third driver, institutions, consists of the document analysis and presents a detailed account of the EU and Dutch policy strategies and policy-mixes aimed at stimulating the circular transition of the Dutch agro-food sector. The fourth chapter does the same as chapter three but now for the Dutch construction sector. The fifth chapter discusses the results of the interviews ordered through Weber and Rohrarcher's failure framework and connects these results to those from chapters three and four. Finally, the results from all these efforts are brought together in the concluding chapter together with policy-recommendations for the improvement of circular economy policy-making in the future.

Literature review and theoretical framework

Sustainability transitions

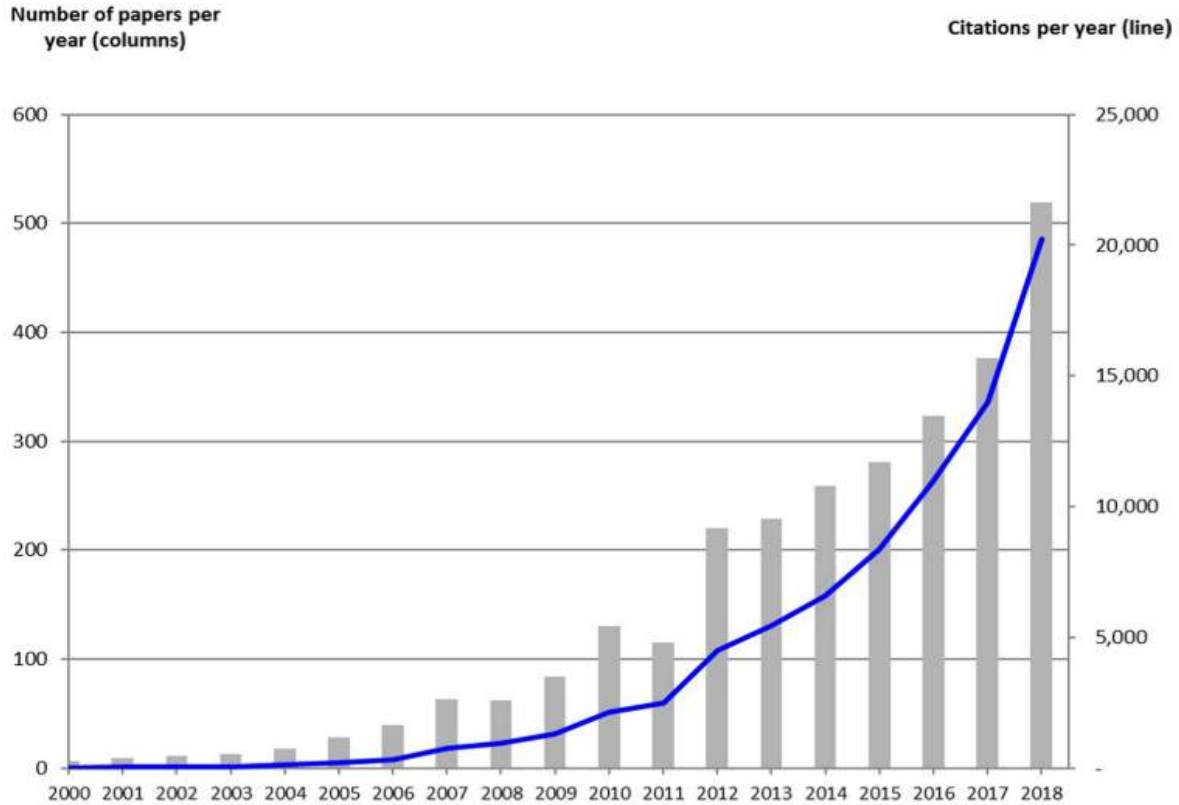
Our the past 40 years, the idea that our current linear economic system needs rigorous change has been exemplified by the rising popularity and importance of sustainability in public discourse and more recently, also in policy making. This popularity has been set in motion by the steadily growing realisation that our current ways of producing and consuming have created systematic issues; the depletion of natural resources, pollution, destruction of biodiversity and so on. Against this background, governments and supranational organisations have created new policies and targets in order to transform our economic system towards one that takes into account social and environmental needs. Circular economy is the most broadly adopted strategy used by policy makers in order to replace the current economic linear system with a cyclical system that also addresses environmental and social challenges (George et al, 2015). Since this means a fundamental shift from our economy's current mode of functioning motivated by an intrinsic motivation to adopt a more sustainable economic system, circular economy can be interpreted as a strategy that stimulates a sustainability transition (Jedelhauser and Binder, 2018).

Sustainability transition is the overarching term applied to the transition of socio-technical systems towards sustainability (Geels, 2018). Markard et al (2012) defined sustainability transitions as 'long-term, multi-dimensional, and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption' (p. 956). These socio-technical systems are made up by various different elements. Geels (2004) identified among others technology, science, regulation, user practices, markets, cultural aspects, infrastructure, production and supply networks as the cluster of elements that together form socio-technical systems. These socio-technical systems are created, maintained and refined by supply-side actors (firms, research institutes, universities, policy makers) and demand-side actors (users, special-interest groups, media) (Geels and Kemp, 2007; p. 442). Examples of socio-technical systems are agro-food systems, housing, mobility and energy.

Research in sustainability transitions aims to create analytical frameworks that identify the preconditions, driving mechanisms, broad patterns and possibilities for sustainable transformations in socio-technical systems (Kanger et al, 2020). This specific field of study has been made possible to a certain degree by the theoretical frameworks that were originally designed to study innovation and technological transitions (de Haan and Rotmans, 2018), but research in the sustainability transitions field has accelerated in recent years and has since come up with its own conceptualisations and theoretical frameworks.

Sustainability transitions have several key characteristics. First of all, sustainability transitions are multi-dimensional processes that consist of interdependent developments that happen at different speeds in different niches of the socio-technical system (Köhler et al, 2019). The transitions are enabled by a wide array of actors like academia, industry stakeholders, political institutions, civil society and individuals. But the most important aspect of sustainability transitions is that they intersect with stability and change. Our current production and consumption patterns are locked into the socio-technical system, which has created a strong path-dependency (Walker, 2000). Our consumption and production patterns are in that sense 'trapped' in the linear economic ideology. At the same time, sustainable innovations are being introduced that try to steer away from this path-dependency and the friction this creates is the core focus of sustainability transition studies. The central idea in innovation studies is that socio-technical system transitions supported by sufficient technological innovations in a favourable environment lead to the successful implement of new system regimes. Geels (2004) argues that socio-technical systems consist of three main dimensions: actors, institutions and technological and material artefacts.

Figure 2: Numbers of papers on sustainability transitions in peer reviewed journals and citations.



Source: Scopus, January 12 2019; taken from Köhler et al, 2019.

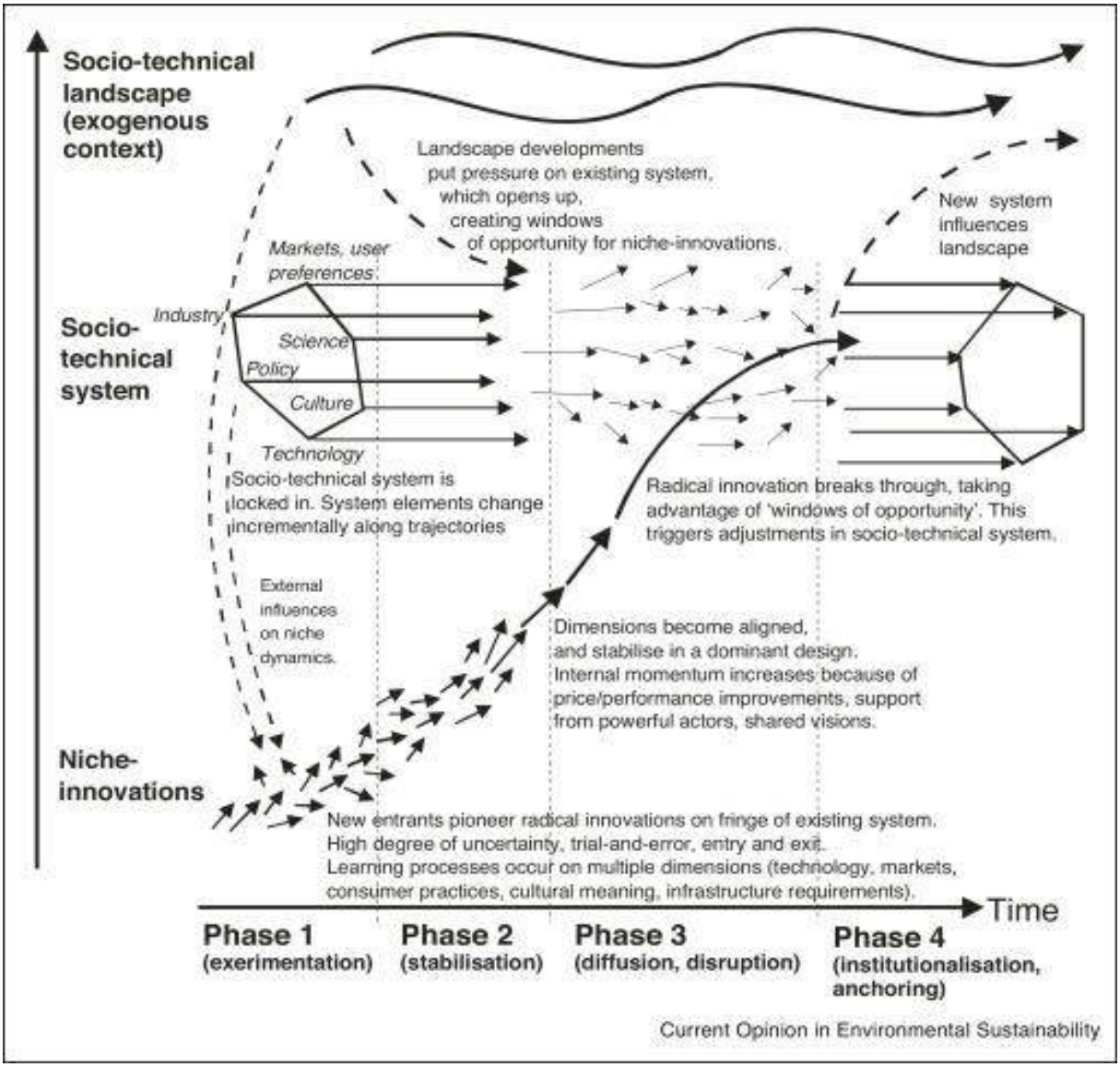
Within the field of sustainability transitions, four main theoretical frameworks can be identified: the Multi-Level Perspective (MLP), Strategic Niche Management (SNM), Transition Management (TM) and Technological Innovation Systems (TIS) (Meelen and Farla, 2013). MLP and TIS are more analytical approaches while TM and SNM are more practical frameworks. The first framework, the Multi-Level Perspective (MLP) is also the most dominant and most used framework within the academic field of sustainability transitions. This theory argues that transitions happen when there is interaction between three different levels: the niche level (radical innovation in specific spaces), the landscape level (the exogenous socio-technical context) and the regime level (the structures of the existing socio-technical system that force path dependency) (Kivimaa and Virkamäki, 2013). Niches can be considered the micro-level of transitions. In this space radical innovations are introduced that are different from the dominant socio-technical systems in place. An example of a niche innovation is the invention of solar panels. Solar panels are a sustainable invention with the aim of replacing other energy sources like coal and gas.

The regimes are the deeper structures that keep a socio-technical structure in place and can be seen as the meso-level of transitions. Regimes can be certain rules or beliefs, infrastructure systems, regulations and so on. Everything that keeps a socio-technical system functioning the way it does can be considered a regime. It are the regimes that force path-dependency and make transitions so difficult. Changing our energy networks in order to make them more sustainable is difficult since this would mean restructuring the entire infrastructure of the energy sector, creating regulations that take sustainable energy into account and so on.

Landscapes can be considered the macro level of transitions and include political ideologies, societal values, macro-economic trends and basically all large trends that influence niches and regimes (Geels, 2012). The reason why solar panels have been developed and the energy sector is adopting sustainable energy sources is because of the belief that climate change is bad and needs to be tackled, which is becoming increasingly more dominant in society. The MLP approach argues that niches, regimes and landscapes need to move towards the same goal in order to facilitate socio-technical transitions. They also exist in conjunction and reinforce each other. The MLP places the regime level at the centre of its approach, since socio-technical transitions are shifts from one regime to another (Geels, 2011). The niche and landscape levels have been interpreted as ‘derived concepts’ since they exist in relation to the regime.

Strategic Niche Management (SNM) is closely related to the MLP approach (Kemp et al, 1998). This framework focuses on providing theoretical and practical insights into how niches can be stimulated in order to facilitate sustainable development and therefore can contribute to the transformation of the regime (Safaryńska et al, 2012). This framework is mostly used for the analysis of radical innovations and how they contribute to sustainable development efforts.

Figure 3: The MLP interpretation of (sustainability) transitions.



Source: Geels, 2004; p. 915.

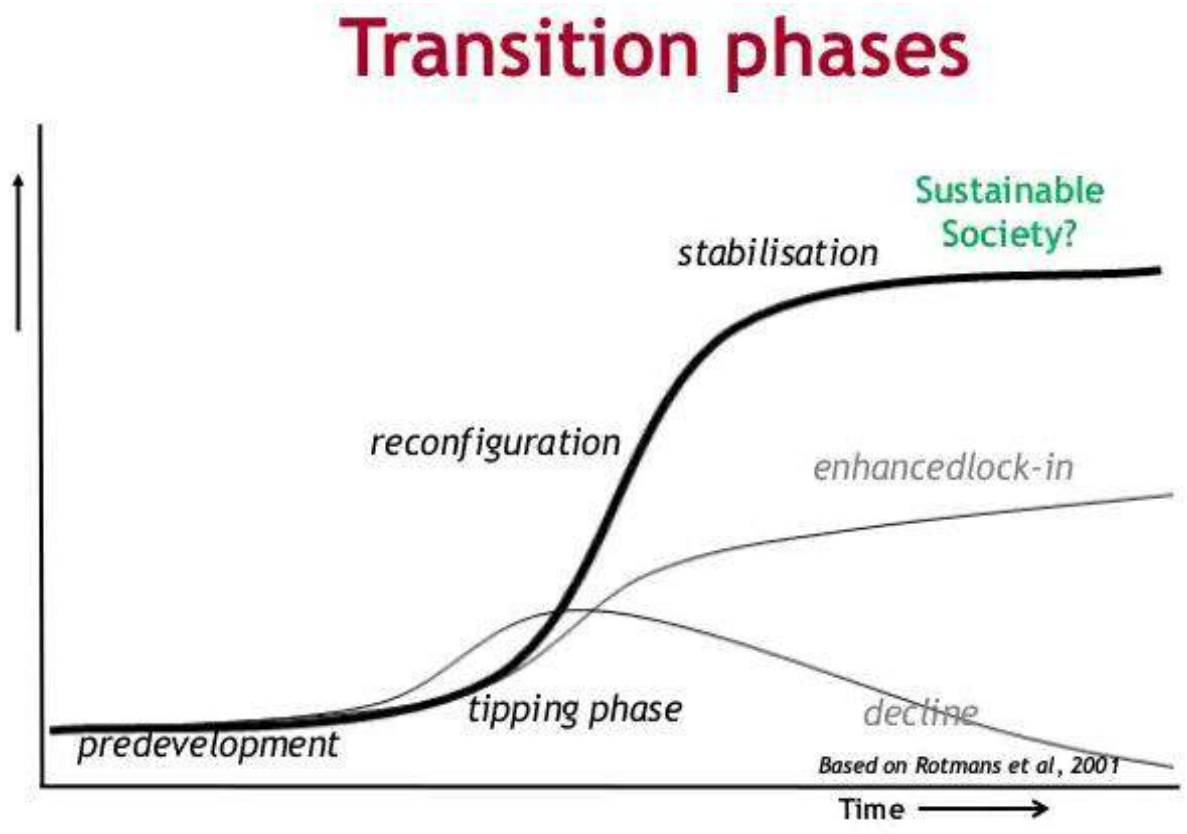
Transition Management (TM) is a more policy-oriented framework and can be seen as the more practice-oriented counterpart of MLP and has created a prescriptive framework consisting of four approaches through which policy makers can facilitate sustainability transitions (Köhler et al, 2019). Policy makers can use strategic (formulation of norms and long-term goals), tactical (steering activities and interests), operational (innovation through projects and programmes) and reflexive (monitoring and assessment of ongoing policies) strategies (Loorbach, 2009). The interpretation of sustainability transitions through the lens of transition management is very similar to the MLP perspective, but since this is the framework mostly used by policy-makers, including the Dutch government (interview 10), it is worthwhile to elaborate on. According to the Transition Management perspective, in the Netherlands better known under the name DRIFT (named after the Dutch Research Institute

For Transitions that helped develop the framework), a transition goes through three different scale levels: the macro, meso and micro levels. These three levels strongly coincide with the landscape, regime and niche levels of the MLP perspective.

According to DRIFT, a transition goes through four consecutive stages (Lodder et al, 2017):

1. Predevelopment: During this phase, some change is taking place in the socio-technical system, but this is not visible yet.
2. Tipping phase: The transition starts to take off during this phase and structural change starts to be visible.
3. Reconfiguration: During the third phase, the change starts to become visible in society and is becoming increasingly more dominant.
4. Stabilisation: De change has led to regime change and the transition will be completed.

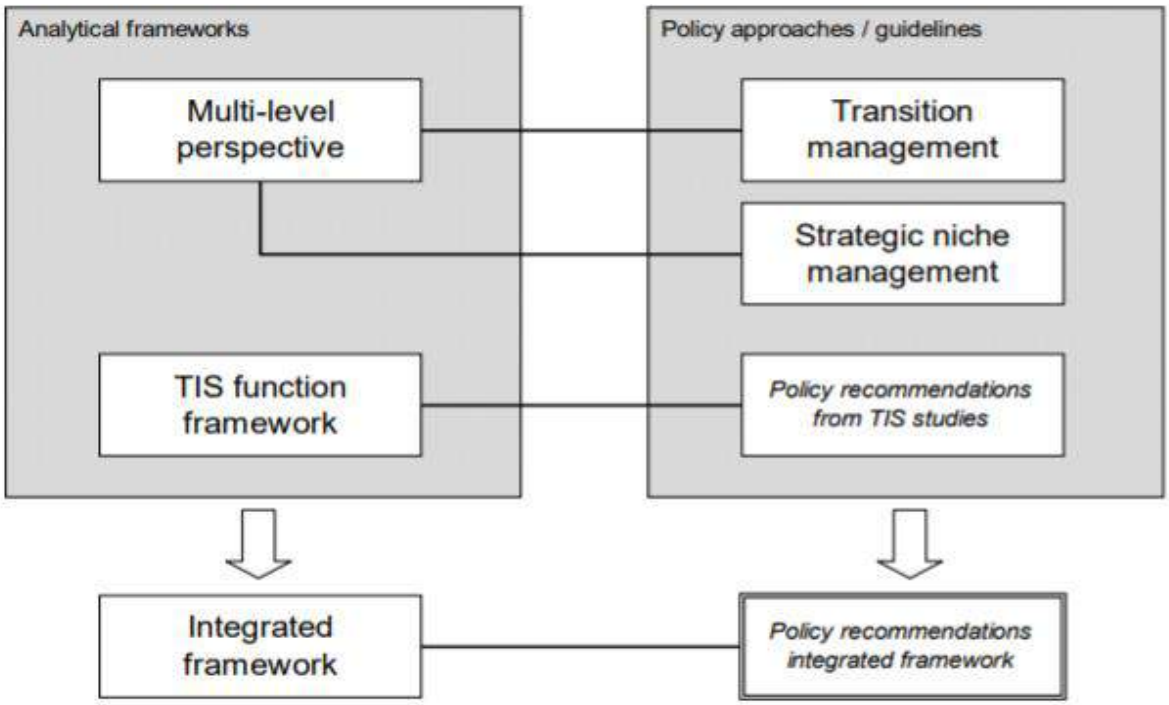
Figure 4: DRIFT transition phases visualised.



Source: DRIFT, 12-12-2013; slide 11.

Lasty, the Technological Innovation Systems (TIS) approach is concerned with the emergence of innovations and pays special attention to the drivers and barriers of a sustainable transition to another socio-technical system (Safaryńska et al, 2012). This has been specifically developed to inform policymaking about sustainability transitions (Markard et al., 2012). What all frameworks have in common is that they underline the multi-dimensional nature of sustainability transitions and aim to create an understanding of how society can transition from one socio-technical system to another one.

Figure 5: Schematic presentation of the four sustainability transition frameworks.



Source: Meelen and Farla, 2013; p. 4.

Sustainability transitions and policy making

There is also a branch of literature in the sustainable transitions field that specifically focuses on identifying the most appropriate policy mixes in order to help society transition to new socio-technical systems. Policy mixes have been defined as a set of policy goals, strategies instruments and policy processes that influence a given sector or system (Kanger et al, 2020; p. 1). Literature that specifically addresses the role of policy mixes in sustainability transitions has been steadily progressing in recent years. Kivimaa and Virkamäki (2013) created an analytical framework for policy analysis based on the work of other scholars and Rogge and Reichardt (2016) specified desirable characteristics of policy mixes; consistence, coherence, credibility and comprehensiveness.

However, it has been pointed out on numerous occasions that academic literature on the relationship between sustainability transitions and policy mixes is still lacking. Turnheim et al (2020) point out that research in regards to the identification and evaluation of relevant policy support mechanisms is rare, especially research on which specific targets and goals policy makers should focus in order to successfully help society transition remains a work in progress (Mazzucato, 2018). This is because policy mixes aimed at stimulating sustainability transitions are particularly challenging to research: they addresses multiple policy domains, there is a lot of uncertainty about the direction of future developments and they are complex since they do not only address technical innovations, but also changes in infrastructures, social practices, and market arrangements (Kern et al, 2019). Better understanding of how policy making can contribute to sustainability transitions can be reached by looking at a field of study that is called science, technology and innovation (STI) policy. This is a term for policies that promote the production, diffusion and use of scientific and technical knowledge in order to realise national objectives (Lundvall and Borrás, 2005). The TIS approach of sustainability transitions was strongly influenced by research from the STI policy field and the emergence of a new STI policy theoretical framework helps explains why policy-makers are promoting sustainability transitions.

STI policies and the transformative change approach

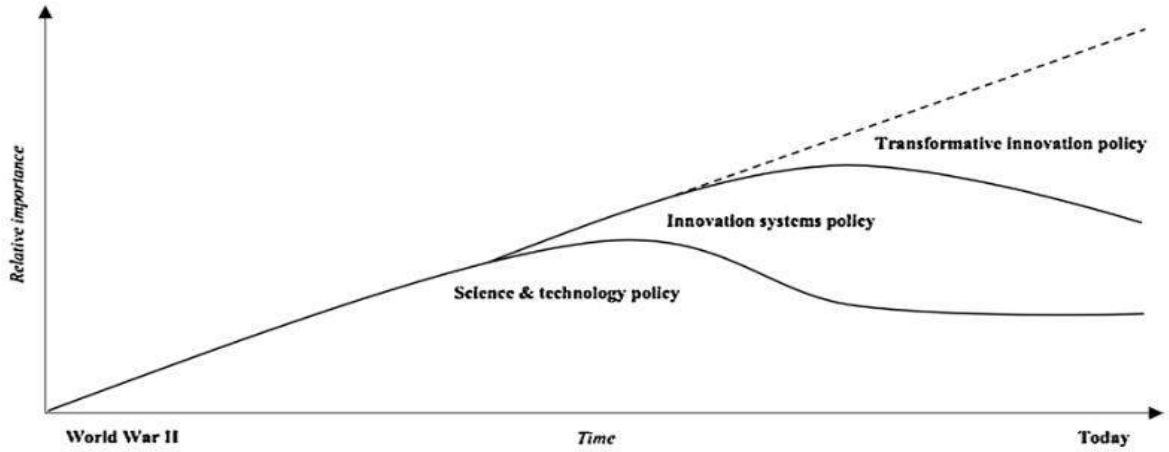
Within the field of STI policy studies, three theoretical framework have been developed in order to analyse policy mixes used by policy-makers in order to stimulate science, technology and innovation in society: the innovation and growth framework, the national systems of innovation framework and the transformative change framework. Innovation and growth developed on a large scale in the post-war era when there was a need for economic stability. This need stimulated government funding of scientific research that could bring economic and industrial benefits. A broad consensus emerged that the state should play an active role in the facilitation of new scientific discoveries, since these discoveries could be used in the private sector for industrial innovations, that in turn contribute to economic welfare (Schot and Steinmueller, 2016). A characteristics of the innovation and growth paradigm is that policy-makers only concern themselves with the R&D phase of innovation, since it is this step that often fails in an open market economy due to market imperfections. Policy mixes that fit this framework are for example favourable tax treatment and subsidies specifically aimed at stimulating R&D research carried out by businesses and private actors.

During the 1960s, anxiety rose about the possible consequences of science for public health and safety and, ultimately, environmental quality (Schot and Steinmueller, 2018). In addition to these societal concerns, doubt arose about the feasibility of the innovation-led economic model after the oil shocks and recessions of the 1970s and early 1980s, proving that innovation

was no guarantee for economic growth. This led to a re-evaluation of innovation and growth policies and the emergence of a new STI framework. This framework, national systems of innovation, captures the shifting focus of policies from businesses and industry to all actors in society and emphasizes the importance of relationships and network interaction in terms of innovation. Innovation is within this framework seen as the result of a complex interaction between various actors and institutions (OECD, 1997). Accordingly, national STI policies shifted their focus from stimulating private innovation to all kinds of varying policy practices focused on innovation carried out by all societal actors. Common examples are policies aimed at the improvement of coordination between stakeholders, the promotion of new technology based firms, market stimulation, the funding of education and training of employees and so on. The central goal of these policies is to improve networking amongst actors in the system in order to enhance the innovative capacity of businesses.

While different in focus, what these two frameworks have in common is that they both place economic growth as the main catalyst behind innovation. With the introduction of the Sustainable Development Goals in 2015 and other policy ambitions that also take ecologic and social norms into account, the new incentives for innovation became increasingly difficult to explain within the established frameworks. The creation of policies aimed at sustainability are seen as a significant break with the past in the field of STI policy, since neither framework is able to provide a satisfying explanation as to how sustainability fits into economic transition. This has led to the creation of a third theoretical framework within innovation policy studies that is able to take into account the contestation, non-linearity and bifurcations of societal challenges (Diercks et al, 2019; p.884). This theoretical framework is called 'transformative change'.

Figure 6: Visualisation of the three consecutive STI policy frameworks.



Source: Diercks et al, 2019.

A shift towards a broader societal policy agenda can be identified from the early 2000s onwards that steered away from the economic policy agenda that was dominant during the second half of the 20th century (Kallerud et al, 2013). National and supranational policies, with the 2009 EU Lund declaration being a notable first, began framing STI as a strategy to address 'grand challenges'. Scientific literature that attempts to capture this development in an analytical framework started to emerge in the 2010s. Weber and Rohrarcher (2012) were the first to connect the new societal focus in policy debates with STI policies, branding the development as a 'new type of policy for transformative change'. Kallerud et al (2013) expanded on this view by conceptualising what transformative change does:

'Policies for transformative change do not only address "failures" as defined within systemic innovation policy frameworks [...]. This involves, inter alia, the identification of major societal problems or challenges for which solutions need to be developed with the help of research and innovation, the formation of collective priorities and the development of shared visions' (Kallerud et al, 2013; p. 3).

Contrary to the innovation and growth and national systems of innovation frameworks, transformative change does interpret social and environment issues as a failure of innovation policies instead of labelling them as negative externalities that are part of the innovation process. STI policy should within this thinking be focused on sustainable transitions and move away from the focus on R&D and networks of actors to provide STI policies that integrate production, distribution and consumption systems (Transformative change [editorial], 2019). In addition to that, transformative change assumes that technological, social and ecological transitions go hand in hand, which is also a change from the previous frameworks that solely focus on the techno-economic aspect of STI-policies.

Weber and Rohrarcher (2012) have connected the Multi-Level Perspective (MLP) and the Technological Innovation Systems (TIS) approach with the transformative change framework and created a framework that helps with the identification of barriers that policies need to address in order to facilitate a successful sustainability transition. The scholars differentiate between three types of failures. Within economics, a long-standing neoclassical rationale that legitimises policy intervention is the market failure argument that argues that sometimes situations can occur in which the open market is not able to reach maximal efficiency on its own. The four market failures are public goods, market control, externalities and imperfect information. This line of argument is nowadays still prevalent within innovation studies to explain why governments create STI policies in order to interfere in the economy. The second category consists of structural system failures and these occur when innovation processes prove to be unable to reach the most efficient process on their own. Woolthuis et al (2005) distinguished four main types of failures within innovation policy design: infrastructural

failure, institutional failure, interaction of network failure and capabilities failure. The transformational system failures, the third category, were categorized by Weber and Rohrarcher themselves and describe failures in the governance of socio-technical systems change. By combining market failures, structural system failures and transformational system failures, Weber and Rohrarcher argue that it is possible to obtain 'a more comprehensive and unified picture of the kinds of failures that would give rise to legitimate rationales for policy interventions in processes of transformative change' (Weber and Rohrarcher, 2012; p. 1044). Within this thesis, the EU and Dutch circular economy plans will be analysed based on how well the proposed strategies, policies and support systems are able to address these barriers.

Figure 7: Weber and Rohrarcher's framework for failures in the context of transformative change.

	Type of failure	Failure mechanism
Market failures	Information asymmetries	Uncertainty about outcomes and short time horizon of private investors lead to undersupply of funding for R&D.
	Knowledge spill-over	Public good character of knowledge and leakage of knowledge lead to socially sub-optimal investment in (basic) research and development.
	Externalization of costs	The possibility to externalize costs leads to innovations that can damage the environment or other social agents.
	Over-exploitation of commons	Public resources are over-used in the absence of institutional rules that limit their exploitation (tragedy of the commons).
Structural system failures	Infrastructural failure	Lack of physical and knowledge infrastructures due to large scale, long time horizon of operation and ultimately too low return on investment for private investors.
	Institutional failures	Hard institutional failure: Absence, excess or shortcomings of formal institutions such as laws, regulations, and standards (in particular regarding IPR and investment) create an unfavourable environment for innovation. Soft institutional failure: Informal institutions (e.g. social norms and values, culture, entrepreneurial spirit, trust, risk-taking) that hinder innovation.
	Interaction or network failure	Strong network failure: Intensive cooperation in closely tied networks leads to lock-in into established trajectories and a lack of infusion of new ideas, due to too inward-looking behaviour, lack of weak ties to third actors and dependence on dominant partners. Weak network failure: too limited interaction and knowledge exchange with other actors inhibits exploitation of complementary sources of knowledge and processes of interactive learning.
	Capabilities failure	Lack of appropriate competencies and resources at actor and firm level prevent the access to new knowledge, and lead to an inability to adapt to changing circumstances, to open up novel opportunities, and to switch from an old to a new technological trajectory.
Transformational system failures	Directionality failure	Lack of shared vision regarding the goal and direction of the transformation process; Inability of collective coordination of distributed agents involved in shaping systemic change; Insufficient regulation or standards to guide and consolidate the direction of change; Lack of targeted funding for research, development and demonstration projects and infrastructures to establish corridors of acceptable development paths.
	Demand articulation failure	Insufficient spaces for anticipating and learning about user needs to enable the uptake of innovations by users. Absence of orienting and stimulating signals from public demand Lack of demand-articulating competencies.
	Policy coordination failure	Lack of multi-level policy coordination across different systemic levels (e.g. regional–national–European or between technological and sectoral systems; Lack of horizontal coordination between research, technology and innovation policies on the one hand and sectoral policies (e.g. transport, energy, agriculture) on the other; Lack of vertical coordination between ministries and implementing agencies leads to a deviation between strategic intentions and operational implementation of policies; No coherence between public policies and private sector institutions; No temporal coordination resulting in mismatches related to the timing of interventions by different actors.
	Reflexivity failure	Insufficient ability of the system to monitor, anticipate and involve actors in processes of self-governance; Lack of distributed reflexive arrangements to connect different discursive spheres, provide spaces for experimentation and learning; No adaptive policy portfolios to keep options open and deal with uncertainty.

