„The Manifestations of Formal Standardisation and Lobbying Activities in Innovation Deals“

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Master of Science Innovation Management & Entrepreneurship

Master of Science Business Administration

Summer Term 2017

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Abstract

This dissertation researches the manifestations of direct lobbying activities in form of regulatory capture, cultural capture, and corporate capture as well as proposed regulatory adaptions in the Innovation Deal 'Sustainable waste water treatment combining anaerobic membrane technology and water reuse' and in the Green Deal 'Gelijkspanning Haarlemmeer'. The objectives of the study were (1) to detect if formal standardisation is pursued in order to promote innovations (2) to show if participants use the Deal concept to lobby for their organisations interests (3) to illustrate if participants use the Innovation Deal to lobby for their country's interests, and (4) to identify if the proposed changes in the regulatory framework benefit the interests of specific companies more than the public interest. The fierce discussion in innovation management and public administration literature about the impact of regulation on innovation and the introduction of this new Innovation Deal instrument motivated the researcher to undertake this study. The topic was specified on lobbying in the face of the manifold interests present at the European level.

In order to conduct this multiple case study research semi-structured interviews with the aid of a questionnaire were applied. Data was collected via Skype or telephone from a sample of both projects as well as non-participants. The resulting qualitative data was analysed by computer assisted analysis software.

The study resulted in the conclusion that both Deals are used to lobby for organisations interests (regulatory capture), however, these concerns are predominantly holistic (cultural capture). A regulatory support for both sustainable innovations will benefit the common good more than private companies (corporate capture). In addition, we found evidence for the use of formal standardisation as a coordination instrument to promote innovation in more emerging markets.

Zusammenfassung

Diese Abschlussarbeit untersucht die Ausprägungen von direkten Lobbyingtätigkeiten in Form von „regulatory capture", „cultural capture" und „corporate capture", sowie die vorgeschlagenen regulatorischen Anpassungen in dem Innovation Deal "Sustainable waste water treatment combining anaerobic membrane technology and water reuse" und in dem Green Deal 'Gelijkspanning Haarlemmeer'. Die Ziele der Studie waren festzustellen, (1) ob formale Standardisierung zur Förderung von Innovationen verfolgt wird, (2) ob die Teilnehmer das Deal-Konzept nutzen, um die Interessen ihrer Organisationen durchzusetzen, (3) ob Lobbyarbeit für die Interessen ihrer Länder durchgeführt wird und (4) ob die vorgeschlagenen Änderungen des gesetzlichen Rahmens den Interessen bestimmter Unternehmen mehr dienen als dem öffentlichen Interesse. Anlass für die Studie gab die intensive Diskussion in den Bereichen Innovationsmanagement und Verwaltungswissenschaft über die Auswirkungen von Regulierungen auf Innovation und die Einführung des neuen Innovation Deal Instruments. In Anbetracht der vielfältigen Interessen auf europäischer Ebene die Auswirkungen auf das Projekt haben können, wurde der Untersuchungsgegenstand auf das Thema Lobbying erweitert.

Zur Durchführung dieser Mehrfachstudie wurden teilstrukturierte Interviews mit Hilfe eines Fragebogens durchgeführt. Die Daten wurden per Skype oder Telefon von einer Stichprobe beider Projekte, sowie Nicht-Teilnehmern, erhoben. Die gesammelten qualitativen Datensätze wurden durch computergestützte Analyse-Software analysiert.

Die Studie führte zu der Schlussfolgerung, dass beide „Deals" genutzt werden, um sich für die Interessen von den teilnehmenden Organisationen einzusetzen (regulatory capture), diese Belange sind jedoch überwiegend holistisch (cultural capture). Eine Anpassung der Gesetze zum Vorteil beider nachhaltigen Innovationen wird mehr dem Gemeinwohl zugute kommen, als privaten Unternehmen (corporate capture). Darüber hinaus zeigen unsere Ergebnisse, dass Standardisierung als Koordinationsinstrument zur Förderung von Innovationen in aufstrebenden Märkten genutzt wird.

Samenvatting

Dit proefschrift onderzoekt de invloed van directe lobbyactiviteiten in de vorm van regulatory capture, cultural capture en corporate capture, mede als de voorgestelde regelgevingsaanpassingen in de Innovation Deal ''Sustainable waste water treatment combining anaerobic membrane technology and water reuse' en in de Green Deal 'Gelijkspanning Haarlemmeer'. De doelstellingen van de studie waren (1) om vast te stellen of formele standaardisatie wordt nagestreefd om innovaties te bevorderen, (2) om aan te tonen dat deelnemers de overeenkomst gebruiken om te lobbyen voor de belangen van hun organisatie, (3) om te illustreren dat deelnemers de innovatieovereenkomst gebruiken om te lobbyen voor de belangen van hun landen en (4) om vast te stellen dat de voorgestelde wijzigingen in het regelgevingskader de belangen van specifieke bedrijven meer dan het publieke belang ten goede komen. De felle discussie in innovatiemanagement en publieke administratie literatuur over de impact van regelgeving op innovatie en de introductie van dit nieuwe innovatieovereenkomst-instrument, motiveerde de onderzoeker om deze studie uit te voeren. Het onderwerp werd gespecificeerd over lobbyen in het licht van de vele belangen die op Europees niveau aanwezig zijn.

Om dit onderzoek met meerdere casestudy's uit te voeren, werden semigestructureerde interviews met behulp van een vragenlijst toegepast. Gegevens werden verzameld via Skype of telefoon uit een sample van beide projecten en niet-deelnemers. De resulterende kwalitatieve gegevens werden geanalyseerd met behulp van computerondersteunde analysesoftware.

De conclusie van de studie is dat beide 'Deals' worden gebruikt om te lobbyen voor belangen van organisaties (regulatory capture), maar deze zorgen zijn overwegend holistisch (cultural capture). Een regulerende ondersteuning voor beide duurzame innovaties zal het algemeen welzijn meer ten goede komen dan particuliere bedrijven (corporate capture). Daarnaast is er bewijs gevonden voor het gebruik van formele standaardisatie als een coördinatie-instrument om innovatie te bevorderen in meer opkomende markten.

Acknowledgements

First of all, I would like to thank Prof. Dr. Knut Blind for introducing me to the topic and granting me the opportunity to conduct this study at his chair and under his supervision. Furthermore, I would like to take the chance to thank him for his guidance throughout the project as well as his teachings as he is responsible for a great part of my education in the field of innovation management and sustainable innovation. Likewise I am grateful for the support of Dr. Michel Ehrenhard for supervising me in the process of developing the topic, writing this dissertation and for providing me inspirations and suggestions.

This study would not have been possible without the major support of Janneke Van Veen of the DG Research & Innovation from the European Commission who was welcoming right from the start and promoted my proposal to put my intentions into effect. Just as important was the willingness to grant me access to the Innovation Deal of the initiator and coordinator Prof. Aurora Seco and, further, the readiness of the research participants to make additional time available for this study. Having this said I would like to point out that I am aware that the Innovation Deal is a time consuming project alongside their regular professions for which I demand just some more. Thus, I am much obliged to the research participants of the Innovation Deal as well as the Green Deal and the non-project participants for taking part in the study. Overall, this paper would not have been realised without much endorsement and I am grateful for everyone that made it possible. With the final words of this section I sincerely thank my friends and family for their support.

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1. Providing Conceptual Analysis

1.1. Background and Need

On 1 January 2016, the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development of the United Nations officially came into force and put sustainable development in the focus of 193 member countries around the world (United Nations Sustainable Development, 2017). Concerning our earth the agenda aims at protecting the planet from degradation through sustainable consumption and production as well as sustainably managing its natural resources (General Assembly, 2015). This unleashed a global race for sustainable innovation, particularly, for innovations for a circular economy.

Pearce and Turner (1990) were among the first to suggest to shift from 'open' linear industrial processes to a 'closed' circular economy. Therefore, resources and waste products must enjoy the same consideration as production, consumer goods, capital, and utility (welfare). They argue 'the amount of waste in any period is equal to the amount of natural resources used up' (Pearce and Turner, 1990, p.37). Everything is an input into everything else. The danger they see arises from the mistreatment of natural environments because, unabated relevant today as when they wrote it, the economy does not recognise the positive prices for these economic functions (Pearce and Turner, 1990, p.41).

As a response to the SDGs the European Commission formulated an action plan for the Circular Economy as part of the EU's research and innovation Framework Programme Horizon 2020. It sets out a 'concrete and ambitious EU mandate to support the transition towards a circular economy' (European Commission, 2015, p.21). The European Commission sees this transformation not only as an

opportunity to reinvent the economy but also to create a new competitive advantage for Europe on a sustainable basis (European Commission, 2017a).

For this and the transition to a circular economy sustainable innovation is considered as key ingredient. As part of the action plan the European Commission launched the concept of an 'Innovation Deal' which constitutes 'a pilot approach to help innovators facing regulatory obstacles, by setting up agreements with stakeholders and public authorities' (European Commission, 2015). Even though similar concepts have been successfully executed, e.g., Green Deals in the Netherlands, the notion still needs thorough investigation. Especially because the Innovation Deal on the European level is confronted with special circumstances. These are the regulation challenges of an integrated Europe just as intense lobbying activities of an overwhelmingly large number of interest groups. On top of that, looms large the overriding issue which regulatory framework conditions benefit innovations and how these novel Innovation Deals can help to identify them.

1.2. Purpose of the Study

Schendelen (2013, p.121) describes three aspects that are relevant for lobbying (1) the actors to approach (2) the factors to use, and (3) the vectors to create. All three are addressed through the construction of the Innovation Deal as the participants are entitled to inform (1) the DG Research & Innovation by (2) working in a cross-sector collaboration for maximum of 18 months in order to (3) discover regulatory barriers that hinder their innovations.

The crucial point that needs thorough investigation is how biased will be the suggestions that will be made by the consortium of the Innovation Deal. In the light of the construction of the European supranational union manifold groups have interests to lobby the

legislative process and prior to that influence the information input necessary to make authoritative decisions. Although and precisely because the Innovation Deal aims at circular innovations it is of utmost importance to evaluate if the contributions made will benefit the common good or rather favouring individual companies or industries to the detriment of the public interest. Equally important is to understand if there is a participant distorting the results by lobbying for organisations or country's interests.

Beyond the lobbying research the authors seize the opportunity to examine the cases regarding the regulatory barriers identified to contribute to the discussion about regulatory impacts on innovation. In recent years, research on the adequate regulatory framework to promote innovations has become very popular. However, literature does not show a consistent picture about the impacts of specific instruments on innovation. A recent study (Blind et al., 2017) argued for formal standardisation to promote innovations in uncertain or more emerging markets. Since these market conditions seem to fit the technology in the Innovation Deal the authors attempt to find evidence for this claim.

Hence, this study aims at making three contributions. Firstly, to the innovation management and public administration literature by finding evidence for the proposition of Blind et al. (2017) if 'in uncertain or more emerging markets, regulators may promote innovation by pushing the use of formal standardisation as a coordination instrument'. Secondly, to the public administration literature in terms of EU lobbying by examining the manifestations of lobbying activities in the shape of regulatory capture, cultural capture, and corporate capture in the Innovation Deal. Finally, the results shall assist the European Commission in order to better interpret the insights produced by the Innovation Deal.

1.3. Research Questions

1. Is formal standardisation pursued to promote the innovation?
2. How do Deal participants carry out lobbying activities?
    a. How strong is the manifestation of regulatory capture, cultural capture and corporate capture among the participants of the Deals?

1.4. Theoretical Study Propositions

The listed theoretical propositions below serve as blueprint for this descriptive multiple case study. They hypothetically present assumptions about why acts occur which will be confirmed or rejected in our academic data analyses (Yin, 2015).

RQ1: Innovation & Regulation

P1: The case study will show if formal standardisation is pursued in order to promote the innovation in an uncertain or more emerging market.

RQ2: Lobbying

P2 (Regulatory capture): This case study will display if participants use the Deal to lobby for their organisations interests.

P3 (Cultural capture): This case study will evince if participants use the Innovation Deal to lobby for their country's interests.

P4 (Corporate capture): This case study will reveal if the proposed changes in the regulatory framework benefit the interests of specific companies more than the public interest.

1.5. Terms and Definitions

Innovation

'An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing

method, or a new organisational method in business practices, workplace organisation or external relations' (OECD, 2005).

Public Policy Instrument

'A public policy instrument constitutes a device that is both technical and social, that organises specific social relations between the state and those it is addressed to, (…). It is a particular type of institution, a technical device with the generic purpose of carrying a concrete concept of the politics/society relationship and sustained by a concept of regulation' (Lascoumes & Le Galès, 2007).

Lobbying

Lobbying has many definitions and labels, because it has several different manifestations. In this paper, we will look at one specific form of market (re)shaping: *firm–to–state lobbying*. Therefore, we interpret lobbing as 'the building of unorthodox efforts to obtain information and support regarding a game of interest in order to get a desired outcome from a power-holder' (McGrath, 2005, chapter 2).

Innovation Deals/Green Deals

Throughout the paper the reader will find several terms around the concepts Innovation Deal and Green Deal. Apart from the abbreviations the term 'Deal' will be used to refer to both concepts. Whenever 'Deal' is used it does not describe the concept as a whole since this would be too broad. Instead it refers explicitly to both concepts under research in this study, the Innovation Deal 'AnMBR' and the Green Deal 'Gelijkspanning Haarlemmeer'. Furthermore, the Innovation Deal 'Sustainable waste water treatment combining anaerobic membrane technology and water reuse' is most often written as 'Innovation Deal AnMBR'.

2. Critical Literature Analysis

2.1. Introduction

As outlined above the Innovation Deal aims to tackle a critical problem of public policy — identifying regulatory barriers that hinder innovation. But which do so? And beyond, what kind of effects have different regulations on innovative companies? As it comes to regulation, regulatory barriers, and changing the regulatory framework interest groups appear to get their importance taken into account and to make sure their concerns are considered. Especially, on the supranational European level these actors are exceptionally diverse and overwhelmingly many, resulting in numerous interests to lobby the Innovation Deal.

Therefore, this critical assessment of present literature will approach the notion 'Innovation Deal' from three different perspectives. Firstly, the concept itself is discussed, where it stems from and what can be learned from similar concepts about this kind of cross-sector collaboration. Secondly, from a public administrative point of view and the accompanying way of looking at the critical relationship between regulation and innovation. Finally, from a lobbying perspective drawing the attention to interest groups, their way of influencing the EU legislative process, and how this could impact the Innovation Deal.

2.2. Innovation Deal for a Circular Economy

2.2.1. Innovation Deals

On 2 December 2015 the European Commission adopted the Circular Economy Package to support the transition towards a more circular economy in the EU (European Commission, 2017b). This package consists of legislative proposals as well as of an Action Plan.

One of the key initiatives for 2016 was 'Innovation Deals for a Circular Economy'. These Innovation Deals are a new pilot scheme that aims at 'bringing together innovators, national/regional/local authorities, and Commission services to clarify perceived regulatory barriers to innovation in EU regulation or Member State implementing measures' (European Commission, 2017b).

From 26 May until 15 September 2016 companies across Europe had the opportunity to hand in their formal expression of interest in the Innovation Deal (ID). The European Commission (2016a) invited 'any innovator, or group of innovators seeking to introduce a circular economy-related product or service to the market but has encountered a perceived regulatory obstacle'. The selection of the IDs was made in the period of October until December 2016. Subsequently, in the first quarter of 2017 the European Commission selected two IDs out of 32 expressions of interest from 14 different Member States: Firstly, 'Sustainable wastewater treatment using innovative anaerobic membrane bioreactors technology (AnMBR)'; And, Secondly, 'From E-mobility to recycling: the virtuous loop of electric vehicle' (European Commission, 2016b).

In April 2017 the involved parties worked out the Joint Declaration of Intent (JDI) for the Innovation Deal 'AnMBR' which contained scope, objectives, actions, roles, tasks, timeline, and expected results. The project is divided into three phases (Early Life, Intermediate Review, Conclusion and Outcomes), each being maximum six months but can be shortened. Hence, the end of the Early Life period, which among others has the aim to identify other prominent barriers than already recognised, is expected to be in October 2017 (European Commission, 2017a). The final evaluation of the complete ID pilot is scheduled for mid 2018 (European Commission, 2016a).

At the outset the term 'Innovation Deal' can be misleading. As outlined the project is about voluntarily providing the European Commission with information about perceived regulatory barriers of anticipated market participants. Of course, the ideal outcome is to foster innovation with measures initiated based upon the insights gained from the Innovation Deal. However, the primary aim of the project is only to detect regulatory barriers that hamper innovation and not actively supporting the innovators in developing the technology. Further, the European Commission reverse the right to act on the results delivered (European Commission, 2017a, p.10). Thus, it is not necessarily a 'deal' in the sense of an agreement that is mutually beneficial, rather than a granted opportunity to provide information about a particular regulatory framework. Without challenging the semantic but for the proper understanding of this paper considering the Innovation Deal a voluntary consulting project for the European Commission seems most appropriate.

2.2.2. Regulatory barrier reducing initiatives

That an information asymmetry, a situation where two actors have different levels of information (e.g., Akerlof, 1970), between the regulatory body and the governed can exist which may lead to inefficient regulations is widely acknowledged and labelled 'white elephants' (Keck, 1988). To that end Blind et al. (2017) argue 'regulatory authorities and market actors have imperfect information as to how (…) regulations should be set in accordance with the actual technological frontier.' This challenge is a crucial point for any regulation, but particularly, for innovation policy, where an inefficient or hindering framework can block promising inventions or the further development and diffusion of profitable innovation. Therefore, it is vital that alongside technical innovations the legal and regulatory

framework evolves in like manner (Bauknecht et al., 2015; Öko-Institut e.V., 2015).

Against this background several attempts to reduce information asymmetry through collaboration have been made in recent years. Most similar to Innovation Deals are Green Deals (GD) firstly introduced in the Netherlands in 2011 and also recently in France. The outline is similar, 'the central government invites enterprises, social organisations and other governments to indicate where things go wrong and to achieve concrete improvement steps by collaboration with others' (Green Deal: Circular Procurement, 2013). Therefore, the Green Deals categorise four sources of barriers (1) Legislation and Regulation, which constitutes the equivalent to IDs (2) Market incentives (3) Innovation, and (4) Networking. Since the launch of the Green Deals 208 GDs with 1,531 participants including 26 Deals on water have been carried out in the Netherlands (Rijksdienst voor Ondernemend, 2017). A crucial insight was 'almost two-thirds of the perceived regulatory barriers currently preventing innovators from bringing their ideas to the market can be overcome through explanations or clearer interpretation of specific regulations by public authorities' (European Commission, 2016c). In fact, the Innovation Deal scheme was born out of this insight.

Closely connected to this new approach of cross-sector collaboration to identify regulatory barriers is the broad concept of 'temporary legislation' including approaches such as experimental legislation and sunset clauses (Ranchordás, 2014). On the one hand experimental legislation describes `in most cases, new temporary regulations with a circumscribed scope that (…) are designed to try out novel legal approaches or to regulate new products or services so as to gather more information about them` (Ranchordás, 2014,p.22). On the other hand, sunset clauses are 'dispositions that determine the expiration of a law or regulation within a beforehand determined

period' (Ranchordás, 2014,p.23). At the end a final evaluation is made on which ground a renewal can occur. Two other prominent concepts from Germany are regulatory innovation zones (Regulatorische Innovationszonen, RIZ) and real-life laboratories (Reallabore) (Öko-Institut e.V., 2015; EFI - Expertenkommission Forschung und Innovation, 2017, p.16). Whereas, a RIZ is a typical type of experimental legislation, real-life laboratories focus explicitly on the collaboration between science and civil society with the aim of mutual learning in an experimental surrounding (Schneidewind & Singer-Brodowski, 2014, Öko-Institut e.V., 2015).

All these concepts are strongly connected and often only differ in the kind of actors of society participating or in minor variations in the framework conditions. A noteworthy similarity is the cross-sectoral collaboration among all concepts following the widely accepted theory that innovation is achieved through a collective of heterogenous inputs of a variety of actors (Rammert, Windeler, Knoblauch & Hutter, 2016, p.6). Green Deals often can be classified as experimental legislations (e.g., GD Gelijkspanning Haarlemmermeer), however, as GDs differ in design it is not possible to generalise. Likewise, the ID AnMBR, at this stage and as the first ID, cannot be categorised in one of these specific forms. With the target to theoretically identifying regulatory barriers ex-ante possible new regulations it is best described as consulting work in the context of *strategic niche management* (Öko-Institut e.V., 2015). This concept describes the broad effort of developing protected spaces for certain applications of a new technology (Kemp et al., 1998). Furthermore, all in this section mentioned concepts can be used as measures to manage technological regime shifts, thus, are parts of strategic niche management.

2.2.3. Cross-sector collaboration in Innovation Deals

Basically, the Innovation Deal is a typical cross-sector collaboration which has been widely discussed in academic literature. Bryson et al. (2006) identify in their seminal Framework for Understanding Cross-Sector Collaboration six researchable process propositions which will be put into context with lessons learned from Dutch Green Deals in the following paragraph. The propositions are: forging initial agreements, building leadership, building legitimacy, building trust, managing conflict, and planning.

Firstly*, forging initial agreements* is about the form and content of the collaborations initial agreement. Studies highlight the importance of a participatory drafting process (Page, 2004). In this regard, the Green Deal progress report confirms that agreements need to be as clear as possible, so all parties know what is required from them (Government of the Netherlands, 2015, p.). *Secondly*, for an effective collaboration participants need formal and informal authority, vision, long-term commitment to the collaboration, integrity, and relational and political skills (*building leadership)* (Crosby and Bryson 2005; Gray 1989; Waddock 1986). Bryson et al. (2006) propose 'cross-sector collaborations are more likely to succeed when they have committed sponsors and effective champions at many levels who provide formal and informal leadership.' Sponsors are individuals who have access to resources as well as considerable prestige and authority within the collaboration, whereas champions focus intently on keeping the collaboration going (Crosby and Bryson 2005). The Green Deal participants point out that it is vital to actively involve the relevant parties, including governments, at an early stage. Further, it is important to get to work right away, keep sight of the objective and keep pace up (Government of the Netherlands, 2015). *Thirdly*, 'cross-sector collaborations are more likely to succeed when they establish the legitimacy of collaboration as a form of organising, as a separate

entity, and as a source of trusted interaction among members' (*building legitimacy*) (Bryson et al., 2006). Relating thereto lessons learned from the Green Deals are to involve partners with the right knowledge and as many stakeholders as possible, but work in small teams to ensure momentum is not lost (Government of the Netherlands, 2015). *Building* mutual *trust* is crucial to Green Deals due to the wide range of interests of the various participants (Government of the Netherlands, 2015). In order to achieve this partners need to share information and knowledge to demonstrate competency, good intentions, and follow-through (Arino and de la Torre 1998; Merrill-Sands and Sheridan 1996). *Fifthly*, *conflict* in a collaboration emerges from the differing aims and expectations that partners bring to a collaboration (Bryson et al., 2006). That is why the Government of the Netherlands (2015) suggests to be aware of the potentially conflicting interests of other parties, learn from the experiences from others, and try to find common interest. Finally, *deliberate planning* is especially important in mandated collaboration. In the Innovation Deal the formal outline is strictly set by the Joint Declaration of Intent. Apart from this the Green Deals suggest to focus on a few key aspects as it is more efficient to focus on a single goal because less monitoring is required. Additionally, a tipping point is to meet and keep communicating regularly.

2.3. Managing the crux of innovation policy

2.3.1. Public policy instrumentation

Lascoumes and Le Galès (2007) emphasise in their publication about the sociology of public policy instrumentation that instruments are 'institutions' in the sociological meaning. This means a more or less coordinated set of rules and procedures that governs the interactions and behaviours of actors and organisations (Powell and

Di Maggio, 1991). In other words, providing a stable frame in which anticipation reduces uncertainties and structures collective action (Lascoumes & Le Galès, 2007). The tipping point here is anticipation. In order to be accurate it requires profound information about the to be regulated environment. Albeit, the technology, circumstances or the environment itself can be subject to change at any time due to various reasons, such as technological progression, new market entrants, etc. This creates an ongoing demand for information to prevent information asymmetries and, consequently, an improper regulatory framework.

Furthermore, the given 'capacities for action' of public policy differ widely according to the instruments chosen. Different public policy instruments have diverse effects on the governed. Besides driving forward a specific representation of a problem, public policy instruments create uncertainties about the effects of the balance of power, will eventually privilege certain actors and interests, may exclude others, and constrain actors while offering them possibilities (Lascoumes & Le Galès, 2007). Hence, instrumentation is an important political endeavour controlling and regularising the relationship between the governing and the governed as well as among different actors, interests and organisations.

Beyond that Lascoumes and Le Galès (2007) remark that instruments at work are not neutral devices. They produce specific effects independently of their stated objectives and structure public policy according to their own logic. As the instruments are used, they tend to produce their own original and sometimes unexpected effects. What is more, every instrument may face delegitimisation over time. As a consequence it is crucial to consider the long-term effects of measures (EFI - Expertenkommission Forschung und Innovation, 2017, p.27).

This is also recognised by the European Commission through the plan for smart regulation to further improve the quality and relevance of EU legislation. The plan contains to evaluate the impact of legislation during the whole policy cycle: when a policy is designed, when it is in place, and when it is revised (European Commission, 2010). Core aspects of the initiative are impact assessment and strengthening the voice of citizens and stakeholders, what is both reflected in the Innovation Deal.

2.3.2. Innovation as economic driver

The present is characterised by significant technological, societal, economical, ecological and other transformations which occur at much higher paces than in previous times (Hoffman-Riem, 2016, p. 14). Often this development is provoked by innovation but certainly it demands constantly new ones to stay competitive. Hence, innovation has become an integral part of economic policy to promote growth (Blind, Petersen & Riillo, 2017).

The crux of innovation policy is well outlined by Hoffman-Riem (2016, p.29,30) when pointing to the interdependency of the two guiding principles ('Leitbilder') of innovation policy: openness to innovation ('Innovationsoffenheit') and innovation responsibility ('Innovationsverantwortung'). The first points to potentials for opportunities associated with innovations and to enable and, if necessary, stimulate but also tolerate innovations. The latter Hoffman-Riem (2016, p.29,30) divides, on the one hand, into the positive responsibility for innovation that is about enabling innovations with a certain quality, which is what most research dealt with so far. On the other hand, innovation responsibility, in the context of innovation regulation, needs to take into account what kind of implications for society, especially, undesired consequences innovations entail. These two guiding principles are conflicting

priorities that create a field of tension in innovation policy often referred to as the 'regulatory challenge'. 'A challenge consisting of preventing the creation of bad policy and regulation, implementing statutes without stifling innovation or imposing unnecessary costs or burdens on the private sector, and providing legal certainty where needed' (Gramm & Gay, 1994).

But not that alone is a crucial point in innovation policy, already the tendency to foresee repercussions of innovations and regulate accordingly is highly controversial as it unavoidably will restrain innovative activities. A prominent example within Europe is the fundamentally opposing regulatory frameworks for genetic research in the UK and Germany ("Neue Ära in der Genforschung - WELT", 2016). Leaving the moral debate aside, the liberal regulations in the UK highly encourage progress and innovations in that field in contrast to the strangling framework in Germany. As clear as this example are only few cases, so, how is the relationship between regulation and innovation?

2.3.3. Innovation & Regulation

Regulating innovation and stimulating it through the regulatory framework is a pressing challenge. Already for a long time there is the ongoing debate in academic literature on the optimal policy interventions to foster and support innovation. On the one side, complying with regulations is likely to increase costs or restricts firms' freedom of action (Palmer et al., 1995; Blind et al., 2017). On the other hand, well designed regulation may guide or even force firms to invest in innovative activities, implement innovative processes or release innovative products (Porter and van der Linde, 1995). So far, empirical research has given no consistent picture in matters of the impact of specific regulatory instruments on innovation (e.g., Aschhoff and Sofka, 2009; Blind, 2012; Blind et al., 2017). In fact,

what it is more and more acknowledged is that different policy instruments cause unequal effects on innovation activities, as comprehensively summarised by Edler, Cunningham, Gök and Shapira (2016) in their seminal collection of fifteen categories of innovation policy instruments. To put it in a nutshell Blind (2012) summarises that numerous empirical studies on the impact of different types of regulation on innovation present a rather heterogeneous picture regarding the type of regulation, the sectors, the companies and the time horizon of the impacts. In another study he adds that even a single type of regulation can influence innovation in various ways depending on how the regulation is implemented (Blind, 2012).

What is particularly interesting for this paper is that a recent study showed theoretically and empirically that regulations and formal standards have diverse effects on innovation, depending on the extent of market uncertainty (Blind et al., 2017). The authors analysed uncertainty resulting from different sources like competition, consumer behaviour or technological complexity (e.g., Jalonen, 2011; Sainio et al., 2012). Concerning regulations the results show lower innovation efficiency in cases of high market uncertainty, as a result of an increase in firm's innovation costs. This is clear evidence that supports deregulation supporting innovation in high uncertain markets. Further the study shows that regulation has a positive effect on firms' innovation efficiency in markets of low uncertainty. This supports the view of Ranchordás (2014, p.255) that permanent legislation is the most adequate legislative approach to the regulation of situations that are not characterised by rapid changes.

Interestingly, in the same study Blind et al. (2017) outline that formal standards have partially opposite effects. 'In markets with low uncertainty, firms must spend a higher amount of resources in order to be innovative if they experience problems with standards' (Blind et al. 2017). Again, in the contrary case, markets with high uncertainty,

they find opposite effects. In plain words, regulation seems to be very fruitful in more mature markets, whereas, in 'uncertain or more emerging markets, regulators may promote innovation by pushing the use of formal standardisation as a coordination instrument' (Blind et al., 2017) (P1). This argues for an increased attention to formal standardisation to regulate early innovations and, therefore, is one proposition that will be analysed in this paper.

2.4. Double-edged sword lobbying

2.4.1. Meet the European Union

The European Union as we know it today in 2017 is a supranational integration project that began around 60 years ago with the foundation of the European Coal and Steel Community (ECSC, Paris Treaty in 1951). From there on integration was pursued more and more with the subsequent treaty of Rome (1957) creating the European Atomic Energy Community (Euratom) and the European Economic Community (EEC). The treaty of Rome is with the treaty of Maastricht (1993) and the treaty of Lisbon (2009) one of the three principal treaties of the EU (Coen and Richardson, 2011). From the seven founding countries of France, Italy, the Netherlands, Belgium, Luxembourg, and West Germany (EEC) the project expanded to its current peak of 28 Member States, including an extensive enlargement with ten countries joining in 2004 all at once. The cooperation between the countries includes not only economic topics anymore but also political, financial, legal and military issues. For the time being, the Treaty of Lisbon (2009) established the European Union as an overall legal unit (McCormick, 2014) further on trying to extent the single market (free movement of people, capital, goods, and services) and to unite monarchies and republics, numerous partly strong regions, around 26 million active enterprises and over 500

million to some extent cultural diverse inhabitants (McCormick, 2014, p.146; Ec.europa.eu, 2017).

As a succession of the treaties of Rome and Maastricht and the subsequent delegated regulatory competences to the EU interest groups and lobbyists increased (Mazey and Richardson 1993, 2005; Kohler-Koch and Eising 1999; Beyers et al. 2008; Greenwood 2011). Along with this shift also the character of lobbying changed. As the early days of interest representation in the European Community were characterised by 'national representation and collective action via trade associations, employee groups, and trade unions' this evolved to 'direct lobbying by businesses, the arrival of NGOs and an increase in societal interests' (Mazey and Richardson, 1993; Coen, 1997; Coen and Richardson, 2011; Greenwood, 2011). The classical European State is drawing back more and more from its role of structuring and running, and is taking a new role in organising and managing (Koeppl, 2001).

With this new structure Coen and Richardson (2011) observed the emergence of distinct EU lobbying strategies and complex advocacy coalitions that take advantage of the new opportunity structures. Domestic interest groups engage increasingly in cross-border activity, joint ventures, and political alliances, especially ad hoc coalition building. Further they state that there is no longer EU interest politics in a 'top-down' nor in a 'bottom-up' manner, instead a managed multilevel process with numerous feedback loops and entry points established, which is constrained by the size of the interest group, lobbying budgets, origin, and the policy area.

A distinguishing feature of the European Union is the legislative procedure. In contrast to the national level where the parliaments have the right to initiate legislative proposals, the European Parliament (EP) depends in this regard on the European Commission (EC). The Commission is an agenda-setter with the sole formal right

to initiate and draft secondary law, unilateral acts and agreements (Cram, 2001; Pollack, 2003; Ec.europa.eu, 2017). The European Commission is responsible for 85% of the 2,500 annual binding decisions, which can be in form of regulations, decrees or directives (Schendelen, 2013, p.43). Simplified the EC works out a proposal and sends it to the Parliament and the Council, which formally discuss it on one, two, or in some cases, after reviewing it in a Conciliation Committee, three 'readings', before the Parliament and the Council finally adopt it as legislative text (e.g., Coen and Richardson, 2011; McCormick, 2014).

Thus, several bodies are interesting in the legislative process. The European Parliament, which gained more legislative power over secondary legislation through consecutive amendments of the treaties from mere consultation, through cooperation, to co-decision and real veto power (Article 189B TEU) (Coen and Richardson, 2011). Consequently, lobbyists have been considerably increasing lobbying the European Parliament (Bouwen, 2004, p.475; Corporate Europe Observatory, 2012). Also important for the process is the Council of Ministers as well as the two advisory bodies European Economic and Social Committee (EESC) and Committee of Regions (COR). As notable as they are the most important remains the European Commission due to the opportunity of 'early lobbying' before the legislation reaches the level of public policy discussions (e.g., Mazey and Richardson 1999:111; Coen & Richardson, 2011; Corporate Europe Observatory, 2012).

2.4.2. Lobbying the European Commission

The drafting of proposals is the first step of the policy-making process and requires a substantial amount of technical and political expert knowledge (e.g., Bouwen, 2002, p.379; Majone, 2003; Dür and De Bièvre, 2007; Schendelen, 2013). Because of the under-

resourced nature of the European Commission, the institution depends heavily on external resources to obtain the necessary information (e.g., Edwards and Spence 1997, p.180; Schendelen, 2013, p.88). Consequently, lobbying at the European Commission is an expertise-based exchange relation (De Bruycker, 2015). Not only private actors attempt to enforce their interests but also the Commission is eager to interact with lobbyists in order to acquire resources that are indispensable to fulfil its institutional role (Bouwen 2002:368; Coen & Richardson, 2011). So, how does the European Commission work?

