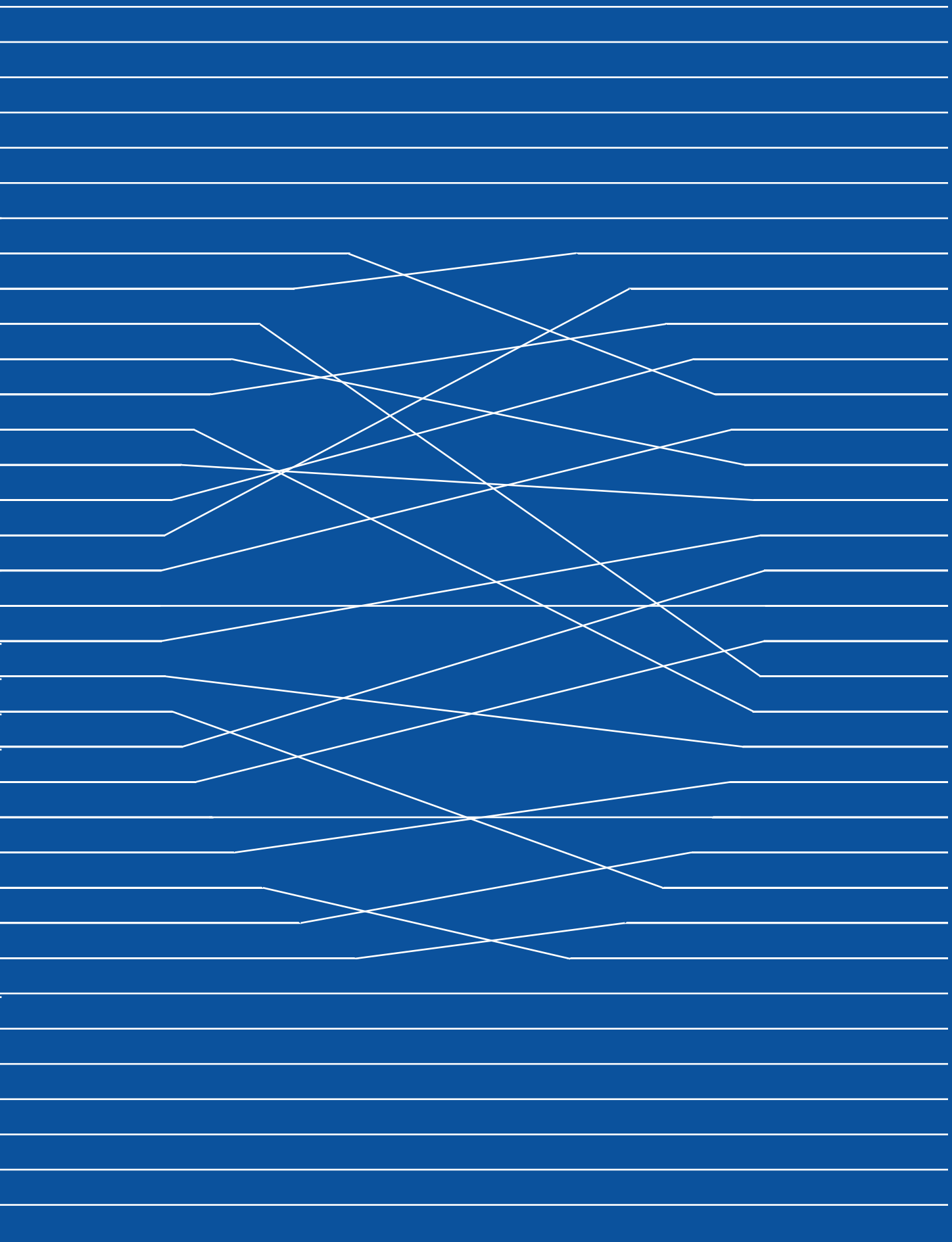
CREDIBILITY THROUGH CONNECTIVITY



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TITLE

Credibility through connectivity:

The relationship between the legitimacy of environmental governance networks and their social network structure

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PREFACE

The thesis presented before you is the product of an internship at WWF-NL, a leading organization in wildlife and nature conservation. I would like to thank WWF-NL for making this research possible through their global network and helpful colleagues. In particular Nora Sticzay and Jorien ten Hoogen were both essential in creating this thesis through valuable feedback, insights and ideas. I would also like to thank Iris Wanzenböck, my university supervisor, for always stimulating me to aim higher and think critically about what I wrote.