Source: Weber and Rohrarcher, 2012; p. 1045.

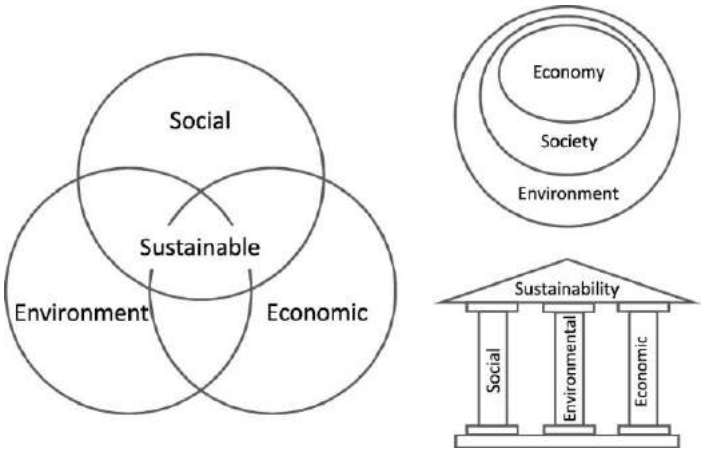
Sustainable development

The advancement of transformative policies follows the growing awareness in society that the linear economic model is insufficient in realising sustainable environmental and economic development (Ellen Macarthur Foundation, 2015). Since the 1960's, multiple developments laid bare the shortcomings of the economic growth model: the growth of inequality and poverty in society, environmental disasters, recessions and so on. It became increasingly clear that there exists a tension between economic growth on one hand and ecologic and social needs on the other (Kates et al, 2005).

The first major attempt to reconcile economic development and environmental integrity, which were commonly regarded as incompatible, was made by a publication by the World Commission on Environment and Development and is nowadays better known under the name Brundtland report (Caldwell, 1984). The Brundtland report introduced the term sustainable development into international policy discourse as the solution to the tensions between economics, society and environment (Purvis et al, 2019). The report describes sustainable development as *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'* (UNESCO, 2019). The Brundtland report did not frame economic growth as the problem, but as the solution; the economic model needs to be adapted in order to include environmental and societal goals in order to create a harmonised system. Since this publication the term sustainable development has been globally adopted by scientists, think-tanks, national governments and international organisations.

This has quickly led to the creation of the so-called 'three pillars of sustainability: profit, planet and people. Also often called the economic, environmental and social pillars of sustainability. Consensus has been reached among scholars to define sustainable development as the harmonisation of economic, environmental and social needs. However, what form that harmonisation needs to take in practice is still up for debate. Some scholars interpret sustainable development as the systematic interaction and intertwinement of the three pillars; they influence one another through mutual causality and positive feedbacks (Geissdoerfer et al, 2017; p. 4). This is often visualised in the form of a Venn diagram and was popularised by Jacobs and Sadler (1990). Another interpretation is that the three pillars move independently from one another, but are together needed in order to reach sustainability. This interpretation sees sustainability as the cumulation of better social, environmental and economic practices. One last interpretation views the different dimensions of sustainability as subordinate to one another, with the economic pillar as the most important one and social and environmental needs as complementary instead of equally important aspects of sustainability. Sometimes a fourth dimension, culture, is added to this interpretation (CIRAIG, 2015).

Figure 8: Visualisation of the interpretations of sustainable development in academic literature.



Source: Purvis et al, 2019; p. 682.

Focus on sustainable development in policy-making gained momentum when the Sustainable Development Goals (SDGs) were created by the United Nations. The SDGs are a list of seventeen goals, ranging from eradicating world hunger to reducing inequality, which need to be met before 2030 by the international community. At the centre of the SDGs is the goal to balance development in order to become social, economic and environmental sustainable. Both the EU and the Dutch government have named the SDGs as the basis of their sustainability reforms in policy documents. The most ambitious transformative strategy proposed by both the EU and the Netherlands to transform the economic system in such a way that it takes into account social and environmental needs is by replacing the linear economy by a circular economy.

Origins of Circular Economy

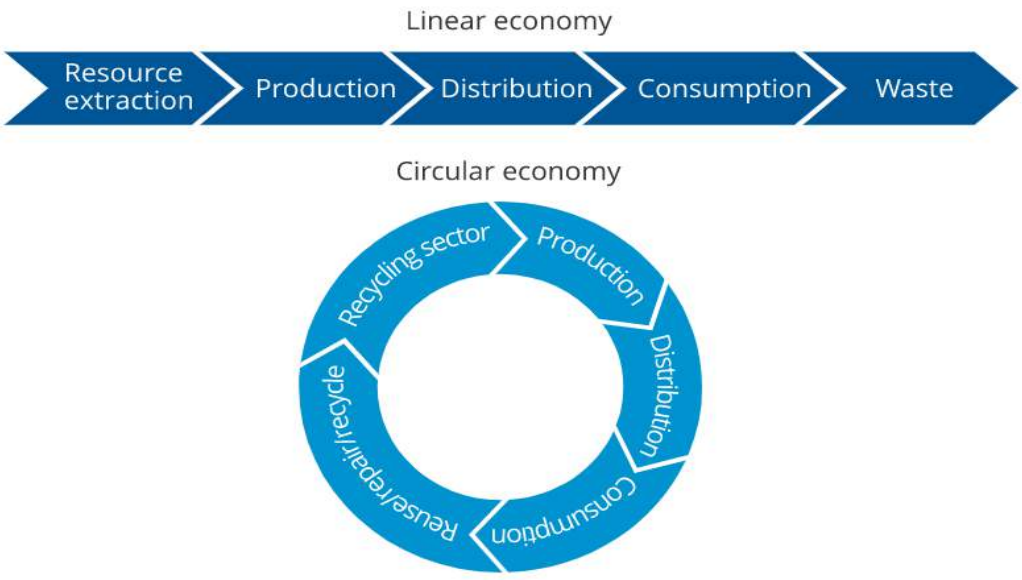
Although there is a growing understanding of the general meaning of the concept of circular economy (CE), it is rather difficult to develop all-encompassing definitions as CE is not a theory in itself but rather a combination of various theories and schools of thought. This has made CE an incredibly large and multifaceted concept whose essence cannot be easily captured in one or two sentences. In order to get a full grasp of wat CE is and what it entails, it is important to understand on which theories CE has been built.

In essence, CE is an alternative economic model. Our current economic system, the linear or industrial economy, is characterised by its linear production flow. This means that we use raw materials to make a product, this product is used by the consumer and after the product has lost its function it is discarded as waste. This form of consuming has really taken off since the start of the Industrial Revolution in the 1870's and has been dominant ever since. Natural

resources are finite and the production processes is consumer goods often cause negative externalities for the environment and local communities. In the end the product ends up as waste which not only cannot be reused meaning that we will need more natural resources, it also contributes to environmental degradation since industrial waste needs to be stored somewhere since it is often non-degradable and this is again damaging to human health and nature.

Multiple scholars coming from all sorts of disciplines have tried to conceptualise new economic systems in which economic activity is decoupled from environmental and social degradation. The first important step in this process is the creation of closed-loop production processes which replace our current linear economic model of 'take-make-dispose' with a 'reduce-reuse-recycle' model (PwC, 2019). Closed loops means that the system knows no output and therefore no waste; once a material is in use, it will stay in the system. These closed loops or cycles have been a key aspect of all the theories that circular economy borrows from: performance economy, cradle to cradle, industrial ecology, biomimicry and natural capitalism. Every theory has conceptualised aspects that have come together to form the essence of the circular economy concept.

Figure 9: Linear and circular economic models compared.



Source: AkzoNobel, 2016

In essence, there are two types of cycles within a circular economy: biological and technological cycles. Within the biological cycle, materials are biodegradable and can be safely returned to nature for biological processes without causing harm to living systems after human use. The technical cycle applies more to materials that have the potential to stay in a continuous industrial cycle by reusing them and by making sure they can stay within one cycle as long as

possible by promoting the repair of consumer goods. When products consist of both biological and technical nutrients, it is important that these two can be easily separated after use (Stouthuysen and le Roy, 2010). Nature's ecosystem is used as a model that these cycles are based on in biomimicry and natural capitalism. Nature does not know waste, merely input and output, which can be turned into input once again. The reasoning behind using nature as an example is that nature has had 3.8 billion years to evolve and constantly improve its ecosystems. These systems therefore have learnt what works best through millions of years of constant evolution. Nature therefore is able to achieve its objectives in terms of energy and material use in the most economically efficient way (Benyus, 1997). By shaping our economic system along the same lines, we will be able to produce and consume in a more effective way.

This brings us to the second important aspect that these theories have introduced: effectiveness. In economics, efficiency measures how successfully inputs have been transformed into outputs. Effectiveness on the other hand measures how successfully the system achieves its desired output (Law, 2009). Current sustainability measures focus too much on efficiency which will not lead to massive gains; the discussion should not be about the size of the carbon footprint, but about the fact that there is a footprint to speak of at all. The focus should therefore be on effectiveness instead since we need to adapt the economic system in order to become truly sustainable.

One final overarching concept that can be found in these theories that has also defined CE thinking is decoupling economic success and resource output. What should be at the centre of the new economic system differs per theory. Performance economy places knowledge (human capital) at the centre of the new system, while natural capitalism aims to include both human and social capital. At the centre of this reasoning is that negative externalities should be included in the cost price of products. The idea is that when the cost of human and natural capital is included on the balance sheet, our economic system becomes more sustainable because more sustainable options are the most cost-effective ones. The environmental and social sphere are just as important for the endurance of the economic sphere and the overall wellbeing of people, but our current linear economy system only attributes value to economic factors, which results in an inaccurate display of reality.

Figure 10: Overview of concepts that circular economy is rooted in.

Concept	Most important aspects
Performance Economy	- Closed loops - Effectiveness instead of efficiency - Knowledge-based instead of resource-based - Circular life cycle instead of linear one
Cradle to Cradle	- Biological and technical cycles - Eco-efficiency to replace efficiency - Three principles: waste is 'food', renewable energy, product diversity - Upcycling - Circular life cycle instead of linear one
Industrial Ecology	- Mimic nature for better production processes. - Closed loops - Dematerialisation
Biomimicry	- Mimic nature's ecosystems - Nature as model, measure and mentor - Cycles
Natural Capitalism	- Assign value to human and natural capital - Closed loops - From quantity to quality - Include negative externalities in price

Circular economy in academia

The introduction of the contemporary concept of circular economy is in academic circles attributed to environmental economists David W. Pearce and R. Kerry Turner (Geissdoerfer et al, 2017). In their 1989 publication *Economics of Natural Resources and the Environment* they describe how our linear and open-ended economic system is influenced by the use of natural resources and more importantly; our inaptitude to handle production and consumption output in the form of waste caused by the use of these resources. In their thinking they were influenced by the work of economist Kenneth Boulding who already in 1966 wrote about a closed and circular economic system in which economy and the environment can coexist with one another. Multiple definitions of circular economy exist. A study conducted by Kirchherr et al (2017) found a staggering 114 different definitions of CE used by scholars and practitioners. This lack of consensus on a CE definition is attributed to the fact that it is still a relatively young field of research that draws from different schools of thought (Blomsma and Brennan, 2017). It is also due to this reason that there is quite some literature on circular economy that purely focuses on researching how CE is defined in academic publications and in what contexts those definitions have been used. The most used definition of circular economy in academic literature has been created by the Elen MacArthur Foundation, a think tank founded with the sole purpose of studying circular economy:

'an industrial system that is restorative or regenerative by intention and design. It replaces the "end-of-life" concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models.' (Ellen MacArthur Foundation, 2013).

Three main branches of studies can be identified within the CE field: there is a group of articles that focus on the social and economic dynamics of circular economy at the macro level, then there are articles that focus on circular implementation at the micro level and lastly articles that discuss industrial symbiosis experiences at the meso level (Merli et al, 2018). Even though scholars use circular economy in different fields and describe different, some topics are brought up more often than others like cleaner production, waste management and reducing environmental impact (Homrich et al, 2018). Early circular economy research (2004 – 2015) was dominated by Chinese scholars and most publications are focused on topics in the environment and engineering field. Starting around 2016 European researchers have been leading the field. Articles from before 2014 were mostly concerned with CE on the macro level in China, while recent publications also include the micro level and investigate specific cases and industries (Khitous et al, 2020).

Circular economy in policy-making

What sets circular economy apart from other models that have been designed for a sustainable economy is the widespread attention the concept has managed to attract among different stakeholders in society. The reason why CE has become well known in comparison to for example biomimicry or cradle to cradle, who essentially promote the same ideas, is because of the wide following CE has attracted among policy-makers and business advocacy bodies in recent years (Korhonen et al, 2018B; p. 544). The concept of CE has almost been exclusively developed by so-called practitioners in its early stages: policy-makers, business associations, consulting groups, foundations etc. Scientific publications on the subject have sky-rocketed in recent years, but the concept of CE has been popularized by civil society instead of academia, contrary to the other theories. This has allowed circular economy to attract more attention among policy-makers, since it has been widely marketed as the strategy to reach sustainable development by civil society organisations.

Multiple circular economy policies have been successfully implemented over the past years, starting in 1996 when Germany created the 'Closed Substance Cycle and Waste Management Act'. This law implemented the closed cycle principle of CE on the country's waste management and made compatible waste disposal obligatory (Heshmati, 2015; p. 2). Japan followed suit in 2002 with 'The Basic Law for Establishing a Recycling-Based Society', which set recycling

targets and has as long-term goal the dematerialisation of Japanese society. Another milestone was hit in 2009 when China introduced the 'Circular Economy Promotion Law of the People's Republic of China'. This law is often seen as the first real circular economy law since it promotes all aspects of CE, not simply recycling and better waste disposal as the German and Japanese law have done. Since the implementation of the law, CE is recommended as an economic growth model in the country. Circular economy was first introduced on a smaller scale in the form of pilot studies, but has since been elaborated on with other laws and sustainability strategies (Pesce et al, 2020). However, CE implementation in China is nowadays still in a rather premature state.

The first supranational effort to promote CE was undertaken by the European Commission in 2012. The EC created the European Resource Efficiency Platform as a guidance platform for member states and the private sector in order to promote the transition to a more resource-efficient economy. The platform also published a manifesto which calls on business, labour and civil society leaders to support the transition to a circular economy (Heshmati, 2020; p.3). Since then, the EU has continued to work on circular economy strategies, most notable the 2015 First Circular Economy Strategy and 2020 Circular Economy Action Plan. Currently, circular economy is promoted by several more national governments like Canada, Finland, France, the Netherlands, Sweden and the UK, as well as by private sector initiatives around the world.

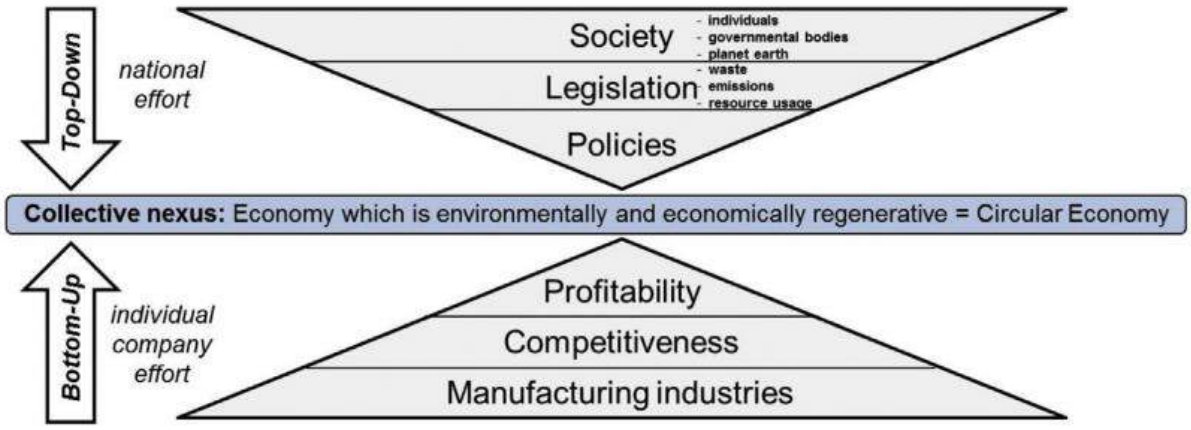
Circular economy implementation and barriers for businesses

Overall, a growing amount of research shows that the implementation of circularity in practice is desired, but that this can be a challenging task given how prevalent the linear economy and its structures still are in our industry and society (Lieder and Rashid, 2016; p. 46). A field of study for policy-making and circular economy is yet to be developed, this is also due to the overall fragmentated nature of circular economy research in academia. According to a report written by the Dutch Sustainability Businesses Association (2015) this lack of generalisation within studies concerning CE implementation has contributed to the lack of comprehensive approaches that governments take while developing their CE transition strategies.

Lieder and Rashid (2016) have aimed to create a framework for a successful CE implementation strategy. They conclude that it is necessary for all relevant stakeholders to be included in the implementation of CE and that this should be accomplished through both bottom-up innovation and top-down stimulation. This two-way approach is necessary since inverse motivation among stakeholders to introduce CE does not align and this needs to be righted. We do know from specific case studies that circularity can be successfully adopted by

industries (Ellen MacArthur Foundation, 2014), but large scale implementation will require a better understanding of the conditions that make this success possible in the first place.

Figure 11: Strategy for successful CE implementation.



Source: Lieder and Rashid, 2016; p. 46.

When it comes to the implementation of CE, scholars mostly focus their research on the creation of models that guide firms and governments in the transition to circularity (Merli et al, 2018). These models aim to identify patterns that in turn can be used to support firms and other stakeholders in the decision-making process. However, current research is still at an early stage when it comes to identifying these specific indicators, especially at the micro-level that companies operate in (Elia et al, 2016). This means that a shared framework on how CE should be implemented by businesses and how business plans can be adapted for circularity is still at large (Murray et al, 2017; Urbinati et al, 2017).

That does not mean that circular economy implementation in businesses is a complete blind spot. Multiple studies on the subject over the years have identified upsides to incorporating CE strategies into a companies' business plan. These include: cost savings in manufacturing, differentiation potential to meet low-cost competition, enhanced customer relations, improved understanding of customer behaviour, improved margins, reduced environmental impact and increased brand protection (Linder and Williander, 2017; p. 184). However, the transition from the traditional business model to a circular business model can be challenging when there is not a well-functioning policies mix in place that helps the socio-technical system transition as well.

An article by Nguyen et al (2014) has identified three main categories when it comes to problems with implementing CE strategies in businesses plans. The first category of issues has

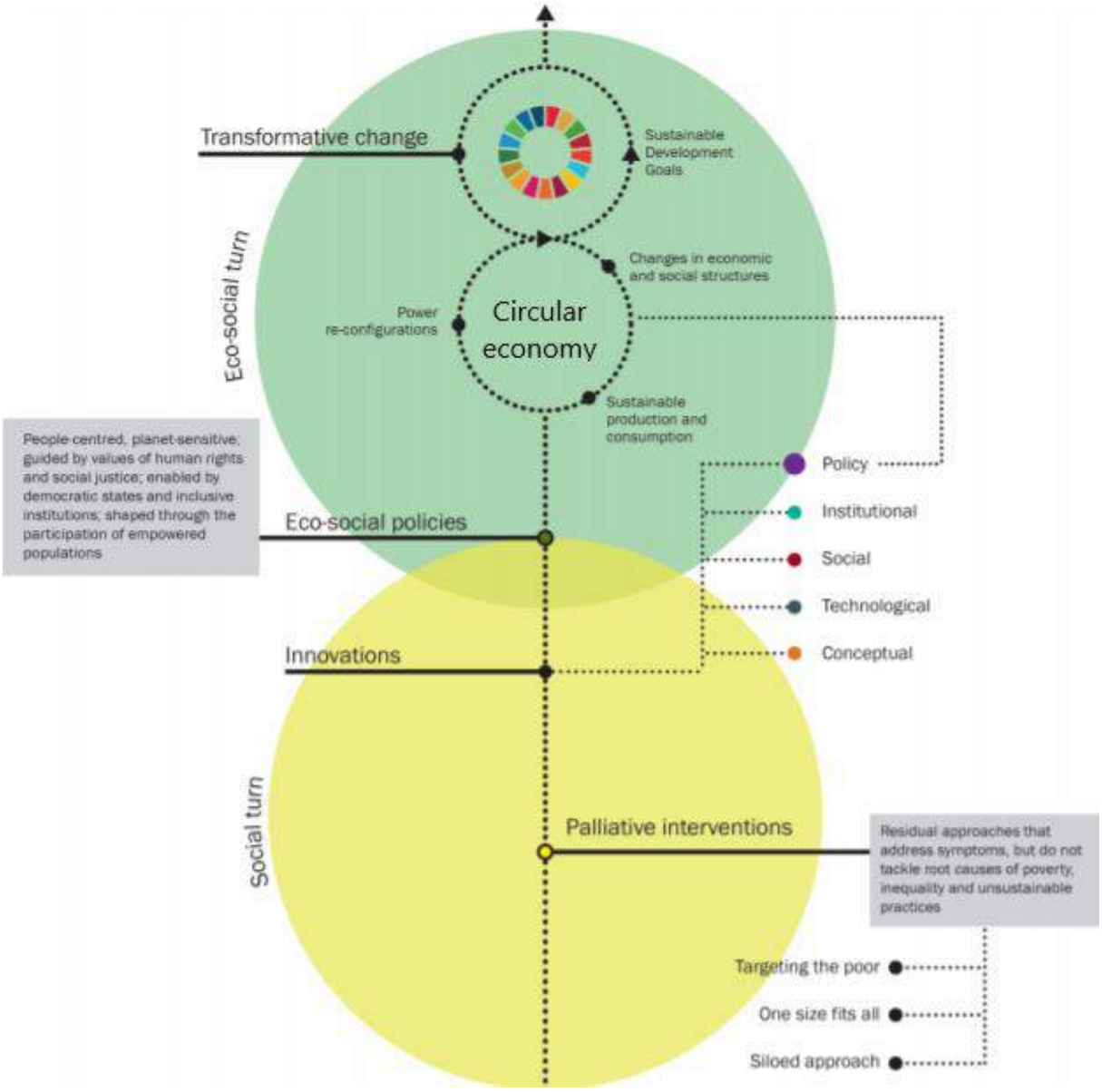
to do with geographic dispersion. The global supply networks within production chains have become so big and complex that implementing CE is incredibly complicated and it means that a lot of different businesses at different stages of the product value chain need to be on board before a product can become circular. The second set of issues has to do with the complexity of materials used in most final products nowadays. Origin of used materials is not always clear which makes guaranteeing a sustainable source difficult and the use of mixed materials makes recycling problematic. The last set of problems has to do with the so-called 'curse of the status quo': it is easier to keep doing what we have always done than to restructure entire processes, this applies to both the production and the consumption side.

Especially the curse of the status quo seems to inhabit a lot of different issues which businesses encounter when wanting to move to a more circular business model. The first issue is that circularity demands technological expertise. Products need to become suitable for remanufacturing and the product will more often than not require redesign, which can be really challenging is certain cases; the entire production process needs to be restructured. This is a very costly process and it is not always certain that the investment can be justified in the form of increased revenue. Secondly, some types of products are simply not suitable for remanufacturing, for example because the added value of the returned components are not competitive enough compared to using new ones.

Another issue is the so-called 'risk of cannibalisation', which means that CE strategies may lead to longer lasting products which will undermine the production output of a business in the long run, since consumers do not need to buy a new version of said product (Guiltinan, 2009). Return flows also prove to be an important source of tension for businesses that work with CE business models. Remanufacturing is built upon the premise that old or broken products are returned so that they can be reused. This product retrieval proves to be challenging in practice since companies are completely dependent on external factors for the return of products which makes return flows unpredictable and unreliable to work with.

Consumers add another complication to the mix. Circularity is aimed at the extension of life of products, but consumers are very sensitive to trends which are inherently short-term. This makes it more difficult for companies to respond to new demands and can lead to a decrease in sales. Circularity also increases risks for the business in general, for example when products are rented instead of sold. Liability is transferred from the customer to the producer, which results in greater financial risks. One last major restriction has been identified by Kuo et al (2010) who have concluded that a lack of supporting regulations forms a major barrier for the implementation of circularity strategies into businesses.

Figure 12: Relationship between transformative change, sustainable development and circular economy.

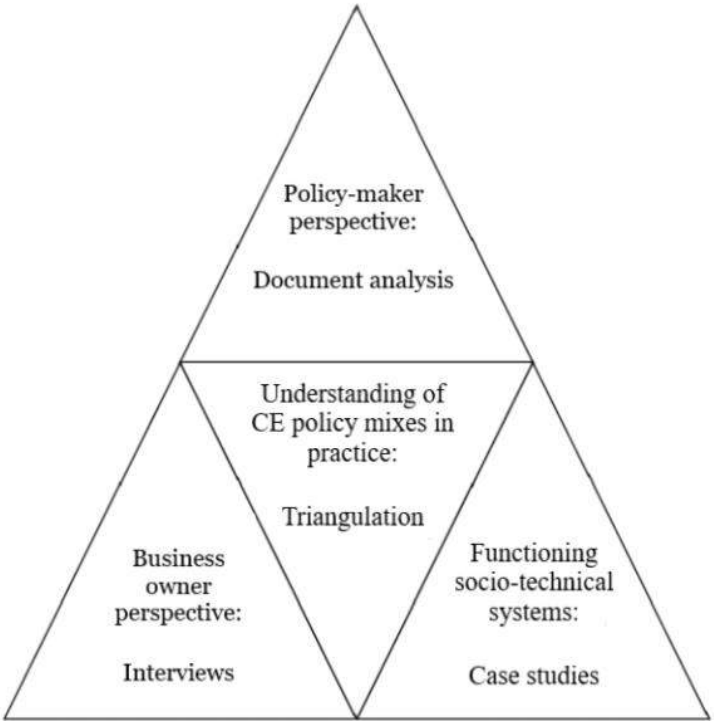


Source: United Nations Research Institute for Social Development, 2017.

Methodology

This thesis aims to investigate both the nature of the EU and Dutch policy mixes created to stimulate the transition to circularity, as well as the perspective of circular business owners on what barriers they experience and how well the introduced policies are able to tackle these. In order to conduct research that allows for both of these perspectives to be investigated while at the same time assure scientific validity, I have chosen to use methodological triangulation. Triangulation is a qualitative research method which involves the use of more than one source of data in the study of the same phenomenon. The goal of this approach is to provide a so-called 'confluence of evidence' that breeds credibility and validity (Bowen, 2009; p. 28). This is because using more than one source of data can limit the impact of potential data bias in qualitative research.

Figure 13: Visualisation of methodological approach.



My triangulation consists of a document analysis on one hand and semi-structured interviews on the other. Case studies will in turn be used to provide the context in which the outcomes of these research methods can be placed. The document analysis is used to analyse the policy documents from both the EU level and the Dutch government concerning circular economy. The outcomes of this research will be used to understand what goals these two regulators have set and how they hope to achieve them. The interviews were held with Dutch business owners and a policy-maker working on circular economy in order to create insight into how these policies, strategies and support systems have come to be and whether circular businesses

consider them to be helpful. The transcripts of these interviews were analysed with help of Grounded Theory coding. Finally these two perspectives will be analysed in the context of case studies. The case studies provide the necessary real-life contexts in order to properly analyse the implementation of circular policy-mixes. The space in which all stakeholders operate is very sector specific and of high influence on how policies are received.

By combining these three methods this thesis aims to provide a valid and comprehensive analysis of the implementation of circular economy policy-mixes from both the national and supranational level on Dutch circular businesses and whether these policies are considered helpful in facilitating the sustainable transition towards a circular economy.

Context socio-technical systems: Case studies

In order to contribute to the understanding of the transposition of policies concerning circular economy from both the EU and the national level on circular businesses, I will make use of two exemplifying case studies. These case studies have as main goal to expand on the current limited knowledge of the implementation phase of circular economy and whether or not the European and Dutch national circular economy policy-mixes are able to contribute to a successful transition to circularity. The use of case studies has been chosen because it is important to understand the framework businesses operate within in order to be able to assess whether policy measures are actually helpful in practice. Since every sector has its own specific context, challenges and needs, it will not be helpful to look at CE through a more holistic approach. Within each sector, specific policymaking consisting is required in order to foster a transition towards another socio-technical system. A sector specific approach is therefore valuable to address the variety of opportunities and challenges involved in transitioning towards a circular economy (Ellen MacArthur Foundation, 2015; p. 3).

I have selected the Dutch agro-food industry and the Dutch construction industry to serve as the case studies through which I will conduct my research. This selection has been based on policy documents provided by the EU and the Dutch government in which both have listed these sectors as so-called priority sectors. The EU new *Circular Economy Action Plan*, which was released in March 2020, has listed multiple sectors in which the 'sustainability challenge posed by key value chains requires urgent, comprehensive and coordinated actions, which will form an integral part of the sustainable product policy framework' (COM(2020) 98 final; p. 6). The sectors are a priority when it comes to circular economy implementation , given that there is a high urgency to transition and that this transition can have a far-reaching effects on the realisation of the EU sustainability goals. The sectors listed are: Electronics and ICT, batteries and vehicles, construction and buildings, packaging, plastics, textiles, and food, water and

nutrients. The Dutch government has taken a similar approach in their circular economy strategy. In a policy report from 2016 published by the Ministry of Infrastructure and the Environment and the Ministry of Economic Affairs, five sectors have been named as priorities: Biomass and food, plastics, the manufacturing industry, the construction sector and consumer goods. The agro-food sector and construction sector are present on both priority lists, which makes these sectors especially interesting to map. The final selection has also been influenced by my current internship position at The Netherlands Scientific Council for Government Policy, the WRR, where I partake in a research project concerning responsible business conduct and societal expectations. The friction between economic, environmental and social goals plays an important role within the project and is currently being investigated through four case studies: the insurance sector, the chemical industry, the food industry and the construction industry. This overlap combines access to resources with scientific relevance which results in the construction and agro-food industries being the most optimal case studies to use in this thesis.