In general, the European Commission has four principal objectives, it is responsible for proposing legislation, implementing decisions, guarding the legal framework and managing the day-to-day business. Therefore, it has 28 members, one per member state, and around 30,000 employees (Corporate Europe Observatory, 2017). It is crucial to understand that the Commission is an internally much fragmented organisation (Nugent & Rhinard, 2015; Coen & Richardson, 2011). The EC is divided into Directorate-General (DG), which typically draft legislative proposals, e.g., the DG Research & Innovation (Koeppl, 2001; McCormick, 2014, p.78). Every DG is headed by a Director-General, who is the most important civil servant in the Commission's offices. However, it is more efficient to lobby the 'low ranking' civil servants responsible for working out the proposal or, especially, the 'rapporteur', who has the functional responsibility for a dossier (Koeppl, 2001; Greenwood, 2011). Another crucial institutional feature is the extensive use of committees in the European Commission's policy formulation process, which have become crucial access points (Coen & Richardson, 2011). Hartlapp et al. (2013) have shown that the primarily responsible DG exercises important influence on the content of the policy proposal. Hence, it makes a difference for lobbying success which DG is responsible for drafting a

legislative proposal (Klüver, Braun & Beyers, 2015). This should elucidate what a unique opportunity an Innovation Deal represents to influence the European regulatory body in favour of supporting an innovation.

As already outlined above there are overwhelmingly many actors trying to influence this legislative process. Apart from the European integration scholars hold responsible the changing economic order characterised by increasing power of corporations, privatisation, and postmodern neoliberal governance (Hofman & Aalbers, 2017). These developments led to 11,250 registered lobby actors and an estimated 25,000-30,000 lobbyists all together working in the European quarter in Brussels matching almost the number of employees at the European Commission (32,546 in 2017) (European Commission, 2017c; Traynor, 2017). Into the bargain conservative estimates suggest that over €1.5 billion is spent every year on lobbying targets such as the EC or the EP (EU Transparency Register - 1 June 2017) (Corporate Europe Observatory, 2017). This oversupply of lobbying makes it enormously difficult to get a clear picture of the lobbying footprint or even more so to regulate it properly. That is why, the Commission solicits to see more aggregated interests (Schendelen, 2013).

2.4.3. Best practices for lobbying the EU legislative procedure

Recent studies show that neither sheer weight of resources (in this research financial resources) (Coen & Richardson, 2011) nor lobbying breath are the key variables in terms of influence (Ridge, Ingram & Hill, 2017). More is not always better. Rather, as lobbying is a communication process (Milbrath, 1960), it is about using good communication skills to transfer valid, reliable and applicable information (Mack, 2005; Schendelen, 2013, p.71). To do so trust and credibility became the most important access criteria for lobbying

EU policy (Coen & Richardson, 2011). That is of particular relevance since several scholars agree that the business lobby's success depends on the extent to which the government is interested in letting a firm succeed (Hojnacki et al., 2012; Woll, 2007; Hofman & Aalbers, 2017). Thus, falling into discredit through lobbying with false information is a highly risky endeavour. Consequently, lobbying is a double-edged sword. On the one hand, it provides citizen's and corporation's views and demands that benefit the legislative process. On the other hand, the advocates of private interests may distort the political process for the detriment of the public good (Martin, Saalfeld & Strøm, 2014, p.526).

For a proper analysis Hofman & Aalbers (2017) conceptualise 3 crucial flows between spaces of lobbying (1) the flows of people between organisations (2) the flows of ideas between these people, and (3) the flows of resources between organisations. This leaves us with a proper concept to analyse regulatory capture (P2), cultural capture (P3), and corporate capture (P4). *Regulatory capture* defines the process in which stakeholders (e.g., the innovators of the AnMBR technology) try to influence the regulation-making body in favour of their own interests (Stigler, 1971). While the concept primarily focuses on the influence on state intervention, i.e., governmental institutions, it can also be used to explain why some firms are lobbying, e.g., an Innovation Deal. *Corporate Capture* then in turn tries to measure how strong the influence had been and if institutions still act in the public interest or prioritise the interests of powerful industries (Miller and Harkins, 2010; Corporate Europe Observatory, 2017), often also referred to as 'institutional corruption', 'market-driven politics' or 'post-democracy' (Leys, 2001; Crouch, 2004; Miller and Harkins, 2010). When people identify with groups or adopt ideas solely because of the status they confer it is described as *cultural capture* (Kwak, 2013, p. 32). In the face of the current societal

development of an increasing nationalistic conscious among certain parts of the populations across Europe it is of utmost interest to research the manifestation of this perception within the participants of the Innovation Deal (Roubini, 2017). All the before mentioned may lead to *cognitive locking* putting the government in a situation that does not allow to see nor seek alternative definitions or solutions other than defined by industries or interest groups (Blyth, 2002).

How and to which degree lobbying happens at EU level is increasingly researched. After the Maastricht treaty (1993) research of EU lobbying and interest groups' activities began to boom. 70 per cent of all articles from the beginning of the European Community until 2013 were published in the last 10 years (2003–2013) (Bunea & Baumgartner, 2014). Bunea & Baumgartner (2014) find several patterns among EU interest groups and lobbying research. Most scholars concentrate on the European Commission (25.5% EC alone, 38.3% in combination) carrying out empirical research (69.9%) and most often in form of qualitative case studies (60%) just in line with the methodology of this study at hand. Further Bunea & Baumgartner (2014) explain 'most articles describe determinants of lobbying strategies, access to and forms of participation in different lobbying and decision-making venues'. Regarding data sources, the current practice is to use a mix-methods approach: most commonly document analysis, interviews and surveys (28 per cent). They identify the exchange of resources theory (Bouwen, 2002) as the dominant theoretical framework when examining the interactions between EU policy-makers/institutions and interest groups, investigating most commonly information, legitimacy and access to multi-level decision-making venues.

Klüver, Braun & Beyers (2015) confirm this and generalise that a large number of interest group studies in the EU focused on individual characteristics, such as, financial resources, organisational

characteristics, ideological views, or expertise (e.g., Bouwen 2004; Dür and de Bievre 2007; Eising 2007). They argue that it is clear from all contributions that a contextualised approach of interest group politics leads to a more precise and valid understanding of lobbying in the EU (Klüver, Braun & Beyers, 2015). Further, Ridge, Ingram & Hill (2017) emphasise when looking at how aspects of lobbying work in concert it offers practical insights with respect to determining ways in which to expend lobbying resources. However, this has only been started to be considered recently (Klüver, Braun & Beyers, 2015).

2.5. Summary

In conclusion the Innovation Deal pilot scheme is a voluntary cross-sector consulting project executed by a team of innovators, research centres, universities, and national and regional authorities from different Member States. The aim is to reduce information asymmetry between the regulator and the regulated by providing the European Commission with information about perceived regulatory barriers that hamper innovation. Within the field of strategic niche management are several concepts, whereas the Deal instrument received more attention to promote sustainable innovations in the last years. The Dutch Green Deals introduced in 2011 is the successful predecessor the Innovation Deal builds upon.

At present where innovation is a crucial economic driver and in the face of political ambitions from the UN and the EU to push towards a more circular economy there is great demand for knowledge about the proper regulatory framework to support innovations. Unfortunately, so far empirical research has given no consistent picture in matters of the impact of specific regulatory instruments on innovation. Recently, a study (Blind et al., 2017) elaborated on the different impact of regulation and formal standardisation on firm's

innovation activities in markets with low and high uncertainty. A conclusion made by the authors was that in uncertain or more emerging markets, regulators may promote innovation by pushing the use of formal standardisation as a coordination instrument. In order to contribute to innovation management and public administration literature the first proposition of this study aims at confirming or rejecting this assumption (P1).

Furthermore, lobbying plays a major role in the European Union. This supranational integration project expanded rapidly in the first decade of the 21st century and at present attempts to unite 28 countries, around 26 million active enterprises and over 500 million inhabitants. It is still in its formation phase, especially, regarding a consistent European regulatory framework in many areas. As a result of this process distinct EU lobbying strategies emerged, executed by an overwhelmingly large number of actors and supported by huge amounts of money. Of particular importance is lobbying for the European Commission as it demands technical expertise, which due to its under-resourced nature must be gained from external sources. At the same time the European Commission is also a primary target for lobbyists because of its unique role in proposing legislation. With this in mind the Innovation Deal represents a unique opportunity to lobby for particular interests alongside the sustainable innovation target described in the project. In this light it is of utmost interest to identify the manifestation of lobbying activities such as regulatory capture (P2), cultural capture (P3), and corporate capture (P4) in the Innovation Deal. *Regulatory capture*, the process in which stakeholders try to influence the regulation-making body in favour of their own interests (Stigler, 1971), seems of minor importance at first since the European Commission has aligning goals with the ID consortium of promoting a circular innovation. However, thorough investigation may reveal participants to lobby for organisations

interests to the detriment of the public good. Furthermore, rising nationalistic tendencies across Europe suggest this biased attitude may be present among the participants alike and as well harm the outcome of the work. Finally, *corporate capture* tries to explain how strong the influence of companies is and if institutions still act in the public interest or prioritise the interests of powerful industries (Miller and Harkins, 2010). As the Innovation Deal at the point of the study is only in its first project phase and no regulatory adaptions will be made it is still of great interest to research which suggestions are followed by the consortium and if those have the potential to favour companies or industries over the public interests. Specifically, as this project is about a sustainable innovation from which it is expected to produce societal benefits. The insights gained out of testing these three propositions will contribute to EU lobbying research by examining the manifestations of lobbying activities in the newly introduced pilot scheme 'Innovation Deal'.

Therefore, we conduct, just in line with recent EU research studies, a multiple qualitative case study using a single methods approach of semi-structured interviews with the participants of the Innovation Deal. This will be complemented by an analysis of a comparable and already successfully executed Green Deal to strengthen our findings. By analysing these two cases we expect to draw an insightful cross-case synthesis to figure out if formal standardisation is used to promote innovations in uncertain markets. In addition, we anticipate to draw revealing conclusions how the ID participants engage in lobbying activities.

3. Determining Methodological Framework

3.1. Introduction

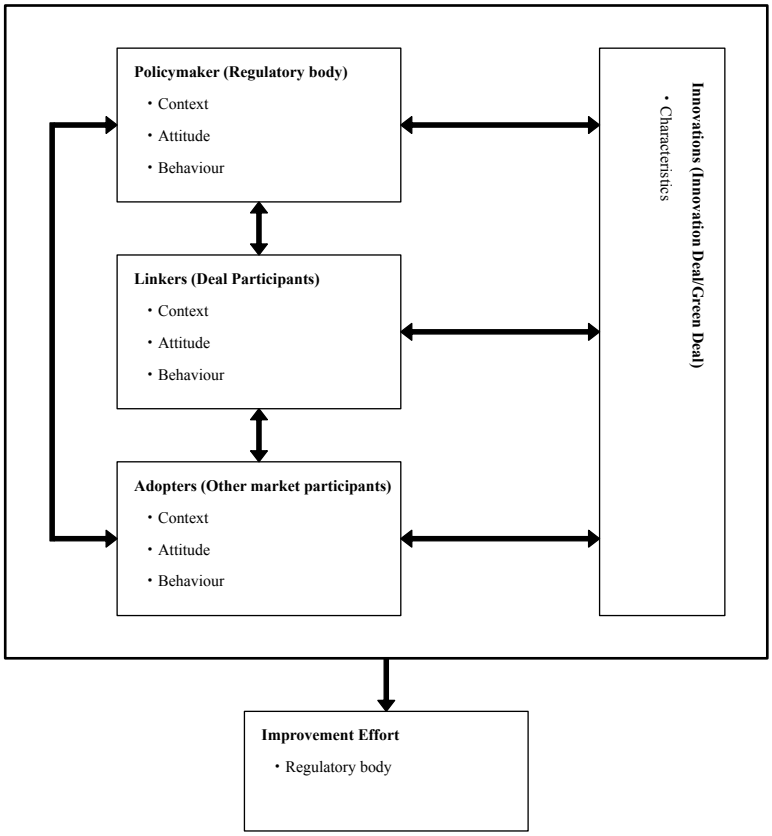
The aim of the research was to elaborate on the regulatory barriers identified by the Deal participants, the solutions proposed, and their influence on the innovations. Furthermore, we aimed at providing a detailed description of the lobbying behaviour present in the Deals in form of regulatory capture, cultural capture, and corporate capture.

In this methodology will be thoroughly detailed, explained and justified how the research was designed. Additionally data collection methods just as data analysis methods will be illustrated. Drawing on textbooks and previous research it will be explained why this design was the best for this dissertation. Furthermore sample and pilot study will be defined. In the end issues of validity and reliability, ethical considerations and limitations will be on closer examination.

3.2. Research Methodology

In order to draw meaningful conclusions the study is designed in accordance to the best practices in EU lobbying research identified by Bunea & Baumgartner (2014). Having this said the study could not be completely executed as their suggestions propose due to some imposed limitations (3.11). Consequently, only a **single methods approach** was applied in form of **semi-structured interviews** with the aid of a **questionnaire with open questions**. It was the most appropriate methodology in order to receive in depth insights into the dynamics within the Deals, the perceptions of the participants towards the technology as well as their attitudes towards lobbying. Furthermore, it suited perfectly since there was only one chance for access per research participant and it provided the opportunity to research their comprehensive understanding of the several topics. The outline of a semi-structured approach was ideal as it enables the

Illustration 1: Conceptual Framework



interviewees to answer freely and address issues they assess as most relevant. Additionally, the interviewer always had the freedom to dig deeper at crucial points. Beyond, the semi-structured guideline produces reliable and comparable data.

The conceptual framework (Illustration 1) outlines the possible research framework for the whole ID pilot project. In this study the focus lays on the Linkers. The interview guideline (Appendix 4) for the semi-structured interview will cover the following topics: context (objectives, interests/concerns), characteristics (role in the ID, knowledge contribution), and behaviour (resource contribution, degree of participation, manifestation of regulatory capture, cultural capture).

Another crucial design issue was to conduct a **multiple case study** in order to improve the interpretation of the results (Baumgartner & Leech, 1998; Hofman & Aalbers, 2017). Since the

Innovation Deal is only in the first project phase at time of research it strongly benefited the study to analyse a comparable Green Deal that already had been finished. The Green Deal Gelijkspanning Haarlemmeer was a great choice for several reasons. Firstly, both Deals faced initially a not market-ready innovation that needed further development and, simultaneously, to overcome regulatory barriers to achieve market acceptance. Secondly, it ran for three years and already went through all project phases what contributed a valuable perspective to the study. Finally, the Green Deal was finished with great success and had been awarded with the Green Deal award in 2016.

3.3. Population of the Study

The first case was predetermined to the Innovation Deal as it is the main object of research. With respect to the second case, there was no comparable case on the European level since the ID is the pilot project. That is why we looked for suitable equivalents in countries that already worked with a comparable Deal instrument. The most similar initiative with an extensive sample had been found in the Netherlands. After contacting a minor selection of adequate projects the Green Deal Gelijkspanning Haarlemmeer was ready to participate. Below are listed all consortium members of both projects.

3.3.1. Case A) Innovation Deal 'Sustainable waste water treatment combining anaerobic membrane technology and water reuse'

Public authorities

- National

- Energy and Water Agency (Malta) represented for the purposes of signature of this JDI by Daniel Azzopardi, Chief Executive Officer

- Confederación Hidrográfica del Júcar (Spain) (Júcar Basin Authority) represented for the purposes of signature of this JDI by María Ángeles Ureña Guillem, President

- Águas de Portugal (Portugal) represented for the purposes of signature of this JDI by Cláudio de Jesus, Member of the Board

- Water Services Corporation (Malta) represented for the purposes of signature of this JDI by Paul Micallef, Executive Director

- Regional

  - Consellería de Agricultura, Medio Ambiente, Cambio Climático y Desarrollo Rural (Spain) represented for the purposes of signature of this JDI by Julià Álvaro Prat, Regional Secretary of Environment and Climate Change

  - Entidad Pública de Saneamiento de Aguas Residuales de la Comunidad Valenciana (Spain) represented for the purposes of signature of this JDI by Enrique José Lapuente Ojeda, Manager of EPSAR

<u>The Consortium</u>

- Universities

  - University of Valencia (Spain) through the Department of Chemical Engineering represented for the purposes of signature of this JDI by Pilar Campíns-Falcó, Vice-Rector for Research and Science Policy

  - Universitat Politècnica de València (Spain) represented for the purposes of signature of this JDI by José E. Capilla Romá, Vice-Rector for Research, Innovation and Transfer

- Nova University of Lisbon (Portugal) represented for the purposes of signature of this JDI by Fernando José Pires Santana, Dean of the Science and Technology Faculty

- Research Centres

  - Institut Européen des Membranes (France) represented for the purposes of signature of this JDI by Mikhael Bechelany, Researcher at Institut Européen des Membranes

  - Laboratoire de Biotechnologie de l´Environnement of INRA (France) represented for the purposes of signature of this JDI by Pierre Cellier, Deputy-Head of Research Division

- Innovators

  - H2020 SMART Plant Project consortium represented for the purposes of signature of this JDI by Gian Marco Revel, Vice Rector for European Research, Università Politecnica delle Marche (Italy)

  - SME: Ecofilae (France) represented for the purposes of signature of this JDI by Nicolas Condom, Chief Executive Officer

- Stakeholders

  - Canal de Riego del Río Túria (Spain) represented for the purposes of signature of this JDI by Luis Blanch Puertes, Vice President

3.3.2. Case B) Green Deal - Gelijkspanning Haarlemmeer

Public authorities

- National

  - Ministry of Economic Affairs and the Environment (Netherlands)

  - Ministry of Infrastructure, Public Works and Water Management (Netherlands)

The Consortium

- Innovators
  - Direct Current B.V.
  - Siemens Nederland B.V.
  - Joulz B.V.

3.4. Sample and Sampling Method

Within both cases sampling was not possible. Since these projects had been difficult to access we must accept the participants that were ready to participate. The Green Deal had the additional difficulty that the consortium was small. However, the interview could be carried out with the initiator and coordinator of the project, who is at the same time the CEO of the leading technology innovator.

The non-project participants that took part in the research were selected by judgemental sampling. They were determined on the grounds of the insights achieved throughout the research phase. Then a list of interesting companies to interview evolved and, subsequently, the responsible persons approached.

Table 1: Conducted interviews

Project	Interview	Respondents	Code	Date	Type	Length (in minutes)
Innovation Deal	1	A, B, C	1.1 - 1.56	29.08.17	Skype	64
	2	D	2.1 - 2.58	04.09.17	Skype	52
	3	E	3.1 - 3.59	18.09.17	Skype	75
	4	F (non-ID-participant)	4.1 - 4.19	29.09.17	Telephone	37
	5	G (non-ID-participant)	-	29.09.17	Telephone	ca. 20
Green Deal	6	H	6.1 - 6.63	19.09.17	Telephone	58

3.5. Pilot Study

Prior to conducting the semi-structured interviews it was vital to pilot the data collection approach. This helped to refine the content of the data and the procedures to be followed. Important to notice we did not conducted a complete pilot case study. Instead the questionnaire for the semi-structured interview was tested with three elected persons: Firstly, with a project manager of a SME; Secondly, with a fellow postgraduate student of the Innovation Management and Entrepreneurship programme; Thirdly, with a PhD candidate in Economics. Their insights were very helpful in detecting which questions were difficult to understand, discovering missing topics and becoming aware how long the questionnaires will approximately take.

3.6. Data Collection Methods

After receiving contact details of the project members that were willing to participate we arranged a time and date for the **semi-structured interviews** with the aid of a **questionnaire with open questions**. Half of the conversations were held via **Skype**, whereas the other half was made via **telephone**. 5 of 6 interviews were audio-recorded and transcribed. One of the non-ID-participants did not agree with it but was willing to participate in the study. In the same ratio 5 of 6 interviews were one-to-one interviews and one interview was a group interview, whereas, also in this was one the main interview partner.

In order to compensate for the limited amount of interviews additional secondary data sources have been taken into account. In Table 2 we present an overview of the information input that fed into the case study descriptions.

Table 2: Data sources

	Innovation Deal		Green Deal	
	Amount	Source	Amount	Source
Interviews	5	see Table 1	1	see Table 1
Governmental publications, reports, regulations	11	Council Directive of 21 May 1991 concerning urban waste water treatment, 1991; European Commission, 2010; European Environment Agency, 2010; European Commission, 2011; ecoprog GmbH, 2013; Raso, 2013; European Commission, 2017a; European Commission, 2017c; European Commission, 2017d; European Commission, 2017e;Hernández-Mora et. al, 2017	3	Massachusetts Institute of Technology, 2011; Global Smart Grid Federation, 2012; Cired, 2015;
Academic articles, presentations	8	Kassam, Yerushalmi & Guiot, 2003; Judd, 2008; Meng et al., 2009; Chang, 2013; Jimenez et. al, 2015; Robles et. al, 2015; Dvořák et. al, 2016; Judd, 2016	6	Flourentzou et. al, 2009; Yu, Cecati, Dillon & Simões, 2011; Rekola, 2013; Cao, 2014; Grillo et. al, 2014; CSIS - Center for Strategic & International Studies, 2017
Published electronic sources	12	World's 10 Largest Water Companies, 2012; Universitat Politecnica de Valencia, 2014; Universitat de Valencia, 2014; blacoh, 2015; European Environment Agency, 2016; Campo de Dalías Reverse Osmosis Desalination Plant, 2017; Home - Life Memory Project, 2017; Hispagua	Sistema Español de Información sobre el Agua, 2017; Inicio - Fundación Nueva Cultura del Agua - FNCA, 2017; Instituto Nacional de Estadistica, 2017; Membranes for energy and water recovery, 2017; Nair, 2017	13	Callavik, 2012; Johansson, 2012; Baker Jr., 2015; allaboutcircuits.com, 2017; Dcfoundation.org, 2017; Dc.systems, 2017; diffen.com, 2017; Electricity, 2017; Gao, 2017; Guentert, 2017; Media, 2017; Powerinverters.org, 2017; Stokman, 2017;

3.7. Data Interpretation Techniques

The qualitative data was evaluated by **categorising** with the computer assisted **qualitative data analysis software NVivo**. With this tool the data was analysed, coded and categorised. In this process clusters were build around repeating or similar concepts and concentrated under specific topics in accordance to the propositions and other overarching themes. These were Deal project, communication, cross-sector collaboration, technology, market, future, and important quotes.

Based on these blocks of information we treated initially each case as **individual cases** using **explanation building** to compare the empirically found pattern with the predicted patterns from the literature review. The rich amount of data of the topics other than the propositions served as basis for the case study descriptions. In the final step we discussed the findings of both cases in a **cross-case synthesis** in order to present our final conclusions and recommendations.

3.8. Validity and Reliability

Construct validity

Case study research designs, especially, researched in form of interviews, often are subject to criticism due to the subjective judgements that can influence the results. Therefore, we followed several techniques to produce as objective data as possible.

Firstly, all research participants received an informed consent form (Appendix 4) outlining the purpose and procedure of the study alongside the interview questions at least one day in advance of the interview. Secondly, the author consciously articulated the questions in each interview the same as they were initially phrased, as long as no further explanation was requested. Thirdly, the interviewer spoke as clear and less as possible to not influence the interviewee through articulation or phrasing a circumstance in a certain way. Fourthly, in order to develop a pleasant conversation atmosphere and to dive deeper into several topics interposed questions were asked.

These were also used to test several assumptions made from previous interviewees for the purpose of identifying respondent bias as well as similarities and contradictions in their perceptions. In the Innovation Deal these premises were (1) regional difference in local regulations (2) anaerobic MBRs are already used in South America/

the technology is not novel (3) the diffusion of the technology would benefit the ID participants in form of requested consultancy (4) the main advantage of AnMBRs is to keep nitrogen and phosphorus inside the treated water (5) in warmer regions the technology is cheaper (6) the main application of AnMBRs would be for farming (7) the scholars around the two universities of Valencia are leading experts in this field (8) information are concentrated at the coordinator of the ID (9) membranes are the most expensive part of the AnMBR technology (10) the prices of membranes have dropped in recent years (11) AnMBR requires massive building alterations (12) there are numerous alternatives to treat water for fertigation (13) aerobe bioreactors shall be replaced by AnMBRs due to insufficient sustainability.

External validity

Even though the authors strived for objective, reliable and robust conclusions the findings are not generalisable. This is caused by the fact that the cases are in different project phases. The ID is in the first Early Life project phase and the Green Deal ran for three years and is completely finished. Moreover, the technology, circumstances and participants are very different from case to case. Nevertheless, similarities were found and to an extent these are also traced back to corresponding attitudes, however, these are neither generalisable to other Green Deals nor future Innovation Deals due to very different frameworks, scopes as well as technology and market circumstances.

The lobbying insights (P2-P4) are useful as advise for the European Commission how to interpret the work of the Innovation Deal, and, further, a first contribution to EU lobbying literature with respect to the pilot project Innovation Deal. Indeed, with P1 we aimed at finding empirical evidence for a general approach to use formal standardisation to promote early innovations in uncertain or emerging

markets. However, due to only two cases under research the findings have just modest generalisable quality.

Reliability

In addition to the factual interview behaviour two other tactics were applied in order to minimise errors and biases in the study. Before starting with the research we created a **case study protocol** (Appendix 2) that was essential for objectively repeating the questionnaire, especially, with the non-participants and the additional case. After conducting the interviews a comprehensive **case study database** (Appendix 3) was made with the qualitative data analysis software NVivo. It entails the transcribed and coded data from the original interviews just as the collection of categorised insights. The protocol and the database were designed on the grounds of the seminal work of Yin (2015, p.84-94). In conclusion, we are confident that if another researcher would conduct the same case studies in the way it had been done in this paper they would arrive at the same results.

3.9. Triangulation

Due to limitations the research project only considers a one method approach (3.11). However, several tactics had been executed to receive more than only the perspective of the research participants on the case. Therefore, in case of the core research subject, the Innovation Deal, also two non ID participants but industry experts from a membrane supplier and a system provider were interviewed. Furthermore, the publicly accessible documents of the project had been reviewed and an extensive internet desk research on the technology and the market had been carried out.

3.10.Ethical Considerations

The ethical issues in this research project were substantial. The persons questioned provided sensitive organisation data, project information and insights about their attitudes. These information needed to be handled with studious care and attention, especially, since the data was audio-recorded and transcribed. An additional consideration was the anonymity that the interviewer had to provide the interviewees. It is not possible that the reader of the dissertation can draw conclusions from the work and figure out who contributed which information. Any data had to be handled carefully. This included the final work itself as well as the process of working on the dissertation in public places, e.g., the library. Furthermore, the research participants were thoroughly informed about the study and its content and structure through an informed consent form before the study. This was signed by all research participants except of one non ID participant that did not agree with audio recording.

3.11.Limitations

First of all there was the time limitation. The initial plan foresee to write the master thesis from March until August 2017. This time frame was invented solely in respect to the regular semester without any consideration of the project. The request to the European Commission to accompany this pilot project was made on 28 March 2017. The efforts to convince the responsible persons from the benefit of this study including Skype and telephone conversations with an official from the DG Research & Innovation as well as the Innovation Deal coordinator was successful on 30 May 2017. The new time frame from June until October 2017 corresponded perfectly with the first project phase of the Innovation Deal pilot. In the following ten weeks the author worked on the literature review, methodology, designing the research as well as contacting possible research

participants and scheduling interviews. The actual research phase started on 29 August 2017. As the researcher had to act upon the availability of the research participants the conducting period took several weeks. The final interview was made on 29 September 2017. This left five weeks for concluding, writing the actual dissertation, and proof-reading.

Another constraint represented the limited offer of comparable cases. The Deal concept is a new scheme that had been carried out in this form and with finished usable examples only in the Netherlands so far. In this sample only few cases were comparable to the scope and project aim of the Innovation Deal. The Green Deal 'Gelijkspanning Haarlemmermeer' that was included in the end was one of the two preferred choices.

However, the consortium of this case was so small that it did not leave much room for conducting many interviews, hence, for receiving various perspectives on the collaboration and the deal process. There were three companies involved and in each one person was responsible. One of those was at the time of the research ill for a long period of time, a second left the other company. Consequently, there was only one person to interview. However, this could not have been a better person of the project since he was the initiator and coordinator of the Green Deal, thus, the main contact person between all project members as well as the CEO of the innovating company. Nevertheless, due to the one sided perspective on this case there is more personal bias involved than in the Innovation Deal that resulted out of the point of views of seven persons.

Finally, the initial aim was to conduct the study with a mixed methods approach using data collection methods of semi-structured interviews, a survey, and a document review. This would have strengthened the results because of a profound *between method*

triangulation approach as suggested by Klüver, Braun & Beyers (2015) for proper lobbying research. In addition, it would have enabled the researcher to interpret the findings not only by pattern matching of the interviews but also by developing a social network analysis of the flows of resources, ideas, and people. Exactly this geographical perspective is strongly suggested in order to map the influencing factors in lobbying (Agnew, 2007, p. 147; Hofman & Aalbers, 2017). However, this undertaking, the additional survey for a social network perspective, did not achieve a majority support among the project participants.

4. Case A: Innovation Deal 'Sustainable waste water treatment combining anaerobic membrane technology and water reuse'

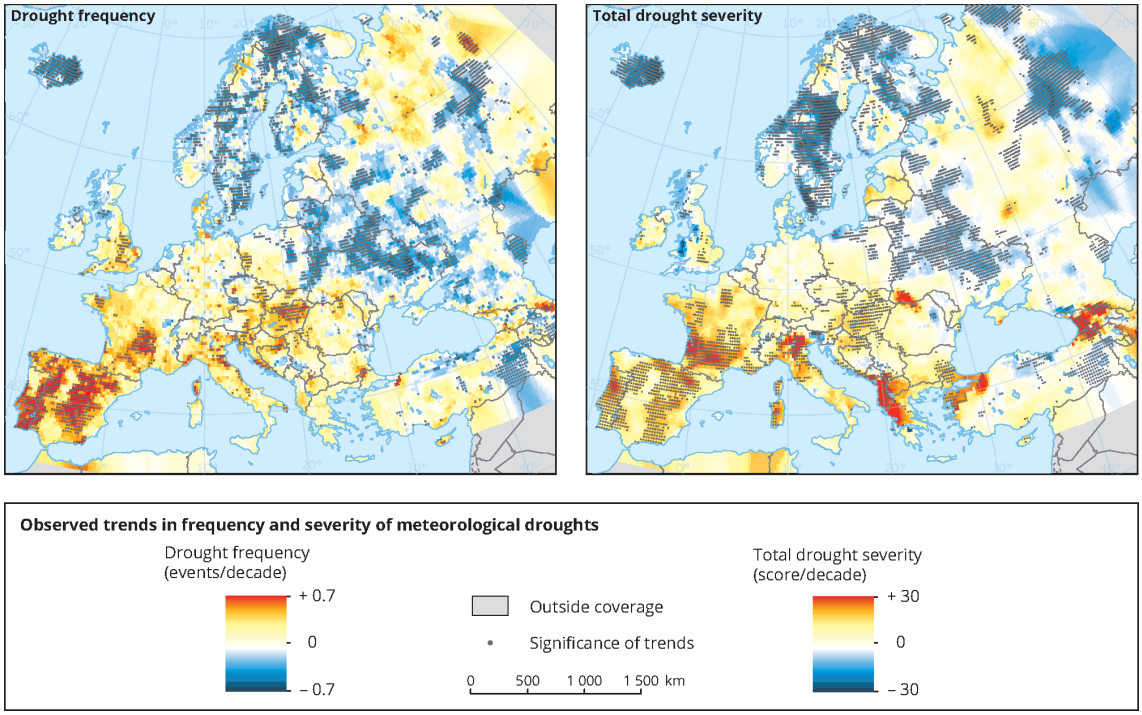
In the following two chapters each case study will be presented following the same procedure. In the beginning the initial situation will be outlined describing the problem the innovations aim to tackle. Subsequently, descriptions of each technology and associated markets is included before the work produced in the Deals is addressed. Against this background the four researched study propositions are discussed and evaluated. The cross-case synthesis combining the insights out of both case studies is the topic of the next chapter.

4.1. Initial Situation

At present Europeans are facing several challenges. Among those a critical one is environmental sustainability including water shortage. In 2010 the European Commission assessed water scarcity being an increasingly frequent and worrying phenomenon that concerns at least 11% of the European population and 17% of EU territory (Illustration 2). In one of the worst droughts in Europe in 2003 even one-third of the European territory and over 100 million people were affected. Furthermore, the number of droughts increased since 1980, they became more severe and costed an estimated €100 billion (European Commission, 2010). In order to tackle this challenge, reduce the contamination burden from wastewater as well as the costs of treatment the EC considers water reuse as an effective way (European Commission, 2017d).

A technological solution that seems promising to tackle a specific water shortage challenge, water for irrigation, is anaerobic membrane

Illustration 2: Observed trends in frequency and severity of meteorological droughts



Source: European Environment Agency, 2016

bioreactors (AnMBR). This is a combination of an anaerobic biological wastewater treatment process with membrane filtration (Chang, 2013). Even though the AnMBR concept was developed in the 1980s its commercial applications have been largely limited by the efficiency of the membrane filtration. Recent development in the large-scale wastewater treatment MBR has strongly increased the potential of anaerobic membrane technology as a practical, advanced full-scale wastewater treatment technology (Chang, 2013). It 'can enable synergistic application of water reuse and recovery of materials and nutrients with economic benefits for waste water treatment operators and users of treated wastewater' (European Commission, 2017a). After the first pilot projects in 1990 in Japan and in 1991 in the US, the technology made its way to Europe with the first pilot-scale submerged MBR plant for municipal wastewater treatment built at Kingston Seymour (UK in 1996) followed by the construction of full-scale wastewater treatment plants at Porlock (UK in 1998), Büchel

and Rödingen (Germany in 1999), and Perthes-en-Gâtinais (France in 1999) (Nair, 2017).