The time and meaningful input from all the interviewees and survey respondents also deserves a specific shout out; they made this thesis possible by providing unique data. Finally, I would like to thank my family and friends for their continuous support, encouragement and feedback throughout the sometimes challenging, but always rewarding process of writing this Master's thesis.

Matthijs Mouthaan

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LIST OF ABBREVIATIONS

BIER	Beverage Industry Environmental Roundtable
BM	Biodiversiteitsmonitor
CBWTi	Context-Based Water Targets initiative
CDP	Carbon Disclosure Project
EP	Embedding Project
FOEN	Swiss Federal Office for the Environment
ICMM	International Council on Mining and Metals
IUCN	International Union for Conservation of Nature and Natural Resources Netherlands
LTO	Land- en Tuinbouw Organisatie
NZO	Nederlandse Zuivel Organisatie
OPT	One Planet Thinking
SDG	Sustainable Development Goals
TNC	The Nature Conservancy
WRI	World Resources Institute
WUR	Wageningen University & Research
WWF-CH	World Wide Fund for Nature Switzerland
WWF-DE	World Wide Fund for Nature Germany
WWF-Int	World Wide Fund for Nature International
WWF-NL	World Wide Fund for Nature Netherlands
WWF-SA	World Wide Fund for Nature South Africa
WWF-US	World Wildlife Fund

SUMMARY

High credibility, in scientific literature generally defined as *legitimacy*, of environmental governance networks is critical for the extent to which the network reaches its goal(s). Input legitimacy in environmental governance can be stimulated by high participation of stakeholders and output legitimacy is present when the network output is perceived by stakeholders to be appropriate for the socioenvironmental issue at hand. Existing literature increasingly suggests that the legitimacy of environmental governance networks is influenced by their network structure, in particular network centralization and the tie characteristics. This interplay is still novel. Therefore, this thesis aims to validate the suggested relationship from existing research between the structure of environmental governance networks and their legitimacy, while also exploring a possible relationship with output legitimacy. The research was commissioned by WWF-NL. A descriptive multi-case research design was used, where four environmental governance networks were studied. Because WWF-NL commissioned this thesis, WWF is the mutual point in all networks. For each case, legitimacy was assessed through interviews with actors in each network and a survey was send to all actors in the network to map the network structure. After performing a cross-case analysis, this thesis suggests that input legitimacy increases with a high network centralization; strong ties; bridging ties between cliques; and with decentralized coordination and decision-making power. These findings are in line with the still novel literature on social network analysis and environmental governance. No observable relationship was found between the network structure and output legitimacy, possibly due to misalignment in operationalization or because output legitimacy is less related to the network structure compared to input legitimacy. Further research is needed to validate this misalignment, and research with more case studies enable statistical analysis to validate the suggested link between input legitimacy and the network structure.

Keywords: *environmental governance*; *social network analysis*; *legitimacy*.

EXECUTIVE SUMMARY

The need for an interdisciplinary approach to socioenvironmental issues is reflected by Sustainable Development Goal 17 ('Partnerships for the Goals'), which emphasizes the importance of cross-sector collaboration. Through collaborative networks, actors can create regulations or norms in areas where environmental government regulation is rare or enhance existing environmental government regulation, as well as increase the credibility of governance networks (Pattberg, 2012). However, credibility, generally defined as *legitimacy* in scientific literature, is often insufficient, leading to critical studies on the effectiveness of environmental governance networks (Kolk, 2013; Liese & Beisheim, 2011).