A case study within social sciences research is understood as an intensive study of a single or a few cases that are supposed to shed light on a bigger phenomenon. It is a qualitative method which relies on small n-number samples which aims to investigate a phenomenon by gathering evidence of 'real-life contexts' (Gerring, 2013). When it comes to case studies we can differentiate between 'case studies' and 'cross-case studies'. The main difference between these two is the number of cases studied. When researchers use many cases within their study, so studies with a higher n-number, the cases tend to be less intensively studied and are likely used to describe the case studies as a sample rather than a series of cases. Cross-case studies are because of this focused on cross-case variation; the differences between the cases studied. I am on the other hand interested in within-case variation: What can the case study of the Dutch agro-food and construction industries tell me about the issues *within* the sector, and what sector-specific and general aspects trigger these issues? It is not about the differences or similarities between the Dutch agro-food and construction sectors, but about what these sectors separately can contribute to our understanding of the friction between policies on paper and their implementation into real-world situations.

This method proves to be most ideal to look at whether or not circular economy policy-mixes can be successfully translated to real-life situations since case studies can investigate phenomena within their bounded system. This method therefore provides the ideal research platform to examine the two sectors as discrete entities which interact and operate within a larger social context (Gordon and Ball, 2017).

The policy-maker perspective: Document analysis

In order to properly analyse the EU and Dutch policy documents concerning circular economy, I will make use of a limited document analysis. Document analysis is the systematic procedure for reviewing or evaluating documents (Bowen, 2009). It provides a nice methodological framework when it comes to legislation and government publications since document analysis lends itself well for intensive studies of a single phenomenon, policy, organisation or programme. On top of that, document analysis is proven to be a valuable method when used in data triangulations studies since the information gathered from document analysis can be combined well with other qualitative forms of research like interviews and case studies.

Circular economy approaches often overlap with other strategies aimed at sustainability and green targets, which is why it does not suffice to look at the circular documents alone. A complete discussion of everything that has been published on the subject of circular economy would therefore be both a long process as well as result in a tedious listing of targets, advice, ambitions and legislation which would not be constructive within the context of this thesis. I have therefore decided to analyse the circular economy strategies for the agro-food and construction sectors within the context of three specific strategies in order to provide a comprehensible structure that will also enable me to analyse the used policy instrument in-depth, which is necessary in order to come to definite conclusions about the strategies being applied. The chosen categories for both sectors are listed in the table below.

Figure 14: Categorisation of document analysis.

	Agro-food sector	Construction sector
Strategy 1	Natural resources	Natural resources
Strategy 2	Consumer and producer behaviour	Consumer and producer behaviour
Strategy 3	Food waste (closing the cycle)	Construction waste (closing the cycle)

The chosen categories mimic the 'input-throughput-output' stages that life-cycles go through within a linear economy. By choosing strategies that are each in a different stage of the production cycle, I will be able to provide a comprehensive analysis of the EU and Dutch circular economy strategies, while at the same time being able to give a more delimited description of the specifics of the strategies in question. Combined the three strategies in each case study will still suffice because of this division in providing an overview of the used policy-mixes on both the EU and Dutch policy-making level.

The business owner perspective: Interviews

In order to shed light on the perspective of businesses in the construction and agro-food industries in regards to circularity, I have made use of semi-structured interviews. The design of the semi-structured interview fits best with the aim of this research. Semi-structured means that the interview is partially filled with premeditated questions but there is also room for input from the interviewee. This means that every interview is unique and follows its own structure. While this might make the analysis less structured, it does leave room to explore relevant topics for the particular interviewee which can lead to a better insight into the issues that businesses face when it comes to implementing aspects of circular economy, especially issues that have previously been overlooked, including by myself during the formulation of my premeditated questions.

This is also why interviews are a good method to use in combination with the case study approach. Case studies that make use of small n-number samples are often not illuminating when one aims to investigate a causal mechanism: the sample pool is simply not big enough to prove a 'when X occurs Y happens' relationship. Case studies however do lend themselves to investigate so-called causal effect; the intermediate factors lying between some structural cause and its purported effect (Gerring, 2013; p. 13). The use of interviews allows for the discovery of causal effects 'in-vivo', meaning in the real world in which they occur. This in turn can offer insights into the intentions, capabilities and procedures that actors involved in the process (have to) follow.

Figure 15: Participants list interviews.

Interview number	Position
Interview 1	CEO circular food processing business
Interview 2	Circular economy expert at a business specialised in helping other businesses implement circular economy practices.
Interview 3	Board member circular food cooperation
Interview 4	CEO of two circular agriculture businesses
Interview 5	Employee circular food business
Interview 6	Project coordinator circular demolition
Interview 7	Representative Dutch employers federation and a public-private circular economy promotion network.
Interview 8	Operational director circular architecture and construction business.
Interview 9	CEO circular construction business
Interview 10	Policy-maker circular economy at the Ministry of Infrastructure and Water Management.

I have analysed the interviews by applying Grounded Theory coding. Grounded Theory is a qualitative methodology that seeks to construct theory about issues of importance in people's lives (Mills et al , 2006). The advantage of Grounded Theory is that it does not seek to prove or disprove a hypothesis, but rather focuses on issues of importance that come up during the conducted interviews. In this thesis, I will specifically make use of the traditional Grounded Theory method developed by Strauss and Corbin (1998) which consists of three types of coding: open coding, axial coding and selective coding. In order to code the interviews in an orderly fashion, I make use of computer programme Atlas.ti.

This list of codes is based on both structured codes and in-vivo codes. Structured codes is the name for the group of codes which have been derived from the literature review and previous studies into the subject. The in-vivo codes are based on concepts or themes that have been introduced by the interviewees during the interviews.

The structured codes used in this thesis are the twelve different failures that are part of Weber & Rohrarcher's framework which are:

Information asymmetries	Knowledge spill-over
Externalisation of costs	Over-exploitation of commons
Infrastructural failure	Institutional failure
Interaction or network failure	Capabilities failure
Directionality failure	Demand articulation failure
Policy coordination failure	Reflexivity failure

The first step of the in-vivo coding process is open coding, which is described by Strauss and Corbin as 'breaking down, examining, comparing, conceptualising and categorising data' (Boeije, 2005; p. 85). Open coding takes mainly place at the start of the data collection process when the researcher takes a first looked at the collected data. In my case that are the transcripts from the interviews. During this step, I have analysed the transcripts and coded certain themes and categories that stood out. The result of this process was a list with 102 codes (see Annex I). These codes where during the second step of the process, axial coding, organised into more coherent categories which down-sized the coding pool to 89 codes, including the 12 structured codes (see Annex II). Finally, during the selective coding process I organised this list of codes into seven different categories: barriers, goals, motivation, strategies, solutions, key phrases and failures. Combined with the structured codes this made it possible to extract the failures occurring in the circular agro-food and construction industries and organise them in a manner that made it possible for me to connect them to the failures framework of Weber and Rohrarcher.

The sustainable development framework

The reason why over the last decades the need for sustainability transitions has reached a point of general consensus in society is connected to the development of sustainable development itself. The idea that we could create another economic system that is able to incorporate social and environmental needs has made gone from a conceptual idea to a policy target. Sustainability transitions like the development from a linear to a circular economy have been made possible by the adopting of sustainable development in the public mindset.

From the perspective of the international community, sustainability has been largely contextualised by the creation of the Sustainable Development Goals back in 2015. These seventeen goals functions as a road map for the international community that should help in guiding the transition towards a more sustainable society (European Commission, 2019). So far the SDGs have been adopted by 193 countries. The SDG's are part of the so-called 'Agenda 2030', which is an extensive plan of action in which the UN aims at strengthening universal peace by implementing plans that focus on harmonising people, planet, prosperity, peace and partnership.

Figure 16: The UN Sustainable Development Goals.

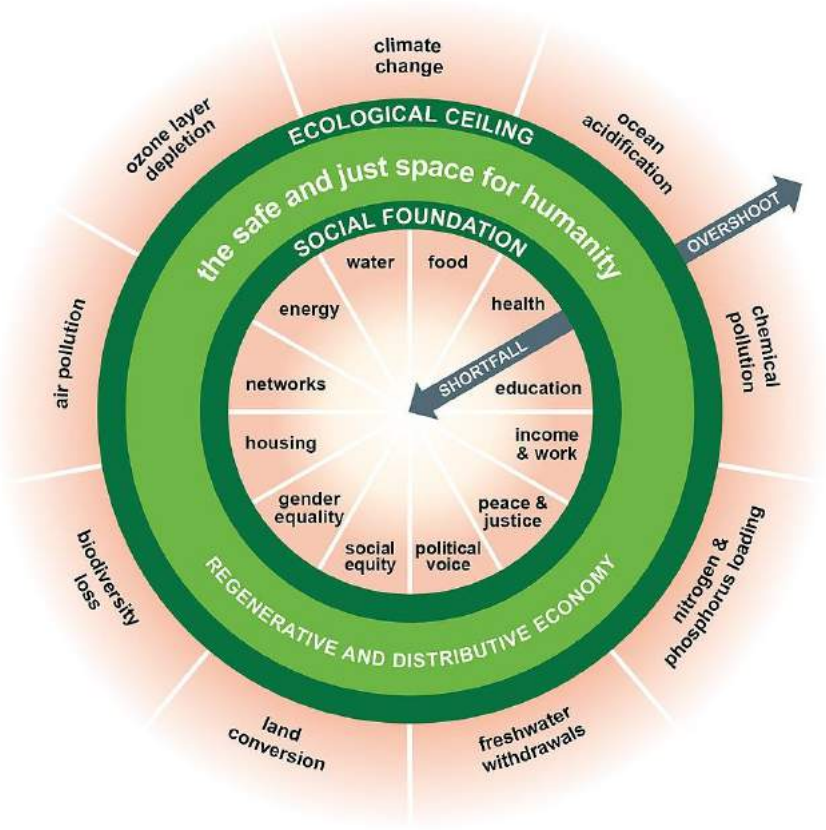
Source: GlobalGoals, 2019.

Sustainable development is the key word when it comes to the SDG's: everything is aimed at creating an international system in which the principles of sustainability function as the driver behind economic, social and environmental decision-making. The theoretical concept of sustainability has been developed through working papers and other publications, which has led to the combination of three different approaches to sustainability which have been combined in one all-encompassing conceptualisation which is being promoted in current policy-making strategies.

The first perspective on sustainable development is the 'quality-of-environment' perspective. This perspective sees Sustainable Development as a necessity due to the fact that the planet's resources are finite and the global community is exhausting them at a great speed, which will only worsen due to a growing population when our current ways of consuming do not change. This situation is untenable and SD therefore represents a change in the way people use natural resources. This is captured by the concept of 'planetary boundaries' which introduces nine boundaries which people should not cross in order to sustain the planet for later generations (Röckstrom et al, 2009). These boundaries are: stratospheric ozone depletion, loss of biosphere integrity, chemical pollution, climate change, ocean acidification, freshwater consumption, land system change, nitrogen and phosphorus flows and atmospheric aerosol loading (Steffen et al, 2015). This framework was created by the Stockholm Resilience Centre and represents the nine processes that regulate the natural systems of the planet. It is within these boundaries that humanity can live and operate in a sustainable manner, but when the boundaries are crossed it could lead to irreversible and damaging environmental changes.

Economist Kate Raworth added a social aspect to the planetary boundaries concept by creating the concept of doughnut economics, which connects planetary boundaries with social boundaries. The doughnut visualizes the space between essentials for life (healthcare, education etc.) and the planetary boundaries we should not cross. Sustainable development is the middle ground which provides for both social and ecological needs. Raworth's publication was an important motor for the equalisation of the social pillar within the SD concept, since more emphasis traditionally went to the environmental and economic aspects of sustainability. Since doughnut economics, the international community shifted to a more equal approach to the three pillars of SD.

Figure 17: Doughnut economics; visualised.



Source: Raworth, 2012; p. 15.

The second perspective on sustainable development is called the 'quality-of-life' perspective and functions as a supplement to the quality-of-environment perspective. Whereas quality-of-environment provides a framework for the 'how' question on SD, the quality-of-life perspective provides us with the instruments to measure the 'what'. This perspective is the result of a change in the way 'welfare' is interpreted. For a long time the only factor that measured welfare was GDP, but this system has become increasingly scrutinised and scholars argue that there are more factors that decide whether a society is positively developing. Quality of life focuses on people's day-to-day routine by monitoring things like occupation, spare time, access to education and healthcare, etc. The concept of quality of life has three main characteristics: it focuses on the welfare of individuals rather than a country, it is a multidimensional concept which covers multiple domains life housing, work-life balance, education, public institutions and their interplay and finally quality of life connects these objective factors on living conditions with subjective views and attitudes to piece together the overall well-being in a society (Keles, 2011; p. 24). Quality of life also distinguishes between the quality of life in the here and now, quality of life later and quality of life elsewhere, as has been laid down in the Brundtland report.

The last perspective is called the 'economics of welfare' and describes why people make certain choices in times of scarcity (PBL, SCP & CPB, 2017). Welfare is not directly measurable within this view, but is described as all means that contribute to a person's satisfaction of needs. Welfare is therefore 'a state of consciousness' and a subjective experience. This makes this perspective difficult to monitor since it consists of abstract notions like love, friendship and security (Ibidem).

Together these three perspective define sustainable development as interpreted by the UN and explain what exactly is meant with the sustainable world that the sustainability transitions aim for. Sustainable development the way it has been explained in this paragraph might sound familiar, since it overlaps strongly with the thinking and motivation behind the circular economy framework. Because of this, CE is often chosen by policy-makers as the main strategy through which governments aim to realise their sustainability ambitions. When looking closer at the specific SDGs, one can quickly understand why circularity is such a popular approach.

In a recent study executed by Schroeder et al (2019), a group of scholars researched the relevance of circular economy practices in view of the SDG's. Their study shows that circularity is strongly linked to SDG6 (clean water and sanitation), SDG7 (affordable and clean energy), SDG8 (decent work and economic growth, SDG12 (responsible consumption and production) and SDG15 (life on land), both directly and indirectly. In 2017, the UN added subgoals to the SDG's, which has made circularity even more relevant. Some sub-targets explicitly address goals where circular principles take centre stage, such as efficient use of resources, redesign, and longer use of materials (Triodos Research, 2017). SDG target 12.5 has even adopted circular economy explicitly:

'By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.'

The development of the SDG's by the UN and their widespread adoption by national governments has contributed to the rising popularity of circular economy principles by policy-makers. A consensus has been reached that circular economy is the best suited economic model for the creation of a sustainable society that suits the principles of sustainable development (Hanumante et al, 2020). This has been exemplified in recent years by the UN hosting multiple events on the topic of CE, most notably the World Circular Economy Forum which brings together stakeholders from all over the world, including policy-makers and business leaders, in order to present the world's best practices when it comes to circular economy solutions.

Circular economy on the European level

The origins of the European circular economy approach can be traced back to the *Roadmap for a Resource-Efficient Europe*, containing a strategy to decouple resource consumption from economic growth. The adoption of this strategy was no so much motivated by sustainable motives, but was created out of fear that the EU was becoming too dependent on the import of raw materials, which could harm the bloc's economic independence in the future. The call for a less resource-based economy was influenced to a certain degree by the European Resource Efficiency Platform (EREP), a platform initiated by the European Commission bringing together stakeholders and experts from the public and private sector which were to advice on how this new economic model was to be reached. The EREP was launched in June of 2012 and concluded in its policy recommendations, among others, that a transition towards a circular economy was desirable.

The policy recommendation was adopted by the Barroso Commission and in July 2014 they introduced the *Circular Economy Package*. The document was put forward by European Environmental Commissioner Janez Potočnik, who was also chairman of the EREP, and it consisted of a range of initiatives that were aimed at waste reduction, sustainable building, green entrepreneurship and green employment. Plans for a more sustainable food industry were at first also part of this *Circular Economy Package,* but were dropped due to heavy resistance in Brussels. Later that year the new Juncker Commission was installed, and they decided that the package was not suitable for their ambitions and it was consequentially abandoned in December 2014.

This decision was met with quite some resistance from different stakeholders within the EU, including NGOs, Member States and various industry representatives, but also within the European Parliament was there discontent because of this decision. This caused the Juncker Commission to reconsider their position. It appointed Vice-President of the Commission Frans Timmermans with the task to work on a circular economy strategy for the EU with a focus on the economic benefits that it could create. Between May and August 2015, the Directorate-General for the Environment hosted a public consultation on circular economy which helped identify priorities, barriers and targets. In the end the results from this period resulted in the *Circular Economy Action Plan* which was presented in December 2015. Nowadays this document is better known under the name *First Circular Economy Action Plan,* logically renamed due to the fact that a more recent strategy has been introduced since.

The *First Circular Economy Action Plan* introduced 54 so-called actions which needed to be delivered between 2015 and 2019 in order to 'to accelerate Europe's transition by helping to "close the loop" of product lifecycles through greater recycling and re-use' by considering both the European economy and the environment (European Commission, 2021D). The actions

focused on the categories of production, consumption, waste management, food waste, plastics, raw materials, construction and demolition, biomass and bio-based materials and innovation and investment. The plan has been considered a success in European circles: circular activities created 155 billion euros in added value in 2017 (Ellen MacArthur Foundation, 2020).

Work on a new EU circular economy strategy was started under EU Commission president von der Leyen in 2019 as part of the European Green Deal. This new *Circular Economy Action Plan (CEAP)* was proposed by the European Commission in March 2020 and is seen as one of the pillars of the EU's sustainability strategy. Again the focus of the plan is on the preservation of natural resources and the creation of sustainable growth and jobs, which is why the *CEAP* is also called the *Circular Economy Action Plan for a Cleaner and More Competitive Europe*. The strategy consists of both legislative and non-legislative measures which together make up 35 actions which will be implemented the next couple of years.

The Commission refers to both the SDG's and planetary boundaries as justification for the *CEAP*: '*This plan will ensure that the regulatory framework is streamlined and made fit for a sustainable future, that the new opportunities from the transition are maximised, while minimising burdens on people and businesses'* (European Union, 2020; p. 5). Key to the plan is that all stakeholders within the EU contribute to the implementation and realisation of the targets set in the *CEAP*; businesses, consumers, citizens and civil society organisations are expected to do their part in addition to the more traditional players like national and local governments. The *CEAP* consists of six main strands.

The first pillar of the *CEAP* is the roll-out of a sustainable product policy framework. The EU wants to enhance the sustainability of the entire life cycle of products by addressing every step within the production value chain. Product design needs to take into account how the product will be brought back into the cycle after use and overall needs to consider repurpose. Up to 80% of a products' environmental impact is determined at the design phase, which is why the product design is an important part of the EU's circular economy strategy (European Commission, 23-06-2021). On top of that, the EU aims to empower consumers and public buyers in order to provide both with cost-saving opportunities. This entails that the EU aims to improve the lifespan and reliability of products, including establishing a 'right to repair' and new horizontal material rights for consumers. For public authorities, the EU wants to introduce a threshold on green public procurement (GPP), which means that government authorities need to buy products and services from sustainable and circular sellers. The third aspect of the framework is improving the circularity in production processes through monitoring, the creation of an European ecolabel and the establishment of sustainability principles should contribute to this effort.

The second pillar of the *CEAP* is a focus on key value chains. The EU Commission created a special strategy for the European electronics and ICT, batteries and vehicles, packaging, plastics, textiles, construction and buildings, and food industries. These industries have been chosen specifically because their transition into a circular system is seen as urgent and in need of comprehensive and coordinated action (EESC, 15-04-2019). The specific EU strategy for the food and construction industries will be discussed in the next chapter. The third pillar consists of initiatives that aim to achieve 'less waste, more value', which includes actions that support waste prevention, address the use of hazardous substances, create a well-functioning EU market for secondary raw materials, and address waste exports from the EU (European Parliament, 2020). Pillar four addresses so-called crosscutting actions in the field of financing, research and innovation. The aim here is to stimulate circular investments in the financial sector and subsidise research on the topic in order to provide stakeholders with better instruments to transition. The fifth pillar is focused on the EU's global relations and lists actions on how the EU can promote circular economy outside of her territory. Lastly, the EU wants to create a better monitoring framework for circular economy in the EU. The European Semester, a coordination framework that oversees EU fiscal policy, will focus more on sustainability efforts and the Monitoring Framework for the Circular Economy will be updated in order to include better indicators on resource use, which can lead to the adopted of more specific strategies in the future.

The first *Circular Economy Action Plan* included four legislative proposals on waste and consequently revised six pieces of existing EU legislation: Directive 2008/98/EC on waste, Directive 1999/31/EC on the landfill of waste, Directive 94/62/EC on packaging and packaging waste, Directive 2000/53/EC on end-of life vehicles, Directive 2006/66/EC on batteries and accumulators and waste batteries and accumulators, Directive 2012/19/EU on waste electrical and electronic equipment (COM(2019)190 final). The first *Circular Economy Action Plan* created more ambitious versions of these pieces of legislation which included stricter recycling rates that Member States need to achieve, revised definitions of terms like 'recycling' to create legal clarity, reinforced rules and new obligations for certain types of waste, minimum requirements for Extended Producer Responsibility and strengthened measures to support waste prevention.

The main legislative difference between the first *Circular Economy Action Plan* and the current *CEAP* is that the focus on waste has been broadened and now also includes proposed legislation in other stages of a product's life cycle. The string of directives and amendments the previous *CEAP* introduced are again being updated in order to bring them in line with the EU's current ambitions. The focus of the revisions will be on 'preventing waste, increasing recycled content, promoting safer and cleaner waste streams, and ensuring high-quality

recycling' and are expected to be published in the course of 2021 and 2022 (European CommissionA, 2020; p. 16).

In addition to amending existing legislation to contain stricter standards, the EU is also working on new legislative proposals as part of their CE strategy. The Commission is working on a proposal for a sustainable product policy initiative which is set to be published this year. The initiative widens the existing Ecodesign Directive, which at the moment only applies to energy-related products, to be applicable to the broadest possible range of products in order to promote circularity in the production value chain of all industries. Other legislative proposals that are complementary to this one are still being considered. They will, in case of introduction, establish sustainability principles for other aspects like the carbon footprint or health hazards of certain materials. The mandatory requirements for products will be based on the criteria established in the EU Ecolabel Regulation, the Product Environmental Footprint approach and the EU GPP (Green Public Procurement) criteria. The introduction of new mandatory requirements will be undertaken by the Commission when the transition is going at a pace that is not in line with the goals established for 2030 and 2050 (European Commission, 03-07-2020).

The EU Commission is also working on legislative proposals that establish a 'right to repair' and empower consumers in the green transition. Both proposals are aimed at expanding consumer rights in order to ensure trustworthy product information in terms of sustainability, increased lifespan of products due to greater durability and mandatory repair service and consumer protection against greenwashing by providing minimum requirements for sustainability labels. This is done by introducing a legislative proposal on substantiating green claims. Public authorities, and more specifically Member State governments, will be subjected soon under mandatory Green Public Procurement criteria and targets set by the Commission. This means that when public authorities buy or invest in products, these need to adhere to a certain sustainability standard. The Commission believes that this will have considerable impact since public authorities' purchasing power represents 14% of the EU's GDP (European Commission, 03-07-2020).

In the category key product value chains, the EU also plans on introducing a couple of legislative proposals. A proposal for a new regulatory framework for batteries was already published last year and aims to ensure batteries used in the EU internal market are both sustainable and safe throughout their entire life cycle. This was also the first proposal to be published that is part of the current CE strategy. In addition to that, the EU plans on implementing a new Directive on Single Use Plastic Products, a policy framework for bio-based plastics, mandatory requirements for plastic waste reduction and a restriction on intentionally added microplastics. Lastly, the Commission will explore the development of a regulatory

framework for certification of carbon removals. This proposal, when decided to introduce, will see the light of day in 2023 and is the last of the 35 actions of the *CEAP* to be implemented.

What we see is that there is a substantial increase in requirements and mandatory targets between the *First Circular Economy Action Plan* and the current version. Whereas legislation was mainly focused on recycling and waste reduction in 2015, we now see a shift towards other stages of the CE product life cycle. Although the focus on products and production remains, the Commission takes important and significant steps in terms of recognising key issues and remaining gaps (Pantzar and Suljada, 2020).

EU strategies are often characterised by their collaborative character and their emphasis on 'best practices' and the *CEAP* is no exception to this. The EU has created multiple platforms and advisory organs that aim to help consumers, businesses, policy-makers and others in the transition to a circular economy. The most prominent body in this context is the *European Circular Economy Stakeholder Platform*. The platform was an initiative of the European Economic and Social Committee and the idea was to create a platform that would facilitate cooperation between national, regional and sectoral actors and would support the exchange of best practices, information and expertise circularity. The platform was officially launched in 2017 and functions today as a civil society consultation network. The platform organises an annual conference on the topic of Circular Economy and maintains a website where businesses and organisations can post about their CE efforts.

In 2017 the *Circular Economy Finance Support Platform* was introduced. The platform is a joined effort of the Commission, the EIB and National Promotional Banks and is a webtool that provides a platform for businesses to showcase how they have contributed to CE practices. The platform is more business-led than the Stakeholders Platform and also works on creating new financial instruments that could potentially contribute to the circularity effort. In addition to that, the *SME strategy* created by the Enterprise Europe Network fosters collaboration between businesses and provides training and advice for businesses that want to implement CE in their business plan. Lasty, there is the *Public Buyers for Climate and Environment*, an initiative by the European Commission that promotes collaboration between public buyers, more specifically cities and regions, to implement green public procurement.

The EU also has a set of financial instruments that stimulate the transition to a Circular Economy, which can be seen in the table below.

Figure 18: European financial support for circular businesses.

Name regulation	Type of support	Purpose
LIFE 2021 – 2027	Subsidy	Financing for pilots that tackle environmental (including Circular Economy, nature and biodiversity) or climate issues.
Horizon 2020 Horizon 2021 – 2027	Subsidy	Financing for businesses that offer solutions to social issues.
EIC Accelerator	Subsidy	Financing of SMEs that develop game-changing innovation.
Interreg	Subsidy	Invests in sustainable solutions for Europe.
Eurostars	Subsidy	Financing of R&D for innovative SMEs that focus on experimental development (includes CE).
Arrangement Green Projects	Advantageous bank loan	Green investments in the latest developments in environmental technology, circular economy and sustainable and innovative (construction) projects.

Source: Netherlands Enterprise Agency, 2021.

Circular economy on the Dutch level

The Dutch government has created its own framework for sustainable development in the Netherlands which is called 'Brede Welvaart' (lit: broad welfare). Work on a framework to measure sustainability started a little over a decade ago under the name Monitor Duurzaam Nederland (Monitor Sustainable Netherlands) in which indicators were identified in order to be able to measure a transition towards sustainability as defined by the Stiglitz report. When the SDGs were introduced in 2015, it was decided that it would be preferable to connect the country's sustainability framework to the SDGs and in October of that same year a special commission was created to look for ways to measure welfare besides GDP. The Grashoff Commission published their findings in 2016 and had asked the three applied policy research institutes of the Dutch government to publish their own interpretation of welfare as well. The publications of CPB, PBL, SCP and the Grashoff Commission together resulted in a coherent strategy for the Dutch Government for measuring sustainability efforts in the country. This *Brede Welvaart* strategy is nowadays the main indicator on how well the country is doing in terms of sustainable development and implementing the SDGs.

Brede Welvaart is officially defined as:

'the quality of life in the here and now and the extent to which this may or may not be at the expense of that of later generations and/or that of people elsewhere in the world.' (CBS, 2018; p. 3).

The three dimensions of sustainable development as laid down by the Brundtland report are key to this definition: welfare in the 'here and now', welfare 'later' and welfare 'elsewhere'. These three themes have their own categories which in combination serve as the indicators for sustainable development in the Netherlands. Welfare here and now has eight categories: safety, environment, health, subjective well-being, work-life balance, housing, education, material prosperity, community involvement, and social relationships and jobs (CBS, 2020). Welfare later consists of economic, ecological, human and social capital and welfare elsewhere looks at trade, environment and natural resources and developmental aid abroad. It is the overall goal of the Netherlands to increase the Brede Welvaart by actively working on improving living standards based on these indicators.

Brede Welvaart has been developed with the SDGs in mind and the Netherlands has committed itself to actively take steps to make sure that the 17 goals are met by 2030. In addition to the SDGs, the Dutch government has also signed the 2015 Paris Agreement, committing to keeping the extent of global warming to less than two degrees Celsius compared to the pre-industrial era. In order to adhere to both international agreements the Dutch Government created the Climate Agreement in 2019 in which they commit themselves to lowering greenhouse gas emissions with 49% compared to 1990 (Rijksoverheid, 28-06-2019). This number will most likely be raised to 55% because of the ambition of the European Commission. This target has also been incorporated into the Raw Materials Agreement (Grondstoffenakkoord) which has been signed by hundreds of companies, trade unions, government bodies and many other social organisations. In order to reach all sustainability targets, the Dutch government announced the transition to a circular economy which should be completed by 2050 (Rijksoverheid, 14-09-2016).

The first time the Dutch government looked into the possibilities of a circular economy was in 2014 with the *Waste to Resource* programme. This programme was the result of the *Netherlands Waste Prevention* programme which was established as part of the European Waste Framework Directive (which would become part of the first *Circular Economy Action Plan*). The Netherlands was one of the first countries to look into a waste prevention strategy that addressed the entire production and value chain, which in European context was unique (van Buren and de Vries, 2017). The circular economy was early on identified as the most productive way to prevent and reduce waste and the introduction of a circular economy framework was the main goal of the *Waste to Resource* programme (Government of the Netherlands, 28-01-2014). The programme introduced eight operational objectives, each with each a set of key actions that needed to be undertaken. The objectives were: Promoting sustainability at the front of the chain, making consumption patterns more sustainable, improving waste separation and collection, focusing existing waste policy on a circular

economy, adopting an approach to specific material chains and waste streams, developing financial and other market incentives, connecting knowledge and education programmes for *Waste to Resource* and simplifying measurement methods, indicators and certification labels (Government of the Netherlands, 2014).

The promotion of the circular economy became more specific in 2016 with the publication of the *Government-wide programme for a Circular Dutch Economy by 2050* (Rijksbrede programma Nederland Circular in 2050). The publication was a response to both the EU's first *Circular Economy Action Plan* from 2015 and the introduction of the SDGs. The programme states that the Netherlands *'wants to contribute to the realisation of the European Commission's ambitious circular agenda' and 'with the transition to a circular economy, the Netherlands is contributing to the realisation of the aforementioned Sustainable Development Goals'* (Rijksoverheid, 14-09-2016; p. 9). The publication explains why a circular economy is necessary and how the Netherlands could profit from a transition from a linear to a circular economy. It also sets out three strategic goals that a Dutch circular economy should meet:

1. Use of raw materials in existing value chains is utilised as efficiently as possible.
2. Where new raw materials are needed, fossil, critical and non-sustainably produced raw materials are replaced by sustainably produced, renewable and widely available raw materials.
3. The development of new production methods, new product designs and redesign areas.