In the European Union the technology can have a large impact since in general the wastewater reuse volume is predicted of 3,222 Mm^3/year in Europe by 2025, in which Spain plays a key role by showing the greatest reuse potential (over 1,200 Mm^3/year). However, neither water reuse nor recovery of energy and nutrients has achieved large scale application in Europe (European Commission, 2017a). As reasons the EC identified six key issues, including technical barriers, scientific uncertainties as well as uncertainties for decision-makers (European Commission, 2017d). With the Innovation Deal 'Sustainable waste water treatment combining anaerobic membrane technology and water reuse' the European Commission addresses both, better regulations to foster this innovation in the wastewater treatment sector and with it the way towards a more circular economy.

4.1.1. Technological Landscape

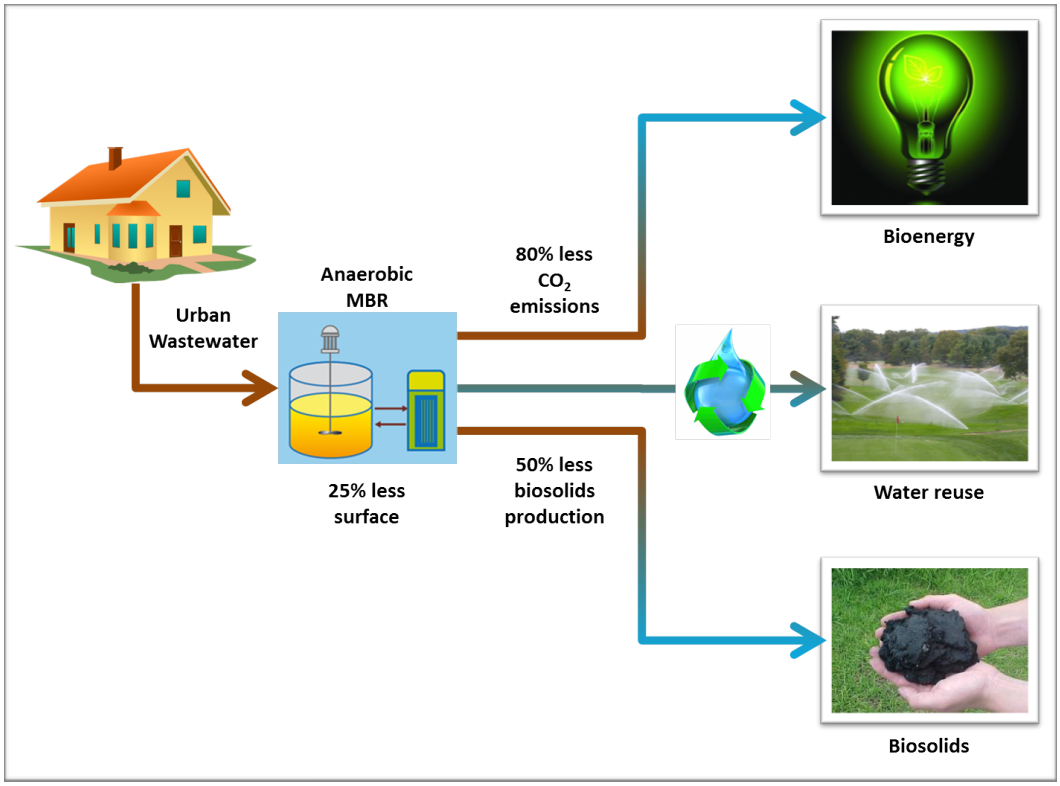
To begin with the ID is about a very special case of water reuse that aims explicitly at treating water to use it for fertigation. This is an invented word combining irrigation and fertilisation and describes the injection of fertilisers, soil amendments, and other water-soluble products into an irrigation system (Fertigation, 2017). The focus on this particular case is apparently justified in the face of high amounts of water demand for irrigation and the pressing drought problem in Europe, especially Southern Europe.

Apart from the AnMBR technology proposed through the ID there are also other and already existing solutions to treat water for this purpose (Case Study Database [CSD] 2.24, 2.29). For some time it is a widespread method to treat water aerobically (CSD 4.5). In this process sludge is produced which is further treated in an anaerobic

bioreactor. The product of it is digested sludge which can be used as fertiliser as long as it is not contaminated by pollutants such as heavy metals (CSD 1.18, 2.52, 2.53). Another byproduct of this process is centrifuged water (CSD 4.5). In order to use this for irrigation purposes additional filtration steps could be arranged as well through a train of membranes of auto-filtration or cloth filters, sand filters, ultraviolet radiation or additional disinfection steps in accordance to water quality input and required water quality output (CSD 1.22, 2.18, 3.25, 4.5). This is current state of the art and already partly circular (CSD 4.5).

The difference of the new process of the Innovation Deal is the kind of waste water input into the anaerobic MBR (Illustration 3). Instead of inserting just excess sludge to the AnMBR, the plan is to use the whole urban waste water volume flow right away (CSD 4.5). This solution offers great advantages but also comes along with some challenges. The biggest benefit seems to be to keep nitrogen and

Illustration 3: AnMBR technology simplified

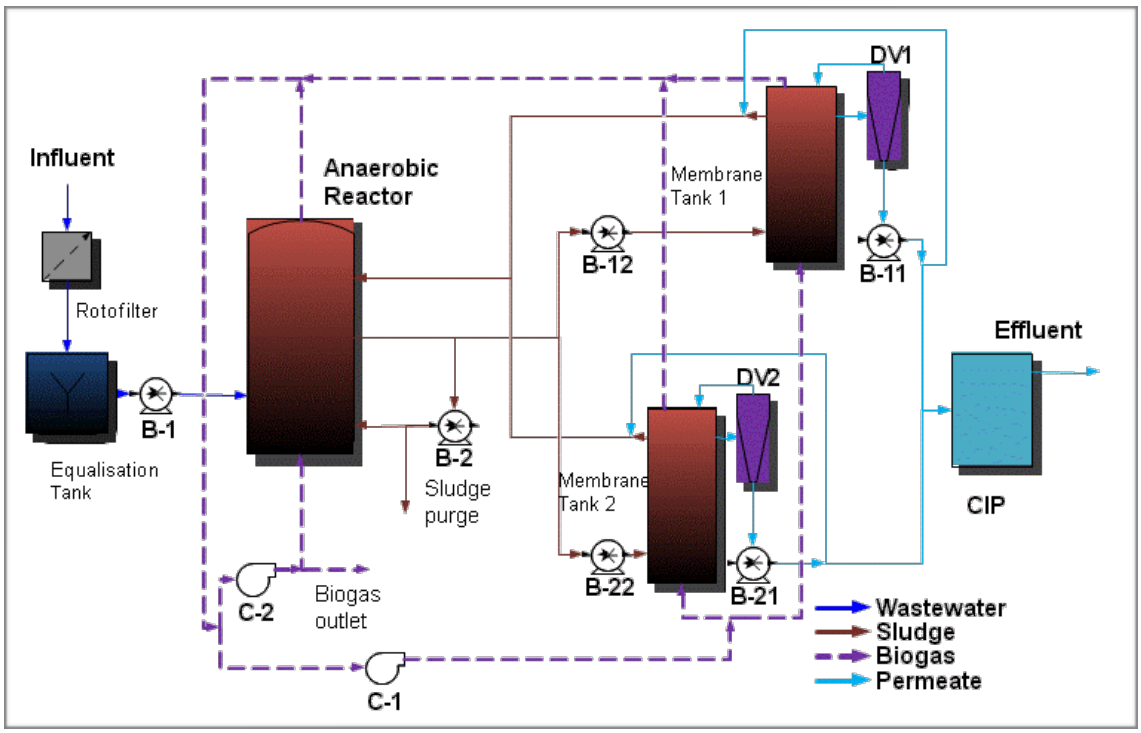


Source: Membranes for energy and water recovery, 2017

phosphorus, necessary for irrigation, inside the centrifuged water to use it directly for fertigation (CSD 1.23, 1.36, 2.25, 2.33, 2.53, 3.12, 3.25). Furthermore, all carbon compounds instead of only some contained in the waste water could be converted into digester gas, what then can be used for energy production (biogas) (CSD 1.24, 1.36, 1.43, 1.48, 3.9, 3.10, 3.26, 4.2, 4.5) (Illustration 4).

On the downside this process also consumes more energy than the conventional methods (CSD 4.17). Plus the significantly higher amount of waste water input into the anaerobic MBR and the in accordance different bioreactor design require a completely new constructed waste water treatment plant (CSD 3.45, 4.6). In addition, the anaerobic process requires temperatures of 35-37 degrees what demands additional energy for processing, especially in colder regions or seasons (CSD 3.49, 4.17; Appendix 1). Despite the high energy consumption the technology has the potential to be energy neutral or even produce energy but this strongly depends on the technology applied in the end and the kind of wastewater

Illustration 4: AnMBR technology process



Source: AnMBR technology: Moving towards sustainable wastewater treatment, 2017

supplied (CSD 1.24, 1.36, 1.48, 3.9, 3.18, 3.26, 4.5, 4.17; Appendix 1). This leads to another challenge for the technology, the wastewater infrastructure.

In order to produce high amounts of biogas for energy supply the technology needs wastewater with high concentration of organic material (CSD 3.10, 3.25, 4.5; Appendix 1). Unfortunately, in Europe exists predominantly combined sewer systems which mixes waste water, e.g., of houses, with rainwater (CSD 4.7). This dilutes the wastewater and results in a lower concentration of organic matter, making AnMBR technology less efficient (CSD 4.7). Another possible input represents industrial waste water that is warmer and therefore more suitable to process but often inhabits the problem of heavy pollutants what in turn requires cost intensive pre-treatment. Probably the most profitable wastewater source would be from food industry with an easy to process waste water with high concentration of organic matter (CSD 4.8). Consequently, the existing waste water infrastructure limits the technology and requires a thorough investigation where it would be profitable.

Beyond it must be considered that also conventional urban wastewater treatment processes are getting more sophisticated, circular and even close to energy neutral. In 2015 a new built plant in Spain installed a cutting-edge isobar energy recovery system besides solar panels and is able to run the entire plant from these resources expect for the desalination process for the sea water (Campo de Dalías Reverse Osmosis Desalination Plant, 2017). Further, in another plant the use of Solar Sludge Dryer made it possible to move from 20% sludge dryness to 85%, massively reducing the tonnages transported for application to agricultural land (European Commission, 2017e).

To put it in a nutshell, the AnMBR technology offers a purely biological, excluding any chemicals, and comprehensive circular

solution to reuse water for fertigation with the possibility to save a lot of energy in comparison to conventional treatment and that may even serve as another renewable energy source. Furthermore, it may benefit the farmers using this water by being involved in the treatment process. The nutrients nitrogen and phosphorus that purposefully are kept inside would be extracted by using the wastewater for fertigation. Hence, farmers would become an active part in the treatment process instead of being an end consumer what offers another business model opportunity. However, the technology is still in the demonstration phase and what kind of business model suits best depends highly on the final technological solution. In consideration of the several other treatment processes that could be applied to use water for irrigation it seems AnMBR technology for fertigation is a very particular case. Into the bargain it demands special circumstances to run it efficiently (a detailed comparison of advantages and disadvantages of aerobic and anaerobic wastewater treatment in Appendix 1).

4.1.2. Market Description

In order to draw a comprehensive picture for this technology two separate markets need to be examined. Firstly, for treated wastewater, and, secondly, for the technology provider consisting of the full scale wastewater treatment vendor and the membrane supplier as membranes are the most expensive part of the process.

At the outset the waste water treatment sector is divided between the treatment process up to a certain water quality and the usage afterwards. The operation of water utilities is in most cases 100% publicly owned, e.g., in Portugal all plants are completely owned by Àguas de Portugal or a municipality operating on their behalf. However, often there are also public private partnerships (PPP). In Italy, Spain and most other countries the majority is as well 100%

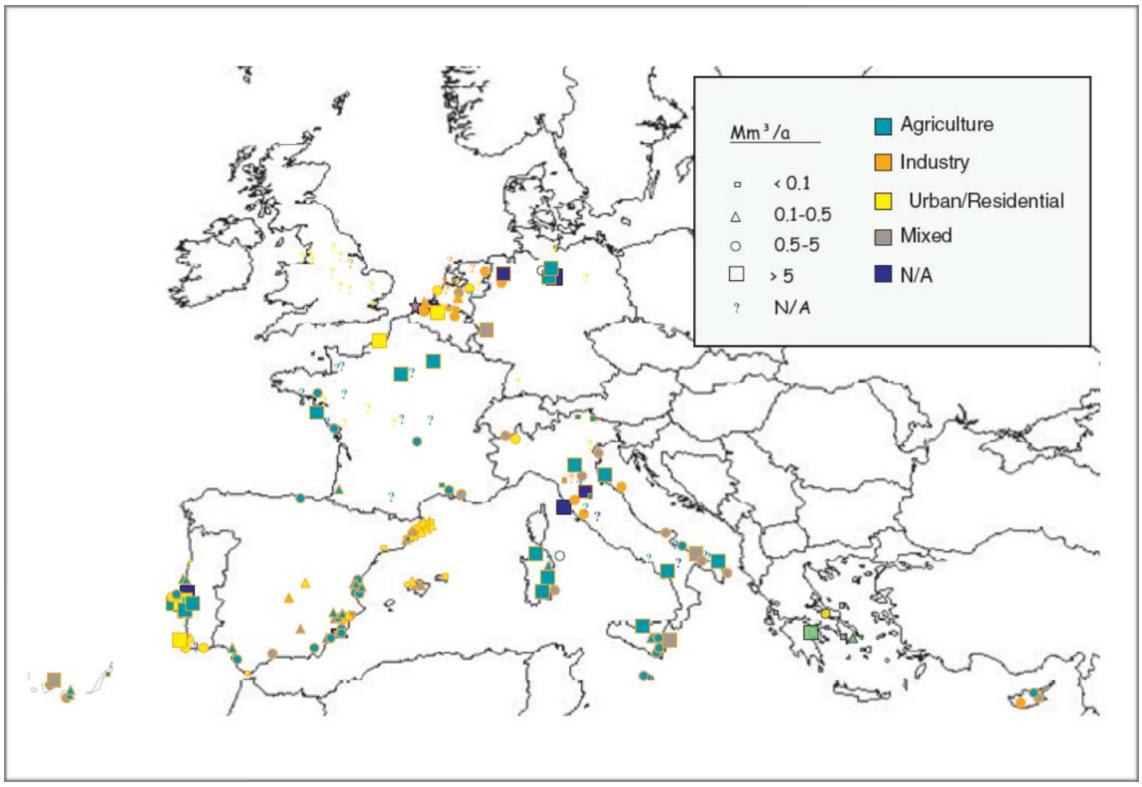
public but often plants are operated by the private sector. The public sector offers the plant for some years and the industrial or private sector agree to operate the plant for certain amount of money each year. Most commonly the plants are operated by an association of farmers (CSD 1.28). Other solutions are by industry companies or other private companies, whereas industrial parks often run their own plants (CSD 1.20, 2.23). For instance, in 2015 a consortium comprising Veolia Water and Spanish companies Sando, Inypsa and Montajes Electricos Crescencio Perez, won the contract to design, construct, operate and maintain the Campo de Dalías Reverse Osmosis Desalination Plant in Almeria (Spain) for a period of 15 years (Campo de Dalías Reverse Osmosis Desalination Plant, 2017).

This organisation contains a conflict. On the one hand, the public water utilities are governed to provide water for free. As an example, in Italy the national regulation determines the treatment plant shall not have any income from providing treated water (CSD 1.27). However, in accordance to the water quality needed treatment can cause high processing costs, not to mention construction costs for the plant. On the other hand, are private companies which also demand water for free (CSD 1.28). As can be imagined, there is very little economic benefit in water reuse at the moment nor high incentives to innovate. This operating at marginal profits leads to countless individual agreements in accordance to single agreements on water quality limits between water utilities and end users across Europe (CSD 1.19).

On the demand side the application possibilities for treated water processed by AnMBR are similar around Europe (CSD 1.11) (Illustration 5). Irrigation is by far the most important (e.g., in the Valencia region 95% of reused water is used for irrigation), followed by industry usage, fire extinguishing or public gardening including watering gulf courses (CSD 1.11, 2.25, 2.33, 3.37, 3.38). This

demand is subject to a strong seasonality particularly increased by water scarcity in summer (CSD 1.37, 2.34). Anyway, the demand is profound and expected to increase in the upcoming decades (CSD 1.37, 2.35, 3.39). Therefore, the consortium will further investigate proper business models in general and for the application of AnMBR in the second phase of the ID.

Illustration 5: Water reuse in the European Union



Source: Raso, 2013

Presumed AnMBR technology matures and reaches market acceptance there would be some companies involved since the technology demands several technology provider. The most important are the full scale wastewater treatment plant constructor and the membrane supplier. So far, it is too early to clearly state which companies would deliver the best solution. Furthermore, even without the diffusion of AnMBR technology their current offer for treating wastewater would be demanded. Consequently, the market participants are interested and supportive but at the same time

rather observant than intensively pushing the technology. The development of the technology is mostly a scientific concern driven by the political circular ambitions. To this end the Innovation Deal offers a great opportunity to support a circular treatment process.

4.1.3. Innovation Deal Project

The consortium consists of 14 parties including national and regional authorities, universities, research centres, innovators and also a farmers association. The centre of it represents the two universities of Valencia, Universitat Politècnica de València (UPV) and Universitat de València (UV), which are also the initiators and coordinators of the Innovation Deal. Their researchers are recognised experts with much experience with AnMBR technology (Universitat Politecnica de Valencia, 2014; Universitat de Valencia, 2014; CSD 1.52, 1.53, 2.31, 3.6, 3.43, 4.3). In addition to the extensive theoretical expertise a first feasibility study was conducted several years ago by UPV and UV testing successfully a small demonstrator. As a result of this a larger pilot on a real wastewater treatment plant treating a partial flow from the feed to the plant is currently tested within the Life Memory project of the European Innovation Partnerships (EIP) on water (Membranes for energy and water recovery, 2017).

A great advantage for the ID is that most participants knew each other already well before the project. Either from previous scientific work or from directly working on this or similar technologies what made it easier to build this comprehensive expert panel (CSD 1.39, 2.38, 3.6, 3.55). So far, the communication between the members was open centralising the information at the coordinators, the commission and important conclusions in an online tool accessible for everybody (CSD 1.4, 1.8, 3.57). Despite the non funded nature

participants are motivated to spend regularly many working hours to achieve the goals set (CSD 1.49, 3.55, 3.59).

In the current first phase of the ID the consortium identified the existing regulatory landscape and the applied business models for water reuse in general across Europe. This builds the foundation for the second phase where the aim is to develop a suitable business model for AnMBRs. At the moment there is no European quality standard for water reuse. On the country level standards and even the methodology to control water quality differs from country to country and in some countries, e.g., in Italy even from region to region (CSD 1.8, 1.13). In fact, it is even more fragmented, whereas in some countries (e.g., Italy) exist only one standard for all kinds of reuses, other countries have different quality standards for each application (CSD 1.12). Understandably, some local regulations are more stringent demanding lower limits on microbiological parameters in areas where wastewater is actually applied (CSD 1.9, 1.14). At this point the ID can achieve grassroots work to establish a European quality standard what will help regulating and integrating a common wastewater market in the EU irrespective of the development of the AnMBR technology.

In particular for AnMBRs an identified regulatory barrier constitutes Article 4 of the European Council directive of 1991 concerning waste water treatment (Council Directive of 21 May 1991 concerning urban waste water treatment, 1991; CSD 2.15, 3.11, 3.12, 3.13, 3.19, 3.51). It states that water quality must meet certain purity standards once discharged from the wastewater treatment plant. In order to use AnMBR effectively for fertigation and to enable to integrate farmers through irrigation into the treatment process the directive needs to consider and acknowledge a wastewater product that permits to keep nutrients (nitrogen and phosphorus) inside.

To take a glance into the next project phase also important for the technology appears to be the in some countries present regulation of public ownership of the treatment plants. Since an anticipated business model solution for AnMBR technology seems a holding model or single company concept that would take care of the whole treatment process from the water utility until the end user including farming (CSD 1.28). However, this will be further analysed in the second phase of the Innovation Deal.

4.2. Academic Data Analysis

The initial step in analysing the Deal concept is to elaborate on the relationship between innovation and regulation. Therefore, the first proposition aims at testing the conclusion of Blind et al. (2017) stating 'in uncertain or more emerging markets, regulators may promote innovation by pushing the use of formal standardisation as a coordination instrument'. For this purpose we investigate *if formal standardisation is pursued in order to promote the innovation in an uncertain or more emerging market* (P1). Thus, we start with a recap of the technology and the market for anaerobe membrane bioreactors (AnMBR) to determine market certainty. Afterwards it will be presented a summary of the regulatory barriers identified by the Innovation Deal participants and their suggestions how to overcome them to be able to confirm or reject P1.

As the main body of research we addressed three concepts of lobbying literature. For the second proposition (P2) the aim was to elaborate on *regulatory capture*, the process in which stakeholders try to influence the regulation-making body in favour of their own interests (Stigler, 1971). We begin to analyse the interests involved of the research participants followed by the cross-sector collaboration in terms of the information flow among participants and towards the regulatory authority as well as the participants' assessment of the

collaboration. Finally, we will be able to argue *if participants use the Deal to lobby for their organisations interests* (P2).

In order to dig deeper into the lobbying activities involved in the Deals we decided to address with the third proposition (P3) *if participants use the Innovation Deal to lobby for their country's interests (Cultural Capture).* In the face of rising nationalistic tendencies across an increasing number of European countries the purpose of this proposition is to identify if a participant lobbies in favour of the home country's interests to the detriment of others or the common interest.

In our final proposition the target was to identify the extent of *corporate capture.* It tries to explain how strong the influence of companies is and if institutions still act in the public interest or prioritise the interests of powerful industries (Miller and Harkins, 2010). Therefore, we investigated *if proposed changes in the regulatory framework benefit the interests of specific companies more than the public interest* (P4).

4.2.1. P1: Regulatory adaption and formal standardisation to enable an emerging niche market

In order to estimate market certainty we looked at competition, technological complexity, and consumer behaviour in line with the classification in the study of Blind et al. (2017). Concerning developing anaerobic MBRs for waste water treatment the initiators and coordinators of the Innovation Deal around UPV and UV are leading in their field and have plenty of experience. Even though there are other universities (e.g., TU Delft) the competition is assessed as rather low. One reason we argue is that the technology itself, the anaerobic bioreactor, is not novel (CSD 2.20). What is new is the combination of an anaerobic bioreactor in combination with membrane technology used for treating wastewater to use it for

fertigation. This special case is only addressed by few research institutes and the innovators of the Innovation Deal seem to have the most experience in Europe in this regard.

As outlined above the technological landscape is complex because of the numerous ways to treat water according to what the water is needed for. Plus even the purpose AnMBR is aiming for (water reuse for fertigation) could be served by other combinations of treatments. However, in cases of wastewater supply with high concentration of organic material it seems to be a value-adding alternative (CSD 4.8). Thus, the market for this technology is highly specialised and it is not expected to achieve massive market share rapidly within the wastewater treatment industry (CSD 4.9, 4.18) due to the present wastewater infrastructure. Indeed, it is a comprehensive and sustainable circular solution for a pressing issue (water scarcity for food production) that even has the potential to become a renewable energy source. Having this said a thorough evaluation where and how it would be profitable is crucial. As a result and against the background of the circular roadmap of the UN and the EU we assess the demand for the technology as an emerging market. Regarding the consumer behaviour there are no shifts expected other than an increase in the demand for water (CSD 1.37, 2.35, 3.39).

In order to identify regulatory barriers the consortium collected local regulations, required quality standards and the governance rules that are currently in place in different countries (CSD 1.8, 1.14, 1.15, 1.16, 1.24, 1.46, 2.6, 2.47, 3.8, 3.9, 3.11, 3.17, 3.51). This is important since water reuse is applied in Europe not only to Nation states (e.g., in Portugal exists a whole regulation for the country), but in most countries even to regional and local regulations (e.g., Spain, Italy, Greece). These can also be different from region to region what is ‘very often a real barrier for the application’ (CSD 1.8). Among all research participants is general consensus that a European quality

standard for water reuse is required (CSD 1.13, 1.15, 1.24, 2.18, 3.21). A research participant describes the European Commission sets only the directive 'water reuse must be improved but did not set a certain quality standard' (CSD 1.13). After that each member state has to apply these principles in their very own local scenario (CSD 1.13). This results in areas with high limits (less stringent) and others with very stringent limits, e.g., for microbiological parameters as present in Italy and Greece, what demands very energy intensive and chemical intensive disinfection steps (CSD 1.10, 1.14). Another regulatory barrier specifically hindering 'anaerobic MBR' technology identified is that the European directive (91/271/EEC of 21 May 1991, Article 4) regulates 'urban waste water entering collecting systems shall be subject to secondary treatment or an equivalent treatment before discharge' (Council Directive of 21 May 1991 concerning urban waste water treatment, 1991). The problem is that discharge is defined as soon as the water leaves the waste water treatment plant (CSD 3.11, 3.12, 3.13, 3.19, 3.51). In order to use waste water treated by anaerobic MBR for fertigation nitrogen and phosphorus need to stay in the water. If at the moment water is used for agricultural purposes, according to the directive, all nutrients need to be removed just to add nitrogen and phosphorus again after discharge.

This leads to the second major issue identified by the consortium. There is no clear framework across Europe about the business model for water reuse (CSD 1.27, 2.11, 2.48). So far, there is the water frame directive which establishes that there has to be a cost recovery principle (CSD 3.15). However, due to the individual agreements on the local level between producer and end user and different water quality needs also production costs for treated waste water varies significantly. In order to achieve a European regulatory framework 'the institutional and regulatory analysis is crucial' (CSD 1.27). A

strong perceived barrier is the fragmented regulatory landscape (CSD 1.8, 1.9). So far, two solutions are considered to advance the regulatory framework. Firstly, the European directive needs to include the special case of anaerobic MBRs which would put out waste water with nutrients (CSD 3.19). Secondly, a consistent European framework or standard is approached to strengthen the industry and the common market (CSD 1.13, 1.15, 1.24, 2.18, 3.21).

After all, we see P1 confirmed. For the technology exists an emerging market and formal standardisation is strongly considered to level the European regulatory landscape and to support the diffusion of the innovation.

4.2.2. P2: Aligned interests and close relations create strong collaboration

The interests of the 14 participants are manifold. The insights of the participants from the interviews we conducted range from identifying regulatory barriers for own similar projects over participating in a constructive discussion about the technology to receiving insights for a comprehensive understanding of the technology and inspiration for future undertakings (CSD 1.39, 1.43, 2.37). Most importantly and shared by all research participants is the realisation and commercialisation of a technology the ID participants are committed to and which is hitherto solely in the research phase (CSD 1.40, 2.36, 3.40). Obviously, this expert panel would benefit of the diffusion of this technology in terms of (engineering) consultancy as technology experts, increase of reputation, and to a certain extend also as technology provider (CSD 1.42, 1.43, 3.45). Furthermore, water utilities would have a value adding alternative if the process is proven profitable. Likewise, if a suitable business model is developed the technology also has the potential to benefit farmers through additional revenue streams (CSD 1.43, 2.45, 2.48, 3.13, 3.52). Apart

from these motivations society as whole would benefit from having a circular waste water treatment process increasing utilisation of resources, thus, reducing harm to the environment plus adding another alternative energy source. This impact plays an important role among research participants (CSD 1.48, 2.15, 3.26, 3.29, 3.53).

Interesting to notice about the information input into the Innovation Deal is the amount of people working on it. Two participants worked with three people on it, another with two, and one of them even consulted 10 participants of a similar project they are involved in including waste water treatment experts and technology provider (CSD 1.2, 2.2, 3.2). So far, information flow among participants is comprehensively assessed as open and transparent. Having this said it needs to be considered that until now the project was mainly about collecting and sharing insensitive information, namely the identified regulatory landscape (CSD 1.51). From a social network perspective ID participants have been predominantly in contact with the coordinator and initiator of the ID. The frequency was similar of about twice per month. The communication at the coordinator was significantly higher being in contact with participants every week. The communication methods were e-mail, telephone, and online calls, in cases of working geographically close to each other, of course, frequently also in person. Apart from the centralised information flow towards the coordinator major information was centralised online as well in a data repository from the EC accessible for every ID participant. In contact with the European Commission has been the initiator and coordinator of the ID for the most part.

In spite of the background that the ID is non-funded without even compensating for travel expenses and the numerous working hours going into the project from each participant the cross sector collaboration is evaluated as positive, productive, and dutiful (CSD

1.49, 2.55, 3.55). Important to notice is that the coordinator knew most of the participants already very well before the ID what supports a strong cooperation (CSD 1.39, 2.38, 3.6, 3.55).

To put it in a nutshell we conclude the ID can be used successfully to lobby for organisations interests. In this particular case, the cooperation seems to be very productive achieved through building an expert consortium with aligning interests formed out of close business acquaintances. Particularly against the background of the numerous alternative possibilities outlined in P1 we assess ID is used in order to further develop and ideally enable a wide spread diffusion of the technology in the future through adapting the regulatory framework.

4.2.3. P3: Together for a more sustainable and circular Europe

First of all, it is obvious the Mediterranean countries of the basin, Greece, South of Italy, Malta, Cyprus, Spain, plus Portugal would benefit from the technology by reducing the threat of water scarcity and by gaining greater independence from fertiliser producer (CSD 1.45, 2.45, 2.46, 3.42, 3.47, 3.49, 3.50). In this sense there are country's interests involved, however, these are collective interests as the concern arises from the pressing issue of droughts and their impacts on the living conditions among all their citizens. Further, water utilities and farmers could benefit from it, but this depends strongly on the business model accompanied to it, what still needs to be developed. Again, this is a collective interest for all utilities and farmers across Europe.

In the next step we looked at the companies which could take advantage of the diffusion of the technology. Parts of minor economic value such as blowers and pumps could be supplied from Siemens AG (Berlin/Munich, Germany) (CSD 3.34). But the most expensive part of the technology are the membranes (CSD 1.30, 2.43). However, for

the membrane suppliers it would be just an additional market niche. The largest companies with adequate membrane technology the research participants named are General Electric (Boston, USA), Kubota Corporation (Tokyo, Japan), Koch Membrane Systems, Inc (Wilmington, Massachusetts, USA), and BASF SE (Ludwigshafen am Rhein, Germany) (CSD 1.30, 2.29, 3.34). Besides, there are several more, also more from European Member States, but the technology is still in the research phase and it is too early to surely state which membrane type of which supplier is most suitable in the end, as the technology is currently tested with membranes developed for aerobic bioreactors (CSD 4.16). On top of that these companies are selling their membranes for conventional treatment processes anyway. How much it would increase their sales and how important the technology will become for them remains to be seen. Further, so far the consortium did not support any particular parts nor membranes, therefore, we do not see any participant lobbying for a particular membrane supplier.

The largest economic benefit of the technology would be for the system supplier which would construct the necessarily new built full scale waste water treatment plants. For this the research participants listed multinationals such as Veolia Environnement S.A. (Paris, France), Suez S.A. (Paris, France), Aqualia (Fomento de Construcciones y Contratas S.A.; Barcelona, Catalonia/Spain), Paques BV (El Balk, Netherlands), or Severn Trent plc. (Coventry, UK) (CSD 1.30, 2.29, 2.42, 2.48, 3.33, 3.46, 4.14). Further we identified Xylem Inc. (former ITT Corporation; New York, USA), United Utilities (United Utilities Group PLC; Warrington, UK), and Thames Water (Thames Water Utilities Ltd.; Reading, UK) (World's 10 Largest Water Companies, 2012). A notable shift we detected in the market is that Suez bought the Xenon-membrane division of GE (CSD 4.14). On the one hand this benefits the company in the way that they can offer all

the necessary technology for the plant all together. On the other hand, it can limit the offer of Suez as a system provider if the GE/ Suez membranes turn out to be less suitable than others. In the long run, if the technology would make a breakthrough, this also could become a strength if they develop a thereupon customised full scale plant. Furthermore, we figured out Veolia having a preferred supply agreement with Koch. Veolia uses preferably but not exclusively Koch membranes for MBR technology (CSD 4.15). For the sake of completeness there are also smaller supplier. However, the couple of anaerobic MBR and membrane is still not consolidated as a product to sell in the market (CSD 4.12). On that account we did not identify the consortium lobbing for a particular potential full scale waste water treatment vendor at the moment.

In summary, there are companies such as membrane supplier and full scale waste water treatment plant provider which could benefit from the diffusion of the technology but we did not find evidence the consortium favouring any particular company in both cases. Great beneficiaries, preconditioned an adequate business model is developed, could be the farmers by becoming part of the treatment process. In any case the technology offers a desirable solution for reducing pressure on water sources which is a collective interest among all Member States. With all this in mind we cannot confirm that any participant lobbied in a particular country's interest.

4.2.4. P4: Grassroots work for the whole industry in the EU

Added to the line of argumentation in P3 about the companies present in the market and potential beneficiaries of the uptake of the technology it is presumed that only a minority of the system provider are able to manufacture anaerobic membrane bioreactors (CSD 1.47). Thus, in the beginning these companies, mostly mentioned by the research participants are Veolia, Suez and Aquialia, could benefit

from the diffusion of the technology. However, the number of companies is expected to increase rapidly as soon as a dominant design will be established (CSD 1.47). The major work executed by the consortium so far is the grassroots work for a European-wide standard for water reuse that would provide the industry with a clear framework.

At this stage of the Innovation Deal taken into account the current state of the technology and in the light of the regulatory changes proposed by the consortium outlined in P1, formal standardisation and adapting the directive by allowing to discharge waste water with nitrogen and phosphorus, there is no evidence benefiting a certain company more than the public interest. On the contrary we assess the technology to have major public benefits by introducing a more sustainable and circular waste water treatment process.