Low legitimacy results in low support from and uptake by stakeholders, as well as (public) criticism (Mena & Palazzo, 2012; Pattberg, 2005). When networks have a low legitimacy, this indicates that diverse stakeholders have either not been equally or sufficiently included, or that the output of the network is perceived by stakeholders as inadequate for the issue at hand (Mena & Palazzo, 2012). This thesis aims to increase the understanding of how legitimacy can be improved through a novel approach in environmental governance research.

The level of legitimacy in environmental governance networks is related to the structural characteristics of the network (Prell et al., 2009). Like any other social network, environmental governance networks have structural characteristics that can be measured through social network analysis. These network properties reflect for example which actors are most influential, which actors are most connected in the network, or if cliques exist within the network. This thesis studied how the structure of environmental governance networks is related to their legitimacy by assessing the network structure and legitimacy of four environmental governance networks.

An extensive literature review was used to identify which network structure indicators are suggested to influence the legitimacy of environmental governance networks. From these

relationships, broader hypotheses were formulated about the expected interplay between the network structure and legitimacy. Consequently, four environmental governance networks were analysed. For each network, the legitimacy was assessed through semi-structured interviews, while the network was mapped using a survey across all network actors. The results were compared across cases to identify common patterns that enable generalization.

Several relationships that the novel literature on social network analysis and environmental governance suggested, have been observed in the results. A trend across the four cases was that an equal decision-making power among network actors increased with decreasing network centrality. Equal decision-making power increases the legitimacy, as each agenda ideally should have a chance to influence the decision-making. Another relationship observed across cases was that the existence of both weak ties and strong ties in the network stimulate the inclusion of diverse actors in the network and a consensual environment, respectively. The latter is important to avoid disagreements, and enable alignment when conflicts do arise.

The actors with most ties in the network for each case were observed to often have a brokering role. This is important to ensure that all actors are informed of each other's values, expectations, while also stimulating alignment across diverse actors. The high number of ties is generally combined with strong ties with most actors. This further stimulates the brokerage role as strong ties enable the development of social resources such as trust and reciprocity. From the empirical results, four recommendations can be derived for organisations active in environmental governance networks, who aim to increase legitimacy. These are each presented on the next page. Summarizing, the socioenvironmental issues we face can only be solved by equally collaborating with all those who affect and are affected by the issues. Connecting is not complementary, but a *prerequisite* for credibility.

Recommendations for WWF-NL

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1. Increase connectedness in the network

First, aim to connect as much actors in the network with each other as possible. In a highly connected network, actors are more likely to have equal access to information, knowledge and other network actors. This in turn equalizes influence and authority across network actors, which increases the legitimacy and support for decisions.

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2. Strengthen relationships

Second, aim to strengthen the ties with all connected actors through more frequent and in-depth interaction, as this stimulates social resources such as trust and reciprocity. This increases support from actors for decisions, and helps to reach alignment when disagreements arise.

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3. Bridge subgroups

Third, in case there are a subset of actors within a network with significantly more interaction between themselves, it is important to ensure that these ‘cliques’ are connected. Otherwise, knowledge and information from these subgroups remains isolated.

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4. Share leadership

Fourth, avoid one actor with a distinct authority and decision-making power. By equalizing decision-making power across actors, both alignment and support in the network is stimulated, as well as an environment where there is more room to voice values, opinions and discuss uncertainties.

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1. INTRODUCTION

In the second half of the twentieth century, political and societal awareness concerning socioenvironmental issues grew (Nisbet, 1982). The United Nations Conference on the Human Environment in 1972 was the UN's first major conference related to the environment, and a turning point for global environmentalism (Baylis & Smith, 2005). During this time, the public, private and government sector increasingly started working together in collaborative networks to mitigate these socioenvironmental issues, as a form of environmental governance (Abbott & Snidal, 2009; Kolk, 2013). The societal relevance of collaborative governance networks has been embedded in an international context in the beginning of the 21th century as one of the United Nations' Sustainable Development Goals, and as a necessity for reaching the other goals (SDG17 – Partnerships for the goals).