These three strategies for circular economy are to be realised by focusing on five so-called 'interventions' by which the Dutch government can use her competences to stimulate the transition. These are:

1. Stimulating legislation and regulations
2. Smart market incentives
3. Financing
4. Knowledge and innovation
5. International cooperation

It was advised in the programme to switch to a circular economy, an advice that was supported by the Social and Economic Council (SER) and the Council for the Environment and Infrastructure (Rli). The 2016 initiative underlines the Dutch ambition to apply circularity to the entire value chain, with special attention for five economic sectors because of their importance for the Dutch economy and their major impact on the environment. These sectors are: biomass and food, plastics, the manufacturing industry, the construction sector, and consumer goods (van Buren and de Vries, 2017; p. 30). This publication would function as the guideline for the design of the *Raw Materials Agreement* that followed in 2017. The

Agreement, with the subtitle 'Letter of intent to arrive at transition agendas for the Circular Economy', places the introduction of a circular economy at the heart of the Dutch strategy to implement the SDGs and the Paris Agreement. All partners that signed the Agreement, including the Government, dedicate themselves to the implementation of a circular economy:

'The partners have against the background of the recommendations of the SER, the Rli and the programme for a Circular Dutch Economy by 2050 the shared ambition of realising a circular economy in which we efficiently and intelligently use raw materials and commodities in order to help strengthen the Dutch economy and help to achieve the sustainable use of natural capital and other environmental objectives. The design of a circular economy is one of the means that can contribute to this effort' (Rijksoverheid, 24-01-2017; p 3).

In the Agreement the partners also commit to the creation of transition agendas for the five aforementioned sectors (Biomass and food, plastics, manufacturing, construction and consumer goods) with the aim to provide insight into how to accelerate the transition to a circular economy in these sectors. These five transition agendas were published in 2018 and provided insight into the specific actions that are necessary in each of the sectors in order to reach complete circularity by 2050. On 29 June 2018, the State Secretary of Infrastructure and Water Management published an official reaction on behalf of the Government to the publication of the five transition agenda's which included ten strategies which were to be followed in light of the recommendations stemming from the publications (van Veldhoven – van der Meer, 29-06-2018):

1. Broadening producer responsibility.
2. Taking away barriers by introducing a 'Green Tape' taskforce (Ruimte in Regels).
3. Stimulating circular product design.
4. Promoting circular public procurement.
5. Stimulating the market by investing in renewable and sustainable products and services.
6. Finance circular business cases in cooperation with businessowners and banks.
7. Monitor the transition to a circular economy and stimulate knowledge and innovation on the topic.
8. Inform consumers on circularity through a public campaign and educate the next generation on circular economy during their education.
9. Create an international strategy for circular economy.
10. The creation of a 'Versnellingshuis' (Acceleration House) in collaboration with businesses, ngo's and public authorities in order to stimulate and promote (regional) circular initiatives and large breakthrough projects, and to remove obstacles encountered by SMEs and other businesses.

The publication of the letter was accompanied by the publication of a new document; *The Circular Economy Implementation Programme: actions and projects 2019 – 2023*, which translated the five transition agendas into concrete actions and projects to be put into effect in the next five years, using the above-listed strategies as its framework. The Dutch circular economy strategy is as of now a holistic and long-term approach based on encouraging voluntary, intrinsic motivated cooperation between all stakeholders in society.

The Dutch government has so far not created any circular legislation. They did however have to transpose the European directives from the *First Circular Economy Action Plan* into the country's legal framework, which resulted in the *Netherlands Waste Prevention Programme*. Waste management is in the Netherlands a competence of the local municipalities and they are therefore responsible for policy-amendments. There are national targets for the reduction of residual household waste, but it is up to the municipalities to come up with strategies to reach the set targets.

As part of the current circular economy strategy, the Dutch government has worked on improving existing legislation through its programme Ruimte in Regels (Room in Rules) that aims at taking away barriers for innovation. It involved a collaboration between the Ministry of Economic Affairs and Climate Policy and the Ministry of Infrastructure and Water Management and ran between 2014 and 2019. In this period, Ruimte in Regels received around 750 reports from civil society on barriers created by current legislation. Out of these reports, 200 reports were classified as grounded and taken up for further investigation. In the end around 100 issues were solved and another 70 were reported to another responsible party to deal with. Out of all reports, seven percent had specifically to do with circular economy (RVO, 2019). The programme closed on 1 January 2020, but its task has been taken over by the Versnellingshuis (Acceleration House) for issues related to circular entrepreneurship. According to the current *Circular Economy Implementation Programme,* the government keeps reviewing current legislation and investigating where possible adjustments to laws and regulations are needed.

It has been namedropped a couple of times already in the previous paragraphs, but the most prominent advisory body for circular economy for the Dutch government is the Versnellingshuis. The organisation was launched in February 2019 and is an initiative of the Ministry of Infrastructure and Water Management and various business organisations. The Versnellingshuis helps entrepreneurs by providing information on circular economy, connecting business owners with each other and by overall gathering expertise on the topic of circularity. The Versnellingshuis does not provide financial support, but its services are free. In addition to a government-led advisory body, there are also multiple private sector initiatives that the Government subsidises.

The Dutch Government does not only provide advice, it also stimulates businesses that work with a circular business model by using financial instruments. The following table shows an overview of all national financial benefits businesses can receive for circular purposes.

Figure 19: Dutch financial support for circular businesses.

Name regulation	Type of support	Purpose
Subsidy Circular Chain project	Subsidy	Subsidy for SMEs that contribute to Circular Economy.
DEI+: Energy and Climate innovation	Subsidy	Subsidy for pilot projects focused on energy renewal and CO2 reduction.
DEI+: Circular Economy	Subsidy	Financing of pilot projects focused on recycling and repurpose.
VEKI	Subsidy	Investment subsidy for CO2 reduction.
MOOI Built Environment and Industry	Subsidy	Funding for pilots that contribute to the Dutch climate goals.
TSE Built Environment	Subsidy	R&D and pilot funding for businesses that focus on products and services for a more green built environment.
TSE Industry	Subsidy	R&D and pilot funding for businesses that work on climate neutral/circular products and services.
Topsector Energystudies Industry	Subsidy	Pillot funding for efforts that focus on reducing CO2 emissions.
MIT	Subsidy	Subsidy for SMEs that help adapt businesses to the targets set in the innovation agenda's.
MIA/VAMIL	Tax benefit	Tax benefit for business owners that make use of environmentally friendly techniques.
WSBO	Tax benefit	Reduction of payroll taxes for businesses that contribute to Circular Economy.
Innovation Credit	Loan	A loan under favourable conditions for businesses that work on innovative ideas.
Early Stage Financing	Loan	A loan under favourable conditions for starting businesses with promising ideas.

Source: Netherlands Enterprise Agency, 2021.

Case study 1: The Dutch agro-food industry and circular economy

The Dutch agro-food industry

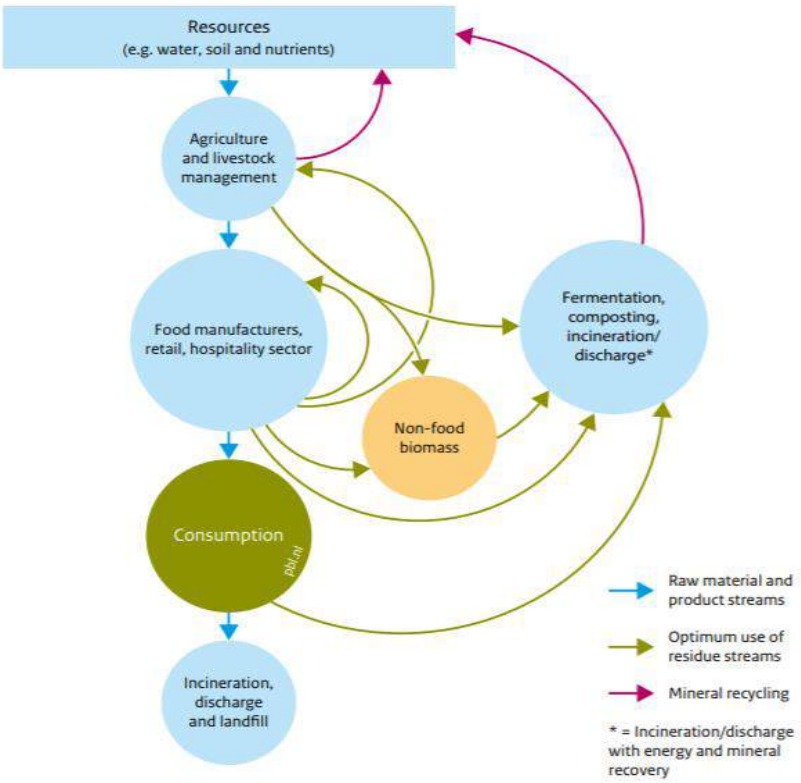
The Dutch agro-food industry is a composition of the agricultural and food industries. Together they are responsible for the commercial production of food and the term captures the direct and indirect activities of all actors involved within the production process of food products, both packaged and fresh (Verhoog, 2020). The production of food is one of the most important pillars of the Dutch economy; the food sector had a turnover of €76.2 billion in 2018, which makes up around 8.3% of the total Dutch GDP. The sector was also responsible for the employment of 145.000 people that same year (FNLI, 2020). Both these numbers are an improvement compared to previous years, showing that the sector keeps growing. This trend can also be spotted when looking at the number of companies that are active within the sector: in 2020 there were 6.930 registered businesses active in the Dutch food industry, which is a growth of 6.3% compared to the previous year. Especially the number of small and medium sizes businesses (SMEs) is increasing. Overall the sector has seen a steady growth of around 4% per year since 2011 in terms of total number of businesses. The agricultural sector consisted of 73.465 businesses in 2020. Most of these are SMEs and in total the sector employs around 200.000 people (CBS, 2020). The agricultural sector consists of horticulture, arable farms, farms with livestock, crops farm and crop-livestock farms. Altogether the sector had a net turnover of 29 billion euros in 2017.

Figure 20: The agro-food industry chain visualised (farm to fork).

Source: The Government of the Netherlands, 2020.

The entire agro-food chain has to adopt a different method of production when transitioning to a circular economy. Circular economy regarding the food system implies reducing waste generated during the production process, utilisation of by-products and food waste, nutrient recycling and a societal change towards a more sustainable diet and prevention of food surplus and waste from the consumer side of the market (Jurgilevich et al, 2016).

Figure 21: Circular economy applied to the agro-food industry.



Source: PBL, 2017.

Circular agriculture is mostly concerned with limiting the negative effects agricultural production has on biodiversity through the disruption of natural habitat of flora and fauna and pollution due to the use of pesticides and fertilisers (Vermunt et al, 2020). When transitioning to a circular means of production solutions need to be found for among others deforestation, water pollution, soil pollution, soil depletion, the destruction of biodiversity and since circular production is closely connected to sustainable development; low profit margins for farmers and the long supply chains.

The Dutch agro-food industry and barriers for sustainability transitions

As has been described in the first chapter, socio-technical systems consist of three main dimensions: actors, institutions and technological artefacts (Geels, 2004). According to sustainability transition literature, all three dimensions within the agro-food sector need to be set in motion in order to successfully transition towards another socio-technical system. The thesis mainly focuses on the institutional aspect of socio-technical systems since it aims to analyse the functioning of the European and Dutch CE policy-mixes, but it is also important to know how the actors and technological artefacts of the analysed sectors are organised in order to understand why and where in the chain institutional action is necessary. The following

paragraphs will describe the characteristics of actors and technological artefacts in the Dutch agro-food sector and investigates whether or not the actors and technological artefacts of this industry are indeed deadlocked within the current socio-technical system or are capable of setting the transition in motion. This will be followed by an analysis of the policy-mixes the EU and the Netherlands have introduced in order to help the sector transition towards a circular economy. In other words; what the institutions have done so far in order to start the socio-technical transition towards a circular economy. When combining the analyses of these three dimensions a clear picture will emerge of how the current socio-technical agro-food system functions and what has been done in order to facilitate the transition of this socio-technical system towards a circular model.

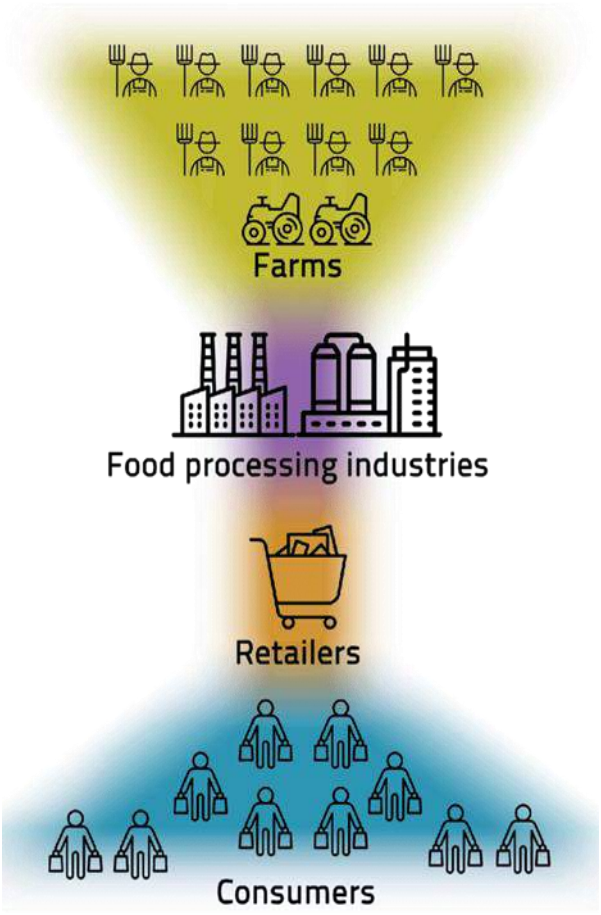
1. Actors

Most businesses in the Dutch agro-food industry are SMEs, but a significant share of the market is held by a few large enterprises. A characteristic of the agro-food industry is that the market leader in a certain sub-sector always has at least twice as much turnover as the second company, a sign of concentrated market power. Meat processing company VION holds more than 50% of the Dutch meat market and diary company FrieslandCampina has a market share of 80%. Overall, only six dairy companies in the Netherlands are good for buying 95% of all milk produced by Dutch dairy farmers (PBL, 2019). This market concentration can also be seen among supermarkets. The Netherlands had over 6000 supermarkets in 2019, but most of these stores were owned by just six different supermarket chains who together are good for 83% of the Dutch retail market (Distrifood, 2021). On top of that, there are only six organisations responsible for the purchases of these supermarkets, meaning that there are also very few actors that decide what products consumers can pick from in stores.

This gives both supermarkets and processing companies enormous influence over the primary food processors in the chain due to their advantageous position within the sector (PBL, 2019; p. 80). Studies have shown that a high degree of market concentration at one company (or a small group) translates into the possibility of imposing requirements and standards on other parties in the supply chain (Gosling et al, 2016). This structure has led to a situation of mutual dependence in the agro-food sector. The processing companies and supermarkets profit from long term relations with the same farmers since this guarantees a stable supply and specific level of quality from the products they receive. The farmers on the other hand have little room to pick alternative buyers, since the market is so concentrated. This gives little room for change when a farmer is unhappy with their current buyer. This means that the Dutch agro-food industry is a buyer-driven chain, in which mainly processing companies and supermarkets influence food production processes due to their strong negotiation position.

Due to increasing competition between supermarkets on the Dutch market, big brand food companies (and in turn the primary producers) have been pressured to lower their prices, resulting in profit margins becoming increasingly thin over the years. Within the agro-food industry, the only way to guarantee growing profit margins within the current system is either by cutting costs or by scaling-up. Due to the small margins, often the only option left is upscaling within the industry (Muehlfeld et al, 2011). This in turn has led to increased acquisition activity by larger companies in order to guarantee profit, resulting in the long run in even more market concentration within the sector. Another consequence of the importance of profit margins is a focus within the agro-food sector on short-term profits rather than long-term goals, which hurts the innovation capacity of the sector, which will be discussed further in the next paragraph.

Figure 22: Market concentration in the agro-food industry visualised.



Source: Eriksson et al, 2016.

These market characteristics have an enormous influence on the decision-making process in terms of sustainability within the sector. Circular farming and production is overall a more costly endeavor: biological farming happens on a smaller scale since it is more labour intensive, more space is needed which once again hurts cost-efficiency, biological crops grow slower since less or no fertilizer is used, labour is more expensive since people are given a fair salary, biological producers are subject to more checks to see if everything is up to standard for certification, which is expensive, and the list goes on. In a market where supply and demand are balanced, a producer could ask for a higher price for their product, but since the food industry struggles with the market dominance of retailers, resulting in them deciding on the price and not the other way round, there is little market incentive to start producing in a more sustainable manner (Dröge, 2020). Retailers in turn also struggle within this system. Competition in the sector is decided primarily by price. One retailer therefore cannot decide to pay more for products than its competitors do, since that will hurt the market position of that specific retailer due to the slim profit margins. Restrictive competition law in turn makes it difficult to make binding sustainability agreements between retailers which strongly limits the

capacity of the food industry to implement more sustainable production on its own (Reitsma et al, 2020).

Consumers also have a significant impact on the sector's (dis)ability to transition towards a circular means of production. At the end of the day it are consumers that choose what they buy and therefore influence what producers put on the market. The amount of people that call for more sustainable and biological products has increased in recent years, which can be illustrated by for example the enormous growth of the meat substitutes industry. Still, most products that can be bought in a supermarket are neither circular nor comply to the standards of sustainable development in terms of social and environmental impact. Even though consumers have high demands for products, for example in terms of sustainability and fair pricing, it turns out that consumers often place higher demands on products than they are willing to express in their purchasing behaviour (WRR; 2014 p. 108). The environmental or social impact of products scores as one of the least meaningful factors in consumers' purchasing decisions, behind price, brand, quantity, content and shelf life. A study has shown that only 10% of Dutch consumers are willing to voluntarily pay a higher price for sustainable products (Reitsma et al, 2020). This means that when the food industry does invest in products from better sources, it will not automatically lead to higher profits since costs go up but sales will barely change. Even more, if only one company would commit itself to better, and more expensive, standards, they would lose their competitive edge in comparison to competitors who can create a similar product for less. The economic motivation to change the production process is therefore very small.

It would not be fair to state that consumers only choose a product because it is cheaper. Price has managed to become such an important tool of comparison within the food sector, more so than in others, due to another characteristic of the sector: a lack of transparency. The agro-food industry is an incredibly complicated sector due to the many players involved in the farm to fork process. Even the big players in the sector, the retailers and processing companies, are barely able to look further back than two steps in the chain outside of the mandatory provided list of product information (WRR, 2014; p. 82). A soy farmer cannot tell what will happen to its produce after it has been shipped, the producer that bought the soy cannot tell in turn from which farm the soy exactly originates and the lack of information is the strongest for consumers who will not know anything about the products outside of the mandatory information provided on the package. On top of that this information can also be quite vague since terms like 'country of origin' are not legally defined. For example an Italian pasta sauce can be 'made in Italy' when all the ingredients are mixed there, but this does not mean that the ingredients used for the sauce were grown in Italy. Where the separate ingredients do come from is a complete mystery, one that not even supermarkets or processing companies have good oversight on. Creating

transparency in the sector is complicated further by the many cross-border interactions in the sector. A final food product is often made from primary ingredients that come from all corners of the world. This means that ingredients and products constantly enter new jurisdictions, making oversight even more complicated since information is often scattered.

The unavoidable effect of this lack of transparency is that responsibility for issues in the chain like pollution and human right violations can be easily transferred onto others. After all, no one in the sector has complete oversight on these problems and where they stem from. Most producers are not even aware of the issues in their own production chain. This has resulted in buck passing between all the actors involved in the industry (Tempels et al, 2017). A combination of limited oversight in the processing chain and the lack of economic reward for investing in sustainability have resulted in little incentive to restructure the production process. It is therefore not the case that businesses in the sector are actively looking the other way when it comes to problems. Some steps towards sustainability and circularity have been taken, yet it is extremely difficult to be a frontrunner in sustainable efforts within the food industry because of the reasons listed above.

Research has shown that there are however still incentives that push the industry towards sustainability and circularity, despite all these problems. The first obvious reason why the agro-food industry makes changes within the production chain is regulation. When companies are forced to adapt certain rules it leaves little room to not do this. What also helps is that everyone is obliged in that case to abide to the same standards, which contributes to a level playing field, something which is especially welcome in a competitive sector as this one. But there are also reasons for food producers, processing companies and retailers to invest in sustainability even more so than the law demands. Research (Ingram et al, 2016; PBL, 2019) has shown that there are three main factors which incentivize actors to voluntarily contribute to sustainability efforts:

1. Preventing reputational damage

As has been addressed before, consumers have high standards when it comes to the products they buy, which means that businesses want to prevent negative press in order to protect their brand and reputation against the many issues that plague the production chain. By building a good reputation businesses try to distinguish themselves from the competition and safeguard themselves from loss in revenue caused by scandals. Most companies on top of that are also genuinely committed to improving the social and environmental conditions under which their product is manufactured, but lack the knowledge and expertise to address these issues in their own production chain. Within this context the role of NGO's, think tanks and other non-profit organisations is also relevant, since they play an important part in kickstarting public campaigns that expose negative practices within the industry and also actively support

businesses in improving their method of operation. Through a combination of having a respectable reputation, extensive knowledge, access to a big audience and societal support they can exert quite some pressure on the industry to make adaptions. An example in which this comes together in the Netherlands is the *Agreement for the Food Products Sector* which has been created by the sector, civil society organisations, trade unions and the Dutch national government in which all stakeholders dedicate themselves to minimising 'the risks of negative impacts, including human rights violations and environmental damage, and work towards a more sustainable production chain in the food products sector' (SER, 2018).

2. Securing supply chains

More and more businesses with direct links to farmers are contributing to circular efforts that are focused on resource usage in order to prevent depletion of farmland. This is done to secure supplies in the long run since fluctuations in supply can heavily impact the entire industry. On top of that, eco-efficiency can lead to a lower cost price which can give a competitive advantage (Stellingwerf, 2019). This has to do with the fact that when a company shortens its supply chains, it will spend less on transportation costs and is assured of a more reliable supply. Incidents like the covid pandemic and the blockage of the Suez canal have shown how fragile international supply chains can be. Using more local suppliers can in those instances also prove to be a major advantage and at the same time contributes to more sustainable production practices.

3. Preparing for the future

The third reason why businesses voluntarily start with sustainability efforts is to anticipate and/or prevent future legislation that the business needs to abide to. Becoming more sustainable is therefore also a strategy to anticipate certain changes in regulatory requirements or prevent these changes from happening in the first place: when the sector shows that it is able to adapt on its own, it might be reason for a government to not interfere in the sector. This means that businesses can transition at their own speed and on their own terms, which is more favourable than abiding to a mandatory norm imposed from above.

Even though these reasons sound promising in term of moving towards a more sustainable system, the above discussed issues exemplify what determines path dependency in the agro-food industry and why it is difficult to transition towards another socio-technical system. Overall, actors in the agro-food industry are not capable of transitions towards a circular agro-food sector on their own due to the way they are locked-in their linear practices and the way the current system punishes sustainable frontrunners by making them almost guaranteed lose market share.

2. Technological artefacts

This brings us to the second dimension of socio-technical systems: technological artefacts. In the most general sense, a technological artefact refers to all material objects made by people as a means to achieve practical ends (O'Reilly, 2021). Within the context of transition studies and socio-technical transitions, technological artefacts are all material aspects within in this case the agro-food industry that contribute to the transition towards a circular economy. As the STI-policies field has already exemplified, innovations are seen as an important motor for transitions. It is given that context also important to understand how well the sector is able to use innovations and knowledge in order to create the material means necessary for a circular production system. It is one thing to want to become more circular, another aspect is whether or not the industry is able to introduce the necessary changes in its own production process in order to make that happen.

Within innovation studies, two different types of innovation have been distinguished: radical and incremental innovation. Radical innovation is the introduction of something entirely new while incremental innovation is the improvement of existing knowledge or technology. The agro-food industry was for a long time mostly concerned with incremental innovations and more specifically on product and process innovations (Logatcheva et al, 2013). However, since sustainability concerns are also increasing within the agro-food sector, we see once again a rise in radical innovations within the sector (Barth et al, 2017). An example of how this manifests in practice is the growth of the alternative meats sector, which has largely been centred around the invention of new meat substitutes.

The R&D intensity of the agro-food industry is in general terms relatively low. The reasons for this vary. Earle and Earle (1997) have identified three reasons why R&D is relatively conservative in the food industry, First of all, as has been mentioned in the previous paragraph, there is a relatively high number of takeovers within the sector which often go hand in hand with cutbacks and thus a reduction of the R&D budget of food companies (Denčić-Mihajlov, 2020). Another reason for the low funding of R&D is that science-driven innovations are still relatively new in the sector and not all companies are investing in them. The relatively difficult control of intellectual property within the food industry is another reason why investing in R&D is not attractive. Lasty, the dominant short-term focus and the small margins with which the sector operates result in expensive innovations not always paying themselves back either because companies cannot ask a higher price in order to earn the innovation back or losing competitiveness when they do.

The Dutch agro-food industry is a special case when it comes to innovation in the agro-food industry because of the high degree of knowledge and research that is being conducted on the topic of nutrition in the country. The Dutch government is also actively stimulating innovation

in the agro-food industry through the top sector policy (topsectorenbeleid) that was introduced in 2011. The top sector policy was designed in order to be able to pay special attention to certain sectors in order to strengthen their international position. Since food is one of the Netherlands' biggest export products, Agri & Food has been granted top sector status. When it comes to innovation, the Top Consortium for Knowledge and Innovation (TKI) plays an important role. The TKI agenda of top sector Agri & Food focuses on supporting research programs and co-finances innovation projects within the sector. The government thus actively stimulates the development of food science in the country.

The east of the country is nicknamed the 'Silicon Valley of Agro-food' (or 'Food Valley') due to the high-level of technical innovation taking place there (Terazono, 2018). The high intensity of research on the topic is also promoted by close cooperation between businesses, the government and research institutes like Wageningen University and Research (WUR), which is specialised in agro-food studies, Seed valley and Top Institute Food and Nutrition (PwC, 2014). The Netherlands being a world leader in agro-food innovation has also attracted foreign multinationals: fifteen out of the top 20 biggest agro-food companies like Nestlé, Coca-Cola and Unilever have R&D sites in the Netherlands (Invest in Holland, n.a.). In 2015, the private sector invested around €800 million in agro-food R&D (Ministerie van EZK, 2017). This high level of research has also translated in research and innovation initiatives on sustainable and circular agro-food projects, which means that the technical and intellectual know-how is certainly present in the country in order to support the transition towards a circular agro-food sector. The technological artefacts needed for such a transition could be relatively easily developed due to the high quality and developed innovation climate of the Dutch agro-food sector.

3. Institutions

The European circular economy strategy for the agro-food industry

The European Commission has quite an extensive circular strategy specifically aimed at the agro-food industry. However, all policy-mixes that contribute in one way or another towards the introduction of circular practices in the agro-food industry have been scattered over a variety of different proposals and publications. First of all, the *Circular Economy Action Plan,* contains a sector-specific strategy for the food industry as part of the key product value chain approach which creates targets, goals and legislation for specific sectors within the EU which are considered to be important for both the EU economy and reaching the sustainable development goals. Another important part of the EU's strategy for the food industry is the *Farm to Fork strategy*. 'The Farm to Fork Strategy for a fair, healthy and environmentally-friendly food system', as it is officially called, is same as the *CEAP* part of the EU's Green Deal

and aims at introducing actions that help build a better EU agro-food industry for consumers, producers and the environment. The strategy relies heavily on the SDG's and overall restructures the agro-food industry in such a way that the sector will operate based on the sustainable development principles. On top of that, the actions laid down in the Farm to Fork strategy also address the entire production chain; from agricultural processes to consumers. The food industry needs to become more just, sustainable, reliable and affordable and the 27 actions that will be introduced between 2020 and 2024 should suffice according to the Commission in guiding the industry in that transition.

These two strategies have been in part inspired by the *EU Platform on Food Losses and Food Waste,* an advisory body which was created by and has supported the EU Commission since 2016. The platform has among others created EU guidelines on food donation, food no longer intended for consumption, expiration date marking and the development of a food waste measurement methodology (European Commission, 18-03-2021). The Platform adopted *Recommendations for action in food waste prevention* in 2019, which as the name already hints at provides recommendations to prevent food waste across the entire food production cycle, which have been partially implemented in both the *CEAP* and the *Farm to Fork strategy*. Alongside these developments the EU also introduced an updated version of the *Bioeconomy Action Plan* in 2018 which aims at reducing the amount of natural resources used in the EU economy. The most important aspects of the plan is to replace fossil materials, preserve ecosystems, create green jobs and turn waste into new added value in order to restructure food and farming systems according to sustainable and circular principles.

Lasty, the Commission also launched *Food 2030*; a specific policy for research and innovation created to transform EU food systems. The idea of *Food 2030* is that this plan provides the policy framework necessary to help the sector transition in such a way that the sector will operate within planetary boundaries in the foreseeable future (DG for Research and Innovation, 2020). Together the *CEAP, Farm to Fork Strategy, Bioeconomy Action Plan* and *Food 2030* have stipulated the EU's approach for a circular economy in the agro-food industry. Now follows a thorough analysis of three specific circular economy strategies in the agro-food industry. As has already been explained in the methodological chapter, I have chosen to analyse three specific circular aspects instead of provide an overall description of the entire strategy since that would result in a holistic summary which does little to explain the motivations of the EU and policy instruments used in order to reach those motivations. By specially addressing three smaller aspects of the strategy, I am able to provide a deeper analysis of the functioning of the European and Dutch circular economy strategies and how they relate to Weber and Rohrarcher's failures framework.

Strategy 1: Natural Resources

Natural resources in the agro-food system consist of both renewable and non-renewable resources. Renewable resources are for example land, landscape, soils, fresh water and biodiversity. Non-renewable resources mainly consist of fossil fuels and so called minerals or nutrients (UNEP and IRP; 2016). In terms of renewable sources, the Commission has laid down a circular strategy for water use in agriculture; the Water Reuse Regulation. This regulation has already been implemented and will enter into force on 26 June 2023 and sets minimum quality requirements for water reuse in agricultural irrigation (DG for Environment, 2021). In addition to that the EU also wants to address the issues related to loss of nutrients caused by the current forms of farming which prevent plants and soil to absorb them. The goal is to reduce nutrient losses by 50% and reduce the use of fertilisers (which harm biodiversity and the natural composition of soil) by 20% by 2030 (European Commission, 2020B). The Commission also plans to develop the 'Integrated Nutrient Management Action Plan' in order to address nutrient pollution caused by the agro-food industry while the use of fertiliser will be addressed in an updated version of the Common Agricultural Policy (CAP). It is however important to note that the Regulation for water reuse does not stipulate rules or targets for water reuse, but facilitates the uptake of water reuse so that member states can decide for themselves if they want to practice water reuse or not, which was previously limited due to strict EU regulation in regards to water safety (Regulation 2020/741).