5. Case B: Green Deal 'Gelijkspanning Haarlemmermeer'

5.1. Initial Situation

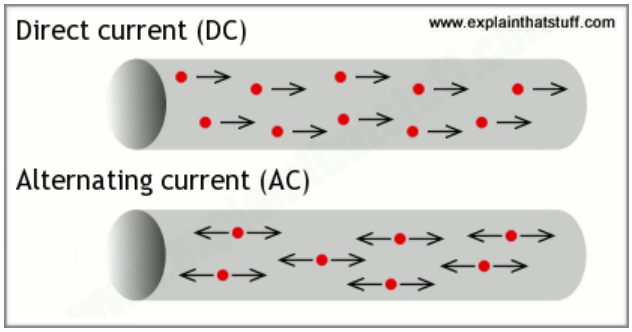
The Green Deal 'Gelijkspanning Haarlemmermeer' was introduced in the Netherlands in 2011 and ran for 3 years. The participants Direct Current B.V., Siemens Nederland B.V. and Joulz B.V. in cooperation with the Dutch government 'Rijksoverheid' (Ministry of Economic Affairs and the Environment, and Ministry of Infrastructure, Public Works and Water Management) started from scratch ambitious to challenge the extensive energy infrastructure based on alternating current (AC) and transform it into direct current (DC) (CSD 6.63). Against most expectations the consortium not only made technological breakthroughs but also established the basis for Dutch standards for electrical systems based on direct current. Overcoming

several regulatory barriers it is now possible to build DC systems as mature as existing AC systems (CSD 6.63). This outstanding achievement was not only rewarded with a Green Deal award in 2016 in the Netherlands (Media, 2017). Moreover, it is the first project of its kind working on large scale DC infrastructure and the necessary formal standardisation in the world (CSD 6.27). Furthermore, a relaunch of the Green Deal is planned with an expertise group around Direct Current called Current OS (CSD 6.6, 6.22). It is best described by comparing it with an open standard like USB that aims at developing the operating system of the currents of the smart grids. Included in the second GD will be a 90 km long demonstrator that has the potential to implement a DC grid in the Netherlands after 2020 (CSD 6.20).

5.1.1. Technological Landscape

In order to understand the Green Deal 'Gelijkspanning Haarlemmermeer' it is necessary to begin with a brief explanation of key terms and the technology. First of all, 'current' describes the movement of electrons through a conductor. On the one hand, there is direct current, in which the electrons flow steadily in a single direction (forward). On the other hand, in alternating current electrons keep switching directions, going forward and backward (Diffen.com, 2017) (Illustration 6). Each alternative has its advantages and disadvantages. The most dominant for long distance

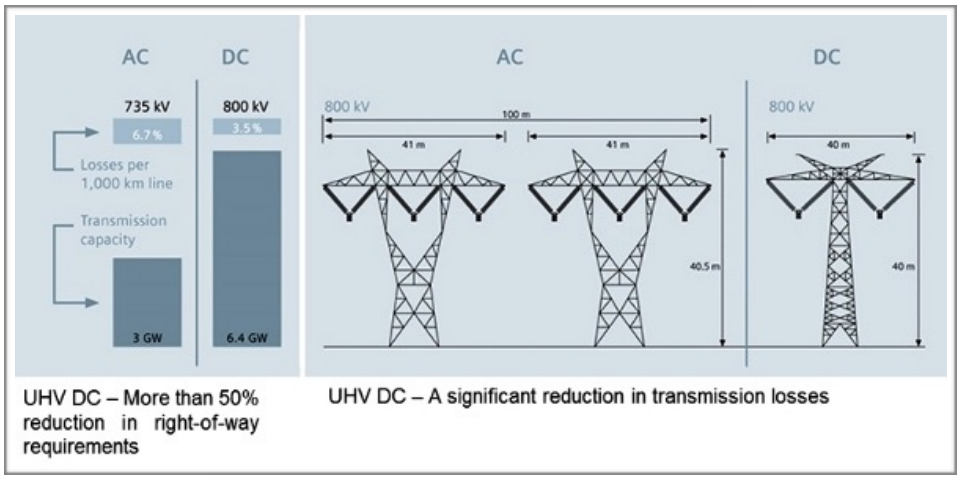
Illustration 6: Alternating Current and Direct Current



Source: Electricity, 2017

power transmission is that AC is much easier (cheaper) to step up and down in voltage than DC. This is vital since high voltages are better for long distance power transmission. The higher the voltage is, the lower are the resistive losses in the cable (Allaboutcircuits.com, 2017). However, AC has also a downside compared to DC: inductive and capacitive losses. The larger the inductance and capacitance of a piece of wire is, the more difficult it is to keep trying to change the direction of flow of electrons, which is what AC is doing at 50 or 60 times a second. DC on the other hand, flowing in one direction all the time, is not impeded by this inductance, and has negligible capacitive losses (Illustration 7) (Gao, 2017).

Illustration 7: Transmissionen losses comparison AC to DC



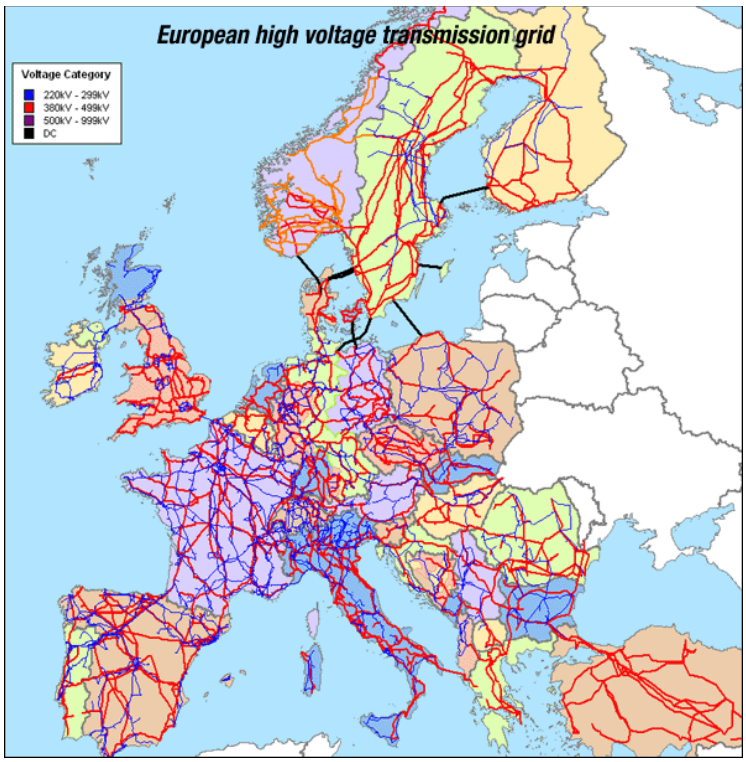
Source: HVDC Classic - Siemens, 2017

To be precise, in some cases DC already has been used for long distance power transmission, e.g., through underwater cables. This is because of a much higher inductance and capacitance due to the interaction of the magnetic and electrical field with the water. In this case AC would have much higher capacitive and inductive losses. However, the majority of long distance power transmission is done via straight wires in air which have very little inductance and capacitive losses. That is why AC despite losses is more economical to be used

there. It is often cheaper just to generate some more energy to counteract for higher transmission losses. Overall, which systems is preferred depends on a combination of overall cost unit of energy delivered (Gao, 2017). The result is a fragmented grid mainly using AC for national grids via straight wires in the air and inter-country underwater long distance cables using DC (Illustration 8).

To put it in a nutshell, DC is inherently better for long-distance power transmission, but step-up/step-down systems are expensive and less efficient than AC so far. Every breakthrough in power semiconductor technology means that DC power transmission becomes slightly better. Plus most future technologies in the industry work with DC, from solar, over wind and hydrogen to even electric automobiles. At some point, it will become feasible that DC power overtakes AC. This is an inevitable transition companies in the industry have to adapt to otherwise they will be at 'the dead end of the development' (CSD 6.47; Guentert, 2017).

Illustration 8: European high voltage transmission grid



Source: Global Energy Network Institute, 2015

5.1.2. Market Description

Today, the market for energy infrastructure is semi-governmental and characterised by few large cooperations that take care of the present grid in cooperation with local authorities (CSD 6.35). This structure is needed for the large AC grid installations. With the technological advancement of DC networks accompanied by emerging renewable energy technologies such as wind, solar, hydrogen, geothermal and biomass, which are DC from the outset, the transition from AC to DC is gathering speed. In addition, the development is not opposed since it even benefits energy sources like coal or nuclear plants by enabling the generators to work more efficiently (CSD 6.31). During the transition period it is expected to develop a second grid for renewables, electro mobility, batteries and similar appliances using DC alongside the existing AC grid (CSD 6.19). At some point the old AC grid will be transferred to the new DC grid to the point where one large smart grid containing numerous micro grids connecting all electric sources and appliances will be established.

This new infrastructure will create room for a blockchain like energy system (CSD 6.40, 6.55). It is comparable to the development of data transmission via the internet. Once there were modems and it was payed per second for the data until that was replaced by fibres and payment was made for capacity (CSD 6.41, 6.43). In case of demand for a faster connection it must be payed more but it is not based on quantities anymore. In the future the energy system likewise will be based on capacity. To save money there will be the option to take a smaller connection. In order to not run out of energy in times of high energy demand devices would need to be disabled or connection capacity be upgraded. This will change consumer patterns and ultimately save energy (CSD 6.41, 6.43). Furthermore, it offers households, e.g., through the installation of solar panels, to produce their own energy, may live autark or even

feed the grid to earn money. One implication of this new system is the independence from external parties and more privacy. By building a smart grid within a household the consumer will fill in the electricity gaps from their own appliances before any request is made to the external grid. At the moment always the request for energy goes out to an external aggregator, with DC own energy is consumed first or it can be directly dealt with neighbours. Consequently, privacy is guaranteed by design and not by protection (CSD 6.42, 6.55).

In the long term this raises questions about the tax system for this energy infrastructure. One solution would be a big energy flow from large cooperations accompanied by a comprehensive tax systems. The other solution would be a system of micro grids to enable a consumers own energy what would lead to a tax issue, since the only costs for the consumer would be the fix costs for the installation of the energy source (e.g., solar panels) and only few variable costs. A few companies would be payed not for producing energy but for being on stand-by (CSD 6.47). In this scenario the energy companies of today would become comfort supplier. The energy company will guarantee a kind of comfort for a certain fixed amount of money by playing with the connection capacity. In case a household does not has its own sources there will be a competition who can offer the most comfort for the lowest connection capacity (CSD 6.43). On the contrary if there is a micro grid including an own energy source this can either be managed by the owner or an energy company can be consulted to optimise the local installation to have the most efficient system. For instance, energy companies could provide batteries to the system to use the energy more efficiently when there is time shift in energy consumption. This service will increase comfort and will reduce monthly costs for energy.

At the moment around Europe there are different systems. For instance, in France Électricité de France SA (EDF) is in charge of the

whole system. In comparison the Dutch model separates and regulates energy generation and transportation (CSD 6.35). In the Netherlands exists only one provider for the connection but consumers are able to select different sources and providers of energy. The latter is also the direction of the European Union, to build transportation and distribution separate from production and consumption in the markets (CSD 6.35). EU directives are heading towards stability in energy flow with reserve generation added to the system what supports the second scenario (CSD 6.47).

Estimates about the market value of this new energy infrastructure technology are difficult. Only to prevent renewing the existing grid it is forecasted to save around 80 billion per year in the developed world (CSD 6.19, 6.21). However, its true value is far greater in consideration of 1.2 billion people without access to electricity only in India and Africa. Taken into account the whole underdeveloped world and the benefits a DC system would provide the value and market potential is tremendous.

5.1.3. Green Deal Project

The small consortium of three companies and one authority was build around the initiator and coordinator of the Green Deal, the company Direct Current. They are a startup that solely concentrates on the development of the DC grid technology (CSD 6.7, 6.22). Thus, the Green Deal was not an additional project for them, instead it supported their core business activities. All three companies worked together on the technology before and with numerous regulatory barriers ahead they applied for the GD to enable their project (CSD 6.2). Even though the whole company of Direct Current was working on the innovation, a small team was formed including the CEO of Direct Current, one person of Siemens and one person of Joulz that met regularly in person (CSD 6.4, 6.7). Likewise the team size and

contact persons at the Dutch government were a fix team that was contacted throughout the project only by one person of the consortium (CSD 6.3).

The Green Deal offered the participants the chance to pilot and develop the technology in a greenhouse as if it would be accepted and standardised what 'provided a lot of new input to make a correct standardisation for the future' (CSD 6.12). The Green Deal is recognised as an 'incredibly strong tool' which 'opens up doors easily at other companies, institutes and the government' (CSD 6.5, 6.49). The regulatory barriers identified by the consortium were basically the non existence of standards for energy trading on a DC gird. Whereas AC grids are mature with defined and standardised units for kilowatt hours this was not standardised for DC yet. Therefore, the consortium did not work on changing the existing framework, instead they developed grid codes, connection codes and trading codes in order to purchase and sell energy on a pure DC grid (CSD 6.11).

The motivation and lobbying interest of the initiator was 'to become the leading company for DC systems everywhere' (CSD 6.18). Having this said it needs to be pointed out that at the moment they are the only innovator working on a DC infrastructure in the world anyway (CSD 6.13, 6.27, 6.51). The other participants are established energy companies and had the strong interest to lead the change that inevitably will impact their organisations (CSD 6.45, 6.46, 6.47). Even though it is clear that the formal standardisation they developed will temporarily benefit them the greater impact is the 'level playing field' and secure market conditions for other companies aiming to enter the market (CSD 6.57). Furthermore, the work achieved in the Green Deal is expected to strongly benefit energy consumers and create access to electricity and improve living standards for many millions around the world in the long run. This global perspective was shared by all participants (CSD 6.49). The identified strong

collaboration in this Green Deal seems to be enabled by the fact that the technology would not replace any company (CSD 6.22, 6.59). Rather it is a technology that sooner or later but certainly will impact the sector and there was a mutual interest among all companies in the industry to make it work (CSD 6.58). Furthermore, the innovator Direct Current has no ambition to become the grid provider, hence, does not challenge the current market players (CSD 6.39). Quite the contrary, they help the established companies in making the shift towards a DC-based smart grid (CSD 6.22).

5.2. Academic Data Analysis

5.2.1. P1: Developing standards for a novel technology in a market of low uncertainty

As before we started the analysis by identifying *if formal standardisation is pursued in order to promote the innovation in an uncertain or more emerging market* (P1). Before outlining the identified regulatory barriers and proposed regulatory adaptations we classify market certainty by looking at competition, consumer behaviour, and technological complexity.

To begin with Direct Current is at present the only innovator for DC grid systems in the world without having any direct competitor (CSD 6.13, 6.27, 6.51). Furthermore, implementing a DC grid and replacing the AC infrastructure is not expected to replace any company in the market nor challenge the present market structure in the short term. 'No, we would not replace the companies. The companies will start implementing other technologies so the players in the field stay the same and the grid operators will only transfer their own assets from AC to DC' (CSD 6.37). On top of that, there are no technological alternatives other than alternating current and direct current. 'Everything is AC and now we have an alternative for AC

(CSD 6.25)'. 'If you restart all over again you will come to the same solution that we have because that is the only way it can work and it can be build like that' (CSD 6.29). Only consumer behaviour changes are expected to happen. This is the disruptive power of the technology that leads to a particular extent of market uncertainty, whereas some consequences are foreseeable.

If we look far into the future, imagining everything is connected via DC, this smart grid enables households to produce their own energy and trade it via the DC grid. This will have several consequences. First of all, energy producers are expected to be challenged in their business model. Numerous small energy provider, producing energy by solar panels, wind energy, hydrogen or biomass, ranging from individual households to farmers and other non typical energy producers will enter the market and provide energy through the access to micro grids. The many present large energy producers probably are going to be diminished to a few companies being on stand by and providing energy in times of energy shortage while other companies will normally run with their local energy (CSD 6.47). Hence, the technology is going to disrupt the market, however, the development will take a long time. Overall, we assess the market uncertainty as rather low due to the limited technological landscape and the innovator not facing any competitors so far.

In the next step we researched which regulatory barriers the project participants identified and which call to actions had been proposed to the regulatory body. Since there is no existing regulatory framework for a DC grid the consortium worked from the ground up developing grid codes, connection codes, and trading codes in order to develop a standardised metre to purchase and sell energy on a DC grid (CSD 6.11). Furthermore, isolation was a major issue so that insurance companies and installers are able to work with this technology (CSD 6.9). In the end, the consortium provided a list of

barriers for these subjects to the Dutch government and 'finalised the Dutch standards for electrical systems in order to build now DC systems as mature as existing AC systems. It is the same standardisation, the same risk, the same insurance prices' (CSD 6.63).

We can confirm the statement made by Blind et al. (2017) that declares 'in uncertain or more emerging markets, regulators may promote innovation by pushing the use of formal standardisation as a coordination instrument.' Even though we assess the market as rather certain, undoubtably, due to the changing consumer behaviour and the attached market opportunities, it is an emerging market. More precisely, an emerging market under rather certain market conditions, which probably is as rare as the limitation of the technological landscape to only two possible solutions. In this case formal standardisation is fundamental to regulate this early innovation.

5.2.2. P2: Aligned business interests as basis for productive collaboration

As the main body of research we addressed three concepts of lobbying literature. For the second proposition (P2) the aim was to elaborate on *regulatory capture*, the process in which stakeholders try to influence the regulation-making body in favour of their own interests (Stigler, 1971). We began to analyse the cross-sector collaboration in terms of the information flow among participants and towards the regulatory authority as well as the participants' assessment of the collaboration. Finally, we would be able to argue *if participants use the Deal to lobby for their organisations interests* (P2).

Important to notice is that the initiator and coordinator of the Green Deal, which is at the same time the innovator of the

technology, would become ‘the leading company for DC systems everywhere’ (CSD 6.18). Further the Green Deal is described as an ‘incredibly strong tool’ which ‘opens up doors easily at other companies, institutes, and the government’ (CSD 6.5, 6.49). The consortium had personal contact frequently, the established small team worked closely together and made sure the different lobbying circuits were consistent when interacting with authorities (CSD 6.3, 6.4). This shows there was great consensus rather than individual company interests transferred. The study results lead to the impression that the driving forces on the side of the innovators is the revolutionary potential of the technology that has the potential to ‘DC-ify the world’ (CSD 6.10). For the participating established companies it is more a matter of leading the change towards a smart grid which massively and inevitably will affect their companies (CSD 6.45, 6.46, 6.47). As these motivations complement each other just as the competences of the participants it seems to have been a harmonic and productive business cooperation (CSD 6.59, 6.60). Certainly, it helped that the companies including the individuals that participated in the GD worked already before the project on the technology (CSD 6.60). As they ran into several regulatory barriers they decided to apply for the GD. During the project the consortium was able to practically pilot their technology in a greenhouse which led to major breakthroughs in the development of the technology as well as establishing the necessary formal standardisation.

These insights lead to the conclusion that Green Deals offer a unique opportunity for developing a technology as well as testing and improving an appropriate regulatory framework. We argue participants have with the Green Deal a strong instrument available that empowers them to support their research and development activities through an encouraging setting and extensive network that extends their capabilities.

5.2.3. P3: Regional innovation ready to change the world

In order to dig deeper into the lobbying activities involved in the Deals we decided to address with the third proposition (P3) *if participants use the Innovation Deal to lobby for their country's interests (Cultural Capture).* Even though this proposition explicitly aims at the Innovation Deal at the European level it was interesting to analyse the mindset present within the participants of the Dutch equivalent as well.

The companies involved were mainly Dutch (Direct Current, Joulz [Stedin Group]) and the Dutch subsidiary of a German conglomerate (Siemens). As expected we did not find evidence for any regional motivations that would be comparable to national interests within the European Union or similar, e.g., particular regional interests would be represented over the common good. The study shows a global perspective by all participants far beyond the boundaries of the Netherlands and also not stopping at the EU level (CSD 6.56). Direct Current is part of and in the focus of the International Electrotechnical Commission, which already plans to implement the technology in India and Africa, where 1.2 billion people have no access to electricity (CSD 6.48). Thus, the consortium was aware of the disruptive power of the innovation and the global impact it entails from the beginning of the project. It seems, especially, the improvement of living standards and market potential of the under developed world was a strong motivator.

5.2.4. P4: First mover set the standards

In our final proposition the target was to identify the extent of *corporate capture.* It tries to explain how strong the influence of companies had been and if institutions still act in the public interest or prioritise the interests of powerful industries (Miller and Harkins, 2010). Therefore, we investigated *if proposed changes in the*

regulatory framework benefit the interests of specific companies more than the public interest (P4).

The initiating company and coordinator of the Green Deal is a company that is working full time on this technology (CSD 6.2). Hence, the Green Deal is not an extra project for them, instead it supports their business activities. Furthermore, the GD was so successful that the participants already developed the standard for a future DC grid. The adoption of this standard by the Dutch government or even more so on the global level certainly has the potential to temporarily benefit Direct Current. At this point it needs to be taken into consideration that at present they are the only company worldwide in the industry concentrating on this system innovation. Additionally, once the standard is set there is a 'level playing field' for future companies (CSD 6.57). Therefore, this temporary advantage for the company we assess as of rather low significance, plus, it does not diminish the benefits of the public interest. Quite the contrary, as earlier a standard exists, the earlier there is a stimulus in form of a secure framework for companies to enter the market. This will lead to more competition and a more rapid development and diffusion of the technology, that even Direct Current desires (CSD 6.50).

In conclusion, we state P4 is not confirmed. Direct Current will temporarily benefit of the uptake of their proposed regulatory changes, namely the formal standardisation. However, in the face of the clear gains for consumers in the developed world and the potential to bring extensive energy supply to the under developed world this temporary benefit for Direct Current at the same time strongly benefits the common good. Hence, we assess the adoption of the proposed formal standardisation does not benefit the company more than the public interest.

6. Discussion

This discussion chapter will apply the same structure predetermined by the author's propositions and already followed in the previous data analysis sections of the two case studies. Before addressing the main purpose of the study, the research of the lobbying activities in the Deals in form of regulatory capture, cultural capture, and corporate capture, we will begin with discussing the role of formal standardisation in order to support innovations.

6.1. Cross-Case Synthesis

6.1.1. P1: Formal standardisation pursued to promote innovation

The results of the study show both consortia aiming for formal standardisation to support these early innovations. Having this said, both innovations have not achieved commercial viability yet and are still in the development phase. As soon as they mature they are subject to be placed in emerging markets. However, the markets are distinctly different. On the one hand, AnMBR technology faces several other possible and already existing alternatives in order to achieve a similar solution AnMBRs offer for wastewater treatment. The emergence of the market is mainly created by the political support for a circular and more sustainable choice. On the other hand, the DC grid is an inevitable development waiting to be addressed by a capable innovator. This is realised by this expert panel through the Green Deal.

Likewise each proposed formal standardisation result out of different motives. In case of AnMBR technology the discussed formal standardisation is grassroots work for wastewater reuse in general across Europe. A more particular support for the diffusion of the AnMBR technology would be an adaption of the European Council

directive of 1991 concerning waste water treatment. However, formal standardisation and the resulting regulatory security on the European single market for wastewater would benefit AnMBR as well as all other existing technologies. In the case of formal standardisation suggested for the DC grid this technology would be the sole beneficiary.

Against this background the insight is a modest contribution to the ongoing discussion in innovation management literature about the impact of regulation or formal standardisation on innovation. Our findings clearly support the view of Blind et al. (2017) 'in uncertain or more emerging markets, regulators may promote innovation by pushing the use of formal standardisation as a coordination instrument'.

6.1.2. P2: Deals are effective tools to lobby for organisations interests

In the second proposition we found common interests. The pursuit of maturing the technology, enabling a promoting regulatory framework and, finally, realisation and commercialisation of the technology was shared among all research participants of both cases. The Deals provide unique access to authorities, companies and institutes that significantly increase the competences of the innovators. In addition, in case of the Green Deal, the opportunity to pilot the technology in a greenhouse led to major breakthroughs in the development as well as in creation of the necessary formal standardisation to enable the application of the technology.

Due to the early stage of the Innovation Deal such substantial conclusions cannot be drawn. Nevertheless, the study certainly shows interests in changing the regulatory body in favour of the AnMBR technology and the accompanied interests of becoming a technology consultant in that field, to a certain extent a technology provider, or

simply of gaining an increase in reputation. Irrespective of knowing if the adaptation of the suggested regulatory changes will happen our study allows the conclusion that the Deal instrument represents a strong tool to lobby for organisations interests.

6.1.3. P3: Holistic attitudes pursued to enable sustainable innovations

In the face of rising national tendencies among citizens across Europe it was of utmost interest to research these attitudes in the Innovation Deal in form of cultural capture. Thus, if a certain actor acted in the interest of their home country's interest over the benefit of the common good. Our analysis showed a sheer supranational perspective of innovators, either European-wide or in case of the Green Deal even World-wide. Especially in the European case (Innovation Deal) we did not find evidence for lobbying activities in favour of a particular country.

One explanation seems to be that the technology is not in a mature stage and it is not foreseeable which providers in the end are able to construct the best solution to run it most efficiently. However, the reduction of the water scarcity problem, adding a renewable energy source, and offering the water utilities and farmers a new business model are collective interests among all project participants' Member States.

Overall, the altruistic motivation seems to play a major role for the innovators of these two sustainable innovations. These will, on the one hand, increase utilisation of the water resource, and, on the other hand, massively increase social welfare. As these are not only regional concerns the innovators in both cases look for the greatest usability possible.

6.1.4. P4: Support for companies interests to benefit the common good

In the final proposition the approach was to elaborate on how strong the influence of companies had been and if institutions still act in the public interest or prioritise the interests of powerful industries. So far, the authorities in both cases have not enacted upon the results of the projects. Nevertheless, the analysis shows in both cases that the common good would strongly benefit in form of a tremendous increase in living standards or access to water for fertigation through a circular treatment process in spite of favouring a company through adaptation of the regulatory framework.

In consideration of P2 and P4 it can be concluded that the companies are granted the opportunity to lobby for their organisations interest through an incredibly strong tool to enable sustainable innovations that, ultimately, will benefit the greater good.

7. Final Consideration

7.1. Introduction

This final chapter will start with introducing the overall conclusion of the research in response to the research questions and study propositions. Further theoretical contributions will be outlined just before achievable recommendations are presented succinctly. In the end remarks about future research will finalise this paper.

7.2. Conclusions

The overall conclusion drawn from the research is that Deals are used to lobby for organisations interests (regulatory capture), however, these concerns are predominantly holistic (cultural capture). A regulatory support for the technology in this Innovation Deal will benefit the common good more than private companies (corporate capture). In addition, we found evidence for the use of formal standardisation as a coordination instrument to promote innovation in more emerging markets.

Further the overall conclusion can be broken down into four major conclusions in response to the initially stated research propositions. Putting the findings into context regarding regulatory capture both cases show strong interests to use the Deal to enable the innovators technologies. The finished Green Deal reveals that the instrument can be a strong tool to mature a technology and formulate a necessary regulatory framework for diffusion. The main conclusion with respect to cultural capture is a holistic mindset identified in both cases. Whether this is the mindset of the participants, a result of altruistic motives of the sustainable innovations or due to the intention of higher market opportunities is not clear. Nonetheless, the analysis of corporate capture shows without doubt the realisation of these

sustainable technologies will strongly benefit the common good. Both cases in their unique ways show public benefits that leaves no possibility for regulatory authorities to prioritise companies or industries without acting strongly in the public interest. In order to build a fundamental regulatory framework formal standardisation is worked out to promote both sustainable innovations in their emerging markets.

In relation to the Innovation Deal 'AnMBR' in particular we conclude the major interest is to mature the technology and realise commercialisation of it (regulatory capture). For this purpose joint efforts are being pursued in spite of diverse cultural backgrounds (cultural capture). In case of following the expected regulatory suggestions and successful diffusion of this circular wastewater treatment process the European Commission will benefit the public interest more than private interests of the industry by reducing harm to the environment and adding an additional renewable energy source (corporate capture).

Finally, there are further insights we identified alongside the researched propositions that we consider as mentionable. From the outcome of our investigation it is possible to conclude that in both cases the present productive atmosphere stems from a prior history of collaboration among each cases participants. Even though only one of both cases is already finished and can be assessed as successful we argue a consortium of participants that worked together before on the project is more likely to succeed. As we look into the process of the cross-sector collaboration in both cases we observed a centralised flow of ideas towards the initiator and coordinator of the Deals. This offers the possibility of a filtered information flow towards the regulatory authorities, what substantiates the importance of our

lobbying research once more. Finally, it has been found that highly specialised applications focusing on only one technological solution seem to have granted the access to the strongly requested Deals.

7.3. Theoretical Contributions

In this paper we firstly looked at the pursued regulatory adaptions to reduce regulatory barriers for the innovations. We found empirical evidence in two cases for the use of formal standardisation as a coordination instrument to promote innovation in more emerging markets. This finding confirms the proposition of Blind et al. (2017) 'in uncertain or more emerging markets, regulators may promote innovation by pushing the use of formal standardisation as a coordination instrument'. Furthermore, it adds to the growing body of literature on the necessary regulatory framework to support innovations and, especially, improves our understanding of fostering sustainable innovations.

As the main body of research we examined the lobbying activities in the Innovation Deal to contribute to EU lobbying literature, in particular to the increasing empirical research in form of qualitative case studies on the European Commission. In line with this approach we present the first research on this new pilot scheme. The evidence from this work suggests that the Innovation Deal is used as an access tool to lobby for organisations interests. This is not surprising since the outline of the project is to support the innovators in their pursuit of maturing and diffusing a technology. However, we have succeeded in gaining satisfactory insights into the motives of the participants. Interestingly, we found no evidence of participants lobbying for particular company's or country's interests. The holistic attitude to contribute to a more circular and sustainable economy that is beneficial across nation states seems to be the dominant motivator. A support for this innovation by adopting the proposed regulatory

changes will in any form have strong public benefits. We believe that our contribution improves knowledge about the lobbying possibilities, attitudes, and activities in the new pilot scheme Innovation Deal.

In order to strengthen our findings we repeated the research on a comparable Green Deal what confirmed our results. However, given the small sample size and the limitations imposed on this study, it must be recognised that the findings are a first contribution and might not be generalisable.

7.4. Recommendations

Owing to the in-depth analysis of lobbying activities in the Innovation Deal recommendations for the European Commission are presented:

- The EC should be aware that the Innovation Deal is used to lobby for organisations interests and that it has a centralised flow of information towards the coordinator. However, as long as sustainable innovations are concerned the common benefit will be predominant
- At this point of the project we found no evidence the ID consortium is lobbying for a particular company's or country's interest
- Choose future Innovation Deals that focus only on one technological solution
- Prioritise a consortium that worked on the technology before

7.5. Future Research

This study is a first insight into the Deal concept on the European level. As indicated earlier our results are not generalisable due to the specific case circumstances. However, our results are encouraging and should be validated by a larger sample size once more Innovation Deals have been carried out.

Further investigations on the Innovation Deal 'AnMBR' are suggested since lobbying activities may increase in the upcoming project phases where business models are discussed. Further, the technology is still in its development phase and as soon as a dominant design establishes also the lobbying for specific system provider or individual part supplier may intensify.

Finally, it is important to notice that this study focused on direct lobbying within the ID only. For these cases the authors assessed this as sufficient due to the rather low strategic relevance of the two technologies. However, for future studies on other Innovation Deals/ Green Deals, especially those with disruptive technologies in a more competitive market environment, a wider approach including indirect lobbying and undisclosed lobbying is crucial (Hofman & Aalbers, 2017).

Word count: **21,806** (excluding references)
25,265 (including references)

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Appendix

1. Comparison of aerobic and anaerobic wastewater treatment

Source: greentumble.com (2015)

	aerobic	anaerobic
How it Works	Aerobic processes use bacteria that require oxygen, so air is circulated throughout the treatment tank.These aerobic bacteria then break down the waste within the wastewater.	Anaerobic bacteria (bacteria that live in environments that contain no oxygen) transform organic matter in the wastewater into biogas that contains large amounts of methane gas and carbon dioxide. Energy-efficient process.
	Some systems utilize a pretreatment stage prior to the main treatment processes, as well as more treatment and sanitizing prior to release into the environment.	Often used to treat industrial wastewater that contains high levels of organic matter in warm temperatures.
	Electricity is required for system operation.	Can be used as a pretreatment prior to aerobic municipal wastewater treatment.
	Pretreatment Process: Some systems reduce the solids that the aerobic bacteria could not easily break down (such as toilet paper) prior to the main treatment to reduce the chance of clogging the system.	
	Main Treatment: Treats household wastewater, and includes both domestic greywater and blackwater.	
	Forced air from an air blower or compressor is mixed with the wastewater, where the aerobic bacteria feed on the waste in the water and reproduce.	
	Solid wastes that the bacteria are unable to process settle out as sludge. Some aerobic treatment systems include a secondary settling tank to facilitate this settling process.	
	The sludge is frequently pumped out of the system to reduce opportunities for clogging.	
	Final Treatment and Disposal: The final treatment processes prepare the water for return to the environment. These processes may include disinfection using chlorination or UV light, discharging the water to a soil absorption field, filtering through sand filters, drip irrigation, or evapotranspiration.	
	Used in rural areas or small communities where central sewage systems would be costly or impractical to implement.	No air input required and generates much less sludge (50-80% less) than aerobic treatment.
	Used when site or soil conditions are not amenable for septic (anaerobic) systems.	Sludge is safe to use as a soil enrichment.

	aerobic	anaerobic
Why it is Used	Used when the water table is too high for effective septic system use.	Uses less energy and fewer chemicals than aerobic treatment.
	Provides a high-quality alternative to septic systems when properly cared for.	The biogas produced can be used for a renewable energy source as a replacement for fossil fuels such as oil and natural gas.
	Often used to replace failing septic systems.	Small-scale systems can be used to treat individual households or several households in a shared facility. In developing countries where centralized wastewater treatment systems are cost-prohibitive to build and implement, small scale anaerobic treatment systems are a viable option, and may include on-site, community on-site or off-site systems.
Maintenance Issues	Electrical and Mechanical parts require regular inspection and maintenance.	Optimal operation of municipal anaerobic treatment systems is dependent upon warmer temperatures that exist around 35°C.
	More expensive to maintain than septic tanks.	Bacterial activity decreases at cooler temperatures.
	In most cases, systems require professional inspection and maintenance.	Due to these temperature constraints, anaerobic systems that are utilized in temperate climates require the use of insulation and heating systems. Generally, only a small volume of wastewater being treated in cold climate countries is treated using anaerobic process, with the majority of water volume treated using aerobic processes that utilize aerators in open and closed ponds.
	Solids must be pumped out of units frequently.	
Costs and Concerns Associated with Use	Aerobic treatment units (ATUs) are more expensive to operate than typical septic systems.	Require lower costs to handle sludge than aerobic treatment systems.
		The methane-rich biogas produced through anaerobic treatment must be collected, treated and used to avoid release into the atmosphere, as methane is a potent greenhouse gas and has a bad odor associated with it.
		The biogas can be used in cogeneration units to produce electricity and heat.
		Minimally, the methane should be flared to reduce its impact on the environment.