Environmental governance networks help members of the network, in this thesis defined as *actors*, to reach results that cannot be reached by individual actors due to the interdisciplinary nature of socioenvironmental issues (Elkington & Fennell, 1998). Despite the popularity and potential of environmental governance networks, the effectiveness, or the extent to which the network reaches its objective, is often contested (Kalfagianni & Pattberg, 2013; Kolk, 2013). Insufficient credibility, often defined in scientific literature as *legitimacy*, is considered a persistent cause of low effectiveness among evaluative studies on environmental governance networks (Bäckstrand, 2006; Kolk, 2013; Liese & Beisheim, 2011; Marx & Cuypers, 2010; Szulecki et al., 2011). This thesis aims to increase the understanding of how legitimacy can be improved through a novel approach in environmental governance research.

Legitimacy entails the extent to which stakeholders perceive actions from a network as 'desirable, proper or appropriate' (Suchman, 1995, p. 574), and therefore, the extent to which stakeholder support the network and its output. Insufficient legitimacy can lead to low support, uptake and criticism from stakeholders (Bulkeley & Mol, 2003; Kalfagianni & Pattberg, 2013; Pattberg, 2005; Ronit & Schneider, 1999). Support from stakeholders can be stimulated either through a high participation of stakeholders in the governance network (*input legitimacy*) (Scharpf, 1997: 1999), and when the network output is perceived by stakeholders as relevant for 'solving the socioenvironmental issue at hand effectively' (*output legitimacy*) (Mena & Palazzo, 2012, p. 20). It follows that to ensure a fit between the network output and the socioenvironmental issue at hand, it is important to include

stakeholders in the governance process, since they possess unique knowledge on the issue (Bäckstrand, 2006). This highlights the interconnectedness and dependency between in-and output legitimacy, and the importance to include both in this thesis.

Novel research increasingly suggests that the legitimacy of environmental governance networks is influenced by their network structure (Bodin & Crona, 2009; Newig et al., 2010; Newman & Dale, 2007; Prell et al., 2009; Sandström & Rova, 2010). Social governance networks can exist in various structures, in terms of both network connectedness and the characteristics of these connections (Reed et al., 2009). As increasingly recognized, the network structure is found to reflect concepts closely related to legitimacy, such as stakeholder involvement, collective action and power asymmetries (Crona et al., 2011; Ernston et al., 2008; Isaac et al., 2007). Social network analysis (SNA) is a methodology to quantify these network structures.

However, combining the two fields of environmental governance and SNA is novel. Another research gap is that most existing research focusses on SNA and input legitimacy. This thesis argues that it is relevant to study SNA and output legitimacy as well, due to the afore-mentioned co-dependence between in-and output legitimacy and the influence of output legitimacy on a networks' effectiveness (Bäckstrand, 2006; Kalfagianni & Pattberg, 2014). Aiming to bridge the two scientific gaps mentioned above, this study seeks to answer the following research question:

How does the social network structure of environmental governance networks relate to their in- and output legitimacy?

A literature review forms the basis of the conceptual framework and hypotheses that suggest relationships between the network structure and legitimacy, as found in theory. A multi-case research design is used to answer the research question. Four governance networks that address socioenvironmental issues are the unit of analysis. The structure of each network is assessed through a survey among all network actors, assessing with whom each actor collaborates, how often and about what; the legitimacy is analysed through in-depth, semi-structured interviews with five actors of

each network. A cross-case analysis allows identifying patterns and outliers that support current literature and the hypotheses that are distilled. This way, this thesis aims to increase understanding and expand current scientific knowledge on how the structure of environmental governance networks relates to their in- and output legitimacy.

The next section builds on the theoretical concepts of legitimacy and social networks, to create a conceptual framework and hypotheses. Section 3 elaborates on the methodology of the study, while section 4 introduces the results of the individual cases. Section 5 presents the cross-case analysis, where the hypotheses will be reflected against cross-case comparison of the results. Section 6 critically discusses the implications and limitations of the thesis. Section 7 concludes with the findings to answer the research question, and give both practical and theoretical recommendations how the legitimacy of environmental governance networks can be improved through their network structure.