In order to reduce the use of non-renewable resources in the agro-food sector, the *CEAP* refers to the plans laid down in the *Bioeconomy Action Plan,* which was designed to help all sectors that rely on biological resources, the agro-food being one of them, to use 'biological resources and processes to produce food, feed, bio-based products, energy and services' (DG Research & Innovation, 2018; p. 4). The *Bioeconomy Action Plan* wants to address both the sustainable management of natural resources while at the same time diminishing the dependence of the sector on non-renewable resources. The main strategy through which the EU aims to achieve this is through increasing demand for biomass. How this is to be achieved is as of now unclear, but the goal is to develop a roadmap by 2024 in which the sourcing of biomass is further elaborated on.

The EU has been laying the groundwork when it comes to the use of renewable resources in order to help close the cycle of the agro-food industry. An issue however arises when looking at the strategy for non-renewable resources, or better said; the lack of a coherent one. One of the main aims of circular economy is that it tackles the use of finite resources, which makes it all the more odd that this particular aspect seems to be missing from the circular strategy for the agro-food industry. The use of finite resources has been addressed on the EU level on countless occasions and entire strategies have been dedicated to this issue specifically, yet how the agro-food sector needs to adapt its practices in light of this transition has been mentioned

once in the *Farm to Fork* strategy in the context of investigating the possibility of tax incentives in order to reflect 'real prices' for among others natural resources and other negative environmental externalities. Given the large place that stopping the use of natural resources has in terms of circular economy, it is quite surprising that the EU's circular strategy has failed to even mention an explicit approach towards the issue in context of the agro-food industry, especially since this industry is responsible for around 17% of the EU's gross resource consumption (Monforti-Ferrario et al, 2015). This does not mean that the EU has not addressed the use of non-renewable sources. The EU has introduced the *Renewable Energy Directive* and the *Energy Efficiency Directive* and both these directives 'do not directly target the food production process in itself but build a framework to which the several sectors and processes involved in food production can refer' (Monforti-Ferrario et al, 2015; p. 92).

Strategy 2: Consumer and producer behaviour

Consumer behaviour plays an important role in the considerations of producers, which is why it was specifically identified as a focus point of the *Farm to Fork strategy*. This publication highlights six actions specifically designed to promote sustainable food consumption and nudge Europeans towards more sustainable and healthy diets. The actions include mandatory front-of-pack nutrition labelling and a sustainable food labelling framework to enable consumers to make sustainable food choices, mandatory criteria for sustainable food procurement for schools and public institutions, an EU promotion programme for sustainable agricultural and food products and new EU rules on date marking ('use by' and 'best before' dates) in order to prevent food waste (European Commission, 2020A). These six plans should in the eyes of the Commission contribute in helping consumers make better informed choices when it comes to sustainably produced food products. The *Bioeconomy Action Plan* also introduces one action specifically tailored towards consumer behaviour, namely:

'Promote and/or develop standards and emerging market-based incentives, and improve labels applicable to bio-based products on the basis of reliable and comparable data on environmental and climate performance' (European Commission, 2018A; p. 64).

This action wants to use the improved information on consumer behaviour gathered from better monitoring practices and better standards for bio-based food products in order to create a sense of accountability among consumers and 'foster consumer's trust' (p. 65). This trust is according to the Commission important because of the low level of transparency in the agro-food industry. By better and more visible standards, for example through the introduction of the EU ecolabel, the Commission wants to make it easier for consumers to identify more circular options in supermarkets and thus be able to choose a more sustainable lifestyle.

In terms of addressing producer behaviour, the EU Commission wants to contribute to countering the concentrated market power within the industry and improve transparency within the chain. How the EU Commission is going to do this is still vague, only mentioning 'legislative initiatives to enhance cooperation of primary producers to support their position in the food chain and non-legislative initiatives to improve transparency' planned to be introduced in 2021 – 2022 (European Commission, 2020A; p. 21). In addition to that, the EU Commission wants to introduce a proposal for mandatory origin indication for certain products to force more product transparency. But again, it remains to be seen what the specifics of such a proposal will be.

The European Commission overall places a lot of importance on consumers and behavioural patterns on the success of the circular transition:

'The successful transition [...] requires a profound transformation both on the supply and the demand side of the economy. On the demand side, consumers and their behaviour play a major role in this transformation process. As demonstrated by a number of studies, consumer awareness and knowledge are important factors determining responsible consumption behaviour' (European Commission, 2018C; p. 85).

But even though the Commission underlines the importance of especially consumer behaviour in reaching a circular economy, all the actions aimed at consumer and producer behaviour from the EU level are aimed at helping make both consumers and producers make better choices, but no action is actually addressing a strategy in order to nudge these groups in a certain direction. The focus of EU policy-mixes in terms of consumer behaviour can be best described, as has been done by the Commission itself in the *Farm to Fork Strategy,* as 'empowering consumers to make informed, healthy and sustainable food choices' (European Commission, 2020B; p. 14). Food labels, better readable expiration dates, food education at schools at so on are all policy instruments focused at creating the option to act more sustainable, but no action is actively steering consumers and producers towards more sustainable choices. As the paragraph on actors already explained, there are many reasons why consumers and producers do not and/or cannot make these choices. But as of now, no actions or policy mixes have been introduced that address that. In the specific case of more transparency in the sector for producers, it remains to be see how much will be done with that in light of the path lock-ins present for most actors in the agro-food production chain.

Strategy 3: Reducing Food Waste

Reducing food waste is a very interesting goal in European context because it was the first and only target the European Commission created for the agro-food sector in its first *Circular Economy Action Plan* from 2015 and it has been a key point of sustainability strategies ever since. The following points of action were introduced in the 2015 proposal:

> *In order to support the achievement of the Sustainable Development Goal target on food waste and to maximise the contribution of actors in the food supply chain, the Commission will:*
> *- develop a common EU methodology to measure food waste and define relevant indicators. It will create a platform involving Member States and stakeholders in order to support the achievement of the SDG targets on food waste, through the sharing of best practice and the evaluation of progress made over time.*
> *- take measures to clarify EU legislation relating to waste, food and feed and facilitate food donation and the use of former foodstuff and by-products from the food chain in feed production without compromising food and feed safety; and*
> *- examine ways to improve the use of date marking by actors in the food chain and its understanding by consumers, in particular the "best before" label.*

Source: European Commission, 02-12-2015; p. 15

The proposed platform was indeed introduced in 2016 and has since supported the Commission as a key-advisor on food waste. Their mandate runs until October 2021, but a re-application has been opened for the period 2022 – 2026 (European Commission, 2021C). The examination of an updated 'best before' label ruled positively on this proposal and it is now part of the updated *Circular Economy Action Plan* of 2020, but is yet to be introduced. Contrary to the first action plan, the current *CEAP* does not address food waste; all new measures that address food waste have been written down in the *Farm to Fork* strategy.

The *Farm to Fork* strategy introduced two actions to counter food waste; one for the previously mentioned EU rules on date marking and one for EU-level targets for food waste reduction. The Commission wants to cut food waste in half by 2030 and is planning on introducing legally binding target for member states in order to achieve this. These targets will most likely be introduced as part of an update of the Waste Framework Directive (2008/98/EC) and are planned for 2023.

Once again the ambitions within this specific strategy are high, but since most action is planned for 2023 it is too soon to tell in what form and through which policy mixes the Commission will (or will not) achieve the laid down targets concerning food waste. The intention to use legally binding measures however stands in stark contrast with the other two strategies which are more voluntary in nature and could have therefore major impact in stimulating a circular agro-food industry in terms of closing the cycle within this specific sector when implemented. One note that needs to be added is that by places targets which needs to be reached by the

member states, the Commission leaves it up to the member states themselves to come up with policy mixes to counter food waste. Overall the EU's approach towards food waste can be described as stimulating private actors (through the EU Platform on Food Losses and Food Waste) and national governments (through the proposed targets) to come up with their own solutions for food waste which will in turn be facilitated by the EU through funding and exchange of know-how between stakeholders.

The Dutch circular economy strategy for the agro-food industry

The Dutch agro-food specific circular economy approach has been designed around the overarching goal of 'sufficient, healthy and sustainable food for all' (PBL, 2019). The roots of the sector-specific circular approach towards agro-food can be traced back to 2015. Following the publication of an advisory report by the Scientific Council for Government Policy (WRR), the Dutch State Secretary of Economic Affairs and the Minister of Health, Welfare and Sport proposed a national food agenda for safe, healthy and sustainable food in a letter to parliament (Dijksma and Schippers, 2015). Public health, ecological sustainability and ruggedness were chosen as the pillars for this new approach, since these three themes were marked as priorities in the WRR report, and within the context of preventing food waste, a circular strategy was opted.

This letter was followed by another one in November 2016 named 'Progress Food Agenda for Safe, Healthy and Sustainable Food' in which a specific 'circular food economy' was outlined by the Cabinet highlighting the importance of re-organising the Dutch agro-food chain and stimulating more sustainable food consumption. The Food Agenda was nationally introduced in 2017 with the *City Deal Food and the Urban Agenda* which was signed by three ministries, twelve cities and one province, pledging to cooperate to improve the Dutch food system. The sector-specific circular strategy for the agro-food sector was eventually introduced in 2018 in the *Transition Agenda Biomass and Food* and this one was followed in 2019 by a *Plan of Action for the transition to a circular agriculture* that sets out the main goals for a new agricultural system that shifts the focus from 'growth in production volumes and cost price reductions towards optimisation in resource use and food production in harmony with nature' (Government of the Netherlands, 2019).

There is also a second track of Dutch circular economy implementation that needs to be discussed, which is the promotion of CE through the top sector policy. The Dutch government introduced the top sector approach in 2011 in order to stimulate the international competitive position of nine sectors in which the country already excels on a global basis. The Dutch Agri & Food sector is one of these nine sectors and therefore receives more sector-specific attention in order to boost innovation by stimulating public-private cooperation between companies,

universities, research centres and the government (Keijzer, 2019). In 2018, the Dutch government introduced four societal 'missions' within the top sector policy in order to connect the sector-specific strategies with the SDG's. One of these missions, energy transition and sustainability, specifically lists the implementation of the Dutch circular economy targets as its main goal. The missions were introduced to create specific goals and ambitions for bigger societal challenges. For Agri & Food the Dutch government has stated the following:

'In the Netherlands, the production cycle from producer to consumer for agriculture and food production functions efficiently and at a low cost. The disadvantage is that margins are low, which makes the sector economically vulnerable, and the pressure on the living environment is high. To ensure that the Netherlands is sustainable and can produce climate-neutral food and greenery, we need to close cycles.' (Keijzer, 2019; p.5).

In terms of circularity, the specific missions for Agri & Food are: circular agriculture by 2030, climate neutral agriculture and food production by 2050 and valuable, healthy and safe food by 2030. This means that all food produced and consumed in the country should be healthy, safe and sustainable with all partners within the production chain, including farmers, receiving a fair price for their product. The responsibility to reach these targets lies with the Agri & Food Top Team, which is composed of representatives from businesses, academia and the government. Overall, the top sector approach stimulates circular innovation in the public-private sphere.

Strategy 1: Natural Resources

One key aspect of the circular strategy for the agro-food sector is diminishing the use of finite natural resources in the agro-food production chain. The Dutch have introduced two ways of doing this: making optimal use of waste flows and switch towards biomass as a sustainable energy source (Rijksoverheid, 2018A). The currently published documents on circular economy implementation in the agro-food sector mention 'making optimal use of waste flows' on multiple occasions, however there is no mention of specific strategies on how this is going to be achieved in practice. A couple of pilots where residual waste flows are being used are being funded by the Dutch government: the Shared Research Programme Biorizon, innovation programme Waard&Vol Groen, the Groene Mineralen Centrale and a programme that stimulates the production of food products made from insects (Ministerie van Infrastructuur en Waterstaat, 2019). However, a sector-wide approach for the stimulation of the use of waste flows has so far not been developed yet.

Biomass is a fuel that is developed from organic materials which can be used to produce electricity or heat. The idea behind biomass is that biological waste is burnt and that the energy this releases can be used as a renewable energy source. What this organic material is can vary:

clippings and wood waste from the forestry and wood processing industries, organic household waste, leftover vegetable oils from food processors, livestock manure, leftover crops that contain high levels of energy like rapeseed and palm trees, sewage slurry and so on (Government of the Netherlands, 2016). The materials can be transformed into energy in different ways. Electricity plants or waste incinerations can generate electricity by burning biomass and using the energy that process releases. Another way is blending petrol with biofuels in order to make that type of fuel more sustainable. Biomass takes a very central role in the circular strategy for the agro-food industry (and the Dutch circular strategy in general). Two from the in total six action points in the transition agenda concern biomass:

- Increase the demand of sustainably produced biomass.
- Optimal use of biomass and waste flows for circular biobased products.

Even though steps were taken in order to increase the production of organic materials that can be used for biomass, the Netherlands is still largely dependent on imports for its biomass. This development has led to doubt whether or not biomass is indeed a viable form of renewable energy since biological waste that can be used for biomass is too scarce in the country and the necessary materials need to be shipped in from all corners of the world. On 8 July 2020 the Socio-Economic Council (SER) published a report which concluded that even though the use of biomass is crucial for reaching the circular economy targets, the way it is produced now it too wasteful and could actually contribute to carbon emissions and therefore global warming (SER, 2020). This year the Dutch government decided to brand biomass as a 'contested topic' which means that the current caretaker government is not allowed to make decisions on the topic and any further political development is halted until the installation of a new government. For the time being subsidies for biomass have been stopped and the construction of new biomass combustion plants has been halted by most energy companies because of the news (Rijksoverheid, 09-06-2021). It is doubtful given the current developments that biomass will be used as a renewable energy source in the foreseeable future, especially because the energy source has developed a negative image in the country. This is not only problematic for circular economy implementation, but for the reduction of emission targets in general since biomass is a key aspect of the country's strategy to reach the 2030 climate and energy targets. In 2020, 54% of the country's renewable energy came from biomass (McDonald, 09-06-2021). Since biomass is also one of the cheapest forms of renewable energy, finding an alternative will be a costly endeavour. As of now, no alternative strategy has been developed to substitute biomass in the circular strategy for the agro-food industry, causing a lot of uncertainty about the Dutch approach towards sustainable energy sourcing.

The whole debacle concerning biomass has strong implications for the Dutch circular economy strategy and especially for the agro-food sector since much of the sector-specific approach was

built around the use of biomass in order to achieve certain circular goals. With no alternative in sight, also due to the fact that a new cabinet has yet to be formed at the time of writing and political intervention is therefore out of the question, it is unclear what the Dutch plans will be concerning the use of sustainable natural resources in the agro-food industry.

Strategy 2: Consumer and producer behaviour

The Dutch government has laid down specific expectations it has for consumers in the transition agenda Biomass & Food: a change in diet, buying behaviour, an attitude change in how food products are handled and a willingness to carefully handle food waste. In order to stimulate these changes in behaviour the government wants to increase the awareness and importance of circular biobased products among producers and consumers alike and explore which mechanisms can be used to influence behaviour. An emphasis is laid on the usefulness of 'nudging' as an instrument. An important role is played by public-private platform Samen Tegen Voedselverspilling (Together Against Food Waste) in order to educate consumers about 1) ethics aspects of food, 2) saving money and 3) how food relates to sustainability. The platform mostly organises workshops and information events at the local level. The government also acknowledges that it needs to increase its knowledge on consumer behaviour in order to stimulate circular buying behaviour, since there is as of now little insight into how measures aimed at influencing consumers work in practice and what the exact drivers and motivators are that change people's behaviour (Government of the Netherlands, 2018). One strategy that is opted is to 'reward good behaviour', but there is no mention of what that should entail. Increasing demand for biobased and circular products is seen as a responsibility of retailers, brand owners and societal organisations. In order to influence consumer's eating habits, the Dutch government is making use of top sector initiative SHARP (Sustainable, Healthy, Affordable, Reliable, and Preferable Diet), which as of now is mostly concerned with monitoring eating habits before it can create proper tools on how to change them. One last tool that is mentioned in the agro-food industry strategy when it comes to consumer behaviour is education and using schools to teach children about sustainable diets and better habits. Overall influencing consumer behaviour is still in its infancy. The government aims to increase knowledge on nudging instruments and how they can help in changing consumer's dietary behaviour, but even so the responsibility of creating consumer demand is mostly placed on the private sector and the industry itself.

This brings us to producer behaviour, a subject which is surprisingly little mentioned in the Dutch CE plans, especially given how much emphasis is laid on the responsibility of businesses when it comes to adopting more circular practices. The only mention of any specific tool that explicitly aims to change producer behaviour is the ambition to introduce a special 'recycle-

tax' for importers of livestock feed and fertilizers when they have been created using so-called 'virgin nutrients' when one could have made use of biological waste instead.

The Dutch strategy to influence consumer behaviour is more elaborate than the European one, yet where the two coincide is their open approach towards good behaviour and voluntary participation of consumers in terms of adopting better behavioural practices. Also in this strategy is specific action aimed at producers heavily underdeveloped, not laying down any general targets or practices for businesses and other private sector actors on what they need to do in order to achieve circularity.

Strategy 3: Reducing Food Waste

Already back in 2009, the Dutch government had set a target to reduce food waste by 20% in the period 2009 – 2015. Multiple initiatives were introduced to inform society about food waste in order to move consumers and producers alike to lessen the 48 kg of food waste that every Dutch citizen annually produces. The target was not reached and in 2016, in light of the publication of the first *Circular Economy Action Plan* and the establishment of the *EU Platform on Food Losses and Food Waste*, the Dutch government proposed six new areas by which it would try to lessen food waste (Waarts et al, 2009):

1. Better monitoring of food waste.
2. Stimulation of innovation through the top sector policy.
3. Informing/educating consumers.
4. Improving understanding and regulation of 'best before' dates on food products.
5. Stimulating food donations.
6. Stimulate European and global agenda-setting on the topic of food waste.

It was not until 2018 however that a target to counter food waste was explicitly added in Dutch policy through the transition agenda Biomass & Food, the circular strategy specifically designed for the sector. Food waste should be cut in half in 2030 compared to 2015. This target is based on SDG 12.3: Global Food Losses and Waste.

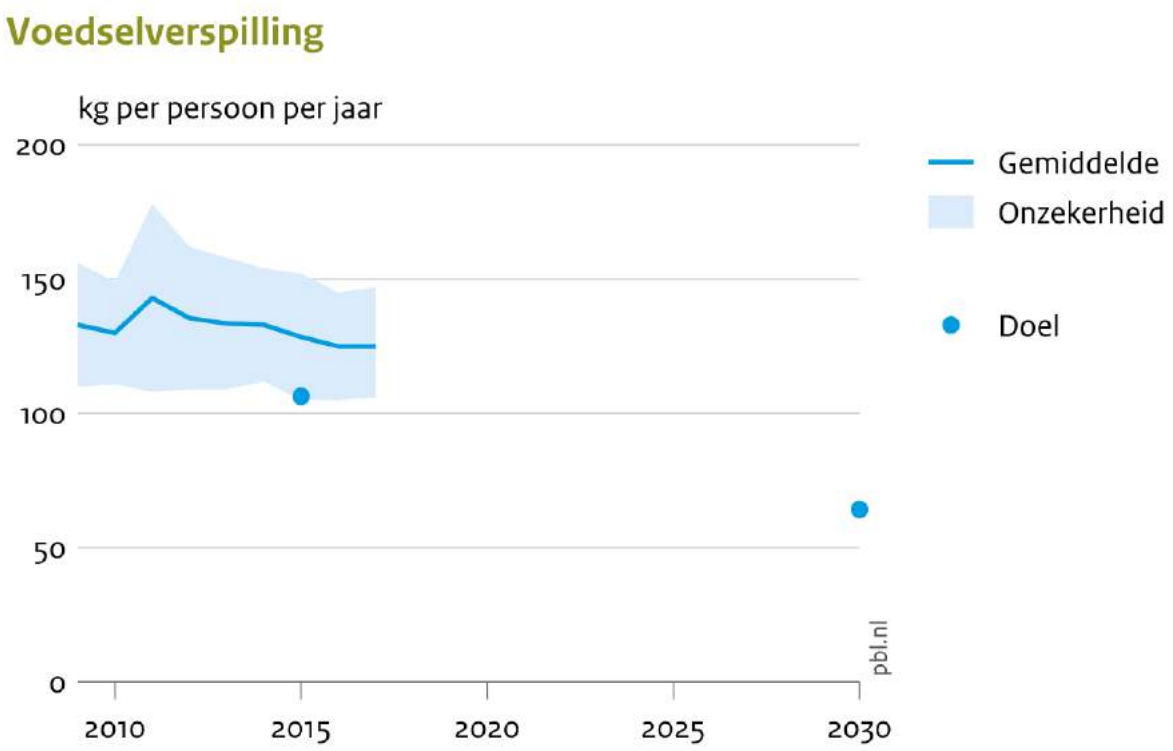
The government introduced seven specific actions in order to combat food waste. The first of these is better monitoring of how much food is wasted throughout the entire production cycle. This is also an action that the country is forced to deliver upon under EU legislation in the form of a bi-annual report. A similar approach was adopted specifically for businesses called the 'target, measure, act' principle. The government's aim is to create awareness among producers on how much food is actually wasted, in the hope that this stimulates the sector to take up measures to prevent food waste. The government provides supporting tools, such as vouchers, process support, opportunity analysis tools and expertise to arrive at an outline business case

for preventing and reducing waste. The third action is the stimulation of innovation in order to reduce food waste by contributing to stakeholder cooperation and the support of start-ups and pilots. This will also happen on a larger scale through action four; living labs. The living labs are a series of networks in which businesses, local governments and educational and knowledge institutions work together to achieve more circularity. Once again the living labs have the intention to stimulate action in the production cycle itself, especially by businesses. One action is also specifically aimed at consumers. Through platform Samen Tegen Voedselverspilling (Together Against Food Waste), the government, in cooperation with the business community, wants to educate consumers about food ethics, saving money and sustainability. The sixth action is the stimulation of interaction between stakeholders in order to exchange best practices with each other; multiple websites have been launched in order to facilitate this. Lastly, the Dutch government wants to exchange knowledge on food waste through international platforms in order to find international solutions to food waste which can be implemented on a local scale.

Overall, the Dutch circular strategy specifically for the prevention of food waste, and indirectly closing the agro-food cycle, can be described as a facilitative approach in which the main aim is to stimulate the sector to prevent food waste on its own accord. The actions proposed are all based on stimulating the exchange of best practices and increasing awareness on this topic amongst society. It is the government's aim to act as mediator while public society, and especially businesses, has a leading role in reducing food waste and so reaching the target on food waste reduction set by SDG 12.3. This is also explicitly stated on the government website: 'Ultimately, it is up to consumers and businesses to waste less food. But the government helps' (Rijksoverheid, 2021).

It is interesting to note that the original target from 2009, 20% reduction of food waste, was not reached in 2015 and as of now still has not been reached; with annual total food waste going down but not at the desired speed. Since the current strategy barely differs in form from previous strategies, it could be argued that this approach on its own will not suffice to reach the proposed targets. This is also in line with the conclusion reached by PBL, who is in charge of the monitoring of food waste: 'Whether this intensification will be sufficient to achieve the 2030 target is uncertain. The available data on food waste do not show a clear downward trend so far' (PBL, 2020).

Figure 23: Dutch progress on tackling food waste 2009 – 2017.



Source: Rijksoverheid, 09-09-2020.

Case study 2: The Dutch construction industry and circular economy

The Dutch construction industry

The Dutch construction industry (bouwsector or 'de bouw') is an umbrella term for all businesses that in some capacity contribute to the design, construction, maintenance or demolition of the built environment of the country. The industry can be divided into three main categories in terms of the specific purpose of businesses. The first category is called Residential and non-Residential Building (Burgerlijke en Utiliteitsbouw, B&U) and works on the design and construction of residential houses, industrial buildings, public buildings and other non-specified buildings. Contractors are usually specialised in one of these categories, but it is not always possible to make a clear distinction between them. One can think for example of a shopping mall with residential houses on the top levels. The second category is called the Civil and Hydraulic Engineering sector (Grond-, Weg-, en Waterbouw, GWW) and is best described as the field that is specialised in the planning, design, implementation and management of public utilities. Another term often used for GWW is infrastructure. Some categories within this subsector are road construction, dry water construction, wet water construction and railway construction. A third category can be identified which consists of businesses which work with so-called specialised construction and are engaged in a wide range of activities, such as demolition, installation of plumbing and heating systems and tasks like painting and plastering (UWV, 2021). In opposition to Agri&Food, the Dutch construction sector is not considered a topsector by the Dutch government.

Figure 24: Businesses in the Dutch construction sector sorted by number of employees; 2021 Q1.

Sector	Total	1	2 - 5	5 – 10	10 – 50	50+
Residential and non-residential building	85.795	75.325	7.465	1.445	1.270	180
Civil an Hydraulic Engineering	10.550	8.555	1.220	330	310	60
Specialised construction	109.180	89.385	13.165	3.215	2.940	275
Construction total	205.520	173.265	21.850	4.990	4.520	515

Source: CBS statline, 2021.

In the first quarter of 2021, the Dutch construction sector consisted of 205.520 registered businesses. The number of businesses within the sector has been growing steadily, with an increase between 2010 and 2019 of 42.3% (European Commission, October 2020). An interesting characteristic of the sector is that most businesses are one-person companies, a trend which accelerated during the economic crisis and has now led to a relatively high percentage of one-person companies (or ZZP'ers in Dutch) in the sector compared to the national average (European Commission, 18-09-2018). The Dutch construction sector makes up around 9% of the GDP and had a production value of 70 billion euros in 2020. In 2018, the Residential and non-Residential sector had a turnover of 24.6 billion euros and the Civil and Hydraulic Engineering sector managed to rake up 8.6 billion euros that same year. Overall, turnover managed to grow with 26.5% since 2010. These numbers have made construction one of the fastest growing sectors in terms of productivity in the last decade (Nederlands Comité voor Ondernemerschap, 2019).

Circular building is defined as 'the design, construction and demolishing of a building in such a way that, in addition to high-quality deployment and reuse of materials, and an adaptive and future-proof design, sustainability ambitions regarding energy, water, biodiversity and ecosystems are taken into account as well' (Ten Dam, 2018; p. 4). Circular economy principles can be introduced within the construction industry across the entire value chain. The most important factors of circular construction that have been identified are the use of demolition waste in order to reduce the amount of 'virgin' raw materials, demountable construction to guarantee reuse of materials, modular construction of buildings so that it is possible to relocate them or attribute new functions and designing with circular principles in mind (Het Groene Brein, n.a.). The importance of the construction industry for sustainable development cannot be overstated. The Dutch construction sector is responsible for 5% of the country's CO2-emissions and 35% of the total waste flow (van Sante, 2017), meaning that implementation of circularity in this sector could contribute to sustainability efforts in a significant way.

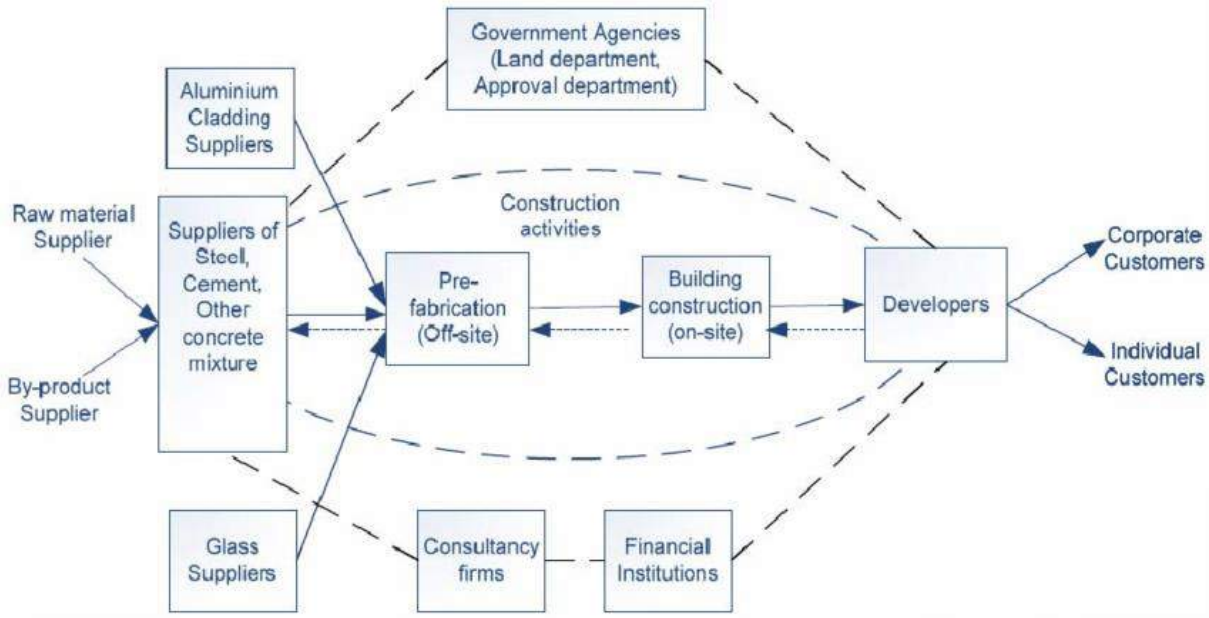
The Dutch construction industry and barriers for sustainability transitions

1. Actors

The construction industry supply chain consists of many different actors from beginning till the end of the production chain. In Dutch policy publications, the construction chain is often divided in four main groups: architectural firms, engineering firms, construction companies and installation companies (EIB, 2020). However, this division leaves out important players like the businesses that supply the (raw) building materials, demolition workers and the clients (either public or private). What sets the construction sector apart from most other industries

is that clients play a role during the building process, while in most other sectors clients or consumers are not involved in the production process and are the very end of the production value chain.

Figure 25: A schematic representation of the construction industry supply chain.



Source: Sundarakani et al, 2014; p. 4.

The construction sector is most of all a tender-based sector where businesses are hired to complete a certain task or project for a client. Within the Residential and non-Residential building sector, the most important project providers are the private sector, housing associations and private individuals. Within the Civil and Hydraulic Engineering sector this divide is a bit different with the government being the most important employment provider. Across the entire construction sector a similar division can be identified based on the size of businesses: large companies are mostly hired by the government, housing associations and other businesses while ZZP'ers mostly hired by private individuals (BouwKennis, 2016).

The Dutch construction industry is currently faced with increasing competition from new and existing competitors due to the increasing complexity of projects, declining project backlogs and limited new project engagements due to current economic uncertainties (KPMG, 2021). New projects are growing in size and complexity, which forces companies to either scale up or specialise. This has resulted in the decline of medium-sized enterprises and thus a growing gap within the sector in terms of company size; companies are either rather small and operate locally or quite large in size and able to operate on a national or even international level. The construction industry is also struggling at the moment with the issue that new projects are being pushed back. This is surprisingly enough nothing to do with the covid-19 pandemic and

the restrictions that have been implemented. Numbers from 2020 show that the impact of the lockdown and curfew were quite limited within the sector (Visser, 2021).