2. Case Study Protocol

A. Overview of the Case Study

The purpose of this multiple case study is to research the manifestations of lobbying activities in form of regulatory capture, cultural capture, and corporate capture in the Deal instruments. In addition, it will be analysed if the innovators aim for formal standardisation to promote their innovation and if these would be in uncertain or emerging markets. Therefore, the following propositions will be test:

P1: The case study will show if formal standardisation is pursued in order to promote the innovation in an uncertain or more emerging market.

P2 (Regulatory capture): This case study will show that participants use the Deal to lobby for their organisations interests.

P3 (Cultural capture): This case study will show that participants use the Innovation Deal to lobby for their country's interests.

P4 (Corporate capture): This case study will show that the proposed changes in the regulatory framework benefit the interests of specific companies more than the public interest.

The time frame for conducting the research and finishing the thesis is set until End of October since at the same time the first project phase of the ID, which this paper accompanies, comes to an end.

The research participants include consortium members of the Innovation Deal itself, just as from another selected Green Deal with comparable project objectives.

B. Data Collection Procedures

The study will use a single method approach in form of semi-structured interviews. These are divided into three sections. In the beginning it is going to be asked about the Innovation Deal process

and the role of the research participant in it. Afterwards it will cover their assessment of the market, the technology and the core of the Deal, the perceived regulatory barriers. Finally, the questionnaire will draw the attention to the various interests in and the anticipated outcome of the Deal.

The interview is not about the theoretical discussion of regulation and innovation nor lobbying rather it is about the personal insights into the process of and collaboration in the Deals. It will last approximately between 30 and 45 minutes and will be conducted via Skype or telephone. All research participants will be informed beforehand that they may withdraw from the research at any time without consequences and the interviews will be audio-recorded and transcribed. Further their identity will be kept anonymous and their contributions will be handled confidential.

C. Data Collection Questions

The questionnaire (Appendix 4) was used for all participants of the Innovation Deal as for the Green Deal alike. For the interviews with non-participant the same questions were applied but only from sections 2 (Market/Technology) and 3 (Lobbying).

In advance of conducting the research the questions of interest and the likely sources of evidence where allocated to have a clear picture where to receive which information. Therefore, in the questionnaire we distinguish clearly among different types of levels of questions as suggested by Yin (2015, p.90):

- Level 1: questions asked of specific interviewees
- Level 2: questions asked of the individual case
- Level 3: questions asked of the pattern of findings across multiple cases
- Level 4: questions asked for an entire study

- Level 5: normative questions going beyond the narrow scope of the study

In addition it is briefly described which insight each question aims to collect.

Further it is important to distinguish between data collection sources the units of analysis. The units of analysis of this paper are the Innovation Deal 'AnMBR' project and the Green Deal' Gelijkspanning Haarlemmermeer' project. The data collection sources are the individual research participants/respondents 1-8.

D. Guide for the Case Study Report

The thesis will be written for three audiences (1) the thesis committee (2) academic colleagues, and (3) non-specialists. Therefore, it is necessary to describe mastery of the methodology and theoretical issues, along with which the research was conducted (thesis committee). Furthermore, the relationships among the case studies, its findings, and previous theory or research are important to outline (academic colleagues). Due to the different technical cases it is crucial to thoroughly present the technology and the market just as to include descriptive elements in portraying some real-world situation (non-specialist).

In order to address all three above describe audiences properly, the cases will be analysed as follows. In the beginning of each case the situation will be described in terms of initial situation before the Deal, technology status, market description and an overview of the project work. On this ground each proposition will be presented with theory-building logic in an unsequenced structure. This means that key insights will be unfolded in order to lead to the main conclusion of each proposition analysis. The case studies will be reported first individually in separate chapters before the analysed propositions will be presented with a pattern matching technique in a comparative

structure in the cross-case analysis in order to provide the final conclusions.

3. Case Study Database

Dataset	Interviews				
	1	2	3	4	6
ID - Technology	1.22, 1.23, 1.31, 1.36,	2.15, 2.18, 2.19, 2.20, 2.24, 2.25, 2.53	3.10, 3.23, 3.24, 3.25, 3.26, 3.27, 3.28, 3.29, 3.30, 3.31	4.5, 4.6, 4.7, 4.8, 4.9, 4.16, 4.17, 4.18	—
ID - Market	1.10, 1.11, 1.19, 1.20, 1.21, 1.25, 1.26, 1.27, 1.28, 1.30, 1.34, 1.35, 1.37, 1.48,	2.18, 2.22, 2.23, 2.26, 2.27, 2.28, 2.29, 2.33, 2.34, 2.51, 2.52,	3.32, 3.33, 3.34, 3.35, 3.37, 3.38, 3.39	4.2, 4.4, 4.10, 4.11, 4.13, 4.14, 4.15	—
ID - Innovation Deal Project	1.2, 1.3, 1.4, 1.23, 1.24, 1.27, 1.39, 1.51, 1.52	2.4, 2.38, 2.55, 2.56	3.8, 3.9, 3.65	—	—
ID - Communication	1.2, 1.4, 1.6, 1.7, 1.51, 1.53	2.2, 2.3, 2.4, 2.55, 2.56	3.2, 3.3, 3.4, 3.5, 3.55, 3.56, 3.57	—	—
ID - ID Participant - Interview 1	1.2, 1.5	—	—	—	—
ID - ID Participant - Interview 2	—	2.5, 2.8, 2.10, 2.11, 2.13, 2.36, 2.37	—	—	—
ID - ID Participant - Interview 3	—	—	3.6, 3.7, 3.8	—	—
ID - P1 - Regulatory Barriers/ Formal Standardisation	1.8, 1.9, 1.10, 1.11, 1.12, 1.13, 1.14, 1.15, 1.16, 1.17, 1.18, 1.27, 1.28, 1.46,	2.6, 2.7, 2.9, 2.14, 2.18	3.11, 3.12, 3.13, 3.14, 3.15, 3.18, 3.19, 3.21, 3.51	—	—
ID - P2 - Regulatory Capture	1.38, 1.39, 1.40, 1.41, 1.42, 1.43, 1.44	2.31, 2.32, 2.36, 2.37, 2.39, 2.40, 2.41	3.40, 3.41, 3.42, 3.43, 3.44, 3.45, 3.48, 3.50	4.14	—
ID - P3 - Cultural Capture	1.45	2.42, 2.45, 2.46	3.47, 3.49, 3.50	—	—
ID - P4 - Corporate Capture	1.33, 1.34, 1.43, 1.47	2.42, 2.43, 2.48, 2.50	3.33, 3.46, 3.48, 3.51, 3.52, 3.53	4.14	—
ID - Future	1.25, 1.32, 1.48	—	—	4.12, 4.19	—

Dataset	Interviews				
	1	2	3	4	6
ID - Important Quotes	—	—	3.18	4.3	—
GD - Technology	—	—	—	—	6.8, 6.14, 6.22, 6.23, 6.26, 6.29, 6.30, 6.32, 6.33, 6.40, 6.47, 6.52
GD - Market	—	—	—	—	6.9, 6.19, 6.22, 6.25, 6.27, 6.28, 6.31, 6.32, 6.35, 6.37, 6.38, 6.43, 6.44, 6.45, 6.46
GD - Green Deal Project	—	—	—	—	6.2, 6.3, 6.5, 6.8, 6.9, 6.11, 6.12, 6.14, 6.15, 6.16, 6.17, 6.30, 6.36, 6.46, 6.59, 6.60, 6.61, 6.63
GD - Communication	—	—	—	—	6.2, 6.3, 6.4
GD - GD Participant - Interview 6	—	—	—	—	6.7, 6.10, 6.13, 6.18, 6.39
GD - P1 - Regulatory Barriers/ Formal Standardisation	—	—	—	—	6.4, 6.5, 6.11, 6.18, 6.53
GD - P2 - Regulatory Capture	—	—	—	—	6.48, 6.49, 6.51, 6.53, 6.54, 6.56
GD - P3 - Cultural Capture	—	—	—	—	—
GD - P4 - Corporate Capture	—	—	—	—	6.50, 6.55, 6.57, 6.58
GD - Future of DC	—	—	—	—	6.6, 6.10, 6.13, 6.19, 6.20, 6.21, 6.24, 6.31, 6.34, 6.40, 6.41, 6.42, 6.43, 6.44, 6.47
GD - Important Quotes	—	—	—	—	6.10, 6.13

4. Interview Guideline

Collaboration	Regulatory Barriers	Market	Lobbying	Outlook

Innovation Deal collaboration

In the beginning I would like to ask you about your participation in the project in general.

III. How many people of your organisation worked on the Innovation Deal?

Level 1 - Flow of ideas, resources, and persons

IV. How many times have you been in contact with other participants of the ID?

Level 1 - Flow of ideas, resources, and persons

V. How have you been in contact with the other participants?

A. Personal meetings, telephone calls/conferences, etc.?

Level 1 - Flow of ideas, resources, and persons

VI. What is your role as an organisation in the Innovation Deal?

Level 1 - Responsibility of participants

VII. Could you briefly state what you have been working on in the Innovation Deal so far?

Level 1 - Current state of the project

A. Only on regulatory barriers on the EU level that prevent the shift from ‘converting waste water treatment plants’ into ‘water and resource recovery facilities’ or also on other issues/barriers?

Identified regulatory barriers

Now I would like to draw the attention to the core of the project.

I. What kind of regulatory barriers did you identify in the Innovation Deal so far?

   A. In EU legislation or member states implementing measures or other?

   B. Concerning which phase: Innovation development, market entry, diffusion, or other?

Level 2 - P1 - Identification of perceived regulatory barriers

II. Which of these barriers would you classify as deterring and which as revealed barriers?
(revealed barrier: increases a firm's perception of that particular barrier but does not deter the firm [e.g., formal standards])
(deterring barrier: describes a barrier which discourages a firm from engaging in the innovation process)

Level 3 - P1 - Identification of perceived regulatory barriers

   A. In this context the tearing down of which barrier would have the biggest impact? (If not answered, which impact?)

Level 2 - P1/P4 - Solutions suggested

III. Did you discuss establishing new regulations as well or solely identifying existing regulatory barriers?

Level 3 - P1 - Solutions suggested

IV. How intense did you discuss standardisation?

Level 3 - P1 - Solutions suggested

Market assessment

In order to draw conclusions on the impact of the reduction of these regulatory barriers on this innovation I would like you to describe the market conditions.

I. How would you describe the market for waste water reuse: As monopoly, oligopoly or polypoly?

Level 2 - P1 - Market description

Supply side

TECHNOLOGICAL DEVELOPMENT

II. Would you describe the technology landscape as homogeneous or heterogeneous? (Competing technologies?)

Level 3 - P1 - Technology description

III. How do you expect the market/technology to develop in the future?

Level 2 - P1 - Technology/Market description

COMPETITION

IV. How would you describe the market structure for waste water reuse on the supply side?

A. How many suppliers are there for waste water treatment? (Public/ private?)

B. Which are the largest companies in the industry?

C. Who is the dominant market player?

Level 2 - P1 - Market description

Demand side

CONSUMER NEEDS

V. Who are the customers for reused water? (Public/private?)

Level 2 - P1 - Market description

VI. How would you describe the consumers purchasing patterns? (Instantly and continuously or rather periodically?)

   A. Do you think these patterns are steady or about to change?

Level 2 - P1 - Market description

Lobbying

Now, for the second part of the interview I would like to address the topic of lobbying practices. If you don't want to answer one of the questions please tell me and we continue with the next question.

Regulatory Capture, Cultural Capture

I. What was your interest in participating in the Innovation Deal?

Level 1 - P2 - Motive

II. How do you assess the contributions of the other participants? Would you say there was a participant that lobbied in their own interest/a particular company interest/home country interest rather than working for the common good?

Level 2 - P2/P3/P4 - Judgement of other participants

III. Would your organisation benefit from the usage of anaerobic membrane technology in waste water treatment?

Level 1 - P2/P4 - Motive

IV. Which companies/organisations would benefit most from the usage of anaerobic membrane technology in waste water treatment?

Level 2 - P2/P4 - Motive

V. Which companies/organisations of your country would benefit most from the usage of anaerobic membrane technology in waste water treatment?

Level 2 - P3 - Motive

VI. Which country would benefit most from the usage of anaerobic membrane technology in waste water treatment? (In which way?)

Level 2 - P3 - Motive

VII. Would your country benefit from the usage of anaerobic membrane technology in waste water treatment? (In which way?)

Level 2 - P2/P3/P4 - Motive

Corporate Capture

VIII. The abolishment of which regulatory barriers would benefit the common good the most?

Level 2 - P4 - Motive

IX. The abolishment of which regulatory barriers would benefit companies/ organisations in the industry the most?

Level 2 - P4 - Motive

A. Would this just described abolishment in regulatory barriers reduce the benefit for the common good?

Level 2 - P4 - Motive

Outlook

Finally, I would like to finish with your judgement of the Innovation Deal.

I. How would you assess the quality of this cross-sector collaboration?

Level 5 - Assessment of cross-sector collaboration

II. How was the information flow among participants? Was information shared openly at all times?

Level 2 - P2/P3/P4 - Assessment of cross-sector collaboration

III. Would you say there is a missing stakeholder in the project who could have add valuable information?

Level 2 - P2/P3/P4 - Assessment of cross-sector collaboration

IV. How would you judge the success of the Innovation Deal so far?

Level 2 - P2/P3/P4 - Assessment of cross-sector collaboration

A. What would need to be done to improve the ID during the rest of the project?

Level 5 - Assessment of cross-sector collaboration

In this interview we talked about the Innovation Deal in general, interests involved in it as well as your specific role in the project and about the market for waster water usage in combination with the anaerobic membrane technology.

Against this background, is there a topic we neglected or anything else you would like to contribute in addition?

Thank you very much for your participation in the study.

5. Interviews

1. Interview 1

Interview participant: Innovation Deal participant - Innovator - 3 persons

Conducted: 29.08.2017 via Skype **Length:** 64 minutes

1.1. ***Interviewer:*** *As I informed you I want to make a study about the impact of regulation on innovation and also about how the Innovation Deal is used as a lobbying tool. The questionnaire contains five areas that I would like to cover. If you agree I would like to start and audio-record the conversation.*

Respondent A: Sure.

1.2. ***Interviewer:*** *In the beginning I would like to ask about your participation in the project. How many people of your organisation worked on the Innovation Deal?*

Respondent A: Well, we are participating in the Innovation Deal as the SMART Plant consortium. SMART Plant is an innovation action of Horizon 2020 that we are coordinating. In this SMART Plant we are 27 partners with 20 companies and 7 universities. So, in my university we are kind of coordinating the SMART Plant and then giving this feedback to the coordinator of the Innovation Deal. So, in my university we are 3 but we have interacted with the partners of the SMART Plant. So, I would say we are at least 10 people working on the Innovation Deal from the SMART Plant consortium, because we interviewed one per partner.

1.3. ***Interviewer:*** *So, it is basically a project within a project?*

Respondent A: Exactly.

1.4. ***Interviewer:*** *So, you are working on the technical solution solely and then you communicate it to the other participants of the Innovation Deal? Is that correct?*

Respondent A: No. Actually, within the Innovation Deal we signed on behalf

of the SMART Plant consortium. SMART Plant is, well, an innovation action with 27 partners. So, through SMART Plant we are collecting information, not only from Italy, but also from the countries that are involved in SMART Plant, e.g., Germany, Israel, UK, Greece, and so on. So, we are not collecting only technical information but also regulatory, because as SMART Plant is an innovation action, we have large industries. So, we are collecting information from all the consortium related to what we are asked from the coordinator or from the Commission. So, I would say 3 people from the coordination side but we interacted with at least 10 people from the SMART Plant consortium.

1.5. ***Interviewer:*** *In order to understand the difference between the SMART Plant project to the Innovation Deal with the anaerobic membrane technology. Where is the difference between these two projects? On the SMART Plant you also work on this technology, right?*

Respondent A: No, well, we work on anaerobic, yes, but we work on resource recovery in general. So not only water reuse but also biopolymer recovery, phosphorus recovery, whatever can be recovered from water resource recovery facilities. Thanks to this experience on circular economy we are collecting information and we are focusing within the Innovation Deal only on water reuse, but SMART Plant is on resource recovery and the value chain as well.

1.6. ***Interviewer:*** *How many times have you been in contact with the other participants of the Innovation Deal?*

Respondent A: Only with the coordinator, with the other participants we will have the first call in September.

1.7. ***Interviewer:*** *How have you been in contact with her?*

Respondent A: Twice per month via Phone, Mail, Skype, and even by the European Commission platform.

1.8. ***Interviewer:*** *Could you state what you have been working on so far?*

Respondent A: According to the work plan, in the first phase, the coordinator of the ID and one of my colleagues (Respondent 3) were interviewing all the SMART Plant participants from the different countries to collect the local

regulations of water reuse, because this is the real barrier. Water reuse is applied in Europe not according to Nation, but then to regional and local regulation that very often is a real barrier for the application. So, we are collecting the local regulation about the water use standard and we were making quiet complex tables in order to understand the regulation, the quality standard, and also the governance rules that are at the moment in place in different countries.

1.9. ***Interviewer:*** *So it is rather at the national than on the European level?*

Respondent A: Well, we were collecting national but also local/regional. To give you an example, in Italy we have the national legislation that is, of course, applying the European directive, but then we have the regional regulation that can be more stringent than the national one. So, this is the real barrier. There are many barriers with national that are almost easy, but thereafter is regional which is the real one that is then applied in practice.

Respondent B: Plus region by region is different.

Respondent A: For example, Italy is quiet a long country, Southern Italy is really different from Northern Italy. The more there is water scarcity the more the possibility to apply water reuse is easy.

1.10. ***Interviewer:*** *So it is more strict in the North?*

Respondent A: Yes (No is correct). What we also noticed in Italy and in Greece we are very stringent in limit on microbiological parameters. We didn't expect that because in regions where we have higher water stress we have very low limits about Eco-life, e.g., pathogens and so on. That is a bit strange. We expected less stringent regulation for water scarce countries but this is not the case. What we think is that it is because in these countries it is where you actually apply water reuse, because in Northern Europe you don't need water reuse. So in countries that actually apply water reuse the limits are lower because they actually apply water reuse and want to be save on the application.

1.11. ***Interviewer:*** *Is there then also a difference for what you use the water, e.g., for farmers?*

Respondent A: Look, the final use are all very similar around Europe. First of all, irrigation (farmers), second can be industry. Non potable use, by the way, direct potable is forbidden all around Europe, formally. So, irrigation, industry, gardening, everything what is non potable.

1.12. Interviewer: *So, there is the same set of rules for it?*

Respondent A: More or less the same. This is a very particular issue. We have only one standard for all kind of reuses. In other countries each use has its own quality standard.

1.13. Interviewer: *How is it on the European level?*

Respondent A: At the European level there is actually no European quality standard. This is exactly what we need to overcome. This is the real challenge. At the European level there is no quality standard. Even the methodology to control is completely different from country to country. At the European level is just the directive that the water reuse must be improved, etc. But then each member state has to apply these principles in local scenario.

1.14. Interviewer: *What kind of regulatory barriers did you identify so far?*

Respondent A: In terms of quality standard at the local level, we are quite clear. What is more grey is the economic side, which is tariff that could be applied to payback the investment, e.g., for tertiary treatment, which is the governance model between the water utility that has the duty to operate up to the treatment plant and the water reclamation association. There is no governance model that is linking these two actors of the water use chain in the right way. Also another, on the regulatory side we found very stringent limits that are applied to microbiological parameters, e.g., in Italy and Greece we have a very low limit per millilitre, so in order to reach these very low limits you have to apply very energy intensive and chemical intensive disinfection steps. This is one of the parameters. Also what we have in Italy we have a lot of parameters on non conventional pollutants but these limits are not the real barrier because the concentration we have in reused waste water is not that high. The real limit what is restraining the water reuse is the microbiological parameters.

1.15. Interviewer: *What would you suggest?*

Respondent A: First of all, a quality standard at the European level. Then we would have less protest against the possible unsafe quality of water reuse. It is the perception of the end users what is the problem. The technology is there and it is reasonable. In case you have the right economic model between the water utility and the water user you can cover the cost of that treatment. But if we don't have European quality standard and a European guideline on the governance model, water treatment has no incentive, no reason, only sustainability reason and that is not valid.

1.16. Interviewer: *How would you classify the barriers you detected so far, as revealed and deterring barriers? [Briefly explained the concepts]*

Respondent A: I would not say there is a deterring barrier, because the technologies are already spread in the market. The point is they are energy intensive and they are not payed back from the governance and regulatory model. E.g. now in the Innovation Deal we are collecting information on the water finance for water reuse. We found that in some countries in some cases they are using 25% of the water tariff as possible payback of the father investment that you need to make for water use. But each case is finding its own solution. So we have the producer, the end user and they sit on a table and find a solution, private consent. The limits are not the barrier, the barrier really is the limit of economics.

1.17. Interviewer: *So, you are saying that there is not a regulatory barrier, it is just about to get the economics right so that it pays off, correct?*

Respondent A: Yes, the regulatory barrier is not the main one. What we miss is a European regulatory framework. That can be a kind of revealed barrier. If we have a European regulatory framework more clear the member states just have to apply these European guidelines. At the moment it is not clear what are the quality standards.

1.18. Interviewer: *In this context, did you already talk with the coordinator of the ID about what could be a standard on the European level or any new regulations?*

Respondent A: We will have a call in September. Actually, we had a nice

discussion with the coordinator of the ID about the limits on adamants compounds and non conventional pollutants. Because, e.g., in Italy we have a long list of heavy metals, hydrocarbons, non conventional pollutants, that are listed in water use table. This is not the same in Spain or other countries. The coordinator of the ID was interested in understanding how this is stringent and how this is a barrier. What we mentioned is actually it is not a barrier because we have this table but the concentration is higher than what we have in standard. And then we were discussing about the extra local regulation. There the situation is very complicated because when you are going into the local regulation then the problems start.

1.19. Interviewer: *In order for me to understand why would you say that there is a higher standard in some areas than in others? Because actually everybody should be interest to have the same clean reused water, right?*

Respondent A: Yes, but as I mentioned in the end water reuse cases are applied on private agreement between the water utility and end user. In the end they find the agreement on the standard. If the end user is the industry and they say they want to have water quality with XY quality, it is lower than the national standard and this can be much lower. Because in the end it is the end user who is setting the limit by the discussion and negotiation with the water utility.

1.20. Interviewer: *How would you describe the market for water reuse?*

Respondent A: I would say oligopoly because we have water utilities that are mainly public owned, but then the end users can be associations of farmers. That is the case quiet often. Can be industries, can be gulf courses. So, I would say oligopoly in that sense. Because from one side we are monopoly of water utility, also water cycle is a monopoly in Italy. You have a concession of 22 territories, so it is a kind of monopoly.

1.21. Interviewer: *And they are publicly owned?*

Respondent A: According to the referendum, we must have more than 50% public ownership of water utilities. So, in the major part of Italy we are 100% public owned, but we have also water utility that are participating in the ownership of private companies like Suez, but less than 50, the major part must be public.

1.22. Interviewer: *If we look at the technology in particular. The anaerobic membrane improved in recent years and that is why it is now being discussed to clear the micro pollutants out of the water, right?*

Respondent A: Actually, in Italy we are one of the first countries to apply large membrane bioreactors because the planting pressure was the largest in the world for many years. Basically, this technology was a kind of fashion about 10, 15 years ago. Now, more and more it is understood that there is no need to apply membrane for water reuse. Even sun filter, tertiary filter, NUV or another disinfection is enough. So, cheaper and less energy intensive technologies are fine. In terms of technology, we use membrane only when we don't have enough footprint area. This is the main reason because in many areas in Italy land is very expensive but in other cases you can apply water reuse by tertiary filtration and disinfection. So it is not technology of choice. Of course, when you want to apply reuse membrane is suggested. Anyway it must be evaluated in terms of cost-benefit analysis.
On the other hand, the anaerobic membrane technology is not analysed at all, because it is in the demonstration scale right now. This is a kind of breakthrough technology for water reuse and fertigation. So, be careful. If we talk about membrane we are not talking about anaerobic membrane - this is what we have in the Innovation Deal. It is about aerobic membrane. Anaerobic is a kind of a possible technology that can improve very much the fertigation - usually a different form of irrigation.

1.23. Interviewer: *And what is exactly you are dealing with in the Innovation Deal?*

Respondent A: In the Innovation Deal we are dealing with water reuse for fertigation, maybe. Because when you have anaerobic you have the water with nutrients, there is nitrogen and phosphorus inside - so you can go to fertigation. Fertigation is when you have water and enough quantity of nutrients for agriculture. This is different from irrigation. In the Innovation Deal we are dealing with water usage in general. We started from aerobic membrane technology but as a matter of fact we are working on water reuse. The last part of the project what will be last year will be on anaerobic membrane technology.

1.24. Interviewer: *In the JDI of the ID it is written that the project is about identifying the 'regulatory barriers on the EU level that prevent the shift from converting waste water treatment plants into water and resource recovery*

facilities'. So, it is not only about that, it is about the water reuse in Europe in general in the end?

Respondent A: Well, it is more complicated than this. Why? Because first of all, we have analysed a general barrier on water reuse, what we were discussing so far. The second point is how we can transform the waster water treatment plant into water and resource recovery facility by converting aerobic to an anaerobic. So, if you want to achieve water reuse and energy recovery or materials recovery anaerobic can be the solution. But the point is in the beginning we still have problems with the simple water reuse. With this we are also supporting the efforts of the European Commission to set a European quality standard for water reuse.

1.25. Interviewer: *How do you expect the market or technology to develop in the future?*

Respondent A: Well, we are quiet confident. Why? Because anaerobic systems are wide spread, e.g., in South America, in temperate and hot climate. This technology was not applied in Europe, or rather cold climate, because there was a kind of wrong perception that the process was not stable or reliable for our conditions. But now, e.g., in UK they are building five demonstration full scale plants to demonstrate that anaerobic system is reliable even in UK. We are quiet optimistic that in the next 5 to 10 years we will see quiet an increase on other big systems in municipal waste water treatment plants. Because we can observe a change of mindsets not only in the Horizon programme but also from water utilities are implementing in full scale.

1.26. Interviewer: *How would you classify the competition on the supply side? (Public/private?)*

Respondent A: Here you need to be careful as well. The public ownership is mainly for the water utility, for the wast water treatment plant. But then once the water is treated up to the quality standard for reuse this can be given to private companies. The manager of a reclamation plant can be a private company. That can also be a private association of farmers. I would say this is it in the majority of the cases. In many cases we have public private agreement, public from the treatment side, and private from the user side. And the point is, from the public there is much more interest in the

sustainability and the social side but from the private side it is only business. This is why we have so many single agreements of the water reuse. Because it is a different perception. Who is supporting the reclamation plant? The ones that have a benefit from it, that have good business from the use of water. The treatment plant has no income.

1.27. Interviewer: *So, would you say it is actually a certain market with a stable public/private supply side and constant demand on the other?*

Respondent A: Well, I would say that it is very chaotic situation. For instance, there is a large water utility in Italy. They want to apply water reuse in North Italy and they are making the benchmark just on their own on the European Italian case. There is no guideline on how to move and they are just analysing other cases how they have moved to understand if that fits their own case. Because according to national regulation you have to give your water treated for free. This is the national regulation. You are not allowed to have any income from giving treated water. But, of course, this is not feasible or sustainable. So there are internal agreements, from one side setting the time horizon of 10, 20 years and from the other side setting a possible increase of tariff up to 25%. Now, this is what we are dealing with in the Innovation Deal. The second phase is exactly about the business model. That is a disaster but not only in Italy, it is all over Europe that we don't have a clear framework on how to move.

Respondent B: The authority has not a clear rule in this agreement. There are no specific guidelines of the different environmental or regional authorities.

Respondent A: The point is that the EPA (Environmental Protection Agency) or the Health Protection Agency is not clear who has to control the contamination of the water. If you are concerning the environment it is clear the EPA has to make the analysis twice per month, once a week according to the size of the plant.

Respondent B: When you are out of the waste water treatment plant there is a single agreement in each situation.

Respondent A: As you can imagine the institutional analysis is crucial in this case. This is another barrier probably. If I am a water utility then you have to start a process to reuse my water, from one side it is not a numerate business

because there is no income. From the other side it is a very long procedure because I have to meet so many authorities and authorisation bodies, the procedure can take ages. So, before I start I need to be very sure that I want water reuse because I need it in my area.

1.28. Interviewer: *So, the market is structured chaotically but in general it is a certain market in the sense of there is a secure demand and secure supply?*

Respondent A: Exactly. There is a market need for sure, especially, in Southern Italy, e.g., in Puglia (the South part of Italy). It is a water scarce area but also a highly relevant area for agriculture and tourism. They are taking fresh water from groundwater that is 300 metres deep. In this case it is very expensive pumping this water and it could be very cost effective to reuse water. But, it is very difficult to find an agreement with the end user, because the end user they want the water for free. This is the point. It is certainly a matter of internal agreement between the end user, very often the end user is an association of different industries, of farmers or farmers and industry. So, first of all, the association has to find an agreement between the members, then, the association has to find an agreement with the water utility. In fact, what we were discussing in the Innovation Deal and we will study at a later stage in the project is a holding model that can include even the water utility. This can be the solution. A holding that can include the water utility and the end user, because only a holding ownership of the value chain you can overcome this barrier. A holding or a single company that can manage the water from the suer until the end use, until the farming.

1.29. Interviewer: *To come back to the competition, who would you say is the largest private company in the industry?*

Respondent A: As water utility, as end user or as technology supplier?

1.30. Interviewer: *Technology provider and water utility.*

Respondent A: As technology provider in terms of membrane most probably it is, well, as multinational, GE (General Electric, Boston, USA) is one of the main. But they are only supplying the membrane, the filter. Others would be Koch membranes (KOCH Membrane Systems GmbH, Aachen, Germany) or Kubota (Kubota Corporation, Tokyo, Japan) these are all membrane suppliers. In terms of anaerobic membrane technology, actually, the development is

very low. We don't have an industry that is selling this technology at large scale. But in terms of anaerobic we sure can mention the Paques (Paques bv, El Balk, Netherlands), Paques is a supplier of anaerobic technology. We can mention Suez (Suez Environment S.A., Paris, France), Veolia (Veolia Environnement S.A., PAris, France). They all have their own anaerobic systems. The couple of anaerobic and membrane is still not consolidated as a product to sell.

1.31. Interviewer: *Is there a quality difference between these suppliers? With which one do you work?*

Respondent A: At the moment the most interesting demonstration plants are working with hollow fibre membrane the KOCH or the GE. These seem to be the best solution but there are no full scale anaerobic membrane plants we cannot say this is the best solution. Because the number of full scale plants is not enough to make an evaluation of the economy of scale. The scale up will be crucial.

1.32. Interviewer: *So, it is still not sure which membrane from which company and with which characteristics will be the best to use in the end?*

Respondent A: Yes, what we think is that once this technology will be more and more widespread […] it was exactly the same case for the aerobic membrane bioreactors. We have 5 to 10 suppliers, then they were modifying their products and in the end 2 or 3 were the major companies.

1.33. Interviewer: *Of these companies who would you say is the dominant market player?*

Respondent A: From the membrane side it is probably GE or Kubota.

1.34. Interviewer: *From the utility side who is there the largest company?*

Respondent A: In our personal opinion the largest water utilities. There is no economic benefit for water reuse at the moment. The larger the more they are interest in sustainability to show that they are doing the best for sustainability. When the utility is small they don't have the economy to think about sustainability. I would say large utilities are the best player in this case, but that is my personal opinion. Because the main driver is the sustainability

asset of the company, and the visibility of the company, especially to their own shareholders that are public. So they want to show to their municipalities, that are the owners/shareholders, that they are doing the best for the common goal, water.

1.35. Interviewer: *And on the demand side who would you say are the dominant players?*

Respondent A: First of all farmers and industry is second. Gulf courses is a special case, e.g., in the south of Portugal in Algarve 10% of water at the moment is used for gulf courses. So gulf courses or public gardening is a major issue.

1.36. Interviewer: *With the anaerobic technology would it even be possible to make it drinking water?*

Respondent A: Well, anaerobic is the best if you want to make fertigation - if you want to link water treatment and agriculture. Because with anaerobic technology you are keeping in the water nitrogen and phosphorus the two key elements for agriculture. So this is the best solution for the nexus water agriculture. It is also the best solution for the water energy nexus because you are also recovering energy. For drinking water no, because you need to remove phosphorus, micro pollutants, etc. [Asked for details] Actually, anaerobic systems were studied a lot and there are quiet a lot of evidence that in anaerobic conditions there is not a lot of increase of the removal of micro pollutants. So, anaerobic is the solution for the energy balance not the solution for micro pollutants.

1.37. Interviewer: *How would you describe the consumer patterns of reused water and do you think these patterns will change?*

Respondent A: For sure, it is periodic but on average we experience more and more water scarcity. So, the good of water use we would have a constant supply of water that can have enough content of, e.g., nitrogen and phosphorus so we can have possibly for agriculture a good source of water that can be used all over the year. That is useable for crop production, etc. Of course, seasonality is crucial but if we could link this with agriculture the added value of water reuse would be really high.

1.38. Interviewer: *Now we are turning to the final section about lobbying. What was your interest in participating in the Innovation Deal?*

Respondent A: Actually, as the SMART Plant coordinator we are working on circular economy in the water sector. And we are very much interested in the value chain. As a background we are water engineers but our large innovation actions includes technology provider, end user, and the value chain is the real barrier to bring our solution to the market. So in SMART Plant we are scaling up our technology, so we are demonstrating that our technologies are reliable and ready for market uptake. We see also there are a lot of barriers concerning customer perception, regulatory barriers, that we cannot address in the innovation action. The Innovation Deal is the right instrument to address these barriers.