2. THEORY

This thesis builds on theories explaining legitimacy and the structure of social networks. This section gives an overview of current literature and how this thesis aims contributes to existing literature. Through a literature review, relationships between the network structure and legitimacy of environmental governance networks are identified. These relationships form the conceptual framework and the basis for the formulation of hypotheses at the end of this section.

2.1. The rise of environmental governance

During the second part of the twentieth century, political and societal awareness grew concerning environmental externalities. This trend, also named 'environmentalism', has been coined as one of the most important social movements of the twentieth century (Nisbet, 1982). Environmentalism was fuelled by publications such as the Club of Rome's *Limits to Growth*, the Brundtland-report *Our Common Future* and Rachel Carson's *Silent Spring* (Carson, 1962; Holling, 1986; Keeble, 1988; Meadows et al., 1972). Decentralization and contested effectiveness of governmental environmental policy decreased the original role of the government as the 'custodian' of nature at the end of the twentieth century. Together with increased understanding of the complexity and interconnectedness of socioenvironmental issues, this enabled non-government actors to influence environmental policy and regulations in the global policy arena (Lemos & Agrawal, 2006; Peluso & Vandergeest, 2001; Raines, 2003; Wunsch & Olowu, 1997). This is also defined as 'governance', which is 'the purposeful and authoritative steering of societal processes' by public and private actors (Biermann et al., 2017, p. 76).

As Haas (2004) mentions, a 'diffusion of political authority over major governance functions' has taken place since these aforementioned developments (p. 3). Public, private and government actors are participating in collaborative networks to steer societal processes (Raines, 2003). Torfing (2005) defines these governance networks as follows: '(1) relatively stable horizontal articulations of interdependent, but operationally autonomous actors who (2) interact with one another ... (3) within a regulative, normative, [and cognitive] ... framework that is (4) self-regulating within limits set by external forces and which (5) contributes to the production of public purpose' (p. 307). From this definition, it is again highlighted that actors within a network are dependent on one another to reach the desired outcomes. This emphasizes the importance of the collaborative aspect in governance networks (Rhodes, 1996; Torfing, 2005).

These governance networks consist of a combination of public, private and/or government actors (Kolk, 2013). Public actors are often non-governmental organisations (NGOs) who represent (marginalized groups of) civil society. The government generally covers governmental institutions on both national, international and transnational level (including the European Union and development banks, for example). The private sector concerns for-profit organisations, ranging from small-to

medium enterprises to multinational enterprises (Kolk, 2013). As generally assumed, these cross-sector networks help actors involved to reach results that cannot be reached by individual actors. This is due to the wicked nature of socioenvironmental issues and the innovative and adaptive learning nature of cross-sector collaboration (Dedeurwaerdere, 2005; Elkington & Fennell, 1998). In other words, as Rhodes (1996) mentions, 'governance is about managing networks' (p. 658).

2.2. Governance networks and sustainable development

The wicked nature of socioenvironmental issues requires a multidisciplinary approach which can be found by partnering with other actors, often from different sectors (Kolk, 2013). These cross-sector networks enable access to unique knowledge, expertise and funding (Elkington & Fennell, 1998; Rondinelli & London, 2003). Through this unique access, governance networks can contribute to sustainable development in three ways (Pattberg, 2012):

- Create norms in areas where governmental regulation is rare or non-existent;

Example
The Marine Stewardship Council (MSC) is a certification network for the international fishery industry, founded by WWF and Unilever. The MSC provides voluntary transnational regulations concerning sustainable fish stocks where international government law lacks the ability to generate autonomous compliance (Karavias, 2018).

- Enhance the implementation of existing or expected (governmental) regulations;

Example
The Common Sense Initiative (CSI), initiated by the American Environmental Protection Agency in collaboration with public, private and government actors, aims to evaluate environmental regulations. These are often deemed too complex which negatively influences innovation and reputation of environmental regulation. The CSI sought to evaluate regulations and improve complex policies into comprehensive strategies to benefit overall implementation efforts (Coglianese & Allen, 2005).

- Enable access to governance networks by less-privileged stakeholders, which increases inclusiveness, democracy and accountability.