Current economic uncertainties are mostly caused by a landmark ruling from 2019 in which the Dutch Supreme Court ruled that the Dutch government must reduce nitrogen emissions by a minimum of 25% before 2020 compared to 1990 levels (De Rechtspraak, 2019). This has had substantial consequences for the construction sector since new projects had to be delayed in order to meet the target. A survey by Bouwend Nederland (Building Netherlands) has shown that almost half of the companies active in the sector have experienced hindrance due to this so-called Urgenda Ruling (Masser, 2020). Large infrastructural projects have been delayed and the construction of entire neighbourhoods has been put on hold for the time being. This has automatically led to a decline in available projects.

Another issue that is currently pressing on the sector is the growing shortage of skilled workers in construction. The job market is currently classified as 'very tight' and a recent survey by UWV has shown that 52% of vacancies in the sector were difficult to fill (UWV, 2019). Adding to this is a consequence that the covid-19 pandemic did have on the Dutch construction industry: The standstill of international trading routes for some time has resulted in a shortage of building materials. The Economic Institute for Construction (EIB) has calculated that one in five businesses active in the subsector Residential and non-Residential building have had to (temporarily) stop building due to a lack of materials (ten Teije, 2021). This shortage has led to higher prices and combined with the shortage of workers in the sector this has led to overall higher costs for construction companies, which is increasingly pressing on the profit margins within the sector (Wind, 2021). This development is also problematic in terms of sustainability. Research by TNO shows that using sustainable products or providing sustainable services will not lead to a higher turn-over for construction businesses. Even more, a trend that is seen is that sustainable businesses in the construction industry are often confronted with a declining turn-over (Klein Woolthuis et al, 2012; p. 20). This means that same as in the Dutch agro-food industry, the Dutch construction sectors also encounters sector-specific issues which hinder socio-technical system transition towards circularity.

2. Technological artefacts

In terms of technological innovation, the construction industry is generally characterised as a more conservative sector (Arnoldussen et al, 2017). The sector is mostly focused on incremental innovation and especially on process innovations. Process innovation mainly revolves around making the production process faster, cheaper or more sustainable. Examples of this for the construction industry include the introduction of 3D printing, which makes it possible to build faster, and the use of bio-based materials, which makes the construction

process more sustainable. The industry still builds the same houses for example, but is through innovation able to do this in different ways.

In line with the relatively low level of radical innovation in the sector, we also see that in the Dutch construction sector relatively little is spent on R&D: the percentage of R&D compared to GDP has been between 1.64% and 2.18% for the last 50 years while the Dutch government aims for a minimum of 2.5% in each sector (Rathenau Instituut, 2021). These numbers are not the same for the entire sector: Civil and Hydraulic Engineering is often more innovative than Residential and non-Residential building and larger businesses are often also more innovative than their smaller counterparts. The Dutch construction industry also has a relatively low number of trained R&D personnel that can work in R&D in the first place, which also forms a barrier for the overall innovation capacity of the sector. When R&D does take place in the sector it mostly concerns the purchase of external knowledge, the training of personnel and the purchase of machines, equipment and software in which innovative knowledge is stored (Klein Woolthuis et al, 2009).

The limited innovative strength of the Dutch construction sector has been mapped several times in reports, which identify the following main reasons for this trend (Klein Woolthuis et al, 2012; Arnoldussen et al, 2017). First of all, there is a high degree of legislation and regulation within the construction industry, only the space sector is more strictly regulated within Europe and this has everything to do with the strict safety requirements (Klein Woolthuis et al, 2012; p. 25). For this reason, it is quite difficult to introduce new innovations, as the strict interpretation of the rules makes it quite complicated to use new materials or construction methods. This also means that there is also a higher risk of a new innovation not being able to comply with the strict regulations and rules, which means that financially speaking investing in innovation is a bigger gamble than usual within the context of the construction industry. A second aspect that influences innovation in the construction industry is that work is mainly done within the context of tenders and projects. These procedures are not aimed at innovation, but at delivering pre-agreed services. This market characteristic discourages construction companies from launching innovations.

Another issue is scale. Process innovations generally only pay off when the innovation can be rolled out on a large scale. Within the construction industry, this is often a bottleneck which is again caused by the project-based nature of the sector. Since construction companies work for different contractors who all have different requirements, there is no guarantee that everyone will want to make use of the one innovation that the company has. Also the large amount of small businesses in the sector hinders innovation since they often lack the means for long-term investment projects. The project-based structure of the sector has also contributed to compartmentalisation within the sector; each company carries out the task for which they were

hired and there is relatively little cooperation between different chains within the construction industry. This means that every chain in the building process is focused on their own task which makes it difficult to take control in such an environment. This structure is problematic when looking at innovation since this means that multiple parties often need to work together during innovation processes while they have different interests (Kamp, Schultz and Blok, 2016). This structure hinders the exchange of knowledge, which is a precondition for innovation.

All of the above factors have contributed to the conservative construction innovation policy characterised by risk aversion. Due to the great emphasis on price and margins, it is automatically not very attractive to start up innovations that can lead to becoming more expensive than the competition. Additionally, the strict laws, rules and regulations ensure that it remains unclear for a long time whether a new innovation will actually pay off. All of this has contributed to a risk-averse culture within the sector which results in relatively little innovative projects being started by the businesses themselves and has resulted in a climate that is not favourable towards privately steered innovation projects.

3. Institutions

The European circular economy strategy for the construction industry

Once again, in order to get the full picture of the European approach for a circular construction industry it does not suffice to look merely at the plans laid down in *CEAP*. The first EU publication on circular practices in the construction sector for a circular construction sector is the 2012 'Strategy for the sustainable competitiveness of the construction sector and its enterprises' (COM(2012)433 final). This strategy was created in order to stimulate the creation of a more sustainable and energy efficient construction sector and was introduced in light of the energy transition (Europa decentraal, 2020). The strategy introduced several actions in order to lay the groundwork for a proper policy and regulatory framework for the European construction industry (EECS, 2013). The most important actions the strategy introduced are the stimulation of favourable investment conditions for sustainable construction projects, improving human capital in the industry, improving resource efficiency through the harmonisation of assessment methods and the strengthening of the internal market for construction through the introduction of the Eurocodes system of risk assessment (Chatzidakis, 2012). The objectives were later adopted by the European Construction Sector Observatory (ECSO) as the objectives for the EU's construction 2020 strategy.

In 2016, the European Commission published the 'EU Construction and Demolition Waste Protocol and Guidelines'. This publication contains a set of non-binding guidelines with as main goal the improvement of the quality of construction and demolition recycled materials

(European Commission, 18-09-2018). The guideline consists of proposals for improved waste identification, improved waste logistics, improved waste processing and better source separation and collection of waste materials. The guidelines were later on adopted in the *Circular Economy Package*. Another set of non-binding recommendations saw the light in 2019 under the name 'Commission Recommendation (EU) 2019/786 of 8 May 2019 on building renovation'. This set of recommendations was published in context of the EU's energy efficiency strategy and explicitly mentions circular construction as a way to renovate buildings in more sustainable manners in the future through the reuse of waste materials (Europa decentraal, 2020).

The Green Deal introduced in 2020 the Renovation Wave Initiative. The reasoning behind this plan is that roughly 75% of buildings in the EU are not energy sufficient (European Commission, 10-06-2021). The EU Commission hopes with this initiative to stimulate the renovation of existing buildings in order to save energy use and thus the unnecessary use of natural resources. An important part of the initiative is the inclusion of a plan to optimize the lifecycle of buildings and the aim to prolong the life expectancy of build assets. This brings is to the *Circular Economy Action Plan* which also includes a sector-specific approach for the construction industry. The European Commission plans to: introduce recycled content requirements for construction products, develop digital logbooks for buildings in order to improve durability and adaptability of buildings, integrate life cycle assessment in public procurement (LEVELS), introduce material recovery targets for construction and demolition waste and promote initiatives that increase the safe, sustainable and circular use of excavated soils (European Commission, 2020A). Another important plan introduced in the *CEAP* is the EU Commission's ambition to create a 'Strategy for a Sustainable Built Environment'.

This strategy was set to be published in 2021, but a more recent publication has now placed the expected to be published in either 2021 or 2022 (Ragonnaud, 24-04-2021). The Strategy for a Sustainable Built Environment wants to increase material efficiency in the sector and introduce circular principles across the entire life cycle of buildings. It remains largely unclear what the new strategy will specifically contain, but some measures have already been confirmed by the European Parliament:

Figure 26: Proposed actions of the Strategy for a Sustainable Built Environment.

Source: Ragonnaud, 24-06-2021.

A couple of these plans have already been published by the 'Renovation Wave Initiative', since the EU Commissioner for Internal Market, Thierry Breton, decided it would be best to frontload them (Ragonnaud, 24-06-2021).

One final string of regulations that has an influence on the EU circular strategy for the construction industry is waste legislation. There is a whole set of EU Directives and Regulations that have been published related to waste over the years, with more recent ones also laying down targets and rules for circular principles. The Waste Framework Directive (2018/851 of the European Parliament and the Council) is an amendment of the 2008 Directive on waste and lays down the basic definitions of concepts such as recycling. It also introduced a Polluter Pays principle and Extended Produced Responsibility, but most importantly; it introduced a waste hierarchy based upon the principles of circular economy aimed at minimizing waste (MWE, 2020). For the construction industry specifically, the Waste Framework laid down the target that in 2020 70% of construction and demolition waste either had to be re-used, recycled or recovered in another form.

Strategy 1: natural resources

Natural resources in the construction industry refer to the materials that are used for construction and destruction activities, which mostly consist of building materials and the energy used for facilitating these activities (Yilmaz and Bakis, 2015). When specifically looking at what policy-mixes the EU has introduced in relation to the minimisation of material use at the start of the circular cycle, a couple of things come up in the above-mentioned policy documents. First of all, the EU stimulates research and innovation of the development of new kinds of bio-based construction materials through the Raw Materials Initiative (RMI) (COM (2012) 433 final). In addition to that, the EU hopes to contribute to the minimisation of

buildings' carbon footprints through the use of organic building materials that can store carbon, such as sustainably sourced wood (COM (2020) 662 final). This approach is part of the life-cycle assessment approach that addresses circularity across the entire construction chain. Another instrument that the Commission uses to stimulate the use of sustainable building materials is the New European Bauhaus. This organisation was created to be an accelerator for the creation of both sustainable and aesthetically pleasing architecture and design. The New Bauhaus has been granted creative freedom to experiment with the use of bio-based construction materials in order to help these materials breakthrough in the more mainstream practices of the sector.

The EU Commission also strongly urges the member states to come up with market incentives that can stimulate circular practices in the construction industry. Some proposed instruments to stimulate use of sustainable materials are environmental taxation, property taxation favouring more sustainable buildings, and special VAT rates for sustainable buildings materials. The Waste Framework also urges member states to take measures to promote selective demolition in order to increase the amount of materials saved from demolished buildings that can be re-used in the cycle. Lasty, the European Commission is planned to introduce material recovery targets and a plan to support the creation of an internal market for secondary raw materials in 2024 (COM (2020) 662 final).

The EU's approach for the reduction of the use of natural resources in the construction industry can be best described as facilitative. The Commission has introduced initiatives that help stimulate the creation of bio-based alternatives in society through funding and awareness campaigns. In addition to that, the Commission addresses the Member States on multiple occasions to come up with their own incentives to stimulate the use of bio-based materials. This is interesting since the Commission has not done this in the policy documents concerning the agro-food industry, even though those policy instruments also have a facilitative nature when it concerns the use of natural resources.

Strategy 2: consumer and producer behaviour

Consumer and producer behaviour in the construction cycle is little addressed in terms of construction. The *Renovation Wave Initiative* mentions that consumer awareness on the energy consumption of buildings can be increased by introducing 'smart meters' in households that give a clearer insight on how much energy is used by what in the hope that this nudges people to change their behaviour at home (COM (2020) 662 final). Consumer awareness is also connected to prevention of waste and that active encouragement of consumers could contribute significantly to waste prevention. The responsibility to make consumers more aware

of this lies with the member states, but the Commission mentioned certain initiatives that could help in raising awareness like education initiatives, deposit-refund schemes and the setting of quantitative targets. These strategies also apply to the handling of construction waste at home. Besides from these sidenote mentions of consumers, not much else is mentioned in the EU policy documents related to circular construction. This is on one hand not all that surprising given the fact that most construction projects are executed by public and private organisations, while at home construction work accounts for a relatively small amount of total construction materials use. On the other hand, this can still amount to quite some waste over a total of around 200 million inhabitants. In the Netherlands the amount of waste created by households increased with 6% in 2020, which has largely been attributed to a stark increase in construction waste caused by pandemic DIY work at home (RTL Nieuws, 06-07-2021).

More attention was paid to producer responsibility through the creation of an extended producer responsibility scheme with minimum requirements across the entire life cycle of products and materials in the Waste Framework, however, a specific approach for construction and demolition will not be introduced until 2024. Overall it can be stated that very little attention is being paid to behaviour, especially when you compare the actions (not) taken in this sector with the agro-food industry. The overall tone of the policy-mixes used that have some influence on consumer and/or producer behaviour are once again facilitative in nature, with their main aim being creating awareness of the impact construction has on the environment. The introduction of specific targets that member states need to meet for 2024 could definitely lead to more actions being taken concerning behaviour on the member state level, but it is as of now too soon to tell what this proposal will entail.

Strategy 3: construction waste

The European Commission has two main objectives for the management of the construction and demolition waste streams: ensure that waste is managed in an environmentally sound way and that materials are being used towards their full potential (DG Environment, 2021A). The European Commission hoped that the 2020 target of re-using, recycling and/or recovering 70% of construction and demolition waste laid down in the Waste Framework Directive would function as an incentive for businesses to pro-actively start work on adopting circular practices concerning construction and demolition waste (COM (2012) 433 final). The aim is to create EU legislation in 2024 to make targets on construction and demolition waste reuse binding. In addition to that, the Commission has introduced a couple of measures to help reach this target. First of all, the renewed Waste Directive of 2018 makes it easier to no longer classify materials as waste when they have undergone a certain procedure that makes them fit for reuse (DG

Environment, 2021B). This should take away legal uncertainty surrounding construction and demolition waste reuse. The Waste Framework Directive also created a system that should prevent the mixing of hazardous and non-hazardous materials to make it easier for non-hazardous construction and demolition waste to re-enter the cycle. In addition to that, the Commission plans to introduce an EU Construction and Demolition Waste management protocol that should help guide the application of circular principles in renovation projects. Finally, the Commission created guidelines in 2018 for audits before the demolition of buildings that should help guide best practices on how buildings planned to be demolished should be assessed in order to safe as much material as possible (European Commission, may 2018).

The EU's approach towards construction and demolition waste shows more interference than the other two strategies, most notably by the adaption of legislation and the intention to introduce binding targets that member states need to reach. This at the same time also shows that the implementation of specific policy-mixes in order to reach those targets are being placed on the Member States, with the EU functioning as a supervisor. Especially interesting to see would be how the European Commission intends to enforce the targets once they have become binding, but this is once again something that cannot be currently assessed.

The Dutch circular economy strategy for the construction industry

The Dutch circular strategy for the construction sector can be traced back to 29 November 2016. On this day the then minister of Economic Affairs, minister of infrastructure and the environment and the minister for housing sent a letter to the Cabinet announcing the idea of a so-called Bouwagenda (Construction Agenda). The Bouwagenda is a renewal strategy for the construction industry aimed at addressing societal issues concerning energy, use of natural resources, sustainability, mobility and so on (Kamp, Schultz and Blok, 2016). The Bouwagenda is a cooperation project between the national government, provinces, local municipalities, construction companies, housing associations, project developers, architects, financial actors and academic institutions and together they laid down the following ambitions:

- An energy neutral built environment by 2050 in line with European agreements.
- 50% less use of natural resources by 2030 and a circular economy by 2050.
- 10% increase of productivity by 2025 .

The idea behind the Bouwagenda is to connect specific projects to these larger ambitions in order to make them more feasible to reach. As has been stated before, the Dutch construction industry is not a top sector, which means that initially it would not receive a sector-specific strategy. The reason why the government is diverting from this initial standpoint is because of the importance of the industry for the Dutch economy (Wientjes, 2021). The Bouwagenda itself

was published not long after the letter and was created through public-private cooperation. The publication describes eleven road maps with seven overarching themes that needed to be implemented in the period 2017 – 2021. One of these themes is circular construction.

In 2017 the Raw Materials Agreement (Grondstoffenakkoord – see chapter 1) was introduced and a year later these ambitions were specified in the Transition Agenda Circular Construction Economy (Transitieagenda Circulaire Bouweconomie: 'CBE'). The CBE was written by the 'transition team' which consists of scholars, civil servants and market actors (TIC, 2020).

The CBE has been divided in three stages, inspired by the metaphorical climbing of a mountain. The first stage is called 'base camp' which runs from 2018 till 2021 and aims at establishing the proper base on which a Dutch circular construction can be created (De circulaire bouweconomie, 2021). This strategy was created with four bigger categories in mind and consists of the following ambitions:

1. market development

For a circular transition in the construction sector, there also needs to be a demand-driven stimulation of this market. The government is planning on stimulating this demand by helping a first series of innovative products and service through the first development phase by providing help with the launch of these products and services. In addition to that there should also be attention for the creation of enough incentive in order to get private investors to invest in circular R&D. The government also wants to invest more in so-called Design Build Finance Maintain (DBFM) contracts in the construction sector in order to stimulate circularity. DBFM contracts make the contractor responsible for the design, construction, financing and the maintenance of the tender, which should work as an incentive the go for more sustainable options (Busse, 2018).

2. Measurement

One of the biggest problems within the current economic system is that no economic value is attributed to aspects like environment, health and safety. In order to correct this issue, the Dutch government aims to create a new measurement tool that takes into account these negative externalities which in turn gives circular options added value in the new system when competing for tenders. In addition to that, the government also wants to create a standardised definition for circular construction to make sure that everyone is held to the same standards.

3. Policies, laws and regulations

The third category of circular construction ambitions concerns policies, laws and regulations. Interestingly enough, the government does not want inhibitory legislation, but stimulating measures instead and places the initiative for different standards on civil society, with the

government having a facilitating role (Rijksoverheid, 2018B). In terms of international cooperation, the government does want to take a more proactive role and wants to actively stimulate cooperation with other member states in order to create possibilities for circular construction.

4. Knowledge and awareness

Lastly, the government wants to create awareness and support for circularity in the sector. This is to be achieved through bringing together circular knowledge, experience and instruments across the entire construction value chain and teach about circularity in schools to make next generations more aware of the need for circular construction.

The second phase will run from 2021 till 2030 and is the period in which the 50% emission reduction needs to be realised through the ambitions laid down in the first step. The third step runs from 2030 till 2050 and is called 'reaching the top'. Thus far it is not been decided yet which specific ambitions and targets will be laid down in steps two and three. In 2020, a progress report was published on how well the CBE was being implemented in the sector. This report concluded that the construction industry still uses too many virgin natural resources, there is insufficient demand and market creation, there is still no common measurement instrument for circularity, policies and regulation form more often than not a barrier for circular construction, there is too little knowledge interaction and a level playing field is missing (Meuwese et al, 2020).

Strategy 1: natural resources

In terms of building materials, the Dutch government has the ambition to keep as many natural resources as possible in the construction cycle and to make more use of biobased materials. A couple of plans throughout the CBE hint at a strategy in connection to this specific aspect of circularity.

First of all, the idea for a material passport was introduced. By demanding all materials to come with a document that shows origin and composition, it would be a lot easier to monitor how sustainable the materials are, which in turn could contribute to more use of better materials. The feasibility of such a passport has been explored and in 2020 by the latest, it would be determined whether or not a materials passport would be compulsory. However, the idea is still in the exploration phase with pilots funded by both the public and private sector making use of them. In September of 2020, the then minister of Interior and Kingdom Relations announced that a policy proposal regarding material passports is to be expected to be presented to the Lower House in early 2022 (Ollongren, 2020).

A second specific plan that was opted was the development of a so-called 'materials bank'. This tool should serve as a platform available to everyone where used construction materials can be offered to people that are looking for them. The government drew inspiration from Markplaats.nl (the Dutch eBay) for this tool and is as of now investigating the feasibility of such a platform (Rijksoverheid, 2018B). In addition to that, the tool should also serve as a place where users can find information on building materials and their impact on the environment.

The Dutch government also wants to stimulate a different mindset in terms of design and the use of building materials. This should include the use of less materials and biobased alternatives instead of natural resources and the use of used materials instead of virgin materials. On an international level, the Netherlands wants to create a 'North-western European circular construction economy' and wants to reach an agreement with Germany and Belgium (and maybe the United Kingdom) about the cross-border trade in building materials in order to create a common price for circular construction materials. Lasty, the government has the ambition to launch multiple studies on building materials, material cycles and material scarcity in order to gain more insight into how these materials can be produced and used in construction activities.

Through the Construction and Technology Innovation Centre (Bouw en Techniek Innovatiecentrum: BTIC), a public-private initiative, the government wants to stimulate the development of innovative circular materials. The strategy specifically mentions a focus on stone-like materials, metals, bitumen, wood and plastics (BTIC, 2020). The goal is to find biobased alternatives for all these material types.

The Dutch approach towards natural resource use in the construction industry is quite extensive. The government aims to, same as the European approach, to facilitate and stimulate the use of bio-based materials as much as possible and does this through a variety of different approaches. Interesting is also the ambition to seek active cooperation on this topic with neighbouring countries in order to facilitate a level-playing-field for the use of construction and demolition waste. Even though this approach is same as with the strategies concerning natural resources and behaviour facilitative and voluntary, it does seem that the government is taking a more invasive approach on this topic.

Strategy 2: consumer and producer behaviour

Circular strategies aimed at influencing consumer and producer behaviour in the construction industry are very scarce. There is very little mention of the importance of consumers and producers alike in the transition towards circularity. One specific strategy however, will have a very direct impact on behaviour and that is the ambition that from 2023 onwards, all

government tenders need to be as circular as possible, from the national to the municipal level, unless it is not possible to complete the tender otherwise. From 2030 onwards, circularity will be a requirement. By demanding circular approaches, it will force construction businesses to adopt circular businesses cases in order to guarantee continuity of their business.

What this demand will do in practice remains to be seen. Over the past couple of years, the government has executed an extensive strategy of scaling back government responsibilities to core tasks (Verhees et al, 2015). Whereas the government used to be the client of most tenders in the past, nowadays we see that most construction projects are being executed by private contractors. The CBE emphasises the importance of demand creation for circular construction, however a specific strategy in order to nudge consumers and producers in a certain direction is as of now not included in the Dutch CE strategy for the construction industry.

The BTIC mentions that it wants to investigate cooperation in the construction sector as part of a strategy to redistribute investment risks between collaborating parties in the chain. The BTIC hopes that by doing this 'old behavioural patterns' in terms of risk aversion can be avoided and that a more aimable investment climate can be created for the industry which could in turn contribute to the development of more circular innovation and investment from private parties.

While the Dutch strategy to influence behaviour is very scarce, the one thing that has been opted could have very large consequences for the sector. Circular public procurement can go a far way in creating demand and therefore a market for circular construction. This will give businesses a strong incentive to start adopting circular practices. This also means that this strategy is one of the few that also actively impacts existing businesses that have no motivation to become circular at their own accord. Work is also being done in order to attract investors to take up circular projects, a group which is not often mentioned in sustainability documents but has significant influence on the uptake of circular activities.

Strategy 3: construction waste

In order to close the cycle, the Dutch government proposes a couple of strategies for the construction industry. The first aspect of the approach concerning construction waste is the creation of a monitoring system that maps the influx and outflow of construction waste in the Dutch construction industry. The reasoning behind this is that the proper mapping of waste flows, differentiated by different categories, gives better insight in what kind of materials are being re-used in the cycle, and more importantly, which ones are not. By having better information on these material flows, the government hopes to create a more specified strategy for construction waste in the future.

In addition to that, the government created a taskforce for 're-enrichment of waste materials' that is tasked with the creation of a circular legislative and enforcement framework for waste materials. Under current legislation, materials can either be classified as product, natural resource or waste material. This distinction is in light of circularity being questioned. BTIC advices the government to only speak of waste in the future when the material poses a direct health threat, for example in the case of asbestos (BTIC, 2020; p. 15). The European directives on waste give the member states quite some leeway when it comes to the interpretation of these categories when used in a circular context, more than the Dutch legislation is currently make use of (Rijksoverheid, 2018B; p. 22). During the first phase of the CBE the government hopes to identify how much freedom it can grant circular businesses in terms of these three categories in order to lower the regulatory barrier for the re-use of construction waste materials. On the European level, the Dutch government pledges itself to limiting regulatory barriers for re-use of construction waste caused by rules laid down in the REACH regulation, the European waste regulation and the building material regulation. Overall the Dutch approach towards waste materials is still in its infancy, with more specific plans being expected to the introduced during the second phase of the EBC.

Same as the European approach towards construction and demolition waste, is the Dutch strategy more tailored towards regulation and adaption of current legislation than the other strategies. This phase of the CBE that runs until 2023 is mostly concerned with gathering insight on the phenomenon of waste streams and how these can be re-entered into the construction cycle as much as possible. However, adapting current legislation can only go so far when no new legislation and targets are adopted in order to further stimulate the reuse of construction 'waste', but as of now no announcements have been made concerning any new plans to further stimulate this.

Results

The last three chapters have attempted to give a detailed insight into the functioning of the European and Dutch circular economy strategies, both general and the ones more specifically aimed at the agro-food and construction industries. With the knowledge on what issues the strategies focus on and what policy-mixes are used to address them, we can now turn to Dutch circular businesses and analyse whether or not they experience the sustainability transition failures as developed by Weber and Rohrarcher. The chapter will be followed by a reflection where the insights gained in the previous chapters and the experiences of the circular business owners and policy-maker about the realities of circular entrepreneurship are connected to each other in order to see how well the used policy-mixes are doing in addressing circular transition failures.

Market failures

The first cluster of failures that can hinder sustainability transitions are market failures. These types of failures are according to classic market theory the main rationale why policy-makers are justified in introducing policy-mixes in order to steer innovations, and on a bigger scale transitions, in a certain direction (Weber and Rohrarcher, 2012). Since market failures have been extensively researched over the years, I will analyse the four market failures from Weber and Rohrarcher's framework as a group instead of analysing each failure separately. The market failures are:

- Information asymmetries: this failure occurs when uncertainty about outcomes of transitions and innovations leads to the underfunding or undersupply of, in this case, circular economy.
- Knowledge spill-over: this failure occurs when certain knowledge or information is being exploited that was first developed by another actor. This is often the case in sustainability transitions since this type of knowledge often has a public goods character. This hinders private investments since it is all but guaranteed that the investment cannot be earned back.
- Externalisation of costs: Negative effects of innovations are in situations like these passed onto society.
- Over-exploitation of commons: occurs in a situation where public resources are overused since the positive effects can be reaped only by one actor while the negative effects are carried by society as a whole. The 'if I do not do it, someone else will' rhetoric that this creates leads to overexploitation.

What all these failures have in common is that they cannot be corrected by the market itself and demand policy intervention in order to be addressed. A market failure can generally be defined as a situation in which the costs and benefits of a certain action or transaction are not

limited to the buyer and seller. Market failure often occurs in sustainability context because it is extremely rare that all the costs and benefits can be carried by the people involved in the transaction (Brown, 12-11-2013). The most obvious example of this is pollution. We use natural resources in order to create energy, this energy is then used by a household or used in order to create a product. The positive outcome of the use of the natural resource can only be enjoyed by a few people; namely the ones that get to use the energy or the product that it resulted in. The negative effect however is carried by society as a whole; we all have to live with the negative effects that the use of the natural resource has; pollution and the depletion of the earth.

The circular economy ideology refuses to involve itself with these market failures outright. The social and environmental impact of production is being accounted for which excludes overexploitation and externalisation of costs from occurring. The linear economy system nudges businesses in not accounting for these aspects since it will only lead to a higher cost price and thus in hurting the competitive edge of the business. The interviews show that this is simply being accepted as an aspect of having a circular business plan: circular businesses choose to accept this worse market position since involving themselves with these market failures is unacceptable in light of the circular economy principles. In line with this thinking lies also the reason why information asymmetries and knowledge-spill over is being accepted as fact. The ultimate goal of circularity is to uphold the three pillars of sustainable development. When a circular business involves itself with innovations, the outcomes of that innovation are most likely to be shared through open sourcing and made available to the public (interview 5). It is not about making money on the investment, it is about sharing the knowledge in order to stimulate the creation of a more sustainable system.

In this sense circular economy does not struggle with the occurrence of market failures. It does however struggle with the effects that accepting these failures has on the businesses. The grand conclusion in terms of market failures that can be diluted from the interviews is the permanent struggle that the businesses have with having to operate a circular business in a system that functions based on different principles entirely. Circular business that operate in a linear economic system have to deal with the fact that their model of operation, which takes into account the social and environmental impact of their production process, is not being accounted for in the linear economic system. This means that they experience higher costs for having a positive impact on their environment while non-circular competitors can pass the negative effects of their production processes onto society with no consequences. This results in them being the 'better' business in the linear economic system since they managed to produce for a lower cost price and are therefore more efficient, which the current system rewards.

'There is increasing pressure to come up with solutions, but that is now happening in a way that makes products more expensive and rewards bad behaviour because you make it more competitive in today's market' (interview 1).

Circular businesses are hurt in the current system since it only accounts for price and profit margins as the ultimate tool to measure value. When taking into account 'true price' i.e. the overall societal value of a product, circular businesses would be the overall more efficient and thus better option, but since the economic system has not been designed to take those larger societal effects into account, it hurts the competitive standing of circular entrepreneurship. As of now, circularity is being upheld by businesses out of an intrinsic motivation to be better for people and the planet.

'In general, you make it more difficult for yourself with the circular combination. It is much easier to buy and produce with raw materials and not look at anything else' (interview 1).

'I do this work out of conviction, if I had wanted to earn money I would have done something else. Then I would have started making concrete buildings' (interview 8).

The number one solution for this issue as opted by the circular businesses is to introduce true pricing mechanisms. Mandatory true pricing would have as an effect that everyone operating in the economic system, circular and non-circular businesses alike, would have to include the overall cost of their product or service on society. This would create a level playing field between circular and non-circular businesses since everyone would be judged based on the same standards. As of now, neither the European Commission nor the Dutch government has the intention to introduce true pricing mechanisms.

Infrastructural failures

Infrastructural failures occur when the existing infrastructure needed to enable a sustainable transition is lacking. This applies to physical infrastructure, but also to under-investment in terms of research and innovation and a lack of the human capital necessary to create the infrastructure needed for in this case a circular economy. Infrastructural failures occur in both the agro-food and the construction industry and is connected to the uncertainty of circular entrepreneurship and under-investment of circular projects.