1.39. Interviewer: *Who took the initiative to apply for this Innovation Deal?*

Respondent A: As SMART Plant we were leading another proposal that didn't pass because in parallel there is an ongoing discussion on the quality standard of recovery materials. So we knew about the Innovation Deal because we also applied. Our proposal was rejected because you cannot have an Innovation Deal that is running in parallel with an in progress work for the Commission. So, we knew the coordinator of this ID already, she was supporting our Innovation Deal because it was also in her interest and we were supporting her Innovation Deal. […] It was a common interest and we think the Innovation Deal is complementing the Horizon 2020 innovation action on circular economy. Because when you are making the projects you don't have always a constructive discussion with the Commission because they are basically monitoring what you are delivering. In the case of Innovation Deal there is no funding, but it is a constructive discussion because we have a common target to achieve.

1.40. Interviewer: *Exactly, because it is non-funded and it is a lot of work for you that is why I was wondering what is the interest.*

Respondent A: The interest is to see the full scale possible realisation and wide spread realisation, expectations and commercialisation of our solutions. From a researcher side it is, of course, a matter of sustainability. We want to see our research results applied in reality.

1.41. Interviewer: *Ok, you mentioned you only had contact with the coordinator so far. Anyway, how would you assess the work of the other participants as far you can judge it? Would you say there was a participant that lobbied in their own interest/a particular company interest/home country interest rather than working for the common good?*

Respondent A: Until now we cannot say anything because we only will have the first sum up call in September. So we don't know at the moment.

1.42. Interviewer: *Would your organisation benefit from the usage of anaerobic membrane technology in waste water treatment?*

Respondent A: Yes, I think we cannot only benefit as a SMART Plant consortium because in SMART Plant a major part is to work on waste water treatment and we will be able to design and to optimise an anaerobic system. For sure, as a consultant or as a technology provider we can benefit from the anaerobic membrane bioreactor technology because we are an expert of this process, of these systems.

1.43. Interviewer: *From your point of view, with your expertise and market knowledge, which companies/organisations would benefit most from the usage of anaerobic membrane technology in waste water treatment? The technology provider or even public authorities?*

Respondent A: I think the nexus water and agriculture can have benefit. The way to find the governance of sharing the benefits from the energy recovery to can have anaerobic system and water reuse. It is not able to find a model where the farmers and water utility can have benefit of the efficiency and the added value that you can have from this technology both water utility and the farmers can benefit. From the side of the technology providers they are anyway selling their plants, they are anyway selling membranes in aerobic systems, they are anyway selling anaerobic systems in South America. For industries I don't think it is a big deal for them but the big deal is really for the society, but this is again personal opinion. Another point that is really important we are teaching and training our engineers to novel solutions, more sustainable solutions. But then when they are in the market if there is no space for these sustainable solutions, there is no added value for them to study these innovations because they don't need it to work in a conventional

treatment plant. So from the academic side we want to boost innovation in the water sector because this is also a market for our students. This is very important, this motivates us a lot.

1.44. ***Interviewer:*** *So would you say, that the universities in Italy would benefit the most in your country from the uptake of the technology?*

Respondent A: This (what he just described) is generally valid for innovation. In this case, concerning anaerobic, of course our student would be one of few with this preparation. All research centres that are working in this field have this. From our side we can attract other students when we are specialising in these innovative solutions.

1.45. ***Interviewer:*** *Which country would benefit most from the usage of anaerobic membrane technology in waste water treatment?*

Respondent A: Spain for sure, because of water scarcity. I would say all the water scarcity Mediterranean Europe, Spain, Southern Italy, South Greece, Cyprus. But it is a kind of strange because the first full scale anaerobic systems are under construction in UK, so for sure in the basin but also other countries.

1.46. ***Interviewer:*** *The abolishment of which regulatory barriers would benefit the common good the most?*

Respondent A: It is the regulatory chaos that is real barrier. There is no clear regulatory framework. In order to increase some regulations some directive you have to make more clear framework, more clear minimum standard.

1.47. ***Interviewer:*** *Would you say it is possible if you work on the standard or regulation to benefit some companies?*

Respondent A: Yes, if you apply anaerobic membrane technology out of hundreds of companies that are active in providing technologies only 10 are able to make anaerobic membrane bioreactors. But the market will adapt very fast. This was the same for aerobic membrane. In 10 years I would say 90% of the technology providers will be able to design and construct anaerobic membrane bioreactors. For sure, membrane supply will have benefits. And anaerobic technology is quiet simple, I mean it is not something that is

patented. Well, there are many patents around anaerobic systems, different components of the anaerobic reactor so it is nothing only one company can construct. For sure, in the first years few companies will have a benefit but in the coming years not a problem.

1.48. ***Interviewer:*** *If the just described would happen it would at the same time also benefit the common good by cleaner water, right?*

Respondent A: Yes, cleaner water and energy efficiency in waste water, better carbon footprint and the possibility of fertigation. From the environmental point of view the benefits are very high, even from the cost point of view. The point is why we were not applying these technology because the water sector is quiet reluctant to apply innovation. It is quiet a poor sector, e.g., you are not allowed to make profits, you have to reinvest all your profit. So, in the water sector there is not that interesting innovation.

1.49. ***Interviewer:*** *In general, how would you assess the quality of this cross-sector collaboration?*

Respondent A: We signed the agreement in April and worked really hard, finished the first stage. We will have the first call now in September, so a bit too early to talk about it.

1.50. ***Interviewer:*** *Is there a written document for the end of the first phase?*

Respondent A: Yes, tables mostly. A collection of information about the local regulations and we will have a first overall call at the end of this first phase, then there will be a report.

1.51. ***Interviewer:*** *Would you say information was shared openly at all times?*

Respondent A: So far, we just have been in contact with the coordinator or the contact at the European Commission, mostly with the coordinator and everything was fine. But we were also just sharing local information, not sharing sensitive information. In the third stage when we will talk about technology maybe there will be some problem, because all of us have some know how that we don’t want to share, but we will see.

1.52. Interviewer: *If you think ahead, is it your technology/insights that you then would share or from other companies?*

Respondent A: I think that within the consortium the most advanced know-how comes from the coordinator of the ID.

1.53. Interviewer: *But you just mentioned that you have information that is crucial. Would you share that?*

Respondent A: We are working on the anaerobic, but on the anaerobic membrane bioreactors there is membrane technology inside, anaerobic technology, biological technology. There are many, many points that you can investigate. The coordinator of the ID has scaled up this full many years ago now, so she has also the practical engineering experience and know-how, more than the others. So, from our side we can have more insights in some specific cases. So, for us there is no problem in sharing. We didn't patent anything about anaerobic membrane bioreactors. We rather have patents on other technologies. So from our side there is no problem.

1.54. Interviewer: *Would you say there is a missing stakeholder in the ID that could add valuable information?*

Respondent A: Well, we don't have a membrane supplier in the consortium. But the coordinator of the ID is also coordinating the European innovation partnership action group on the membrane bioreactor technology, so she is also in contact with membrane supplier. In the consortium we have innovation provider but they are not selling technologies. Are assembling and optimising technologies, so what we are missing is a real technology provider. There is an engineering company but they are not selling membrane. The coordinator of the ID and we as SMART Plant are in contact with technology provider.

1.55. Interviewer: *Anything else, you would suggest to improve the ID?*

Respondent A: We just started and need to see what is the feedback from the Commission. Until now we were just collecting information. That was very useful also for us.

1.56. Interviewer: *Would you say, you would have benefited from interacting with the other participants?*

Respondent A: In think this will happen in the coming months.

28.08.2017

Informed consent

Research study: Innovation Deals for a Circular Economy
Researcher's name: Daniel Natrup
Researcher's status: Final year student MSc. Innovation Management & Entrepreneurship, Technical University of Berlin/University of Twente
Researcher's contact details: d.natrup@student.utwente.nl
+49 170 845 00 37

Dear Sir or Madame,

Hereby you are invited to participate in a research study designed to explore the impact of regulation on innovation as well as to examine lobbying practices in the Innovation Deal.

At the outset I would like to introduce myself once again. My name is Daniel Natrup and I am a postgraduate student of the double degree master programme Innovation Management & Entrepreneurship and Business Administration of Technical University of Berlin and University of Twente. As already described in my request my master thesis is about the project of the European Commission 'Innovation Deals for a Circular Economy'.

More precisely I aim at making three contributions with this research: Firstly, to the fierce discussion about the interplay of regulation and innovation in innovation management and public administration literature by investigating the identified regulatory barriers in this project; Secondly, to the public administration literature in terms of EU lobbying by examining the lobbying activities within the Innovation Deal; And, finally, the results shall assist the European Commission in order to interpret and use the insights of the Innovation Deal properly.

The interview is divided into three sections. In the beginning I am going to ask you about the Innovation Deal process and your role in it. Afterwards we will cover your assessment of the market and the core of the project regulatory barriers. Then I'll draw the attention to various interests in and the anticipated outcome of the Innovation Deal.

Furthermore, I would like to point out that this interview is not about the theoretical discussion of regulation and innovation nor lobbying rather it is about your personal insights into the process of and collaboration in the Innovation Deal. With this in mind some questions, e.g., about the market structure or about the technology itself may seem obvious, however, your personal answer to it is vital for my research.

If you would like to participate in this research please read this form and sign it at the bottom. Participation in this study will include an interview, which will take approximately 30 minutes. The interview method will be semi-structured and it will be conducted via Skype. All information will remain confidential and your identity will remain anonymous.

The interview will be audio-recorded and the information gathered will be transcribed by the researcher. Only the scholar will have access to the transcripts, and all of them will be coded.

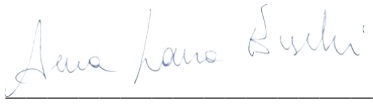
Thank you for your participation,

Daniel Natrup

Please read the following statements and if you understand them, and if you wish to participate in this study, please indicate your agreement to take part by ticking the boxes and signing below:

- ☐ I have read and I understand the description of the study.
- ☐ I willingly consent to participate in the study.
- ☐ I understand that I may withdraw from the research at any time without consequence.
- ☐ I understand that the interview will be audio-recorded and the researcher will take notes.
- ☐ I understand that my identity will remain anonymous and my contribution will be confidential.

I. Participant

Signature: 

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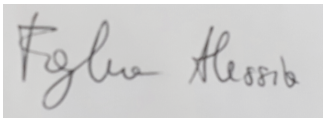
II. Participant

Signature: 

Name in block capitals: _____

III. Participant

Signature: 

Name in block capitals: _____

Researcher

Signature: _____

Name in block capitals: Daniel Natrup_____

2. Interview 2

Research participant: Innovation Deal participant - University - 1 person

Conducted: 04.09.2017 via Skype **Length:** 52 minutes

2.1. ***Interviewer:*** *(Introducing myself, the master thesis and the outline of the interview) If you agree I would like to start and audio-record the conversation.*

Respondent D: Yes.

2.2. ***Interviewer:*** *How many people of your organisation worked on the Innovation Deal?*

Respondent D: We are a team of three, but I have been in contact with the other participants mostly, so far.

2.3. ***Interviewer:*** *How many times have you been in contact with other participants of the ID?*

Respondent D: During the preparation quiet frequently, maybe once every two weeks on average. After that we had an intense period for the preparation for the JDI during January and February, mostly through Skype and E-Mail.

2.4. ***Interviewer:*** *And with whom of the other participants?*

Respondent D: I contacted mostly the coordinator of the ID and the other stakeholder from Portugal. With this one we get together occasionally for this and other subjects but it has been easier just via email or telephone.

2.5. ***Interviewer:*** *What is your role as an organisation in the Innovation Deal?*

Respondent D: We have good knowledge about the methodology, because we also work with membranes and anaerobic digestion and waste water treatment. So we have good knowledge of the technology, although it's mostly Valencia who have more experimental data regarding this particular application. But having this background makes it easier to understand what is the outcome of the treatment process and then we link it up with the other

Portuguese stakeholder, who has a deeper knowledge about the regulation itself and what has been done in terms of water reuse in the real industry. So we try to link it up.

2.6. ***Interviewer:*** *Did you only work on the regulatory barriers that prevent the shift from 'converting waste water treatment plants' into 'water and resource recovery facilities' or also on other issues/barriers?*

Respondent D: Yeah, we covered basically any regulation that deals with water in Portugal, because there are actually not that so many. We have the implementation of the water law, the conversion of the European Decree Law into our own regulation, which is pretty much a reflection of the European water framework. We have that but then there is a whole set of other laws that somehow regulate quality of water for recreational uses or for watering, irrigation application or even industry applications. We pretty much covered all the regulations concerning water in Portugal.

2.7. ***Interviewer:*** *Is there a regional or local difference?*

Respondent D: No, not in Portugal, I mean there are some specificities about these charges in sensitives areas like anywhere else but we don't have specific regulations for Algarve versus the North. It is pretty much a whole regulation.

2.8. ***Interviewer:*** *Is the South more effected from water scarcity than the North?*

Respondent D: Yes, I wouldn't say we have water scarcity at all in the centre or North of Portugal. We mostly have water scarcity South of Tejo.

2.9. ***Interviewer:*** *What kind of regulatory barriers did you identify so far?*

Respondent D: That is a part that we need to discuss still. We did analyse the barriers, but I am also not sure what we can call a barrier. There are standards to be met before the water can be applied, but they make sense. We can't just use charge untreated water directly and use it for irrigation purposes. Even if, the idea as I understand it from the ID is, that the irrigation would be a continuation of the treatment process so we would transfer part of the responsibility of finalising the treatment to the agriculture sector, but still there are standards to be met and that is one of the barriers that I am not sure

how that can be overcome. Other barriers I find are most an issue of cost. Who is responsible to pay for the premises? If it is part of the process is the farmer going to receive part of the money? How far do we want to propose this as a Consortium to the European Union? This is what we need to discuss.

2.10. Interviewer: *So, the cost issue is a major concern. How is it solved so far in Portugal?*

Respondent D: There is no water reuse in that sense. The regulation is very clear that if there is any water reuse, the cost of the reuse process, pumping, piping, the treatment itself, cannot increase the prices of the water for the consumer.

2.11. Interviewer: *So, the government pays for it?*

Respondent D: Or it is a budget on itself, it is a process, it is commissioned to a company and then they make a business model on their own. To give you an example, if we intend to use reused water for water in the gardens which are public and that is a public system and the governments responsibility, but that cannot be used as an excuse to increase the water fairs for the consumer. That is what is in the legislation so far. I think that is the only point where they mention anything regarding the costs.

2.12. Interviewer: *If the public cannot put it on the consumer, who is going to pay for it?*

Respondent D: I don't know if there is a solution so far or if it is just vague.

2.13. Interviewer: *And so far just the government took over the costs?*

Respondent D: Yes, so far, I think the only pilots that we have for water reuse were for applications, e.g., gulf courses in the Algarve, and some parks and gardens in small urban areas. So far, I think it was public and payed by taxes.

2.14. Interviewer: *Which of theses identified „barriers" would you describe as revealed and which as deterring barriers? (Briefly explained the two concepts)*

Respondent D: I think it is mostly raising perception that a particular barrier

does not deter the firm. I don't think we have barriers that are really detrimental for the process to be implemented.

2.15. Interviewer: *Also not for the technology? (In what sense?) E.g., concerning the material of the membrane or any chemicals used in the process.*

Respondent D: This process is pretty environmental friendly. There are no chemicals involved, it is purely biological and then a physical barrier. The only issues for health are really regarding the quality of the water discharge at the end, but that is related to the waste water origin of the water not with the process.

2.16. Interviewer: *And this then can be improved through a better membrane?*

Respondent D: And the anaerobic process itself stabilises a bit the water. So there is less pathogens after anaerobic treatment than before. So yes, the membrane is auto-filtration so it should retain all the bacteria basically unless there is perforation and there is always leaks but the system itself is pretty safe.

2.17. Interviewer: *Did you also discuss establishing new regulations or anything like this?*

Respondent D: No, not yet.

2.18. Interviewer: *Did you discuss standardisation in anyway yet?*

Respondent D: No, we haven't yet but I see some potential there. But this is quiet innovative, well, the technology itself is maybe not such a breakthrough but it hasn't really been implemented as a standard and it is not standard at all to reuse water not in Europe at least. In other countries water reuse has been established for longer time, like Singapore, they haven't been using this technology as a whole, like the integration of the anaerobic digestion and the membrane but they do use a train of membranes of auto-filtration that is effective and has proven a really good quality product.

2.19. Interviewer: *I heard the anaerobic is already used in South America?*

Respondent D: Yes, they do. Even more as a basic sanitation process in

remote areas, because it is very autonomous. Basically, you can do a whole waste water treatment with an anaerobic MBR not just as a polishing step as it is proposed here but as a compact system. And in some remote areas in South Africa there has been big test on that, which worked well.

2.20. Interviewer: *So the technology itself is not that novel?*

Respondent D: No, for the purpose of water reuse as a tertiary product, like a final polishing step, perhaps but even then I don't think that Valencia is claiming any preparatory rights on it. I don't think so maybe they do have a patent but I am not aware of it.

2.21. Interviewer: *Is it a different membrane or technology?*

Respondent D: I don't think the type of membrane is defined as such. In an anaerobic MBR you just have predefined the pore size which in this case is auto-filtration or micro-filtration. So I don't think there is something too specific defined. I mean the ID itself is broad and left open.

2.22. Interviewer: *How would you describe the market for water reuse?*

Respondent D: I would guess oligopoly. I don't think there is a single company that will take over and I also don't think there will a big boom of small companies doing this. Why? I think we are going very gradual on the issue of water reuse because it is only going to be popular when it is a serious need. And it is going to be a serious need in maybe 10, 20, or at least 30 years. In 2050 they predict not only that we are going to be 10 billion people on the planet but also that water resource are going to be vastly contaminated. So it is going to be an issue very soon but still until we really fell it, it is not going to boom. Also because it is clearly associated to the public domain it is the government's responsibility to provide us with clean water. So, until we really feel the need I don't see everyone to press the government enough to purchase a number of individual water reuse systems.

2.23. Interviewer: *You have water treatments plants in Portugal and they are publicly owned?*

Respondent D: The urban water treatment is all publicly owned either by the water board which is Àguas de Portugal or some kind of sub-system of that

or the municipalities. Then there is waste water treatment processes in industries, which are privately owned, but that is a very specific kind of waste water. So, industries or industry consortia like industry parks, have their own waste water treatment plant, which treats their own industrial waste water, and that is privately owned.

2.24. Interviewer: *How would you describe the technology about the membrane and the anaerobic bioreactors, rather homogeneous or heterogeneous?*

Respondent D: It is heterogeneous as I mentioned you the case of Singapore. They don't have another anaerobic digestion process associated with and just do […], I mean, they might, because it is always a train of treatments that you put the final membrane sequence to polish. But yes, there are alternatives to anaerobic MBRs.

2.25. Interviewer: *Would you assess the anaerobic membrane technology superior to the alternatives?*

Respondent D: It might be less costly. (And the water quality?) Probably a little worse, but just if you compare these two processes directly. But let me go back. The objective here in the ID is to treat only up to a certain point because later you are going to transfer that effort to irrigation which will benefit from nutrients that are left untreated. You don't actually want to treat everything. You just don't want to leave any pathogens, any toxic compounds, that should be degraded and that is what the biological process is for to remove most of the carbon. But if the nutrients, nitrogen and phosphorus, pass that is beneficial for the downstream use of this particular application. (It is all just non potable use?) Yes, mostly, for irrigation, industry application but from this ID it is mostly for fertigation - fertilisation with irrigation combined.

2.26. Interviewer: *This water, with nitrogen and phosphorus, then would you also use for gulf courses and public gardening?*

Respondent D: You could, it is safe enough for that.

2.27. Interviewer: *How would you describe the market structure for waste water reuse? Some is public, some private …*

Respondent D: Maybe leave it as public, the target waste water we are talking about here is mostly urban municipal waste water domestic usage and that is all public.

2.28. Interviewer: *Which are the largest companies?*

Respondent D: Àguas de Portugal and the municipalities own some of the treatment processes individually as well.

2.29. Interviewer: *From the membrane point of view who is the dominant market player?*

Respondent D: I don't know. There is a number of good companies, e.g., the Japanese Kubota, also German companies or in the Netherlands or Belgium. I don't know what is the dominant company in the membrane area right now. As the process for water reuse, there you have the big global companies, e.g., Veolia, Suez, they have processes that are marketed already targeting reuse at public system level, watering gardens and gulf courses, but also for industrial processes, that needs some treatment before being applied in the whole process and saving money for the companies. So there is a market for that specific use already. For irrigation there are some products already marketed in that sense which are not competitive to this technology because they don't use anaerobic MBRs, they use other types of combinations of processes but it all ends up with a membrane, but the previous system doesn't necessarily have to be biological. And then you have the big companies.

2.30. Interviewer: *So, they don't work with a bioreactor they have other methods?*

Respondent D: I don't know. I cannot guarantee for sure, that there is not already a product that involves anaerobic digestion and a membrane filter but the ones I am aware of are mostly combining a physical chemical process and a membrane filter. But I am not aware of the whole market.

2.31. Interviewer: *So, these other processes of Veolia and Suez could also be considered in the Innovation Deal or are you in the ID focused solely on the anaerobic membrane technology?*

Respondent D: I think this ID is very specific for this technology. In fact, that

was something that surprised me when I got the invitation to participate because it is so specific, but it is maybe something the coordinators felt very comfortable with. They actually haven't been working on many alternative processes for water reuse. But they have been working on this for quiet a long time, so maybe it is just they know a lot about this technology and they wanted to focus on this technology.

2.32. Interviewer: *As an expert, you would not say you know why this specific process was chosen?*

Respondent D: I didn't discuss this, it just caught my attention that it was so specific. It is a good process and I know historically why they chose it because they know about it. And also in the call for the ID they wanted to have something very specific, they wanted to have one technology so they had to narrow it down and why not use the one we know. So, it makes sense to me but at first I was a little surprised because it is not the only process possible.

2.33. Interviewer: *On the demand side, who are the customers for reused water?*

Respondent D: I think it is the public application, like gulf courses, gardens, fire extinguishing and eventually industrial parks, that might require a lot of water for their industries. In the long term if you treat it well enough the public user (…) but I think the main application, and I am leaving it for the end, is irrigation regarding the high content nitrogen and phosphorus. So far its parks, gulf courses, but also agriculture.

2.34. Interviewer: *In that sense, how would you describe the purchasing patterns?*

Respondent D: There is quiet a big seasonality, e.g., in the summer for all of this purposes, and also in terms of agriculture, there are crops that work only part of the year.

2.35. Interviewer: *Do you think these patterns will change or increase?*

Respondent D: I think it will increase.

2.36. Interviewer: *What was your interest in participating in the Innovation Deal?*

Respondent D: Well, it is always exciting to anticipate the real application of your research. I had done some research on MBRs and on anaerobic digestion separately, so seeing them both combined and applied for a real purpose that touches us Portuguese as a country very particularly is fascinating. I think it is a good move of the European Commission to promote more the transfer of circular economy technologies to the real market and make it also a means to, in the first place, to apply the technology, but also to generate an industry and to generate jobs.

2.37. Interviewer: *Why I am asking is the project is non funded but you have to put work on it, spend time on it (…)*

Respondent D: True, but sometimes it is interesting to devote some of your time to think a little beyond you current projects and a bit more future oriented. And, of course, being part of the consortium as a researcher and as a research unit here we also benefit getting more interactions and thoughts for future proposals that then will bring money. So there is also a little institutional interest.

2.38. Interviewer: *How did you come to the Innovation Deal? You got invited you said?*

Respondent D: Yes, I know the coordinator of the ID for many years. We know each other from our research institutions and each others work very well, too, because it is very close in terms of topics.

2.39. Interviewer: *So far, as you can judge it. How do you assess the contributions of the other participants? Would you say there was a participant that lobbied in their own interest/a particular company interest/home country interest rather than working for the common good?*

Respondent D: I am not aware of any of that. If there was, I really didn't see.

2.40. Interviewer: *Would your organisation benefit from the usage of anaerobic membrane technology in waste water treatment?*

Respondent D: No, we don't have any companies, spin-offs that deal with that kind of markets.

2.41. Interviewer: *Also not you as a consultant because of your expertise?*

Respondent D: No, but that is an interesting idea.

2.42. Interviewer: *Which companies/organisations would benefit most from the usage of anaerobic membrane technology in waste water treatment?*

Respondent D: I guess companies that deal with waste water treatment and water reuse processes in the level of Veolia and Suez but probably smaller. I am not sure I have a clear idea of names in my head because it is really novel and not sold yet as this technology.

2.43. Interviewer: *There comes another question in my mind. At the moment water is treated already and this is basically just another process. So, would you think this new process would have profit benefits for those companies?*

Respondent D: Well, the membranes are the most expensive part of the process but the prices are dropping. To upgrade a waste water treatment plant to have that final polishing step would require some investment. So maybe the membrane companies would be benefit from the implementation of this technology. Also just the companies that deal with the construction of waste water treatment plants because there is some structural adaptation that has to be done.

2.44. Interviewer: *Which companies/organisations of your country would benefit most from the usage of anaerobic membrane technology in waste water treatment?*

Respondent D: I really don't know. We don't have any membrane company as far as I know. They all come from somewhere else, but some companies deal with them. The thing with this construction of waste water treatment plants in Portugal many times they are outsourced to international companies so I am not sure there are many Portuguese companies that would directly benefit from the implementation of it.

2.45. Interviewer: *Which country would benefit most from the usage of anaerobic membrane technology in waste water treatment?*

Respondent D: I think Spain would benefit a lot, also Greece, which is not a

partner, maybe Malta. In Spain I know a bit more of the reality. They do have irrigation problems, they do need to deviate water streams to irrigate their fields and have made a number of interventions in that sense, transferring water from one river to another, etc. And they also have associations of farmers specifically for the irrigation topic to deal with all the problems of farming, so I think it is a special issue. So, I think that is a big issue especially in the South, South-East of Spain, that is why I think they will probably benefit the most.

2.46. Interviewer: *Would your country benefit from the usage of anaerobic membrane technology in waste water treatment?*

Respondent D: In Portugal we have definitely water scarcity in the South. A few years ago there was a big damn being build inland to increase the water availability in the South-East of Portugal, which I think has solved part of the drought problems that we had in the summer. But if we could additionally have this water source I think it would be beneficial. It is an agricultural area so they need water.

2.47. Interviewer: *The abolishment of which regulatory barriers would benefit the common good the most?*

Respondent D: We still need to analyse how much of a barrier these regulations are. But easing some of the regulations require that you apply for a special permission, e.g., to apply water for fertigation, etc. So, knowing how bureaucracy goes in general with a lot of steps, etc., this is a barrier that we would like to see overcome.

2.48. Interviewer: *With this facilitation of regulations would it be possible to benefit a specific company/organisation?*

Respondent D: I don't think so. I think there are two basic players in the implementation of this technology. One is the company that designs and builds the process small or big (Veolia, Suez), anaerobic MBR and implements it in a waste water treatment plant. And the other one is the end user, the farmer if we are going to talk about the application for fertigation. I don't know if the farmer would pay for the water or would receive some because he is part of the treatment process. Who will benefit more heavily depends on the business model that will be implemented.

2.49. ***Interviewer:*** *So, you would actually leave out the membrane supplier?*

Respondent D: No, but it is just one more institution in the process chain, but they are going to be benefit if this would suddenly boom in the market.

2.50. ***Interviewer:*** *Would you say that even if you would benefit a certain company it would not harm the common good?*

Respondent D: I would say so. Even if there would be a monopoly in the end the application still would be beneficial.

2.51. ***Interviewer:*** *As we talked there is one question that I would like to come back to. Do you think it is a certain market in the sense of constant supply, constant demand,the technology is quite sophisticated besides the different processes and not much room for innovation?*

Respondent D: Depends what you want to treat. It depends on your waste water. There is always novel approaches to the same process. You can use it in a different way. Even in an anaerobic MBR you can use different conditions for the operation of the biological part to treat specifically compounds that are harder to degrade. For instance, you might have to increase the temperature or the time of residence of the water in the process, operations issues and the membrane requires maintenance as well, there are fouling problems.

2.52. ***Interviewer:*** *And in the sense of irrigation what the ID is about, would you say there it is a secure market? In particular to the technology?*

Respondent D: I don't know because it depends on what your applications are and the source of your waste water. If, for instance, it is municipal waste water that receives solely water from domestic use it is standard but if you have industrial waste waters being collected in combination with the domestic you might have pollutants that are a bit tricky and that are even illegal, like heavy metals in general are banned and other compounds that haven't really been completely banned and make the final product less safe. So, at the end you have to analyse the application to make sure it is all under control. For general use, yes, I think it is a secure market.

2.53. Interviewer: *If you have very polluted waste water the specific membranes are so sophisticated that in the end there will be just nitrogen and phosphorus left or also others?*

Respondent D: No, there could be also other compounds leaking, yes. More than the membrane itself it is the anaerobic process that will deal with those compounds as long as they are biodegradable. That is why I mentioned the heavy metals, because they are not biodegradable, if there is a lot of them and the levels are above the discharge limits then you would have to consider another step of filtration or electro-chemical process to remove those heavy metals, but this would be a particular case of waste water that is heavily contaminated with those pollutants. The standard usage would not have such high levels. These charge levels exist for any affluent already in waste water treatment plant so already the plants have to deal with it. The difference here is you want to have a final product that still doesn't have all that and leaves some levels of nitrogen and phosphorus that then will be used for fertigation.

2.54. Interviewer: *Where does the waste water for reuse mostly comes from?*

Respondent D: Domestic waste water treatment plants that don't have normally very high levels of industrial waste water.

2.55. Interviewer: *How would you assess the quality of this cross-sector collaboration?*

Respondent D: Well, we haven't met so much yet. In the Portuguese case it worked wonderful. It is a great collaboration.

2.56. Interviewer: *How was the information flow among participants? Was information shared openly at all times?*

Respondent D: Yes, everything was shared. We did the surveys individually per country but everything was shared and put on the website.

2.57. Interviewer: *Would you say there is a missing stakeholder in the project who could have add valuable information?*

Respondent D: I haven't identified one yet.

2.58. Interviewer: *How would you judge the success of the Innovation Deal so far and what would be needed to improve the project?*

Respondent D: Well, there is no funding for travelling, even for the signature of the ID, or for meetings, which then need to be via Skype, this is limiting.

Interview 2 - Informed Consent

28.08.2017

Informed consent

Research study: Innovation Deals for a Circular Economy
Researcher's name: Daniel Natrup
Researcher's status: Final year student MSc. Innovation Management & Entrepreneurship, Technical University of Berlin/University of Twente
Researcher's contact details: d.natrup@student.utwente.nl
+49 170 845 00 37

Dear Sir or Madame,

Hereby you are invited to participate in a research study designed to explore the impact of regulation on innovation as well as to examine lobbying practices in the Innovation Deal.

At the outset I would like to introduce myself once again. My name is Daniel Natrup and I am a postgraduate student of the double degree master programme Innovation Management & Entrepreneurship and Business Administration of Technical University of Berlin and University of Twente. As already described in my request my master thesis is about the project of the European Commission 'Innovation Deals for a Circular Economy'.

More precisely I aim at making three contributions with this research: Firstly, to the fierce discussion about the interplay of regulation and innovation in innovation management and public administration literature by investigating the identified regulatory barriers in this project; Secondly, to the public administration literature in terms of EU lobbying by examining the lobbying activities within the Innovation Deal; And, finally, the results shall assist the European Commission in order to interpret and use the insights of the Innovation Deal properly.

The interview is divided into three sections. In the beginning I am going to ask you about the Innovation Deal process and your role in it. Afterwards we will cover your assessment of the market and the core of the project regulatory barriers. Then I'll draw the attention to various interests in and the anticipated outcome of the Innovation Deal.

Furthermore, I would like to point out that this interview is not about the theoretical discussion of regulation and innovation nor lobbying rather it is about your personal insights into the process of and collaboration in the Innovation Deal. With this in mind some questions, e.g., about the market structure or about the technology itself may seem obvious, however, your personal answer to it is vital for my research.

If you would like to participate in this research please read this form and sign it at the bottom. Participation in this study will include an interview, which will take approximately 30 minutes. The interview method will be semi-structured and it will be conducted via Skype. All information will remain confidential and your identity will remain anonymous.

1 of 2

28.08.2017

The interview will be audio-recorded and the information gathered will be transcribed by the researcher. Only the scholar will have access to the transcripts, and all of them will be coded.

Thank you for your participation,

Daniel Natrup

Please read the following statements and if you understand them, and if you wish to participate in this study, please indicate your agreement to take part by ticking the boxes and signing below:

- [x] I have read and I understand the description of the study.
- [x] I willingly consent to participate in the study.
- [x] I understand that I may withdraw from the research at any time without consequence.
- [x] I understand that the interview will be audio-recorded and the researcher will take notes.
- [x] I understand that my identity will remain anonymous and my contribution will be confidential.

I. Participant

Signature: _____

Name in block capitals: GILDA CARVALHO

II. Participant

Signature: _____

Name in block capitals: _____

III. Participant

Signature: _____

Name in block capitals: _____

Researcher

Signature: _____

Name in block capitals: Daniel Natrup

3. Interview 3

Research participant: Innovation Deal participant - University - 1 person

Conducted: 18.09.2017 via Skype **Length:** 75 minutes

3.1. ***Interviewer:*** *(Introducing myself, the master thesis and the outline of the interview) If you agree I would like to start and audio-record the conversation.*

Respondent E: Yes.

3.2. ***Interviewer:*** *How many people of your organisation worked on the Innovation Deal?*

Respondent E: Right now, we are two people working on it.

3.3. ***Interviewer:*** *How many times have you been in contact with other participants of the ID?*

Respondent E: Almost every week we are sending emails. Some weeks more, some weeks less but almost all weeks we are in contact. It depends on what we are doing, with the partners from Valencia every week, with the rest of the partners once every two weeks. I have to say that the communication between the partners is very fluently. The partners from Portugal, from France and also from Italy that are people that are very well known here.

3.4. ***Interviewer:*** *How have you been in contact with the other partners?*

Respondent E: Mainly by e-mail but sometimes we use Skype as well.

3.5. ***Interviewer:*** *There are many stakeholders in Valencia. Did you also meet in person?*

Respondent E: Well, we try to meet before the regular meetings to coordinate ourselves of the Spanish partners. The relationships of the universities and national authorities are also very fluent. There are often phone calls for a lot of things and then the Innovation Deal is also a topic.

3.6. ***Interviewer:*** *What is your role as an organisation in the Innovation Deal?*

Respondent E: As university it has to do with the development of the anaerobic membrane technology, which is one of the research lines of this research group. Mostly, we have to do with the development and promotion of the technology and circular economy principles. But this university also participates in the coordination, because UPV and Universitat de Valencia has a strong relationship. The professors of both universities in that field work together for more than 25 years and they are together in this project.