Example
Mexico's National Forestry Commission launched a program where government actors involved multiple indigenous and rural social movements, often neglected in negotiations, to improve rural, sustainable agriculture and preserve natural resources (McAfee and Shapiro, 2010).

Besides stimulating sustainable development, governance networks can lead to improved stakeholder relations, reputation, credibility, operational efficiencies, risk management and motivation of actors in the network (Elkington & Fennell, 1998; Rondinelli & London, 2003). However, the trend to form governance networks is paralleled by a (contested) shift in democratic authority. Government actors have democratic authority on issuing policies and regulations, since they are chosen democratically through elections or other forms of (in)direct voting rights by society (in developed countries). In contrast, governance networks do not have this democratic basis and self-evident authority since they do not involve, or only partly involve government actors. Therefore, their democratic authority must be built bottom-up (Bernstein & Cashore, 2007).

The aforementioned 'democratic authority' is coined *legitimacy*, which is defined as 'a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions' (Suchman, 1995, p. 574). If the actions and output of a network are not perceived by stakeholders as desirable, proper or appropriate, this can lead to low support and uptake from stakeholders, as well as (public) criticism (Pattberg, 2005; Raines, 2003; Ronit & Schneider, 1999).

2.3. Legitimacy

Legitimacy in environmental governance literature is generally divided in a two-fold perspective. First, sufficient participative inclusion of a diverse range of stakeholders in a deliberative environment increases their support for the network output, whether this is policy, regulations, or voluntary standards (Mena & Palazzo, 2012; Pattberg, 2005; Pieth, 2007). This is the level of participation by stakeholders in the governance network, and is defined as *input legitimacy* (Scharpf, 1997: 1999).

Second, in case the output of a governance network is unfit for the socioenvironmental issue at hand, because the output is not stringent enough, creates unintended, negative externalities, or because the output is too focussed on and specific for certain actor groups, the effectiveness is also impaired (Dupuy, 1991; Mena & Palazzo, 2012; Raines, 2003; Sethi, 2003). This 'capacity of governance mechanisms to effectively take a regulatory role' is defined as *output legitimacy* (Mena & Palazzo, 2012, p. 14). The next section (2.3.1) will elaborate on input legitimacy; followed by output legitimacy (2.3.2.)

2.3.1. Input legitimacy

Input legitimacy concerns the level of participation by stakeholders in the governance network (Scharpf, 1997: 1999). The level of participation can be assessed by looking at who is included, the extent to what they are included and how the input of these actors is used (see Figure 1) (Renn & Schweitzer, 2009; Wesselink et al., 2011). *Who* is included is also defined as *inclusiveness*. Ideally, environmental governance networks include a broad range of stakeholders with different interests (Gulbrandsen, 2010).

What is included can differ per actor and network. For example, actors can be included solely as a source of information; other actors may be asked for decision-making and their opinions or views. From a legitimacy perspective, ideally, actors in the network have an equal decision-making power, as this stimulates alignment and support among actors (Mena & Palazzo, 2012). The extent to which actors have an equal input and decision-making power in the network is also defined as *procedural fairness*.

How the input of actors is included can vary based on the different agendas a diverse group of stakeholders bring to the table. It is to be expected that these different agendas are traced back to different values, opinions, interests and expectations. In order to get support from diverse stakeholders, it is important to reach alignment and wide agreement (Mena & Palazzo, 2012). The extent to which there is a deliberative environment to aim for consensus reflects this (*consensual orientation*). Each of these three indicators is elaborated upon in a separate section below.