First of all, circular economy is a new and uncertain business model which only recently has really taken off. This means that there is still a lot unsure about circular economy as a revenue model both for business owners and investors.

'Companies are mostly concerned with keeping their business afloat. […] If you have a choice between a one-off project investment or a periodic additional cost of a product, take your pick. I think you are opting for a project investment. In fact, I know that for sure, because then you know where you are working towards. With circularity, you just don't know. There is much more uncertainty in that, since you won't know where you will stand in 5 years. So why pay an extra price for sustainable products right? Too few companies are willing to commit themselves to that, because it is simply too far in the future and there is too much uncertainty there' (interview 3).

Not only businesses are holding back when it comes to circular investments, investors are also hesitant in making the commitment to circular projects, especially because there is a lot of uncertainty surrounding the revenue model of circular innovations. This shows the current gap that exists between the societal interest in sustainability and the willingness to act on that interest. This is exemplified by the experiences of a circular agricultural business:

'So far, the number of retailers that have visited and show interest is large, but the step to commit for a number of years is still lacking. They say 'we want to try that', but it doesn't work that way. You can't build a farm and then deliver once or twice. So that farm will only be built if there is a commitment for 5 years, which as of now does not happen a lot' (interview 4).

The best policy-mixes that can be used to overcome this hurdle are investing in circular innovation and research, which luckily is happening on a large scale on both the European and Dutch level for both sectors. First of all, both policy-makers have introduced a variety of subsidies that businesses can make use of for the development of circular innovations and business models. In addition to that, both invest in research on the topic at their own accord in order to make that information available for the public. Most notably the Dutch top sector approach in the agro-food industry shows how much the Netherlands has done to stimulate research and innovation in order to stimulate circular innovations. One side note that needs to be mentioned however is that those subsidies are not easy to come by. Especially the SME's that have been interviewed in light of this thesis say that the process of receiving a subsidy is long and complicated and that they often lack the means to make it through, resulting in them often not applying for the subsidies anymore. The conditions that are connected to the subsidies can from time to time also hinder their use by circular businesses.

'What we also encounter, for example, is that Leader [European subsidy] is a system in which Leader finances a part, but a local government must also contribute, but part must come out of your own pocket. Leader's contribution is a maximum of 50% of the costs. But for us 50% of a lot of money is still a lot of money' (interview 5).

But it is not only the strict rules that make it difficult to apply for subsidies. Circular businesses also encounter issues with the bureaucratic dimension of the process caused by the fact that there is as of now no existing framework that captures what circular businesses do. Subsidies have been

rejected based on wrong information about the size of the business (interview 2) or the business model (interview 5).

'A huge barrier that we encounter is that many subsidies are only available for foundations and not for businesses. So we have already considered at least three times, like many other companies, to start a foundation that is also called [name company] and then you can do very smart things. For example, the [name company] foundation can hire the company to do the work and the foundation receives the money. But that's ridiculous isn't it? Why are we doing this? Why is it so complicated?' (interview 5).

So even though the right policy-mixes are in place in order to take away the barriers for infrastructural failure caused by under-investment, there is still room left for improvement in terms of the conditions of subsidies which prevent the optimal use of the available subsidies by Dutch circular businesses.

Institutional failures

With 42 mentions based on the Grounded Theory coding this failure is experienced the most by Dutch circular businesses in the agro-food and construction industries. Institutional failure occurs when institutional mechanisms hinder the adoption of circular economy. Within this framework, institutional failures can be distinguished in two categories: hard and soft institutional failures. Hard institutional failures are failures caused by the formal, written laws and regulations created by institutions while soft institutional failure are failures caused by the wider political context of culture and social values (Klein Woolthuis et al, 2005; p. 613).

The first reason why this failure occurs in these industries is connected to hard institutional failure and the way current systems of regulation and legislation form a barrier for the circular transition. An issue that often occurs in transitions and more specifically in sustainability transitions is that the innovations and projects used are so new to no legislation exists that specifically addresses them. Businesses can therefore run into situations where the lack of legislation can form a barrier for the implementation of innovative ideas, mostly caused by the fact that since no fitting legislation and/or regulations exists, no one really knows how to solve the problems circular businesses encounter.

'Let me give a very appealing example. Music festival De Zwarte Cross came to us two years ago. They really wanted the festival visitor to be able to pee on the site, that you would then wait ten minutes and that your own pee would be processed into a bottle of drinking water. I can tell you, the technology for that exists. I can also tell you that that water is cleaner than the water you get from the tap. So you would say, well that's nicely arranged. In practice, if you want to organize the permit for that, you have to go to ILT. That is the body that makes the standards for drinking water and also tests whether it meets those standards, and that is an authority under the ministry.

When we put the question to that body; 'Can you tell us, if we are going to set up a measurement system to show that it complies with all laws and regulations, should we comply with the standards for surface water or the standards for groundwater?' That is a simple question; answer a or answer b. What happens in practice? You don't get an answer. Because, oh dear, this is new, this is scary, we don't dare to do this and then the ILT says; policy must first be drawn up on this, because urine is not groundwater and urine is not surface water. This is the practice. So policy and the assessment of legislation and regulations are very often pointing at each other, and then nothing happens' (interview 7).

Circular solutions often fall outside the scope of existing legislation, which makes it extremely difficult to assess what circular businesses can expect and what is allowed. Quite some time and effort needs to be invested by the businesses themselves when they want clarity on certain subjects.

'Coffee grounds are officially classified as waste and landfilling is something that is legally quite a hassle. The fact that coffee grounds are waste makes all those steps more complicated at a legal level. We are now also working with a lawyer to see what the rules are that we can tap into; should we ask for an exception to the fertilizer law? Or ensure that coffee grounds are no longer classified as waste? To what extent does the processing we do ensure that it is no longer coffee grounds and therefore no longer falls under that law? Those kinds of things are legal and government technical. We think that's complicated. It's not that you can call to a place and say "hey how about this" because no one exactly knows' (interview 5).

Or specifically relevant for the construction industry; regulation is so strict that is leaves no room for innovation:

'The issue we encounter the most concerns the sale of the materials. That is something that is just a very difficult thing and that, to a large extent, it is also due to the Building Decree [Bouwakkoord]. There are many things that are fixed about what is and is not allowed in new construction. A lot of things have changed in recent years, which means that most of the buildings I demolish do not meet this requirement and circular materials cannot be used' (interview 6).

A second aspect of hard institutional failure that agro-food and construction businesses encounter is that they feel that the government is sometimes focusing on the wrong things when drawing up circular economy related policy. An often mentioned complaint that is expressed by the business owners is the fact that the government is too involvement with stimulating good behaviour instead of punishing bad behaviour, something that would be more helpful for circular business in terms of balancing the level playing field between circular and non-circular businesses. The subsidies are a welcome instrument in terms of help, but on more than one occasion the interviewees expressed that they would be better off with instruments

that address the bad practices of others, for example through taxes on natural resources or through the implementation of true pricing.

'Subsidies stimulate supply, subsidies do not stimulate demand' (interview 2).

The business owners feel that subsidies do little in creating actual demand for circular products and services and this has to do with the overall barriers that circular businesses encounter. As has been mentioned before, almost all circular businesses are being operated by people who are motivated by ideology. This is something that a subsidy will not change: when you really want to contribute to a sustainable system you will do this with or without a subsidy and when you do not particularly care for sustainability, a subsidy will not change your mind given the extra set of issues you will encounter. The use of subsidies will therefore in the eyes of the business owners not contribute to more circular businesses on the Dutch market and they would be better served through market incentives that nudge more people towards circularity.

'What I especially think is that the current regulations penalize good behaviour' (interview 1).

Soft institutional failure is also present in the Dutch institutional system based on the sentiment shared by the business-owners on the country's risk culture. Most business owners express annoyance over the risk-averse approach of the Dutch government and the strong anti-risk culture that is existent in the country. The careful approach of the government is seen as a huge barrier for circular innovation since innovation and risk go hand in hand. Taking a risk-averse approach therefore strongly limits the room that circular businesses have in order to introduce new and circular ideas.

'When it comes to risk, the Netherlands always tends to say; 'zero risk, and it must be addressed immediately.' That explains that when there is an incident, the newspapers and socials are full about it, a Member of Parliament asks a question, and then new laws and regulations are introduced. So de facto that codebook only gets bigger, instead of accepting the mistake, explaining it and making it better. We are therefore very bad at dealing with incidents that happen. I think if you look around you will see many examples of this' (interview 7)

'Look around you, then you drive on the road and you see that you could use the roadside wonderfully for biodiversity, but that is not happening because that is not allowed. And why not? That's because regulations, by definition, restrict things because we think in terms of risks. It could be that there is something in it that is unsafe for public health. Then I leave it open for a moment whether that is completely justified, but we are completely regulated by rules of "this is not allowed, this is not possible, this is dangerous". We need to look more at the bigger picture' (interview 3).

Interaction or network failures

Network failures describes the phenomenon that occurs when interaction between the different actors involved in the transition slows down the process due to either too close ties that contribute to path dependency or too weak ties which leads to not making use of the most optimal availability of resources. Cooperation is incremental for innovation processes since one single actor in the system often lacks either the necessary knowledge to innovate or the monetary and material assets needed to get the process started. Businesses, government agencies, knowledge institutions and (private) investors are all needed for sustainability transitions since it concerns long-term, cross-sector innovations which are not always profitable from the beginning. When issues occur in terms of the interaction between these actors, it could form a barrier for the innovation process and thus the transition. Policy-mixes aimed at connecting stakeholders, promoting best practices and overall fostering cooperation that allows room for change and new participants are best suited to tackle any issues concerning interaction or network failures. Both the EU and the Netherlands have taken great strides in facilitating cooperation between different stakeholders involved in the circular transition. Through initiatives like Het Versnellingshuis, platform Samen Tegen Voedselverspilling and on the European level the Circular Economy Stakeholder Platform just to name a few, a lot has been done in order to make sure that actors cooperate and combine their resources in order to help create innovations that help the transition towards a circular economy. Both the EU and the Dutch policy-mixes have contributed a lot to the facilitation of these network interactions, which is also the reason why there was barely any mention of this type of failure during the interviews; only six times out of a total of 159 failure mentions. The only specific mention of an interaction failure was made in connection to this type of failure is the lack of consumer involvement in the transition.

'The consumer is pampered and we do not dare to address them. We dare to tackle a producer, but we do not dare to tackle the individual, and that is also an institutional error of this country; we do not dare to tackle the individual' (interview 7).

But one can argue that this can also be described as a soft institutional failure since this issue is mostly caused by the lack of specific policies and targets aimed at consumers in the EU and Dutch circular economy strategies stemming for the political culture to not create specific targets for consumers in sustainability strategies.

Capabilities failures

Capabilities failures are created by situations in which an actor involved in an innovation process simply lacks the competences, capacity or recourses to make the transition from an old to a new paradigm happen. This in relationship to business manifests itself as the failure to

adapt to new technologies or markets (Klein Woolthuis et al, 2005). Most circular businesses are SME's and they often run into the issue that they simply lack to resources for certain aspects of circular entrepreneurship: applying for subsidies, starting innovation projects, inform stakeholders about circular economy, having to figure out legislation and so on. This is caused by two overarching issues. The first aspect that causes capabilities failure among Dutch circular businesses in both the agro-food and construction industries is caused by the earlier discussed problem that circular businesses have to operate in an economic system that stands in stark opposition of what circular economy is about; circular economy upholds the principles of sustainable development which means taking into account economic, ecological and social aspects of the production process. Doing this in a system that only accounts for economic value does not only create a unfavourable competitive position, it also takes more effort to keep a circular business running.

'[Circularity] is labour and cost-intensive and we are now figuring out whether we can do that in terms of costs' (interview 6).

The second reason why circular businesses often run into the limits of their capacity is caused by the fact that circular entrepreneurship entails much more than creating a product or service and then selling that. Most circular businesses that I have interviewed are also actively involved with promoting circular economy and teaching others about how they could contribute to the transition. One circular food cooperation maintains a special school where they teach interested parties about circular economy (interview 3) and another one created an entire educational programme on circular economy for schools (interview 5). Circular businesses see this as part of their responsibility and these extra tasks also demand more resources. Interestingly enough, most subsidies used by circular businesses go to projects like this. The money stemming from subsidies is often not used for the core business task (i.e. the production of the circular product), since circular businesses often do not want to be dependent on funding for their existence. The money is instead used for these additional projects and it shows that circular businesses have adopted a wider set of tasks than traditional non-circular businesses have. More tasks simply results in needing more resources in order to realise them which can quicker lead to capabilities failure, especially since almost all circular businesses are SME's who often have meagre resources to begin with.

'We have really said from the beginning "we want to be a company that functions and earns enough money to pay salaries". But we do want to do something that makes a positive contribution to the world. We didn't start out to get very rich, but to do something good' (interview 5).

A second capabilities failure that has been frequently mentioned by the Dutch businesses is the lack of political representation. Circular economy and circular businesses in particular do not

have an organised interest group which can lobby for the interests of circular businesses on the pollical level. This results in sporadic interaction and wishes and demands from circular businesses often not being met simply because they are not part of the decision-making process to begin with. This is because circular businesses lack the capacity to organise themselves.

'If I were a minister, I would want to know about societal issues that people experience, but I am not informed on that by an anonymous citizen or people who are not organized. I am informed by groups that are organized; lobbyists, interest groups, etc. Fortunately there are also environmental interest groups, which has ensured that society is reasonably well represented in that playing field, but you are certainly not infirmed by the circular economy stakeholders, because there is no interest group for circular economy. You are also not informed by bio-based builders, because there is no interest group for bio-based construction. […] We have become more visible in recent years, with that a social shift is starting, but we are not yet so well or extensively organised that we can actually form interest groups and thereby also influence the political playing field' (interview 6).

This is especially viewed as frustrating since 'the other side' i.e. the more traditional businesses and industries have been extremely well organised and can therefore exert a lot more influence on the decision-making process than the circular businesses can.

Directionality failures

Directionality failure refers to the failure of creating a shared vision for the direction of the proposed system change, mainly caused by insufficient policies to guide society in the desired direction. Direction is a central theme of sustainability transitions, which stands in stark contrast with previous innovation theories that argue that deciding the direction of innovation falls outside of the scope of what STI policy mixes are supposed to be doing (Kubeczko and Weber, 2009). Directionality is therefore one of the key characteristics of sustainability transitions, since they always contain a value judgement: sustainability transitions demand of society that we move in a particular direction that benefits people, profit and planet and a transition that delineates from those ambitions is undesirable. The transition towards a circular economy therefore needs to be strictly outlined with specific goals and targets in mind and moreover, the transition towards a circular economy needs to be clear for all actors involved with a clear division of tasks. When this is not the case, one runs the risk that the socio-technical transition towards a circular economy fails because innovations and improvements move in the wrong direction. Directionality failure can be overcome by implementing clear and binding targets by policy-makers.

On the European level, the main issue when it comes to directionality was not connected to the question if there should be a circular economy at all, but was rather focused on how to best achieve that goal (Lazarevic and Valve, 2017; p.65). When analysing the EU policy documents on circular economy, two different narratives can be identified on the EU level when the first EU plan for circular economy was introduced back in 2015: one narrative saw circular economy policy-mixes as a means to impose radical change to production and consumption systems in order to break the dominant linear economy paradigm (Ellen MacArthur Foundation, McKinsey and SUN; 2015). The second narrative actually argued for deregulation and that circular economy should instead be promoted through industry-led innovations that use circular economy models. These two views contested each other in the sense that the first narrative argued for policy mixes aimed at transforming the socio-technical system (i.e. institutions, infrastructures, markets) while the other view saw policies aimed at stimulating innovation in sectoral niches as sufficient to bring about a circular economy (Ibidem).

This has led to the adoption of aspects of both views in the first *Circular Economy Action Plan*. The EU ambitions for a circular economy in this plan surpass one policy domain and attempts to change the entire structure of how the EU produces and consumes products and services, but at the same time the plan is framed as a way to guarantee the growth of the European economy by 'tying [circular economy] into other EU priorities of employment, investment and industrial innovation driven by businesses and consumers' (Lacarevic and Brandão, 2020; p. 14). The policy mixes used by the EU in order to facilitate the introduction of a circular economy have thus been inspired by two different narratives for circular economy that fundamentally contradict each other. Hobson and Lynch (2016) previously questioned the first *Circular Economy Action Plan* and wondered whether the proposed policy mixes were actually able to kickstart the transition towards another socio-technical system.

As the discussion of the EU's circular economy strategy in the previous chapters has shown, the tone of the first *Circular Economy Action Plan* and the current *Circular Economy Action Plan* is very different: the EU has introduced legislative action in more policy areas and also addresses more actors within the economic system in its current plan. Whereas the first *Circular Economy Action Plan* was mainly concerned with the EU economy, the current plan highlights the importance of social and ecological goals way more, which makes it more a transformative change strategy than the circular economy strategy from 2015. Undercurrents of the narrative that niche innovation is enough to transition to a circular economy have all but disappeared. The importance of businesses and private innovations is still highlighted, but circular economy, according to the EU, can only happen 'in co-creation with economic actors, consumers, citizens and civil society organisations (European Commission, 2020A; p. 5). When it comes to directionality, the EU has made improvements since the current *Circular*

Economy Action Plan proposes a more coherent vision than its predecessor. This is also reached through the introduction of more binding agreements and specific targets which shape a more explicit view on what a European circular economy should entail.

The Dutch policy documents concerning circular economy that have been published over the years show no such issue. From the start the government was quick to identify the main targets for a Dutch circular economy and has been consistent in upholding these ever since. That does not mean that we cannot speak of directionality failure on the Dutch policy-making level. Directionality is not only about pointing transition efforts in a certain direction, it is also about being clear about everyone's role within that process (Raven and Walrave, 2020). Here we see the same issue on both the European and the national level. The EU and Dutch plans introduced in order to reach a circular economy are mostly based on encouraging stakeholders in society to participate in the creation of a circular economy, a movement which both the EU and the Netherlands facilitate through a number of policy instruments, for example through subsidies, pilots and information campaigns. However, the strategies for both the agro-food and construction industries fail to exemplify actor-specific targets. This makes it very difficult for businesses, consumers and others to understand what they are specifically responsible for in light of the transition towards a circular economy. This phenomenon has two specific consequences. First of all, the generality of the targets and their voluntary basis has led to a lack of urgency, something that is also experienced by the circular businesses active in the Dutch agro-food and construction industries.

'This mandatory component creates urgency and that sense of urgency is necessary for creativity and innovation and ensures that things start to move. That is relatively traditional, but if something has to happen fast, then that urgency has to be increased' (interview 2).

The second issue that directionality failure connects to, which is also influenced by the lack of urgency, is a general lack of responsibility. I have earlier identified how 'buck-passing' occurs in the sectors, especially in the agro-food industry. How this lack of responsibility translates in practice, has been exemplified during the interviews.

'All the gears are intertwined. You will also see that recyclers say there is no obligation to purchase raw materials, the producer will say there is insufficient quality, the consumer says it is more expensive, the producer then says "yes the raw materials are also more expensive" and the consumer puts the responsibility to do things in the hands of the recycler. The three parties in that chain point to each other' (interview 2).

Since there is no clear vision on who needs to do what, very few actors are willing to take the first step. This is because frontrunners in the agro-food and construction industries experience first-mover disadvantages, which makes circularity not particularly appealing from a business

case point-of-view (Zhang and Song, 2020). This is especially problematic when it concerns transitions of the socio-technical system since you need more than just a couple of actors (i.e. niches) who are willing to take the first step. As of now the only movers are doing this because of an intrinsic motivation to do so. This problem is not only identifiable from a society-wide perspective, also within the sectors the lack of a clear division of responsibilities is seen as a barrier in the transition towards a circular economy.

'I do see that different branches within the construction industry are at different levels in terms of how far they are and that also makes it difficult because [the demolition sector is] moving towards the full reuse of materials, but the builders are much more involved with recycled raw materials and that does not match. That's the whole thing of circularity: you can't do it alone. You need all parties in the chain. Everyone has to be on the same page and if a party doesn't want to do anything at all, you simply can't get any further.' (Interview 6).

Leaving explicit actor-specific targets out of the agro-food and construction strategies has resulted in an unequal transition within the sectors themselves, which in turn can lead to the transition being slowed down by the laggards.

A very clear example of how vagueness in the strategies can lead to the passing on of responsibility has been made clear by the overall approach towards preventing food waste. The European Commission has made the creation of policies to prevent food waste a task for the Member States. The Netherlands in turn has stated that preventing food waste is the responsibility of consumers and producers, with the government only willing to act as a supporter of their plans. As we have seen, it is extremely difficult to introduce sustainable changes in the agro-food industry, both from the consumer and producer side, so in the end nothing is going to happen in terms of the prevention of food waste.

Demand articulation failures

Demand articulation failures refer to the fact that in the context of sustainability transitions, markets for new technologies may not exist yet (Weber and Rohrarcher, 2012). This means makes it in turn difficult to anticipate on consumer needs and preferences and this forms a barrier for innovation. Demand articulation failure can be overcome when policy-mixes help create consumer demand, and thus markets, for circular products and services.

The issue of demand articulation failure was specifically addressed by the European Commission in the *CEAP*:

'the Commission will cooperate closely with stakeholders in key value chains to identify barriers to the expansion of markets for circular products and ways to address those barriers' (European Commission, 2020A; p. 10).

The EU has introduced a couple of strategies that indeed foster market creation. Both the plans for sustainable product design and the plan to create a well-functioning EU market for secondary raw materials promise to help in the creation of markets for circular products. A larger role was expected to be played by the introduction of mandatory circular public procurement targets in the *Circular Economy Action Plan* (Kautto and Lazarevic, 2020). But when the plans were published in march of this year in a staff working document the proposed mandatory GPP target were instead turned into voluntary green procurement criteria for computers, monitors, tablets and smartphones (European Commission, 05-03-2021). The voluntary aspect of the actual plan and the fact that it only includes electronics and not all public procurement does diminish the effect on circular public procurement and in turn demand creation for circular products.

On the Dutch level, circular public procurement is actively promoted under ministries and government agencies, but same as on the European level circular public procurement is as of now voluntary based. We do see a strong difference between the Dutch agro-food and construction sectors. The Dutch circular transition agenda for construction does dictate a circular public procurement target: all public procurement in 2030 related to construction needs to be circular and as of 2023 all tenders coming from government authorities need to ask for circular construction when possible (De bouwagenda, 2018).

The effect these targets have on the creation for demand for circular construction can be identified in the interviews held with circular construction businesses. All indicate that they are receiving increasingly more business from the government; from ministries, provinces and local municipalities (interview 6). Especially the request to include a so-called EMVI-plan when competing for a tender is helping in this regard. The EMVI-plan gives points to businesses based on their ability to construct sustainably and circularly; a high score on the EMVI ranking means that a business is allowed to ask for more money for the tender. This helps circular construction businesses compete with their non-circular competitors.

The growing demand for circular construction from public authorities at the same time highlights the issues that still exist in respect to demand creation and articulation when private sector customers are involved. Within the current socio-technical system, price is still the most important factor when deciding on a tender. Price margins are also very thin in the sector as has been argued in the previous chapter which makes it even more difficult to compete with non-circular builders who can finish the same job, albeit non-circular, for a lower price:

'The biggest problem remains the price story, which is under extreme pressure. The margins are simply very tight and you can see that this causes the biggest problems and that many people are simply not prepared to pay more for [circularity] […] People are much less willing to pay 10/15% when all they receive is the extra wisdom that it is done circularly. […] A colleague of mine in my

neighbourhood does not do anything with circularity and can demolish a house €3000 cheaper than I can. Then a client also says "that's very nice, but I'm going to the competitor because it's a lot cheaper" ' (Interview 6).

Same as the businesses themselves, most private sector customers that decide to work with circular construction businesses do this because of an intrinsic motivation to limit the negative impact of their project as much as possible:

'The customers we have are fairly ideologically driven. They still need a business case, but they are not customers who say 'we want the maximum profit' or 'we want the lowest price', they instead say: 'We want to have a business case that is acceptable to us'. Our average client realizes that they could probably have built the same building in concrete for slightly less money. There is an acceptance in that that they are willing to do that.' (Interview 7).

The exact same issue can also be identified in the agro-food sector: demand for circular products is limited because they are in general more expensive than their non-circular counterparts. There is nonetheless a market for the products because there are people that are willing to pay more for a product with a 'good story'

*'We have a product with a story. That creates value'. (*Interview 3).

All interviewees from the agro-food industry highlight the importance of them being able to tell their story to their customers directly. This creates the demand since they are not able to sell their product based on price, but based on the added value the product has compared to comparable non-circular items. This at the same time also shows one of the reasons why it is only SME's that are able to have a viable business that is completely circular: they are in direct contact with their customers.

'With us they are willing to pay more, but they like to do that because there is such a nice story behind it and that gives a good feeling'. (interview 5).

The business case is only successful when (potential) customers are informed of the reasons why the products differ from non-circular counterparts and are aware of the positive ecological and social impact of the production processes. This at the same time also creates a barrier for market creation. All but one of the interviewed businesses shun supermarkets because of this reason.

'So far, we've been trying to stay out of retail. That is simply not convenient when selling our products. We have a product with a story that creates value. Supermarkets are the worst place to do your story-telling. Everything there is very one-dimensional. There is also no store clerk who will worry about promoting one product or another. In addition, they are also just volume makers and they go for margins, we don't fit in that strategy very well' (interview 3).

The one circular agro-food business that is able to successfully sell its products in supermarkets is able to do this not because of their circular message, but because of the fact that their products do not contain any added sugars and are therefore able to sell within a retail setting because they are a healthier option compared to the other products on the shelf (interview 1). Supermarkets are however the number one place where people go for their groceries. The fact that most circular business cannot and/or will not sell their products in supermarkets creates an enormous barrier for market expansion. Since most people will not come into contact with these circular alternatives this in turn slows down the growth of a market for circular agro-food products. Currently, no strategy from the European or Dutch level provides a solution for this specific issue. All strategies, especially those concerning consumer and producer behaviour, are focused on stimulation of circularity, but do little to force producers and consumers towards more circular options. As the agro-food industry chapter showed, only around 10% of people are willing to pay extra for sustainable options. It is great that the EU and the Netherlands facilitate this group, but since there is no coherent policy instrument in place to get the other 90% to move, this could pose a serious obstacle for the creation of a circular market.

'I think 15% of the Dutch are 'dark green', that's what that's called. 15% who is really conscious of sustainability and also acts voluntarily even then it is difficult. You have to be well informed to make choices and issues are not always easy to explain. Then you have 30-35% that is light green, they want to be sustainable but they are also a bit lazy. You have to lend them a hand, that is possible on a voluntary basis, but then you are left with 50% who are not so interested. If you really want to make way, you have to enforce it. We will not get there on a voluntary basis in 2050' (interview 3).

Policy Coordination failures

The policy coordination failure is based on the observation that issues regarding sustainability transitions can occur due to a lack of coordination between different levels of governance (vertical policy coordination failure), between different policies (horizontal coordination failure), between ministries and implementing agencies and between public and private institutions (Raven and Walrave, 2020). Policy coordination failure can occur rather quickly when it comes to policies aimed at sustainability transitions since they often address multiple policy areas with different measures which in practice can lead to incoherent implementation:

'The mix of policies that influence transitions is highly complex, encompassing areas such as innovation, industry, sectors, education, employment and trade. Because such policies are normally developed in distinct departments with contrasting objectives and expertise,

misalignments are common. As a result, there may be tensions or even contradictions between policy incentives and signals.' (EEA, 2019; p. 33).

This also applies to policy-mixes concerning circular economy. The implementation of circular economy requires specific policy instruments in different sectors which all address different stages of the circular cycle. A mismatch in implementation is therefore quickly made which could hurt the transition towards a circular economy. In addition to that, the circular economy strategy is introduced in an already existing framework that was designed for a linear economy. This can in turn result in a phenomenon which is called policy layering. Policy layering occurs when new policy goals and means are added, or layered onto, existing ones (European Consortium for Political Research, 2013). The mix of old and new policies can hurt the effectiveness of the newly introduced policy instruments or lead to unnecessary regulatory burden for the circular economy since old regulations were designed with the linear economy in mind (Kautto and Lazarevic, 2020). To make matters even more complicated, policy coordination failure can also occur when there is a conflict of interest between different sustainability transitions which are simultaneously being pursued.

'We should not reinvent the wheel with the circular economy transition. We are 10 to 15 years behind the energy transition. We also started that one earlier because there was more urgency and now we are gradually discovering that we will never achieve the energy transition without the circular economy. […] In the worst case, those transitions can work against each other. If you start building windmills everywhere without thinking about whether they are circular and what we do with them at the end of their life cycles, those transitions will work against each other' (interview 10).

Both on the EU and the Dutch policy-making levels can we identify a high level of compartmentalisation in relation to sustainability transitions: biodiversity, energy, circular economy; all these transitions have their own strategies, publications, organisations and civil servants developing them. This means that when someone is working on circular economy, they will often not be fully aware of developments that fall under the scope of the energy transition, even though those two impact one another. This is not necessarily a barrier for the implementation of circular economy, but can unintentionally lead to not having a full picture of all the different instruments in place that can impact circular economy. This seems to be the case on the European level. In order to reconstruct the entire EU approach concerning circular economy for my case study sectors, I had to combine at least five different policy documents each time. Strategies aimed at introducing circular economy in the agro-food sector are described in the *Circular Economy Action Plan,* the *Fark to Fork* strategy, the *Bioeconomy Action Plan* and *Food 2030*. Each of these plans have their own objectives and own strategies,

even though they are strongly entwined. This makes it difficult, even for policy-makers themselves, to have a clear understanding of the bigger picture.

On the Dutch level there are multiple ministries responsible for the implementation of the circular economy strategies: the Ministry of Agriculture, Nature and Food Quality is responsible for the Biomass & Food agenda, the Ministry of Economic Affairs and Climate Policy is responsible for Residential and non-Residential building within the Construction Agenda and the Ministry of Infrastructure and Water Management is responsible for the agenda's Consumption Goods, Plastics and the Civil and Hydraulic Engineering part of the Construction agenda (interview 10). There are bi-weekly meetings between all the different ministries regarding circular economy and also on the civil servant level is there plenty of interaction in order to guide the transition in an organised and well-adjusted manner. This becomes once again more complicated regarding the communication on different sustainability transitions.

'[Communication] is there, but I would like to mention it because it is sometimes difficult when everyone is working on their own transition to first understand your own transition and then also make the translation to other transitions [...] you could say that it could be much better organised indeed' (interview 10).

So far there has been no research on how different sustainability transitions influence each other, but there are indications that due to the broad range of policies relevant to circular economy this could lead to conflicting goals (EEA and EPSC, 10-09-2019). Further research on the topic could shed light on how this compartmentalisation forms a barrier for transitions, but for now all I can do is conclude that it could potentially be one and that more research on the interaction between sustainability transitions is needed.