3.7. ***Interviewer:*** *What did you mean when you talked about the technology? Is it more the process in total or more the anaerobic part or membrane filtration?*

Respondent E: I would say the whole process. The engineering process but also all the technologies besides the process, membranes, reactors, blowers, and also the control system.

3.8. ***Interviewer:*** *Could you briefly state what you have been working on in the Innovation Deal so far?*

Respondent E: I personally have been in support for the two professors to coordinate and to gather information. Our function is to keep all the partners connected, to make all the partners know what we are doing, and what information do we need from them, to collect these information, to summarise, to organise this information and send it back to check if everything is correct. As institution the university together with the partners tried to detect the bottlenecks of these barriers and we try to link technology with regulation. We know what the technology makes and we try to find why the regulation, establishing a bottleneck for the uptake of the technology.

3.9. ***Interviewer:*** *Only on regulatory barriers on the EU level that prevent the shift from 'converting waste water treatment plants' into 'water and resource recovery facilities' or also on other issues/barriers?*

Respondent E: Both of them, we are interested in shifting this paradigm of water treatment, because it has solved the pollution problem with the water but also other problems, such as energy consumption or resource consumption. The resources that are included in the water are gone, you clean the water but you loose a lot of resources. If you change the

technology, not only anaerobic membrane and MBR is a possible technology. If it is the best I don't know but it is a possible technology. We want to change in this way because we think it is better to change it. But if we find several bottlenecks beyond this shift we will address these.

3.10. Interviewer: *Could you elaborate on the impact of the technology on energy consumption?*

Respondent E: This technology permits valorise the organic matter in this content in the water. So the anaerobic process converts the organic matter into methane, so you can use it as a fuel. (Biomass?) Exactly, you can burn it and make electricity or heat. (Would that be a lot?) Well, it contributes to energy sustainability, because it is renewable. It is another source. It was not present before and now you can take advantage of it.

3.11. Interviewer: *What kind of regulatory barriers did you identify in the Innovation Deal so far?*

Respondent E: What we have found so far, and I have to say it is a very preliminary conclusion, the European directives for waste water treatment established that you have to accomplish with quality of the water before you can use it. It means that you have to remove nutrients before reusing it, e.g., if you are surrounding a sensitive area. This means that the concept we are pushing forward is agricultural use is also a treatment because it also removes nutrients cannot be applied in this sense. But what we want is that the final discharge has to be done after the agricultural usage. But directives seems to establish once the water comes out for the plant it is a discharge. So you have to accomplish with the regulation at this point, not after the water reuse. So you have to remove nutrients before you use it but the agricultural has to add nutrients then because have to grow the crops. That makes no sense and goes against the circular economy principle.

3.12. Interviewer: *I thought that is what the anaerobic membrane technology is all about. So that nitrogen and phosphorus stay inside.*

Respondent E: Exactly, so the anaerobic MBR goes well with the circular economy principle because it keeps the nutrients inside and you can also valorise the organic matter but the directive establish that it doesn't matter.

You have to remove nutrients before discharge. This is one of the bottlenecks that we have found.

3.13. Interviewer: *This is on the European level. The EU says the water needs to be clean and then you can add whatever you need.*

Respondent E: Yes, it has to do with the discharge concept. This is how we understand it right now, the interpretation of the directive is that discharge is once it comes out of the plant. It doesn't matter what happens after that. So you have to comply with the regulation at this point. What we are trying to explain or to change is that discharge should be after the reuse because also the agricultural use also removes nutrients. It could be understood as part of the treatment. And this has some consequences, also in water pricing and everything. E.g., if farmers contribute to cleaner water maybe they don't need to pay for that water as they are doing now because they are contributing to this treatment.

3.14. Interviewer: *Did you also identify other barriers?*

Respondent E: Others would be water pricing.

3.15. Interviewer: *So far, there is no price for the treated water, the government pays for it, right?*

Respondent E: What we have found up to now is that all the member states they have the transportation of the water frame directive, which establish that there has to be a cost recovery principle has been translated to their national regulation and the way the countries are dealing with it is not clear or not harmonised. For each case they develop a business plan and depending on that business plan the water has a price. Malta has just approved a new regulation that established that they have prices for cubic metres and also based on surface. Each country has to deal with these transposition in the way they desire.

3.16. Interviewer: *The goal is to level it for every country in Europe?*

Respondent E: Well, the directive does not establish how the member state should recover the cost, so each country approves their normative in the way they have interpreted the directive. We don't know about the goal.

3.17. ***Interviewer:*** *Which of these barriers would you classify as deterring and which as revealed barriers?*

Respondent E: Well, the technology works. Maybe it is just that this situation of the normative does not give security for using this technology for this moment. The technology to be sustainable it needs to work together with agriculture. That is important. If those things can happen together the technology and anaerobic membrane reactors become competitive or more competitive than the conventional treatment. But if you need to remove the nutrients then the business case is not so clear.

3.18. ***Interviewer:*** *Would you say that if the EU would allow to let nitrogen and phosphorus to stay in the water directly, then the market for anaerobic MBR would be a lot bigger?*

Respondent E: A lot bigger, or clear. It is not only that you can reuse the nutrients it is also about that the products need to be safe. From the technological point of view, the technology works. The problem now is to make the market secure for the products of water with nutrients. The energy point is more or less clear. You can use methane to produce energy and heat. That is not the problem but reuse of water is not so easy.

3.19. ***Interviewer:*** *Would you say that allowing this treatment is the actual barrier that needs to be overcome?*

Respondent E: The interpretation of the discharge in the EC directive should change or reinterpreted in order to guarantee that the reuse of that water coming from anaerobic MBR can be used without any problem. This would be a key point.

3.20. ***Interviewer:*** *Did you discuss establishing new regulations as well or solely identifying existing regulatory barriers?*

Respondent E: That is not allowed, we in the ID cannot change anything, but we discussed it.

3.21. ***Interviewer:*** *How could that look like? E.g., establishing a standard?*

Respondent E: Establishing a standard could also be a good idea. Standards

in all the countries are very different. What we have seen in the national regulation is that not only the parameters had to be checked but also the frequency of monitoring and some other disposals that are regulated differently in each country. I think the more we standardise the easier for all of us to know how to deal with all these things. E.g., if my products are checked twice a week here in Spain but in France has to be checked four times a week we do not comply with French regulations, so have problems with the common market. I think standardising is a good idea.

3.22. Interviewer: *How would you describe the market for waste water reuse: As monopoly, oligopoly?*

Respondent E: That is not easy for me. I really don't know how exactly the market for water reuse works here in Spain because I have never been in contact with farmers. In this point I cannot help you.

3.23. Interviewer: *Would you describe the technology landscape as homogeneous or heterogeneous? (Competing technologies?)*

Respondent E: Alternatives to anaerobic MBR, there are some of them. There are not a lot of technologies to treat water, activated sludge is the most common - physiological process together with some physical chemical processes - but only few of them. I don't see there too many.

3.24. Interviewer: *And especially for Fertigation?*

Respondent E: You can use conventional technology to produce water for reuse and you only don't have to remove the nutrients but you don't take advantage of the organic matter that is present in the water.

3.25. Interviewer: *Is the main advantage to keep nitrogen and phosphorus inside?*

Respondent E: Yes, you keep it inside. You valorise the organic matter and also the membrane allows you to produce an influent with a good quality in terms of microbiological point of view. It has no bacteria, also some viruses are removed, in this sense it is clean. In the conventional treatment you have a settler that don't remove these microbiological pollutants, you need to add tertiary treatment which consists of, e.g., ultraviolet radiation, filtration,

chlorination in order to guarantee the microbiological quality of the water. If you want to reuse it, e.g., for growing crops.

3.26. Interviewer: *What would you say are the strongest benefits of using anaerobic MBRs?*

Respondent E: You produce energy or at least spend less energy to clean the water than in the conventional one. You prevent not only the energy consumption regarding the nutrients removal in the conventional system but also the energy consumption and all the environmental impacts related to fertiliser production because you already have the fertilisers. And also the anaerobic process produces less sludge. The waste you produce in the conventional treatment (sludge) is huge in comparison to anaerobic sludge, which is small. If you combine all of them anaerobic MBR treatments have a lot of advantages compared to the conventional one but they have these little disadvantages, e.g., temperature. If you need to remove nutrients economically it is not so beneficial. The benefits are not so big.

3.27. Interviewer: *As you mentioned the disadvantages. What would you say are the disadvantages of anaerobic MBRs?*

Respondent E: Disadvantages are you don't remove nutrients but if you can make use of them it is an advantage. The other one is that the growing speed of the anaerobic bacteria is smaller than the aerobic bacteria so to keep the bacteria inside the reactor you need much more time or much more temperature. So if you are in a country with low temperature you need much more time to make the anaerobic bacteria grow. So the process is not so fast. The solution for that disadvantage is the membrane. Because the water comes out of the membrane but the bacteria remains in the system. In this sense the membrane makes the disadvantages of the temperature not so problematic. So the growing of the bacteria and the nutrients but you have technology to prevent these disadvantages.

3.28. Interviewer: *So the same plant in the South of Spain is cheaper to run than in Scotland?*

Respondent E: Well, it is easier to run it in the South of Spain or at least it is cheaper, but it should also run in Scotland. But you have to keep in mind, e.g., temperature issues. Now there is a plant running in the centre of Spain

which in Winter has around 0°c temperature. You always have to keep in mind to operate it and taking into account this.

3.29. Interviewer: *How do you expect the market/technology to develop in the future? Would you say the anaerobic MBR is the best solution for fertigation?*

Respondent E: What we hear is that the time for the conventional treatment is ending. Not because it does not work, it works, it makes water clean. But its sustainability is not the best one. We have to change it and look for new technologies that make sustainability not only environmental but also economically. The anaerobic MBR is one solution, it is not the only one, there are some of them. Or some technologies but most of them are dealing with anaerobic processes.

3.30. Interviewer: *Could you name these other solutions?*

Respondent E: You can use directly anaerobic MBR to treat the whole water . But all the movement that is in this water sector they are trying to improve the sustainability of the current plants, because now the sustainability has become a problem.

3.31. Interviewer: *Would you say in terms of the circular economy the anaerobic MBR is the most sustainable solution?*

Respondent E: Together with fertigation, yes. I cannot say if it is the best one but it is a very good one.

3.32. Interviewer: *How would you describe the market structure for waste water reuse on the supply side?*

Respondent E: Water management is mostly public, but in Spain and a lot of countries waste water treatment plants are operated by the private sector. The public sector makes a contract for a few years. They offer the plant and the industrial or private sector make an offer to operate the plant for a quantity of money each year. This is their business, they clean the water and they discharge it. Then the water reuse sector I don't know very well. I know this private sector discharges the water into a river or sometimes into a channel that can be used for fertigation. But I don't really know how it works.

3.33. ***Interviewer:*** *Do you know which is the largest company?*

Respondent E: Here in Spain it is Aqualia. Another one could be Veolia (French), it is the MNC. Another one Suez, also French I think. There are also big ones in United Kingdom such as Scottish Water or Severn Trent.

3.34. ***Interviewer:*** *Who would you say is the dominant market player?*

Respondent E: From the technology market it is not easy because the technology takes parts from different suppliers. Blowers and pumps from Siemens but membranes, e.g., Koch or BASF and reactors I am not sure but there are a few ones because it depends on which part of the plant you want to build.

3.35. ***Interviewer:*** *But companies like Veolia they offer the whole process, right?*

Respondent E: Yes, that is right. I think they have some patents as well. They have a license model, they build the plant and put it where ever you want it. But I think they also use parts of other suppliers but I am not sure.

3.36. ***Interviewer:*** *But the plant they deliver is completely in tact as they deliver it with all parts of all suppliers?*

Respondent E: Yes, they build it all together and then give it to you.

3.37. ***Interviewer:*** *Who are the customers for reused water? For what is it needed the most?*

Respondent E: Here in Spain it is irrigation, at least in the Valencia region with 95% of the reused water is used for irrigation. (Public gardening or industry?) Well, it is also used for cleaning streets and also for irrigation gardens but the most is for irrigation.

3.38. ***Interviewer:*** *Even in the South when there are droughts it is mainly about farming?*

Respondent E: Yes, in the South and the West of Spain you'll find the most population and there is also a lot of farming businesses, all the fruits and

vegetables that goes to the North it grows mostly in the Mediterranean cost, which is also the region with the most drought problems in Spain.

3.39. Interviewer: *How would you describe the consumers purchasing patterns? Do you think they are about to change or even to increase?*

Respondent E: I think it has to increase, because there is no other solution with climate change and so on.

3.40. Interviewer: *What was your interest as an organisation to participate in the Innovation Deal?*

Respondent E: Our interest is to push forward the change of the technology in the waste water treatment systems. We want the anaerobic MBR to be used because we believe in this technology and it could help with some problems that we have. We have also an action under the EIP water and our contact in the secretary told us about this new Innovation Deal initiative. The EC encouraged us to present a proposal. We read the call and decided to go ahead.

3.41. Interviewer: *What is the EIP water?*

Respondent E: It is the European Innovation Partnership on water. It is another initiative where the EC also participates and it has some levels. At the bottom level there are the action groups that work together on a topic. In our case we have an anaerobic MBR action group. Then we report to another level, the task group. Then there is another level, the steering group, and this group informs or reports to the EC.

3.42. Interviewer: *How do you assess the contributions of the other participants? Would you say there was a participant that lobbied in their own interest/a particular company interest/home country interest rather than working for the common good?*

Respondent E: Well, I was surprised because this initiative has no budget and people are working here for free and I have found that most of them are very motivated. So, I think given that all work in the same topic they are working together quiet well, they are not trying to take advantage for the country or institution. At this point I don't see it. I think they are all very

concerned about the water reuse and they want to make it possible as soon as possible.

3.43. Interviewer: *But it is correct that you around the University of Valencia are the experts of this technology […]?*

Respondent E: Yes, both of them and also the INRA, the French institute, and also the European institute of membranes are also technological partners. Both groups, UPV and University of Valencia, have been working on anaerobic MBRs for a long time so they are experts in this.

3.44. Interviewer: *Would you say that they as experts would benefit from the uptake of the technology?*

Respondent E: They will benefit from this uptake but given that we are not a company benefits are not economically, more metaphysical. We were right. (Reputation-wise?]) Yes, that is right. We really want to make it possible and to see if we were right.

3.45. Interviewer: *Would your organisation benefit from the usage of anaerobic membrane technology in waste water treatment?*

Respondent E: Well, we do not produce the technology itself, don't sell any component. What we can do is engineering consultancy. How the waste water treatment based on this technology should be build, should be implemented. (But a bit of money would be involved?) Yes, true.

3.46. Interviewer: *If you think about the technology, which companies do you think would benefit the most from the usage of it?*

Respondent E: Well, the membrane producers and the plant operators […] (Plant operators are not companies like Veolia, they are plant builders, right?) Veolia could be a plant operator. They produce also technology but if they run the plant, they are also operators because in the way that the process is economically sustainable is better for the company that operates the plant. (Here you talk also about the PPP?) Well, yes, also the public sector if they don't have to pay so much for this.

3.47. ***Interviewer:*** *Which companies/organisations of your country would benefit most from the usage of anaerobic membrane technology in waste water treatment?*

Respondent E: Aqualia, e.g., is a plant operator, and they could benefit from the technology. ACS is a construction […] The companies in Spain that are now working with savages, they were the old construction companies, they had to rearrange their business case because of the crisis. They are now giving assistance to the public sector in waste water treatment or waste treatment. All of this companies like ACS could also benefit from this technology.

3.48. ***Interviewer:*** *Where do you think is the most profit? Would it be the operator in the end, or the membrane suppliers, but I also heard the prices are dropping […]*

Respondent E: Yes, the prices are dropping. This is also an advantage of the technology. 10 years ago the prices have been very high and now it became […] (Do you know why they are dropping?) I think because of improvement of production processes. Now they know how to do it and they don't need to spend so much money anymore on building it as the technology matures.

3.49. ***Interviewer:*** *Which country would benefit most from the usage of anaerobic membrane technology in waste water treatment? (In which way?)*

Respondent E: The technology works also in cold weathers but is easier to run a plant with this technology in South Europe, in countries with warm weather. It is not only Europe, America, Africa, Asia. Doesn't matter, you only need warm weather to make it possible, but here in Europe, of course, South Europe, Italy, South France, Spain, Greece, Cyprus.

3.50. ***Interviewer:*** *Would your country benefit from the usage of anaerobic membrane technology in waste water treatment? (In which way?)*

Respondent E: We would have another source of water. In case we could use the nutrients, we wouldn't need to import, so our independence of the fertiliser producers will improve.

3.51. Interviewer: *The abolishment of which regulatory barriers would benefit the common good the most? If you think about reusing water, the abolishment of which barrier would have the biggest impact for this technology?*

Respondent E: If we could change where we have to decide the concept of discharge, I think it could change the whole framework. If discharge is after the plant . This could change everything. (And that only by rewriting the directive, right?) The problem is we cannot rewrite anything. The innovation should come from the reinterpretation of that and we are now looking if this is possible or not. If not the conclusion of the Innovation Deal could be we have to rewrite the directive. I don't know but this could be a key point for that. Because if you allow ferti …

3.52. Interviewer: *Could this just described change benefit a certain company?*

Respondent E: Well, in the way that we can reuse water it could open new markets. Not only for water but also for guaranteeing the quality of the water or for new companies that could together with the farmers to make it safe. Crops sometimes need more nutrients, sometimes only nutrients and more water if some consultancy together with farmers for reusing water could open new business plans.

3.53. Interviewer: *Is there a way, that these regulatory changes, even if they would benefit a certain company, would they reduce the common good?*

Respondent E: Of course, treating water can make profit for a company. This is clear, but in the way that we are not making new pressure to clean water sources that we need to drink we are also making benefit for that. Maybe there is no economical benefit but we can use water twice. We drink water, waste it, and reuse it. This then can used to irrigate. So the environmental benefits by reducing pressure of the water sources benefits all. This has also to be taken into account.

3.54. Interviewer: *Just out of curiosity, isn't it possible to take water from the Mediterranean see, put the salt out and use it for fertigation?*

Respondent E: Well, in that water you can also find nutrients but you have the problem of the salt. The problem is to remove the salt […] which needs huge amount of energy. So, here in Spain on the Mediterranean cost or the

Canary Islands we use the ocean water to remove the salt and use the water for drinking and irrigating but it is very expensive. It is easier to reuse the water that comes from urban waste water. The membrane process is not the same, the amount for the ultrafiltration process is not so big.

3.55. Interviewer: *How would you assess the quality of this cross-sector collaboration?*

Respondent E: This is my first cross-sector collaboration as I think for most participants and I think it is a good idea. These people are all experts in their field but sometimes we only focus on our field and we don't have a comprehensive point of view. I think all respond very well. Given that there is money inside they are working for free. They just believe in the idea and try to get the best out of the initiative. (That is what I am so interest in. It is non-funded and you really have to put a lot of work in it.) Yes, that is right. We work hard on it. We didn't know that were working so many hours on this initiative, because coordinating so many people is not so easy. We also have to take care of that because we cannot press the people too much, because they work on it for free but on the other hand we are all concerned with the work plan and agreement and decided to take part in this initiative so we have to accomplish what we had to decided to do. That is not so easy to do sometimes.

3.56. Interviewer: *How was the information flow among the participants? Would you say all information was shared openly at all times?*

Respondent E: Yes, I think it is very open. The technology part is just one part of the Innovation Deal. The main point now is the legal framework and this is free open information. We need the partners to interpret them and to analyse them because we cannot manage all of them. For now information flows quiet well. Regarding the coordination we tried to make a first approach, the coordinator together with the EC, once it had been more or less agreed, we opened a discussion with the rest of the partners to participate. But we tried to go to the partners with a proposal in each case because we made this in our free time, we cannot discuss this days and days, we tried to be very concrete.

3.57. Interviewer: *I have the impression that all information is concentrated at the coordinator, would you say so?*

Respondent E: We try to centralise the information together with the Commission, e.g., in the Circa Visi, the propository, only one person can add information. So nobody can change anything because it would be a mess. In this case we try to centralise the information, it is good for some things, but also leads to a huge amount of emails and information that we need to collect, gather and organise.

3.58. Interviewer: *Would you say there is a missing stakeholder in the project who could have add valuable information?*

Respondent E: No, I think the whole value chain is well represented. (But there is no plant operator or membrane provider.) Maybe, you are right. A plant operator could be inside but we have the EXIL which is the public entity in Valencia which is in charge of all the plants. Here in Valencia all the plants belong to the public authority but it is operated by private companies. So yes, we have no private company that operates any plant, that owns the plants.

3.59. Interviewer: *How would you judge the success of the Innovation Deal so far?*

Respondent E: Well, given that we are in the first phase I cannot say anything about the success. I think this initiative can succeed if people are motivated and the EC should […] If they don't want to give any money for it they should give other support such as organisation because we are spending a lot of hours and ask also a lot of people to spend a lot of hours of their time. We know this is a pilot project but the EC cannot expect that people work for free every time. At least the travel expenses should be covered. To put together all the opinions on all the stakeholders I think it is a good idea. You always learn something and it helps to understand the point of view of others.

Interview 3 - Informed Consent

28.08.2017

Informed consent

Research study:	Innovation Deals for a Circular Economy
Researcher's name:	Daniel Natrup
Researcher's status:	Final year student MSc. Innovation Management & Entrepreneurship, Technical University of Berlin/University of Twente
Researcher's contact details:	d.natrup@student.utwente.nl +49 170 845 00 37

Dear Sir or Madame,

Hereby you are invited to participate in a research study designed to explore the impact of regulation on innovation as well as to examine lobbying practices in the Innovation Deal.

At the outset I would like to introduce myself once again. My name is Daniel Natrup and I am a postgraduate student of the double degree master programme Innovation Management & Entrepreneurship and Business Administration of Technical University of Berlin and University of Twente. As already described in my request my master thesis is about the project of the European Commission 'Innovation Deals for a Circular Economy'.

More precisely I aim at making three contributions with this research: Firstly, to the fierce discussion about the interplay of regulation and innovation in innovation management and public administration literature by investigating the identified regulatory barriers in this project; Secondly, to the public administration literature in terms of EU lobbying by examining the lobbying activities within the Innovation Deal; And, finally, the results shall assist the European Commission in order to interpret and use the insights of the Innovation Deal properly.

The interview is divided into three sections. In the beginning I am going to ask you about the Innovation Deal process and your role in it. Afterwards we will cover your assessment of the market and the core of the project regulatory barriers. Then I'll draw the attention to various interests in and the anticipated outcome of the Innovation Deal.

Furthermore, I would like to point out that this interview is not about the theoretical discussion of regulation and innovation nor lobbying rather it is about your personal insights into the process of and collaboration in the Innovation Deal. With this in mind some questions, e.g., about the market structure or about the technology itself may seem obvious, however, your personal answer to it is vital for my research.

If you would like to participate in this research please read this form and sign it at the bottom. Participation in this study will include an interview, which will take approximately 30 minutes. The interview method will be semi-structured and it will be conducted via Skype. All information will remain confidential and your identity will remain anonymous.

28.08.2017

The interview will be audio-recorded and the information gathered will be transcribed by the researcher. Only the scholar will have access to the transcripts, and all of them will be coded.

Thank you for your participation,

Daniel Natrup

Please read the following statements and if you understand them, and if you wish to participate in this study, please indicate your agreement to take part by ticking the boxes and signing below:

- [x] I have read and I understand the description of the study.
- [x] I willingly consent to participate in the study.
- [x] I understand that I may withdraw from the research at any time without consequence.
- [x] I understand that the interview will be audio-recorded and the researcher will take notes.
- [x] I understand that my identity will remain anonymous and my contribution will be confidential.

I. Participant

Signature: _____

Name in block capitals: ANTONIO SIMÓNEZ BENÍTEZ

II. Participant

Signature: _____

Name in block capitals: _____

III. Participant

Signature: _____

Name in block capitals: _____

Researcher

Signature: _____

Name in block capitals: Daniel Natrup

4. Interview 4

Research participant: Non ID participant - Membrane supplier - 1 person

Conducted: 29.09.2017 via Telephone **Length:** 37 minutes

4.1. ***Interviewer:*** *(Introducing myself, the master thesis and the outline of the interview) If you agree I would like to start and audio-record the conversation.*

Respondent F: Ja.

4.2. ***Interviewer:*** *In Anbetracht der Technologie „anaerobic bioreactors with membrane technology" wie würden Sie den Markt dafür beschreiben?*

Respondent F: Derzeit sehe ich das noch im Forschungsstadium. Wenn es sich allerdings dahingehend entwickelt, dass es preislich relevant wird, ist dort ein großes Potenzial. Wenn man nicht aerob behandelt spart man sich eine Menge Energie und man kann sogar Energie zurückgewinnen. Marktpotenzial sehen wir schon. Wir beteiligen uns im Moment an einem Forschungsprojekt als Lieferant für die Membranen in der Hoffnung das es in Zukunft interessant werden könnte, aber im Moment sehen wir da den Markt noch nicht.

4.3. ***Interviewer:*** *Ist dies das Projekt in Großbritannien?*

Respondent F: Nein, wir beteiligen uns an einem Forschungsvorhaben in Spanien. Das nennt sich Life Memory mit unterschiedliche Projektpartner u.a. die spanische Firma Aqualia, die Universität de Valencia und die polytechnische Universität de Valencia sind da involviert und wir hängen da als Membranenlieferant mit dran. Dazu muss man sagen, es hat schon vorher im kleineren Maßstab ein Pilotprojekt gegeben, auch diese Technik und auch von einer der beiden Universitäten in Valencia, da haben wir vor ein paar Jahren eine Pilotanlage im kleineren Maßstab geliefert mit der sie eine erste Machbarkeitsstudie durchgeführt haben und daraufhin ist dann dieses Projekt in einem Technikumsmaßstab entstanden, wo die Anlage jetzt tatsächlich auf einer reellen Kläranlage steht und einen Teilstrom von dem Zulauf der Kläranlage behandelt. Also bei dem ersten kleinen Projekt hatten wir die Pilotanlage geliefert und jetzt bei dem zweiten Pilotprojekt die Membranen.

4.4. ***Interviewer:*** *Wenn Sie sich die Technologie anschauen, die Preise der Membranen sind doch in letzter Zeit gesunken, oder?*

Respondent F: Ja, sie sind sicherlich gesunken. Die Frage ist nur wie man den Zeitraum definiert. Im Verhältnis zu vor 10 Jahren sind natürlich auch die Herstellungskosten gesunken, das hat man dann natürlich auch an den Markt weitergegeben, aber irgendwo ist ein Punkt, wo es nicht viel weniger werden kann, weil es durch die Kosten der Rohmaterialien bestimmt wird.

4.5. ***Interviewer:*** *Sie haben ja gerade gesagt, dass Sie auf diese Technologie noch nicht setzten. Gerade im Bezug auf „Fertigation“ welche alternative Technologien sehen Sie da noch?*

Respondent F: Seit einiger Zeit ist es weit verbreiteter Stand der Technik das die Kläranlagen aerob betrieben werden. Von einer aerob-Anlage der Überschussschlamm, das ist auch weit verbreitete Technik, geht in anaerob-Reaktoren, also Faultürme. Das Zentratwasser aus diesen Faultürmen geht wieder vor die Kläranlage, in dem Sinne also auch Kreislauf, und der ausgefaulte Schlamm aus den Faultürmen kann soweit er nicht zu schwer mit Schwermetallen belastet ist als Dünger verwendet werden. Auch das ist eigentlich seit Jahrzehnten Stand der Technik. Ich war vor 25 Jahren Projektleiter in einem Betrieb, die haben konventionelle Kläranlagen ausgerüstet, da haben wir sowas gemacht. Das ist nicht neu. Jetzt geht es nur darum das man das behandelte Abwasser soweit aufbereitet, damit es zur Bewässerung benutzt werden kann. Das ist mit unterschiedlichen Technologien möglich. Nach einer konventionellen Kläranlage könnte man Filtrationsstufen noch zusätzlich schalten, das wird auch schon seit einiger Zeit gemacht, das können Membranfilter sein, das können Tuchfilter sein, es können Sandfilter sein, zusätzliche Desinfektion, je nach Anforderung. Also Technologien gibt es jede Menge, der wesentliche Unterschied hierbei ist das nicht nur ein Teilstrom, nämlich der Überschussschlamm in den anaerob Reaktor geht, sondern der komplette Volumenstrom geht in den anaerob Reaktor. Dadurch hat man ein paar Vorteile und ein paar Nachteile. Die Volumenströme, die dann zu behandeln sind, werden deutlich größer, bedeutet man braucht auch entsprechend größere Bioreaktoren, also Faultürme. Vorteil ist man wandelt die Kohlenstoffverbindungen, die in dem Abwasser enthalten sind, nicht zum Teil um in Verbindungen, die in die Atmosphäre gehen, sondern man wandelt es komplett um in Faulgas. Dieses Faulgas ist eine Energiequelle. Im Endeffekt, die konventionelle Energie, die

eigentlich seit Jahren auf dem Markt ist und eigentlich das gleiche kann, Dünger- und Bewässerungswasser erzeugen, hat gegenüber dieser Technologie anaerob MBR den Nachteil, dass sie mehr Energie verbraucht. Die anaerob Technologie hat möglicherweise das Potenzial entweder energieneutral zu werden oder sogar Energie zu produzieren. Das ist allerdings nicht so sehr von der Technologie abhängig, sonder sehr stark abhängig davon wie viel organisches Material in dem zuläufigen Wasser enthalten ist. Das wiederum bedeutet das anaerob Bioreaktor-Technologie wahrscheinlich da besonders interessant wird, wo die Organikfrachten hoch sind.

4.6. ***Interviewer:*** *Diese neuen anaeroben Bioreaktoren hätten große Umbauten der konventionellen Anlagen zur Folge, oder?*

Respondent F: Das ist nicht nur ein Umbau, das muss ein kompletter Neubau sein. Denn die Bioreaktoren, die bis dato vorhanden sind, mit der konventionellen Technik, das sind alles relativ flache oben offene Becken, die belüftet werden. Wenn Sie anaerob Technik machen wollen, dann sind das komplett gasdicht geschlossene Systeme. Das bedeutet das ist ein ganz anders aufgebauter Reaktor. Aus Sicherheitsgründen werden die sogar unter leichtem Überdruck betrieben werden (5-30 Millibar).

4.7. ***Interviewer:*** *Dann muss aber sehr genau geprüft werden im Vorfeld wie wirtschaftlich ist so eine Anlage im Endeffekt? (Natürlich!) Würden Sie denn sagen, dass es eher eine Nieschentechnologie ist und höchst wahrscheinlich nicht flächendeckend die aeroben Bioreaktoren ersetzen wird?*

Respondent F: Davon gehe ich nicht aus. Speziell bei Anlagen, die mit niedrigen Frachten arbeiten, also wenn das zulaufenden Wasser stark verdünnt ist, dann kann ich mir persönlich bei dem jetzigen Stand der Technik kaum vorstellen das sich das rechnen wird. Da muss man jetzt sehr gut unterscheiden. Wenn man eine Kommune hat wie das in Deutschland sehr häufig der Fall ist, mit einer Mischwasserkanalisation, d.h., die Abwässer aus den Häusern gehen in das Abwasser genauso wie das Regenwasser, dann verdünnt dieses ablaufende Regenwasser natürlich die Fracht. Dadurch ist das was in den Kläranlagen ankommt sehr häufig ziemlich stark verdünnt. In solchen Fällen kann ich mir schwer vorstellen, dass das irgendwann mal finanziell relevant wird. Habe ich allerdings eine andere Situation, wo ich bspw. das Abwasser eines ganzen Hochhauses einsammele und nicht

vermische, sodass ich nur das Abwasser mit hoher organischer Fracht habe, dann ist das natürlich hoch konzentriert und da könnte es sich lohnen. Vom Volumen her sind das allerdings keine großen Volumenströme, aber wie gesagt, in solchen Fällen kann sich das lohnen, speziell wenn man vielleicht in der Zukunft das Abwasser von Toiletten gesondert auffangen würde. Dann hätte man wirklich eine hohe Konzentration.

4.8. ***Interviewer:*** *Wie wäre das bei Industrieabwasser?*

Respondent F: Bei Industrieabwässern mit hohen organischen Frachten, speziell wenn es sich um Industrieabwässer handelt, bspw. aus der Lebensmittelindustrie, wenn die Organik leicht zu verarbeiten ist, bei solchen Abwässern kann ich mir das durchaus sehr gut vorstellen, dass sich das irgendwann rechnen wird.

4.9. ***Interviewer:*** *Also bei dieser Technologie hängt noch ein bisschen mehr dran, die Zulieferung von organischen Abwässern muss darauf abgestimmt werden?*

Respondent F: Ja, stimmt. Es kann sich durchaus dafür in absehbarer Zeit ein relevanter Markt entwickeln, aber es ist jetzt kein Markt, wo es darum geht 100% der derzeitigen Behandlungskapazitäten durch eine neue Technologie zu ersetzen, sondern da wird man sich konzentrieren auf die Bereiche, wo viel Organik in dem Abwasser drin ist.

4.10. ***Interviewer:*** *Wissen Sie, wie es in Europa bezüglich der Abwasserkanalisation aussieht? Ist es größtenteils wie in Deutschland, dass alle Abwässer zusammenfließen?*

Respondent F: Es gibt Kommunen in Europa mit Trennkanalisation und es gibt Kommunen mit Mischwasserkanalisation. Das ist oft sehr stark abhängig davon wie neu das ganze ist. Die ganzen alten Bestandskanalisationen das ist alles überwiegend Mischwasserkanalisation und es wäre natürlich eine Mammutaufgabe in einer Stadt so etwas auf Trennwasserkanalisation umzubauen. Das wird sich so nie rechnen. Bei Neubauten bzw. Neubaugebieten kann man das natürlich direkt gut berücksichtigen und diese Trennwasserkanalisation wird häufig bei neueren Gewerbegebieten durchgeführt.

4.11. Interviewer: *Wie ist Ihre Marktstellung als Membranenhersteller?*

Respondent F: Wir sind einer von mehreren Fabrikaten für Membranen. Im Bereich der Membranen-Bioreaktor-Technik gibt es Marktteilnehmer, die deutlich größere Marktanteile haben als wir. Wir sind ein weltweit agierendes Unternehmen, welches teilweise Spezialmembranen haben, die in speziellen Anwendungen auch Marktführer sind, aber speziell im Membranen-Bioreaktor im Allgemeinen sind wir nur einer von vielen. (Ist Kubota der größte?) Kubota ist sehr groß. Ich weiß nicht, ob sie die größten sind, da habe ich meine Zweifel. Ich vermute, dass der größte Hersteller GE ist mit den Xenon Membranen. Es kann sein, dass Kubota mehr Projekte hat, wobei meines Wissens nach, diese Projekte eher kleine Projekte sind, also Hochhäuser, kleinere Siedlungen, während Hersteller wie GE und auch wir eher die größeren Projekte beliefern.

4.12. Interviewer: *Kann man denn sagen, dass wenn anaerobe Bioreaktoren auf den Markt kommen würde, dass es sich dann zwischen Ihnen und GE bezüglich der Membranen entscheiden würde?*

Respondent F: Das wissen wir noch nicht. Im Moment ist das ganze ja noch im Forschungsstadium. Das Membranen-Modul-Konzept sowohl von GE als auch von uns weißt schon diverse Unterschiede aus. Was diese einzelnen Produkte im Bereich anaerob möglicherweise für Vor- oder Nachteile haben, das muss noch in den Forschungen herausgefunden werden. Wir denken, dass unser Produkt gut geeignet ist basierend auf den Ergebnissen bis dato, ob das Konkurrenzprodukt genauso gut geeignet sein wird, können wir noch nicht beurteilen. Aber wie gesagt, dass kann man noch nicht absehen. Das ist noch zu früh.

4.13. Interviewer: *Würden Sie sagen, dass der Markt für die Technologie im Moment relativ klein ist, es sei denn es würden sie noch strukturelle Maßnahmen begleiten?*

Respondent F: Der Markt ist im Moment praktisch noch nicht vorhanden. Das ganze ist derzeit noch im Forschungsstadium. Der Markt muss erst noch entwickelt werden.

4.14. Interviewer: *Angenommen die Technologie entwickelt sich positiv weiter, würden Sie sagen, dass die Prozessanbieter, wie Veolia, Suez, oder auch*

Aqualia von der Technologie am meisten profitieren würden?

Respondent F: Das sind die Unternehmen, die hinterher die Anlagen bauen werden. Wir sind Membranen-Lieferant. Im Markt gibt es noch die kleine Neuerung, dass Suez die Wassersparte von GE übernommen hat und deswegen die Xenon-Membranen zur Firma Suez gehören. Das hat für sie den Vorteil, dass sie die ganze Technologie in einem Haus haben, allerdings auch den Nachteil, dass die Wettbewerber von Suez nicht unbedingt gerne Membranen kaufen mit denen sie Suez unterstützen. (Das schränkt Suez doch auch sehr in den Anwendungsgebieten ein?) Richtig.

4.15. Interviewer: *Wie kann ich mir Ihr Verhältnis, als Unternehmen, zu Prozessanbietern wie Veolia und Suez vorstellen?*

Respondent F: Das sind bis dato relativ normale Geschäftsbeziehungen. Wir sind Lieferant, die sind Kunde, wobei speziell Veolia für uns ein sehr wichtiger Kunde ist und wir haben mit Veolia ein Preferred Supply Agreement. Veolia greift, wenn Sie auf Membranen für MBR Technologie zurückgreift, bevorzugt, aber nicht exklusiv auf unsere Membranen zurück. Es gibt durchaus auch Projekte, wo Veolia Membranen von anderen Herstellern eingesetzt hat. Häufig liegt das daran, dass der Endkunde sich bereits im Vorfeld des Projektes auf einen Membranenhersteller festgelegt hat.

4.16. Interviewer: *Ist es richtig zu sagen, dass es die Membranen-Technologie, die in den anaeroben Bioreaktoren benötigt werden, die gibt es. Man weiß nur nicht, welche Vor- und Nachteile sie in diesem Einsatzgebiet hat?*

Respondent F: Fakt ist, derzeit setzten wir Membranen-Module ein, die eigentlich für aerobe Bioreaktoren entwickelt worden sind und diese Membranen in aeroben Bioreaktoren werden mit Umgebungsluft belüftet. In einem anaeroben Bioreaktor kann man das natürlich nicht machen, dabei würden direkt explosionsfähige Gemische entstehen. Deswegen nimmt man hier keine Umgebungsluft, sondern man nimmt das Faulgas aus dem anaerob Reaktor und „belüftet“ damit die Membranen. Das Faulgas ist dann nicht weg, man muss es nur noch mal zusätzlich mit nem Gebläse auf die Druckstufe bringen, die man braucht zur Membranenbelüftung, aber dann kommt es praktisch oben aus der Membrane auch wieder heraus.

4.17. Interviewer: *Die anaeroben Bioreaktoren sind bei Kälte teurer zu unterhalten als in wärmerer Umgebung, richtig?*

Respondent F: Ja, der anaerobe Prozess läuft bei hohen Temperaturen besser. Die typischen Faultürmen auf kommunalen Kläranlagen in Deutschland, diese Prozesse laufen eigentlich immer bei 37 Grad ab. Diese Türme kann man isolieren und beheizen, bspw. auch mit dem Faulgas direkt, aber es wird beheizt und über die Außenhaut dieser Faultürme geht natürlich Wärme verloren. Das muss man ausgleichen, d.h., man muss Wärme da rein stecken, damit es effektiv arbeitet. Je kälter die Flüssigkeit wird, desto weniger ausbeute an Biogas erzielt man, basierend auf der selben Maße an Kohlenstoffverbindungen. Demzufolge muss man da nach einem Optimum suchen zwischen 'mehr aufheizen und bessere ausbeute haben, dann geht aber auch mehr Wärme weg' oder 'weniger aufheizen, damit weniger Wärme weg geht, dann hat man aber auch eine niedrigere ausbeute'. Da muss man halt das Optimum finden. Das Projekt bspw. das in Spanien läuft, läuft im Sommer ohne zusätzliches Aufheizen und im Winter wird das ganze auf eine bestimmte Minimaltemperatur aufgeheizt. Da versuchen sie aber auch noch die sinnvollste Minimaltemperatur herauszufinden. Das bedeutet aber, wenn ich aufheizen muss, dann kostet das Energie. Die Energie habe ich zwar vorher gewonnen durch die Erzeugung von Biogas, aber ich habe dann halt nicht mehr so viel Überschussenergie zur Verfügung.

4.18. Interviewer: *Haben Sie auch den Eindruck, dass alle derzeitigen Projekte darauf abzielen, dass die aeroben Bioreaktoren mangels ihrer unzureichenden Nachhaltigkeit durch anaerobe Bioreaktoren abgelöst werden sollen?*

Respondent F: Jein. Soll, richtig. Ich sehe das allerdings nicht, dass das auf breiter Front […] Wenn es 100% Abwasserbehandlungskapazität gibt, dann sehe ich nicht, dass die Mehrheit davon mit anaeroben Bioreaktoren stattfinden wird. Wenn es irgendwann mal in Richtung 10% geht, dann wäre das schon eine deutliche Hausnummer. (Nischentechnologie?) Das kann durchaus eine große Nische werden, aber ich sehe nicht, dass sie den Markt komplett umkrempeln wird. Ich bin auch in Kontakt mit Planern aus großen Abwasserverbänden, die sehen das auch so. Das kann sich gar nicht rechnen. Die machen eine Rechnung basierend darauf, wir haben so viel Abwasser pro Jahr, in diesem Abwasser ist pro Jahr so viel Kohlenstoff enthalten, davon kann man einen bestimmten Teil energetisch verfügbar machen, rechnen wie viel das kostet und kommen zu dem Schluss: Nein, in

den Größenordnungen, wo die sich bewegen, haben sehr häufig viel zu niedrige Kohlenstofffrachten als das sich das überhaupt rechnen kann.

4.19. Interviewer: *Würden Sie sagen, dass die Technologie, die derzeit in dem Projekt in Valencia erprobt wird, die besten Chancen am Markt hat?*

Respondent F: Da müsste ich in die Glaskugel gucken. Im Endeffekt ist es ein anaerob Bioreaktor gekoppelt mit einer Abtrennungsstufe, diese Abtrennungsstufe hier Membranen sind und dann auch noch unsere Membranen sind, das freut uns natürlich, aber der große Part dieser Technologie ist meiner Meinung nach eher der anaerob Reaktor und den anaerob Reaktor am Laufen zu halten. Das ist auch nicht ganz ohne. Wenn man ein großtechnisches Projekt nimmt, bspw. einen Lebensmittelbetrieb der Abwässer mit hohen Organikfrachten hat, wenn Sie da das Investitionsvolumen abschätzen, was erforderlich ist für einen anaeroben MBR, dann haben wir vielleicht 10% an diesem Volumen mit den Membranen. Mehr glaube ich nicht.

28.08.2017

Informed consent

Research study: Innovation Deals for a Circular Economy
Researcher's name: Daniel Natrup
Researcher's status: Final year student MSc. Innovation Management & Entrepreneurship, Technical University of Berlin/University of Twente
Researcher's contact details: d.natrup@student.utwente.nl
+49 170 845 00 37

Dear Sir or Madame,

Hereby you are invited to participate in a research study designed to explore the impact of regulation on innovation as well as to examine lobbying practices in the Innovation Deal/Green Deal.

At the outset I would like to introduce myself once again. My name is Daniel Natrup and I am a postgraduate student of the double degree master programme Innovation Management & Entrepreneurship of Technical University of Berlin and Business Administration of University of Twente. As already described in my request my master thesis is about the project of the European Commission 'Innovation Deals for a Circular Economy'. Therefore, this project as well as a similar Green Deal are examined.

More precisely I aim at making three contributions with this research: Firstly, to the fierce discussion about the interplay of regulation and innovation in innovation management and public administration literature by investigating the identified regulatory barriers in these projects; Secondly, to the public administration literature in terms of EU lobbying by examining the lobbying activities within the Innovation Deal; And, finally, the results shall assist the European Commission in order to interpret and use the insights of the Innovation Deal properly.

The interview is divided into five sections. In the beginning I am going to ask you about the Innovation Deal/Green Deal process and your role in it. Afterwards we will cover your assessment of the market and the core of the project regulatory barriers. Then I'll draw the attention to various interests in and the anticipated outcome of the Innovation Deal.

Furthermore, I would like to point out that this interview is not about the theoretical discussion of regulation and innovation nor lobbying rather it is about your personal insights into the process of and collaboration in the Innovation Deal/Green Deal. With this in mind some questions, e.g., about the market structure or about the technology itself may seem obvious, however, your personal answer to it is vital for my research.

If you would like to participate in this research please read this form and sign it at the bottom. Participation in this study will include an interview, which will take approximately 45 minutes. The interview method will be semi-structured and it will be conducted via

Skype, telephone or in person. All information will remain confidential and your identity will remain anonymous. The interview will be audio-recorded and the information gathered will be transcribed by the researcher. Only the scholar will have access to the transcripts, and all of them will be coded.

Thank you for your participation,

Daniel Natrup

Please read the following statements and if you understand them, and if you wish to participate in this study, please indicate your agreement to take part by ticking the boxes and signing below:

- [x] I have read and I understand the description of the study.
- [x] I willingly consent to participate in the study.
- [x] I understand that I may withdraw from the research at any time without consequence.
- [x] I understand that the interview will be audio-recorded and the researcher will take notes.
- [x] I understand that my identity will remain anonymous and my contribution will be confidential.

I. Participant

Signature: _____

Name in block capitals: Ch. Marner

II. Participant

Signature: _____

Name in block capitals: _____

III. Participant

Signature: _____

Name in block capitals: _____

Researcher

Signature: _____

Name in block capitals: Daniel Natrup

6. Interview 6

Research participant: Green Deal participant - Green Deal - 1 person

Conducted: 19.09.2017 via Telephone **Length:** 58 minutes

6.1. ***Interviewer:*** *As I informed you I want to make a study about the impact of regulation on innovation and also about how the Innovation Deal is used as a lobbying tool. The questionnaire contains five areas that I would like to cover. If you agree I would like to start and audio-record the conversation.*

Respondent H: It's ok.

6.2. ***Interviewer:*** *How many people of your organisation worked on the Green Deal?*

Respondent H: It is not working on the Green Deal. I think that is a misunderstanding. We use the Green Deal to enable our projects. On the projects itself the whole company is working. The communication between the government is done by one person.

6.3. ***Interviewer:*** *Was it also this one person who was in contact with Siemens, Joulz and the ministries?*

Respondent H: Yes, we made a small team close together with one person from Siemens and one person from Joulz and myself in this case. To keep the team small and also the team size at the government it was always a fix team.

6.4. ***Interviewer:*** *How have you been in contact with the other participants?*

Respondent H: Often in person, we had many many meetings in between preparation and everything to make sure that the lobby circuit from within Siemens and the lobby circuit from within Joulz and the network that we have is consistent.

6.5. ***Interviewer:*** *How long was the project?*

Respondent H: Three years, actually more, we tried to extend it as much as

possible because the nice thing about the Green Deal is that it opens up easily doors at other companies, institutes and the government.

6.6. ***Interviewer:*** *I read that it is considered to reopen it again. Do you know if that will happen?*

Respondent H: Yes, it will be reopened. We will call for version 2.0 because we are now a bit more mature in our project and now we have to go to the next step. And that is starting to enable regulations for grid operators.

6.7. ***Interviewer:*** *What is your role as an organisation in the Green Deal?*

Respondent H: We are the innovator and the driver behind the GD. We have taken Siemens and Joulz into the project.

6.8. ***Interviewer:*** *Could you say what you have been working on in the Innovation Deal?*

Respondent H: We have worked mostly on enabling direct current (DC) Systems in the greenhouses to work on regulations and standardisations to make sure that the whole product can be officially accepted by the market for insurance companies and everything that is related to it. Normally AC systems for the everything is controlled, regulated and standardised, so if someone makes a mistake there are clear guidelines for it. For DC there aren't there. So our biggest innovation besides technology is actually how to get DC into the system, in the community and that it is accepted by insurance companies, accepted by safety health and accepted by everything that requires a kind of standard. Standards were missing at that time, so we enabled the government because they are a kind of shareholder in standardisation in the standardisation institute in the Netherlands and they have forced actually to reopen a group for DC to make DC part of the standard systems that allowed now an AC but then also a DC.

6.9. ***Interviewer:*** *I read that DC saves energy […]*

Respondent H: Yes, exactly, that are the side effects but the biggest challenge was, e.g., if you go to an installer at the corner in your village and even will install installation in your home and, if you will ask another installer, he will just come to your home and he automatically sees what the other

person has done. He understands that because it is standardised. But for DC standardisation doesn't exists. The biggest issue was how to build an isolation that is according to standards, they don't exist, because an insurance company want to know that installation is according to standards because if otherwise that means there would be a high risk because they couldn't estimate.

6.10. Interviewer: *Why was energy actually transferred via AC before?*

Respondent H: That is a technical subject because they used the greenhouses to start this installation and that is because of the system density. It's difficult to explain but if you want to do some innovation it is nice to do that in greenhouses because the greenhouse owner is the decision maker and it is automatically large scale, so that we can prove and show that there are economical benefits to go to DC. But for us the bigger scope in this is that we want to DC-ify the world. Actually, to make the future systems if all the energy will be produced in the last mile and if electro mobility is involved we want to enable them all - they are all DC applications - and what we are actually doing is the connection between production and consumption of energy via DC in the most efficient and most controllable way. The next step is smart grids. That is actually what is the innovation about. We are enabling a new infrastructure that is more future proof for the upcoming chances in the world.

6.11. Interviewer: *What kind of regulatory barriers did you identify?*

Respondent H: E.g., the grid codes, the connection codes, the trading codes, e.g., if we sell energy on a DC grid and somebody else is going to buy that energy that should be according to a standardised metre and at the moment the unity for DC is not standardised yet. The kilowatt hour in AC is defined and standardised but the kilowatt hour in DC is not standardised yet. That is one thing we want to work on, so we can make guidelines for the energy metering to do trading.

6.12. Interviewer: *So, at the moment there is no regulation, you didn't face any regulatory barriers, instead you concerned yourself with how to standardise it properly.*

Respondent H: Yes, exactly and that is one of the reasons why we made the

Green Deal. Because, how to standardise if you don't have a system in a market? What we did was that forcing with the government together a system in the market that can be used as the input for the standardisation. Otherwise you always have the chicken and egg problem. How to standardise an item that can only be build if the items are standardised. That is what we did. We made the breakthrough by getting the permission of the Dutch government to give us the case to work as if it would be accepted and standardised and that provides a lot of new input to make a correct standardisation for the future.

6.13. Interviewer: *If your proposal would be accepted, would it be implemented in the whole Netherlands or just certain regions?*

Respondent H: That is why we need 2.0 to make the next step so that it could be implemented in the whole Netherlands and that means that we then can remove the barriers for DC in the Netherlands. At the moment we are a big example in the world for other countries how DC is now already partially regulated.

6.14. Interviewer: *Why was DC not used before to transmit energy?*

Respondent H: In old days it didn't exist. Only in the transmission of small parts in the existing grid but then it was owned by the same grid operator. As we implement it now these days there is no AC connection so it is directly DC, the whole installation directly in DC, that is unique. At the moment you can only have an AC connection for your home but we are working on that in the future you will have a choice.

6.15. Interviewer: *Basically, you discussed how to set a new standard that it will work on the market?*

Respondent H: Yes, and how to enable it so we have enough information to standardise it.

6.16. Interviewer: *Did you give a proposal to the Dutch government in the end and how did it look like?*

Respondent H: We gave a list of barriers […] What is important in the Green Deal is that it is not a one way agreement. If you make a deal you should also do something back. Our deal is not about money, that is what most people

think - with Green Deals you get money to do things […] What we did is bringing all the information to universities. We started in a faculty at TU Delft and the set up courses in the polytechnical education in DC to bring the knowledge to the public domain.

6.17. Interviewer: *Was the Green Deal funded?*

Respondent H: No, we didn't ask for it.

6.18. Interviewer: *Are you the technical innovator in this Green Deal?*

Respondent H: Yes, and also in your interest what is in it for us. We would become the leading company for DC systems everywhere.

6.19. Interviewer: *That is a great point, we will come back to this. First, the market, how would you describe the market for DC based power networks? Could it completely replace AC?*

Respondent H: Yes, it could completely replace but that would take a long time. It is expected to establish a second grid instead of renewing the existing grid. By adding a new grid for electro mobility, renewables, batteries and everything you want to do that will be connected to the new grid, the second grid, and by time the old grid will be transferred to the new grid. The market size only to prevent renewing the existing grid is around 80 billion per year. It is only about enabling networking, excluding charge station and all the items you have.

6.20. Interviewer: *The connection was not so good. Do you mean only in the Harlemmemeer and around Amsterdam?*

Respondent H: No, in the whole Netherlands we have now already 90 kilometres enabled as a small demonstrator for the second Green Deal. That has then the potential for implementing it here after 2020, so it is a huge market.

6.21. Interviewer: *But of course, then it could be implemented all around the world?*

Respondent H: Yes, exactly, what see is […] We had a discussion with India

and Africa because of the 1.2 billion people without access to electricity and they already are working with DC but on a very small scale, for batteries, small LED light, or small solar panels. And we are working with […] to enable stronger networks also to enable cooking with electricity […] That these everybody needs will be done by DC. That area we didn't even count into the 80 billion that is only for the developed world but if you go into the under developed world it will be a much bigger number.

6.22. ***Interviewer:*** *How would you describe the market in terms of how it works?*

Respondent H: What we are doing is enabling technology. That is why we also worked with Siemens and Sony, etc. We don't have the ambition to do high competent production. Production will be done by the big ones and we are just the small company that does the innovation that enables the technology. We have set up a kind of USB organisation, a kind of open standard, in which big companies to join that we called Current OS and that is the operating system of the currents for the smartest grids. (In this, the big ones like Sony and Siemens joined already?) Yes.

6.23. ***Interviewer:*** *Is there a website where I can inform myself?*

Respondent H: No, not yet, because at the moment everything is in legal construction phase. We have a small group of big ones where we are setting the big stuff around it. By the end of the year we expect that the website will […] and some standard for DC systems and then the other companies can be involved by implementing the technology. At the end of the day the protocol will be a public domain. The solution is based on the patents and on the technology.

6.24. ***Interviewer:*** *Who joins Current OS will those companies automatically also join the upcoming Green Deal?*

Respondent H: Yes.

6.25. ***Interviewer:*** *Would you agree that it is not a very competitive technological market in the sense that there are many other solutions, there is just AC and DC?*

Respondent H: Exactly, everything is AC and now we have an alternative for AC.

6.26. Interviewer: *Is there another alternative? Is there a possibility of another DC approach?*

Respondent H: No, there is no alternative technically feasible.

6.27. Interviewer: *But probably you are not the only company working on it, right?*

Respondent H: Yes, there are a lot of universities working on it right now. If you look into the DC market our company is unique. (As a private company, you are the only one in this field?) Yes, to make DC systems. There a small companies who do something with DC, e.g., to make LED lighting in the roof or something, small applications but at the moment we are the only company in the world which makes DC systems and that is one of the reasons why we work with the big ones because it is normally the field of the big companies, normally it is the area of Siemens, because it is mostly on grid level and that is quite a unique situation.

6.28. Interviewer: *How would you expect the market/technology to develop in the future?*

Respondent H: Of course, there will be competitors.

6.29. Interviewer: *But once again, there is no alternative technologically other than to your solution?*

Respondent H: No, if you restart all over again you will come to the same solution that we have because that is the only way it can work and that can be build like that. Of course, there are tries but that is compared like on camping a small scale system but that cannot be a replacement for a big system and if you want to make a system more mature means you have to solve other items in the chain to really build up the system. That is also one of the reasons why all the big companies are very interested in our technology because it is something.

6.30. Interviewer: *How the energy is produced doesn't matter, right?*

Respondent H: No, it doesn't matter. But all renewables are used to DC, like hydrogen is DC, solar is DC, wind is DC, […] solutions are DC, so everything is DC. We create with all these components an infrastructure so that all work together instead of making everything AC and communicate with the AC network between these sources.

6.31. Interviewer: *So, renewables are already DC but nuclear or coal plants are not?*

Respondent H: No, they are not but they will be converted to DC. One of the reasons why you want to convert them is because now they have the technological storage but they cannot occupy this generator for […] 100%. That means, the energy production for the power plant can go up because in certain points the system has to […], e.g., 15% reactive power, that means they cannot produce real power. That is a technical discussion, but that is why the efficiency of generators goes up if they could apply to a DC network. The good thing on that one is that on the transmission level in the grid there is already a lot of DC going. On the HVDC, like the cables that go from the North of Germany to the South of Germany it will be fully DC for transmission […] and there will be more and more DC connections coming inside Europe to build up a super grid. That means on the top side of the system everything will be DC and on the top side of the system will be the big power generators which are feeding in DC transmission systems.

6.32. Interviewer: *What exactly means top side?*

Respondent H: Top side is the high voltage transmission level. If you compare electrical infrastructure with roads, you have the highways and you have the provincial distribution roads in the villages. Transmission means the highways, the high voltage systems the dog power, and then you have the distribution grid, what is done by dino and dinsos and then you have actually the last mile and that are the small vessels. What we are doing now is the last mile to DC plus we start to enable the local distribution on DC, the mean voltage. (And then at some point the highways?) Yes, so it is actually moving away the whole AC system.

6.33. Interviewer: *Is it more expensive for the coal plants and nuclear energy plants to transfer to DC?*

Respondent H: No, it is in the business case because of what I say is occupation of the generator is for 100%. Now you have power anymore in the generator, so better utilisation of the system.

6.34. Interviewer: *So the aim is to replace the current grid […]*

Respondent H: That is actually our end target.

6.35. Interviewer: *Who is now in charge of the grid? Is it the government or private companies?*

Respondent H: It is semi-government. I think is […] the EU that transform the other countries to follow, e.g., in France it is a totally different story because there is EDF in charge for everything but the Dutch model is that generation and transportation are separated and they are regulated because you don't have competition on the local grid, because you only can have one provider for the connection but you can select from different sources, different providers the energy, so it is like facilitating the energy system. That is also the direction of the EU, to build transportation, distribution separate from production and consumption in the markets.

6.36. Interviewer: *In the Green Deal was also a pilot in which you tested the grid, it was not just theoretical, right?*

Respondent H: Of course, we really implemented it.

6.37. Interviewer: *Which are the largest companies of the grid you would replace?*

Respondent H: No, we would not replace the companies. The companies will start implementing other technologies so the player in the field stays the same but the grid operators will only transfer their own assets from AC to DC.

6.38. Interviewer: *Before the technology came from themselves?*

Respondent H: Yes, the essence is that the playing field doesn't change, only technology changes.

6.39. Interviewer: *So you will work as a technology provider once and from then on as a consulting service?*

Respondent H: Exactly, because we have no ambition in production therefore we would need to compete with Siemens and that makes no sense for us.

6.40. ***Interviewer:*** *How about the consumer side, what is there going to change?*

Respondent H: The good thing for the consumer is that it really widens if you look at these modern terms like blockchain technology that is physically easy on DC. On AC it will only be an IT approach but in the energy to energy flows it could be physically make the blockchain technology and not only based on a theoretical model that is run by ICT.

6.41. ***Interviewer:*** *Would the DC based power network change consumer patterns?*

Respondent H: Yes, what we expect with DC is that if you think about the system, there are no OPECS anymore involved in the system because the investment is done by buying the renewable and that means you don't have variable costs anymore. You don't have margin costs in the system. You can compare it to the internet, in the old days you had a modem and you payed per second for the data that was replaced by fibres and you pay for the capacity. If you have a faster connection you pay a bit more but it is not based on quantities anymore and that means that the energy system will be based on capacity. That means for the consumer it will change because that is what will enable the smart grid. The consumer will change to fill in the gaps from their own appliances to build a smart grid inside the house and not inside the grid itself. If you want to save money you take smaller connection and if you don't have so much energy consumption in your house you will start the washing machine, and if you consume a lot of energy you disable a few devices because otherwise you'll run out of your capacity. That will be a change for the consumers. This is a way to save energy.

6.42. ***Interviewer:*** *Would it also be easier for households to feed the system?*

Respondent H: Yes, that is the nice thing about the system. It can be done in the house without control by external parties, e.g., the washing machine can automatically start if you have capacity for it in your system or if your solar system stops using energy the washing machine will run automatically and

you are not consuming energy from the system. So it is also going into privacy issues in the grid.

6.43. Interviewer: *Did you discuss with the other companies also the business model around it?*

Respondent H: Yes, the business model for the big companies with which we are producing we go for factory licenses, a licensing model, and for the sub companies, they go for a kind of […] One of the services that can be […] if you buy from an energy supplier and you buy energy but in the future we say you are not going to buy energy, you will buy comfort and the energy company will enable you for a certain fixed amount of money by playing with your connection capacity to guarantee you a kind of comfort. Then there will be a competition who can offer the most comfort for the lowest connection capacity.

6.44. Interviewer: *If I, as a household, produce my own energy with solar panels how would that work for the energy companies?*

Respondent H: What they will do, they will say ok, if you want you can get a service from us or you can do it by yourself but if you are not an expert they can say I produce so many kilowatt hours a day, so much a year, I want to manage it and my house should be parametered in the correct way, so it should be that all the energy I produce should consumed by me first and the leftovers will go to the grid and then you will need to optimise your local installation to have the most efficient system. Further you can have batteries on your system and when you produce a little more and you have some time shift in the energy consumption so I want to have a battery on it, so that is a service, that will increase your comfort and will lower the monthly cost from energy.

6.45. Interviewer: *But when I become an energy provider as a household that would diminish heavily the profits of the big companies, right?*

Respondent H: Yes, exactly, but all the big energy providers are in big trouble already.

6.46. Interviewer: *Why do they engage to work with the DC system when it will disrupt their market so much?*

Respondent H: That is one the reasons why they want to be in.

6.47. Interviewer: *Do you think there is a way that they can control the DC network?*

Respondent H: No, that is why we are working with the Dutch suppliers, because they are willing to change to different models and the energy supplier they also have to change the model otherwise they are at the dead end of the development. But they are already moving in this direction like RWE and all that companies are running into problems with the current system. (But that is then highly political in the end?) Yes, the political statement in this one is actually do we want to have a system that is totally run locally with micro grids and enabling our own energy, then you have a tax issue in the system or do you want to get the big energy flow and have a big tax system on it. I think in the end of the day as I look to the EU directives now I think the EU will go for stability in energy flow, so there will be reserve generation added to the system. This means a few companies will be payed not for producing energy but for being on stand by all the time and other companies will normally run with their local energy that market model will change.

6.48. Interviewer: *Ok, now to the lobbying part. What was your interest in participating in the Green Deal?*

Respondent H: My interest was to enable it, because we run into all these regulations and how to overcome them. (And you said, you would then become the dominant market player?) Yes, that is why we in our network we have an incredible strong network at the moment, the IEC, the standardisation for the whole world level including the areas for India and Africa where the new systems will be build and part of that network we are in the focus.

6.49. Interviewer: *How do you assess the contributions of the other participants? Would you say there was a participant that lobbied in their own interest/a particular company interest/home country interest rather than working for the common good?*

Respondent H: No, everybody was in the focus of the global look. That is

also one of the reasons why we are also promoting the Dutch Green Deals strongly, because I think the instrument is incredibly strong.

6.50. Interviewer: *You as the dominant market player naturally have the strongest interest in pushing the development in your direction but you are also saying you are already the only one there, so there is not much need for you to push?*

Respondent H: Yes, we need companies that are also moving in the same direction and start competing to make the system growing faster, because it is really fast growing market. The world is too big to run from a casino company, because otherwise we will be a kind of Google or Microsoft but that I think it needs other […] I think it is easy to do in computer technology but it is very hard to do with physically product flow.

6.51. Interviewer: *Which company is the next one after yours that is on your toes in that sense?*

Respondent H: No one, we haven't met them yet. (Even globally, e.g., in India?) In India, of course, there are a few companies but they are working in very small systems, e.g., in homes enabling with a small battery to make an LED lamp connect. On the system level in order to make buildings or connect villages with villages and make local grids, micro grids, that is a lot of paper work in universities but not physically done by a company directly, in this case we are unique.

6.52. Interviewer: *Is the technology much different from what is done in household?*

Respondent H: Yes, there a lot of additional parameters to it and it is very complex.

6.53. Interviewer: *Would your organisation benefit from the usage a DC-based power network?*

Respondent H: Of course.

6.54. Interviewer: *Which companies/organisations would benefit most from the usage a DC-based power network?*

Respondent H: Everybody will benefit most. We believe in working together and enabling a big pool of companies which then can enable this.

6.55. Interviewer: *Would you also say that the energy consumers would benefit from it?*

Respondent H: Yes, definitely, because of making this blockchain possible and also the privacy of consumers will benefit. To explain in an AC system if your neighbour is producing too much energy with its solar panels then he will communicate that to a data centre, to an aggregator, and the aggregator will tell you to turn on the washing machine, so that means he is waiting for you to make a request so that he knows that you want to consume on or before a certain time some energy, so a lot of privacy is going outside. With the DC system this is done internally and automatically without the interference of an aggregator. You can deal with your neighbour directly and say you put your energy on the system and we agree that I will consume because we give ourselves a higher priority if you bring your energy to the street so you can regulate with your neighbours without anyone else. The only thing you need in the end is someone who will manage the payment. It is a totally different game than today in the ICT market. The privacy is guaranteed by design and not by protection.

6.56. Interviewer: *Which companies/organisations of your country would benefit most from the usage a DC-based power network?*

Respondent H: We don't look so much on the country level. I think the local departments of the big companies but for us it is really on the global market.

6.57. Interviewer: *With the new standard you are working on, would it be possible to benefit one company over another?*

Respondent H: No, that will not be the case, because once things are standardised that means you should be on a level playing field. The only thing we benefit from to be honest is that we standardised the protocol that the solution to implement the protocol there is a lot of IT behind. We are a little bit earlier, maybe a bit smarter but that doesn't mean that other companies can't be as smart and make competition on that level. So, at the end of the day it should be done on the global playing field.

6.58. ***Interviewer:*** *Which other companies develop the standard with you?*

Respondent H: The whole global group, we included cable manufacturers, device manufacturers, everybody is pushing onto the same target with this one. (Is the standard only for the Netherlands or directly European-wide?) It is already European-wide and I think it will also leapfrog quickly in the upcoming countries for that one because there is a big need for the 1.2 billion that don't have electricity access. (So it serves as a blueprint for global application?) Yes.

6.59. ***Interviewer:*** *How would you assess the quality of this cross-sector collaboration?*

Respondent H: Very, very productive, very strong.

6.60. ***Interviewer:*** *How did you approach the other participants?*

Respondent H: We know each other already. We faced these issues and then I said let's make a Green Deal on that one. Then we made a simple application for the Green Deal to bring a clear idea to the government because if you put too many projects in the same Green Deal than it will be a bit fuzzy for everybody.

6.61. ***Interviewer:*** *How was the information flow among participants? Was information shared openly at all times?*

Respondent H: Yes.

6.62. ***Interviewer:*** *Would you say there was a missing stakeholder in the project who could have add valuable information?*

Respondent H: The first GD was without the grid operator, and the next GD will be with the Dutch grid operators and probably the ACM, the authority, and that is a bit a hard one because they are normally not involved in GDs because they are regulators and should remain independent but we want to challenge them to get in.

6.63. ***Interviewer:*** *How would you judge the success of the Innovation Deal?*

Respondent H: In the beginning we said it would be a success if the GD gives us the status of a serious technology instead of being a donkey shop because we started really at the donkey shop level because nobody believed that it will be possible to change this huge infrastructure that is existing now. So we wanted to create ourselves at least a Robin Hood status but we are farther than this one now. (What happened after the ending of the first GD?) We finalised the Dutch standards for electrical systems that means that we now can build DC systems as mature as existing AC systems. It is the same standardisation, the same risk, the same insurance prices. (So you achieved your goal, now you can work in the market?) Now we can work in the market and that is also why we want to go the next step, we want to work more on regulation level for the grid operators to get more influence on that one. That is why we need the Green Deal 2.0. (But after that it will be completely market ready?) Yes.