There is active attention for coordination between de EU level and the national (Dutch) level in regards to circular economy. One of the goals presented in the most recent Dutch circular economy publication (*The Circular Economy Implementation Programme)* is strengthening international cooperation. On more than one occasion the Dutch government has emphasized that they are paying active attention to what happens with circular economy on the European level and the country is doing a good job at transposing EU law in its national frameworks (Government of the Netherlands, 2016). Moreover, the country has also had an active role in the creation of the EU *Circular Economy Action Plan*. The Netherlands held the Presidency of the Council of the European Union in the first half of 2016 and 'made the circular economy a centrepiece' of its EU ambitions during that time (European Commission, 02-12-2015). The Netherlands is also presenting itself as a circular economy frontrunner on the European level and actively contributes to efforts made on the supranational level to stimulate the transition towards a circular economy.

On the national level, first signs of policy coordination failure become visible when looking at the interaction between the ministries and other government (implementation) agencies. An example of how this can become a barrier was presented by a business that wanted to apply for a subsidy at the Netherlands Enterprise Agency (RVO), a government agency under the Ministry of Economic Affairs and Climate Policy whose goal is to facilitate entrepreneurship. Their idea was to create a business that produces based on demand instead of producing as much as possible, which is a very common ambition in circular economy thinking. However, the RVO did not understand their reasoning for doing that and it in the end took the business 2.5 years to receive the subsidy since they needed to convince the RVO that demand-based production was indeed part of circular economy and they therefore were allowed to make use of the subsidy (interview 1). The issue of implementing agencies not acting upon the Dutch circular economy ambitions is not an incidental occurrence, but a structural barrier that Dutch circular businesses encounter.

'Very often the problem is not laws and regulations themselves, but the person who has to work with them and how they interpret them. An environmental agency needs to give permission when someone applies for a permit for recycled materials, since it often requires a modification of the permit. What you often see, in the Netherlands you have 29 different environmental services, so 29 people in 29 services who have to answer a company's question. Well, do you think those 29 people in the same cases also give the same answer?' (interview 7).

Same as on the national level, provinces and municipalities have made circular economy and everything it entails the responsibility of one specific department within their organisational structure. This leads to other departments not being fully aware of the circular economy ambitions of their own organisation and thus what happens in practice is that for example a local municipality does not act on its own circular economy promises.

'Strangely enough, the municipality is also the party that says on one hand that circular construction is very important, but at the same time they also want the greatest value for their money and these two views sometimes contradict each other. The municipality does not exist, you actually have two different streams within the municipality: one group that says "this is what we want" on the basis of policy, sustainability and circularity, but then you encounter the people from finance at the municipality and they then say: "very nice, but that costs money and then we would have to ignore the land value." Whether that is true or not, it does not matter, but that is what they say. And then you see that as a rule, money wins. Money trumps ideology' (Interview 8).

The lack of policy coordination in the Netherlands is mainly caused by the issue that circular economy is often made the sole responsibility of one department at each government level, which in practice means that the government (whether on the national, regional or local level) sometimes does not act on its own circular economy plans since other departments are not

sufficiently aware of what they are supposed to be doing in light of the country's circular economy ambitions. Another horizontal aspect of policy coordination failure that can become a barrier for the overall implementation of circular economy is that even though there is sufficient vertical coordination between the EU and the Netherlands, there is barely any interaction with other member states on the topic. The implementation of circular economy is very much focused on the country's transition, which can lead to something that is called a 'waterbed effect' in Dutch policy-making. A waterbed effect occurs when an issue is solved somewhere only to lead to issues elsewhere. Carbon leakage is a good example of such an effect. This could be a barrier for the overall transition towards a circular economy since it could stimulate non-circular businesses elsewhere, which in the end hurts the circular economy effort. So if the Netherlands were to successfully introduce a circular economy, it could give a competitive advantage to countries that did not do this since they can produce the same product for a lower price. This in the end functions as an incentive for businesses to once again not work with circular businesses models since being too far ahead of the curve means losing customers who will seek products they need in neighbouring countries against a lower price. Horizontal coordination is incremental for the creation of a circular level playing field in countries. But so far the only active cooperation between the Netherlands and other member states is the proposed cooperation on construction and demolition waste.

Reflexivity failures

A famous proverb in the management and economics field is "you can't manage what you can't measure" and this also applies to sustainability transitions and more specifically to circular economy (Bilal et al, 2020). The reflexivity failure refers to transition failures caused by the lack or the inability to monitor anticipate and involve actors in processes of self-governance (Weber and Rohrarcher, 2012). Monitoring is necessary in the context of sustainability transitions since knowledge gaps exists between our ambitions and our understanding of how we can reach those ambitions. The introduction of circular economy related policies is monitored to make sure that they have the desired outcome and do not lead to unanticipated negative situations. In addition to that, sustainability transitions are often made possible through new innovations which sometimes can fail. Reflexivity shows how well policy-makers can anticipate these kickbacks when (parts of) a strategy do not seem to work in practice. Monitorisation is the best policy tool in order to make sure that reflexivity failures can be identified.

On multiple occasions, monitoring is mentioned in the interviews as a helpful tool in the creation of a more level playing field between circular and non-circular businesses. As has been explained in the agro-food case study, the lack of transparency in the sector is often seen

as a barrier for sustainable producers since they are not very capable of distinguishing themselves from non-sustainable sellers in a retail-setting. Circular businesses in the agro-food industry in particular struggle with the non-existence of proper monitorisation tools for circular (or more broadly; sustainable) products since there is as of now no measurement tool available that shows how circular a product is. A start has been made with the introduction of certifications on food products in terms of fair pay, animal cruelty and sustainability, but as of now no certification in the food industry exists for circular products and none has been proposed on both the European and the Dutch level. It is due to the before-mentioned issues in the agro-food industry also very difficult to create such a measurement tool due to the lack of oversight and transparency that is present in the sector.

More work has been done in terms of monitorisation in the construction sector, with multiple tools being in place in order to measure how circular a certain building project is. However, a reflexivity failure has arisen in the Dutch construction industry, but not because of a lack of monitorisation. The issue has to do with the fact that in practice monitoring systems are still underdevelopment and fall short.

'For example the MPG score, a measurement system to measure sustainability. You can see that the metal and concrete lobbies were well represented these measuring systems were drawn up. Concrete now scores better on sustainability than wood and steel also scores better on sustainability than bio-based materials. So when we have to compete in a tender based on sustainability, a concrete building usually wins. It is truly incomprehensible' (interview 8).

In the construction sector, the MPG-score, a tool designed to measure sustainability, in practice leads to the exclusion of the most sustainable options when competing for a tender with more traditionally designed buildings because of errors in the design of the tool. In this case a monitoring tool is hurting circular businesses instead of helping them. It is important that monitorisation systems keep being improved upon as new systems often deal with growing pains. Monitorisation is identified by a representative of the Ministry of Infrastructure and Water Management as the biggest barrier for circular economy at the moment (interview 10). It is not strange that current monitoring systems contains errors because it is relatively hard to develop monitoring systems for circular economy.

'An important overarching barrier is monitoring. How do we ensure that we know where we stand? How far are we from our goals? With climate, for example, this is fairly easy because you can look at CO2 emissions or CO2 equivalents; that's one number you can hold on to. Circular economy is much more difficult to measure because it is much more abstract. It also concerns land use, environmental impact, biodiversity loss, etc. You need a much broader set of indicators to know exactly where we are. And there are also more questions that we need to solve. Are we looking at the producer side or the consumer side? Do we only look at what is happening in the

Netherlands or in the entire chain? Do we measure in tons or in volumes? These are all questions that still need to be answered. It is quite a challenge to arrange that properly. We are a world leader by thinking about it and drawing up a good set of indicators and goals. I think this is the main barrier for us right now' (interview 10).

The recognition on the Dutch level that monitorisation is indeed important and the proactive attitude towards the development of new and better monitorisation tools is promising and shows that improvement will be made in the foreseeable future. Circular economy monitorisation is in its infancy, but the Dutch government shows itself to be a front-runner on this specific issue. In addition to that, there is as of now no system in place in order to oversee whether circular construction projects are actually being carried out as promised on paper.

'I think what's important to mention is retrospectivity. The feeling we get from some fellow companies is that they promise you the world, but when it comes to the implementation not all those promises are being fulfilled. So it is important that it is checked whether those promises are actually carried out' (Interview 6).

It is difficult to assess how much of an issue this is in the sector yet something that is worthwhile to be paid attention to by policy-makers, since the actual implementation of circular innovations and projects is quite crucial for the transition. However, neither the EU nor the Dutch strategy makes any mention of enforcement of circular standards.

The second aspect of reflexivity is how well a strategy can be adjusted in light of set-backs. This is especially relevant for both the European and Dutch strategies for the agro-food industry due to the controversy surrounding biomass. On the Dutch level biomass has been branded a political contested topic and there is a lot of uncertainty surrounding the use of biomass in the future. These concerns about biomass are also becoming visible on the European level with major societal backlash on a Commission proposal that promotes the use of more biomass (Ruffalo, 08-07-2021).

'Biomass is in my opinion downcycling and not so much recycling' (interview 2).

Biomass is an incredibly important aspect of both the European and Dutch strategy in order to turn the sector circular and has even been named indispensable (Sherwood, 2020). Biomass accounts on both the European and Dutch level for around half of the total amount of renewable energy and chances are big that without the use of biomass or an acceptable alternative the circular goals for the agro-food industry will not be reached. However, it is at the moment uncertain how sustainable biomass is, so even when it is decided to go ahead with the plans as they have now been made, it could very well be that not as much will be contributed to sustainability as is now expected. Neither the European Commission nor the Dutch

government have as of now commented on how biomass will be approached in the future, showing a very explicit reflexivity failure in the circular strategy for the agro-food industry.

Discussion

The analysis of the European and Dutch circular economy strategies and connected policy-mixes for the agro-food and construction industries and the assessment of those strategies in connection to the framework of Weber and Rohrarcher show some useful insights into how well the circular economy strategies work in practice. In terms of market failures, the overarching issue that circular businesses encounter is the lack of a fair playing field between circular and non-circular businesses. The circular businesses hold themselves to higher standards which result in higher costs and therefore higher prices, something that the linear economy system does not take into account. This results in competitive disadvantages which the circular business owners take for granted, but it does not make it easier to keep a circular business running. A very pressing issue is the fact that circular economy for now needs to find a way to work in a system that is fundamentally opposed to what it tries to achieve.

The European and Dutch strategies are both doing well in terms of preventing infrastructural failures due to policy instruments being in place that facilitate research and development in the circular field. The main tool that is used to stimulate this in the private sector is through subsidies. A tool which is helpful, but circular businesses frequently encounter issues during the application process for subsidies and efforts should be made in order to take away the various hurdles that circular businesses encounter.

Institutional failure is the most pressing barrier when one looks at the amount of times the topic unknowingly comes up during the interviews. The first major barrier that circular businesses encounter in this context is the lack of existing legislation and regulation that can be applied to their special circumstances. Circular economy often finds itself in a legislation gap which almost automatically leads to a standstill: new developments cannot be pursued until legislation is created and/or the businesses themselves need to invest a lot of their own resources into figuring out a way to navigate laws and regulations. In addition to that, a majority feels that the government approach is wrong. Too much attention is being paid to stimulating good behaviour while barely anything has been done to punish bad behaviour. Most businesses operate out of intrinsic motivation and would have done it with or without government support, which is why overall circular entrepreneurs feel that government effort is being wasted. It would in their opinion be better to address the non-movers instead of the front-runners who are promoting circular economy either way.

The best efforts have been made in order to tackle interaction or network failure. Both the EU and the Dutch circular economy strategies are very much focused on promoting best practices, bringing stakeholders together and public-private cooperation. This results in an effective and efficient use of resources and barely any sight of interaction or network failure in circular businesses' everyday life. Directionality failure however is another story. Both the European and Dutch strategies suffer from a certain level of vagueness which 1) makes it difficult sometimes to dilute specific targets and 2) makes it impossible to tell who is responsible for doing what. This ambiguity has to negative consequences for the circular transition: a lack of urgency and a lack of responsibility. It is made very easy to pass on the so-called buck to other actors in the socio-technical system which in the end leads to no action being taken. The approach towards food waste and the lack of progress in that field exemplify this.

The circular transition also suffers from demand articulation failure. There are no policies in place that actually create demand for circular products, apart from the limited standards that are being introduced for mandatory circular public procurement. The strategies as of now completely rely on voluntary cooperation which, as the agro-food case study showed, is really limited. Nothing is done in terms of addressing the non-movers while this group still accounts for a big majority, which forms a great barrier for the growth of circular demand.

Policy coordination failure has its ups and downs. Vertical interaction between the EU and the Netherlands on the topic of circular economy is going really well; with both actively monitoring what is happening on the other policy levels and adopting themselves to that. Issues however start to arise on the national level in terms of the interaction between the government and implementation agencies and within government actors themselves. This leads to situations where government actors do not practice what they preach in terms of their circular ambitions. Lastly, reflexivity failure is very present on both the European and the Dutch level due to a lack of well-functioning monitoring tools to measure the circular transition. This is something that both levels work hard on to develop, but the models are still in their infancy and in need of improvement. This issue does seem to be properly addressed and as of now all that is needed to limit the effects of this failure is time.

Conclusion

Circular economy is the most used framework by policy-makers in order to reform our linear economic system into a more sustainable model that also takes into account social and environmental value and overall aims at diminishing the use of finite natural resources and the creation of waste as much as possible. Both the European Union and the Netherlands have dedicated themselves to the creation of a completely circular economy by 2050 and have published multiple policy documents over the years detailing the strategies used to make that happen. This thesis has aimed to analyse the effectiveness of both these strategies in the Netherlands thus far by analysing the specific policy-mixes used by the EU and the Dutch government to facilitate the transition to a circular economy. In order to give a detailed analysis that takes into account the sector-specific (socio-technical) barriers that strongly influence sustainability transitions, I have chosen to analyse the strategies used in order to introduce circular economy in the Dutch agro-food and construction industries. Both these sectors have been described as incremental for the creation of a completely circular economy and on both the EU and the national level do specific circular strategies exist for these sectors.

Geels (2004) has argued that in order to realise the successful transition of a socio-technical system, you need three aspects to start moving: the actors in the socio-technical system, the technical artefacts in the socio-technical system and the institutions that oversee the socio-technical system.

In the case of the Dutch agro-food industry there are a couple of factors that form a barrier that prevent the actors in the socio-technical system from transitioning towards more sustainable practices. First of all, the sector is struggling with a high degree of market concentration which has given a few players enormous influence over the value production chain of the sector. Retailers can exert a high degree of influence on their suppliers which has created a system in which the retailers can decide on the price of products and not the other way round. This is problematic since this dynamic has made it all but impossible to ask for a higher price than the retailers are willing to pay. In the case of circular (or more generic: sustainable) products, this means that when the producer has higher costs due to their higher quality and thus more expensive production process, they are not able to pass on those higher costs and will therefore lose revenue. This system makes it extremely unattractive to start using circular practices since your costs will go up, but your selling price will stay the same. With profit margins already being low, it disincentivises agro-food producers to start working with circular economy models on their own accord. This also explains why most circular businesses by-pass retailers altogether and sell their products locally. This development is once again problematic for the market creation of circular products since most sales are done in supermarkets, meaning that circular agro-food sellers miss out on a large portion of their potential clients. Consumer willingness to pay a higher price for sustainable products is another barrier that agro-food

producers encounter in this sector. Research has shown that only 10% of consumers is willing to pay a mark-up for sustainably produced food products, meaning that the pool of potential clients is already small to begin with. A third barrier for circular production in the agro-food industry is the lack of transparency in the sector. It is very difficult, even for the actors within the production chain, to know where food products come from and under what circumstances they have been produced. This makes it first of all difficult to check which products are more sustainable than others and second of all, this dynamic has made price the number one category for comparison, which burdens price margins even more. This has all in all led to the agro-food industry being a very unfavourable environment for producers to voluntary adopt circular business practices in since it will almost certainly lead to a loss of revenue and market share.

The actors present in the Dutch construction industry are struggling with a growing lack of personnel and delays in the realisation of building projects caused by the Urgenda lawsuit and the a growing shortage of building materials. On top of that, the tender-based organisation of the sector has created a strong short-term and project-specific focus of businesses. Most issues, including the ones mentioned above, are ad-hoc issues which businesses also want to solve through short-term solutions. This culture stands in stark contrast with sustainability transitions which by definition are long-term processes that need intervention on multiple levels through multiple instruments. The actors in this sector suffer less from lock-ins like those in the agro-food industry do, however the dominant culture in the industry inhibits most actors from looking at long-term developments and on top of that, most businesses in the industry are one-man businesses (ZZP'ers) who lack the means for expensive and long-term transition processes and will definitely not act as first-movers in this process.

In terms of the technical artefacts present in the Dutch agro-food industry, the Netherlands is doing extremely well. The Netherlands has one of the best developed research environments in the world in terms of food and agriculture which has earned the east of the country the nickname 'Silicon Valley of Agro-food' or 'Food Valley'. Around 800 million euros is invested each year by private actors in R&D for agro-food related innovations and the Dutch government has also made a lot of effort to create a strong investment climate in this sector through their top sector policy. This means that in terms of technological artefacts the material and immaterial know-how is present in the industry to facilitate the transition to another socio-technical system.

The technological artefacts are more of a slippery slope in the construction industry. Due to sector-specific characteristics like strict regulations and standards, the relatively small scale that businesses operate in and the tender-based organisation of the sector, the construction industry has a very risk averse culture which forms a barrier for research and innovation in

the industry. This has resulted in relatively little investment projects being started by the businesses themselves. In addition to that, the construction industry has not been classified by the Dutch government as a top sector which means that there are no sector-specific strategies in place focused on stimulating innovation in the industry. Due to the importance of the industry public-private cooperation networks have been created, but not on the scale and organisation level as has been used for top sectors. This makes the construction industry a far weaker sector than the agro-food industry in terms of technological artefacts in order to create the means necessary for a circular transition. This does not mean that innovations are not taking place, it does however mean that the most optimal environment for those innovations is not present.

This brings us to the institutions: the EU and the Dutch government and their efforts to facilitate the circular transition. Whether or not policies are effective is a very subjective riddle to solve. This is why a theoretical framework in order to assess effectiveness is necessary to come to any viable conclusions. Such a framework is provided by Weber and Rohrarcher (2012) who have come up with twelve transition barriers that inhibit sustainability transitions. Through interviews with circular business-owners and experts on the topic I have analysed whether or not these twelve barriers are present in the Dutch agro-food and construction industries and through the document analysis I have assessed whether or not the proper policy instruments are in place to tackle these barriers. The most pressing barriers present in the Dutch agro-food and construction industries in terms of the circular transition which the strategies fail to tackle are the effects of market failures, institutional failures, capabilities failure, directionality failure, demand articulation failure, policy coordination failures and reflexivity failure.

The overarching issue caused by market failures is that circular businesses need to operate in a system that fundamentally opposes the principles of circular economy. Linear economy only takes into account economic value and disregards ecologic and social value. Circular businesses do take this into account which leads to higher costs and thus higher prices, something that results in competitive disadvantages compared to non-circular businesses. This unfair playing field between circular and non-circular businesses makes the everyday operation of circular businesses more difficult and creates barriers in terms of profitability and continuity.

Institutional failures are in the eyes of the interviewees the most pressing barriers. The first major issue caused by institutional failure is that because specific legislation and regulation for circular economy does not exist as of now, this leads to situations where legislation and regulation cannot be applied to the circular businesses. This means in practice that innovations and business practices come to a standstill because non-existing legislation means that it is not possible to carry out the proposed ambitions. On the implementation level, no one knows who

is responsible for the decision-making process in case such a situation occurs, which means that the issue also cannot be solved on short notice. This results in circular businesses having to dedicate scarce time and resources towards having to resolve the issues caused by this institutional failure on their own. In addition to that, many feel that the focus of the institutions is being placed on the wrong aspects. Both the EU and the Dutch strategies are created to facilitate circular behaviour, but the Dutch circular businesses want more policies that are aimed at punishing bad behaviour. The reasoning behind this is that since circular entrepreneurship is such an unattractive business model due to the effects of the market failures that many do it out of intrinsic motivation and not due to economic gains. This means that the strategies in place are ineffective since the circular entrepreneurs would do what they are doing regardless of those facilitative efforts. At the same time barely anything is being done to incentivize actors that are not voluntary moving towards a circular economy which will eventually lead to a standstill in the transition, because there are only so many people that are willing to contribute voluntarily. It would in the opinion of the circular businesses be better to address the non-movers instead of the front-runners who are promoting circular economy either way. One final institutional failure is caused by the Dutch risk-averse culture. The careful approach of the government is seen as a huge barrier for circular innovation since innovation and risk go hand in hand. Taking a risk-averse approach therefore strongly limits the room that circular businesses have in order to introduce new ideas.

Another big issue present in both the EU and Dutch strategies related to the agro-food and construction industries is the lack of direction and a specific division of tasks. This vagueness leads to both a lack of urgency and a lack of responsibility in terms of who carries out the proposed ambitions in the strategies. A lack of responsibility will lead to buck-passing and eventually to certain ambitions not being carried out at all. Both strategies also lack policy instruments that tackle demand articulation failure. There are no policies in place that actually create demand for circular products and services in the private sphere and since everything else is on a voluntary basis, non-movers are giving a free-pass not to participate in the circular ambitions which forms an enormous barrier for the creation of circular markets. Lasty, both the EU and the Dutch government have shown that they are not very capable of handling kickbacks in the transition strategies which in case of failing innovations or strategies can cause major barriers for the overall success of the circular transition. What also needs to be mentioned is that the introduced policy-mixes are successful in addressing infrastructural failure and interaction or network failure, with elaborate strategies in place to break down the barriers caused by these transition failures.

When we connect these results with my research question:

'How well are the European and Dutch policy mixes aimed at introducing a circular economy capable of tackling barriers of sustainability transitions in the Dutch agro-food and construction industries?'

I come to the following conclusion. The European and Dutch strategies for a circular agro-food industry and construction industry are capable of tackling two out of twelve transition barriers. This means that a lot of work needs to be done in terms of introducing policy-mixes that address the remaining ten transition barriers that Dutch circular business struggle with on an everyday basis. The barriers that the businesses encounter have on top of that enormous impact on the businesses given their enormous influence on the businesses' day to day functioning. Especially the failures that are created by the institutional level, the institutional failures and the policy coordination failures, seem to be the most burdensome issues that Dutch circular businesses experience. In order to facilitate a successful transition towards a circular economy, both the EU and the Netherlands need to address the abovementioned issues caused by the transition failures in order to create a completely circular economy by 2050. Based on the policy-mixes that are in place now it is safe to say that this ambition will not be reached when we continue using the strategies that are in place now without making adjustments.

This thesis has also shown that it is valuable to approach circular economy from a meso-perspective. Most studies related to circular economy are either conducted on the micro-level, with the study of one or a group of companies, or on the macro-level, with society wide studies. The micro level studies fail to identify which successful aspects of circular businesses can be implemented by other businesses and other sectors and the marco-level studies are not capable of taking into account the characteristics of socio-technical systems, which as my case studies have shown are incremental to consider for a successful transition. This thesis has shown the viability and usefulness of using a meso-level approach to circular economy and more broadly sustainability transitions. Since research in the field is still very new a lot of questions still need to be answered, but this research is a good first step in order to understand why the transition towards a circular economy is struggling in the Dutch agro-food and construction industries. This thesis has also identified that sustainability transitions do not stand on their own, but to a high degree also influence each other. This is currently not being taken into account in research and I hope that more research on the interlinkedness of sustainability transitions and the implications this has will be conducted in the future.

Policy recommendations

Based on these conclusions, I want to present the following policy-recommendations in order to create better suited strategies on both the EU and the Dutch level aimed at the stimulation of a circular economy:

- The focus of circular strategies, and sustainable strategies in general, needs to be refocused from facilitating good behaviour to punishing bad behaviour. Voluntary cooperation has its limits and in order to create a completely circular economy by 2050 a lot more actors need to get involved than is the case now. On the Dutch level, the ambition to work more with 'drang en dwang' (compulsory actions) has been expressed (interview 10). This development sounds promising but in order to help Dutch circular businesses speed is required in terms of the implementation of these ambitions. On the EU level, the ambitions are solely focused on stimulating good behaviour in terms of circular economy strategies for the agro-food and construction industries. More effort should be put in creating binding targets and ambitions which then also need to be enforced in order to successfully transitions to a circular economy.

- More emphasis should be placed on stimulating circular economy practices in existing businesses instead of creating circular pilots and start-ups. In the end, the entire economy needs to be circular by 2050 and existing businesses struggle more with the implementation of circular practices due to path-dependency.

- The current plans are too vague and do not assign responsibilities to specific groups. This is necessary to avoid a lack of responsibility which in turn leads to a lack of actions being undertaken.

- The best course of action to create a truly circular economy that is able to function to the best of its abilities is to introduce true pricing mechanisms. By having producers take into account not only their economic costs, but also the ecologic and social costs their product causes, this will help circular businesses overcome their competitive disadvantages since both types of businesses will be held by the same standards under true pricing systems. In the long run this will also lead to more efficiency since, when all these aspects are taken into account, circular products end up being cheaper to produce than their non-circular counterparts. Such a policy intervention would mean that our current production and pricing mechanisms need to fundamentally change in order to facilitate true pricing. However, such an action is justified when we truly want to create a functioning circular economy by 2050. To use the words of one of my interviewees: *'grow some balls'* (interview 1).

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Annex I: code tree open coding

awareness

barrier

big distances

bureaucracy

call for cooperation

change chain

change society

changing market

circular building materials

closing the chain

co2 tax

collective consciousness

competition law

conservative sector

continuity

cost transition

criticism of government strategy; wrong focus

decentralization

demand-driven production

downcycling

drive

economic principles

education

extra effort

forced transition

frontrunner

future proof

get parties to cooperate

government criticism: needs to be more ambitious

government ignorance

government implementation

government policy discrepancy

grants

image companies

imaging

Importance of being distinctive

importance of cooperation

importance of international policy

importance price

importance story

ineffective policies

influence consumer behaviour

innovation

international cooperation

interpretation meaning circular

intrinsic motivation

investing interest

lack of control

lack of demand

lack of knowledge

lack of representation

lack of standards

laws and regulations

leakage effect

learning process

level playing field

linear principles

linear vs. circular

lobby and influence

local visibility

low sales

market creation

monitoring

motivation circular investing

motivation for circular entrepreneurship

multiple value creation

opposition sector

opposition to government policy

organizational ability

Polarization

political interests

political will

price control

punish instead of encourage

relationship between government and companies

reluctant government

retail

right to exist

risk averse

role consumer

role of government

Scale

Shared responsibility

Shelf life circular model

short term thinking

shortage of raw materials

shortcoming regulation

Shorten chain

Simple value creation

spread knowledge

Sustainable Development Goals

system change

tax

true pricing

unfair competition

unfair system

urgency

value creation

want to stand on its own two feet

waterbed construction

willingness to pay

wrong system

Annex II: code tree axial and selective coding

Code	Code Groups
Angst voor toekomstige restricties	Motivatie circulair ondernemen
barriere	Barrieres
beeldvorming gebrekkig	Barrieres
Belang onderscheidend zijn	Sleutelwoorden CE
belang prijs	Barrieres
belang samenwerking	Sleutelwoorden CE
belang verhaal	Sleutelwoorden CE
belasting	Oplossingen
betalingsbereidheid	Barrieres
bewustwording	Motivatie circulair ondernemen
Capabilities failure	Weber and Rohrarcher
circulaire bouwmaterialen	Onderzochte strategie genoemd
Cirulair vraagt meer moeite	Barrieres
co2 tax	Oplossingen
conservatieve sector	Barrieres
consumentengedrag beïnvloeden	Onderzochte strategie genoemd
continuïteit	Motivatie circulair ondernemen
decentralisatie	Barrieres
Demand articulation failure	Weber and Rohrarcher
Directionality failure	Weber and Rohrarcher
discrepantie overheidsbeleid	Barrieres
Externalisation of costs	Weber and Rohrarcher
Gebrek aan capaciteit	Barrieres
gebrek aan controle	Barrieres
gebrek aan kennis	Barrieres
Gebrek aan monitoring of werkt niet	Barrieres
gebrek aan representatie en/of invloed	Barrieres
gebrek aan standaarden	Barrieres
gebrek aan vraag	Barrieres
Gedeelde verantwoordelijkheid	Sleutelwoorden CE
gedwongen transitie	Motivatie circulair ondernemen
grondstoffentekort	Motivatie circulair ondernemen
Huidige wet- en regelgeving werkt tegen	Barrieres
imago bedrijven	Motivatie circulair ondernemen
Information asymmetries	Weber and Rohrarcher
Infrastructural failure	Weber and Rohrarcher
innovatie	Sleutelwoorden CE
Institutional failure	Weber and Rohrarcher
Interaction failure	Weber and Rohrarcher
internationale samenwerking	Oplossingen
intrinsieke motivatie	Motivatie circulair ondernemen
kennis verspreiden	Doelen onderneming
Knowledge spill-over	Weber and Rohrarcher
kortetermijn denken	Barrieres
kosten transitie	Barrieres

lage afzet	Barrieres
lineair vs. circulair	Barrieres
marktcreatie	Oplossingen
mededingingsrecht	Barrieres
meervoudige waardecreatie	Sleutelwoorden CE
mensen informeren	Oplossingen
monitoring	Oplossingen
motivatie voor circulair ondernemen	Motivatie circulair ondernemen
Nieuw terrein wet- en regelgeving	Barrieres
onderwijs	Doelen onderneming
oneerlijk systeem	Barrieres
oneerlijke concurrentie	Barrieres
onwetendheid overheid	Barrieres
Over-exploitation of commons	Weber and Rohrarcher
Overheid moet duidelijker zijn	Oplossingen
Overheid niet ambitieus genoeg	Barrieres
Overheid niet goed geïnformeerd	Barrieres
Partijen meekrijgen	Doelen onderneming
Policy coordination failure	Weber and Rohrarcher
politieke belangen	Barrieres
politieke polarisatie	Barrieres
prijssturing	Oplossingen
Reflexivity failure	Weber and Rohrarcher
risicoavers	Barrieres
schaal	Barrieres
sluiten van de keten	Doelen onderneming
straffen i.p.v. stimuleren	Oplossingen
subsidie werkt niet (goed)	Barrieres
systeemverandering	Oplossingen
targets stellen	Oplossingen
tegenwerking overheidsbeleid	Barrieres
tegenwerking sector	Barrieres
tekortkoming regelgeving	Barrieres
terughoudende overheid	Barrieres
toekomstbestendig	Motivatie circulair ondernemen
true pricing	Oplossingen
veranderende markt	Motivatie circulair ondernemen
verandering maatschappij	Motivatie circulair ondernemen
Verkeerde focus overheidsbeleid	Barrieres
Verkorten keten	Doelen onderneming
vraaggestuurd produceren	Doelen onderneming
waardecreatie	Oplossingen
weglekeffect	Barrieres
wil om op eigen benen te staan	Doelen onderneming

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