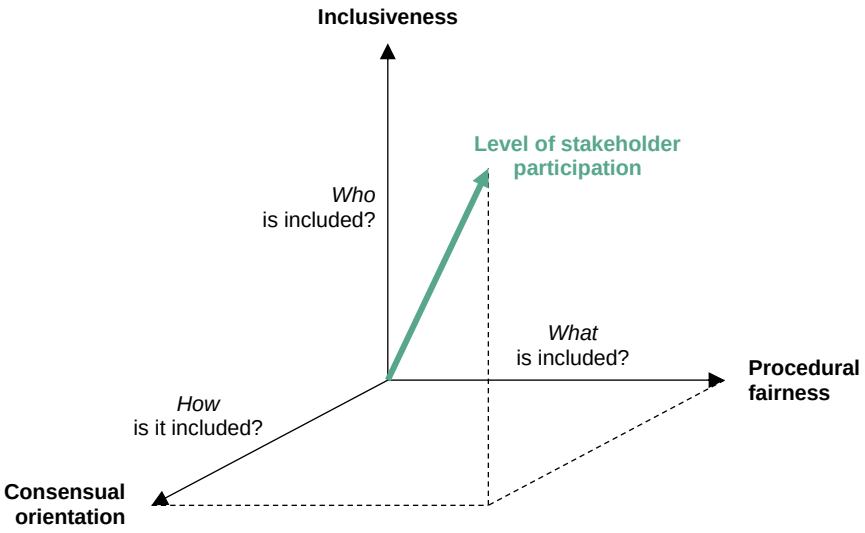

FIGURE 1 ■ The three indicators for input legitimacy.

Inclusiveness

Inclusiveness concerns the extent to which all stakeholders are represented in the network (Gulbrandsen, 2010). Inclusion of stakeholders with different backgrounds and interests is important because of several advantages. First, it enables a bridge between the socioenvironmental issue and first-hand experiences from stakeholders who both affect and are affected by the socioenvironmental issue at hand. Second, inclusion stimulates broad support due to the possibility to clarify and discuss different views and interests. Third, it creates a learning curve for all stakeholders involved, which also increases the support for outcomes.

Fourth, inclusiveness stimulates commitment by stakeholders, which prevents implementation problems. And fifth, it increases output legitimacy (Bulkeley & Mol, 2003; Kalfagianni & Pattberg, 2013; Pattberg, 2005; Raines, 2003). In particular the inclusion of public actors are important in environmental governance, as they add expertise and moral authority (Boström, 2006; Gulbrandsen, 2010; Hall and Biersteker, 2002). Insufficient inclusiveness can result in public criticism and scrutiny (Rametsteiner & Simula, 2003; Ronit & Schneider, 1999).

Example
The Forest Stewardship Council (FSC) is criticized by NGOs and academia for not including indigenous communities who live in and depend on the forests, as well as not considering the interests of developing countries sufficiently. Most certified forests and companies are namely in developed countries (Rametsteiner & Simula, 2003; Ronit & Schneider, 1999).

Procedural fairness

Procedural fairness concerns whether unequal decision-making power among actors is neutralized to enable equal, fair and neutral decision-making (Mena & Palazzo, 2012). Some partnerships have rules and procedures to ensure equal active involvement throughout the partnership life cycle by both naturally dominant- and non-dominant stakeholders (Mena & Palazzo, 2012).

Example
The Round Table Responsible Soy (RTRS) is a network with private actors throughout the soy supply chain (farmers, processors, distributors) and public actors to promote a sustainable soy industry. The RTRS has a fixed, pre-determined number of stakeholders for each relevant sector in the executive board of the network to ensure each sector has an equal voice in decision-making (Round Table Responsible Soy, 2018).

In environmental governance literature, equal power relations among actors are commonly reflected by the distribution of roles (Mena & Palazzo, 2012; Webler & Tuler, 2006). Webler & Tuler (2006) define several forms of collaborative networks, from which three actor roles can be distilled. First, an actor can have a leadership role with dominant decision-making power. As Webler & Tuler (2006) note, the presence of a strong leader runs the risk of 'alienating participants and leading to a lower sense of ownership over the process' (Webler & Tuler, 2006, p. 713). This way, a leadership role negatively influences the procedural fairness of the network.

Second, actors can function as a soundboard in a 'one-way channel': a 'coordinating unit' in the network asks actors to provide either open-ended feedback on certain progress, or specific (scientific) knowledge input (Webler & Tuler, 2006). It is described as a one-way channel as the actors with this role act as 'providers', where the feedback or knowledge they provide is on-demand and the

‘coordinating unit’ of the network’ has the decision-making power to decide the extent to which their input is used (Webler & Tuler, 2006). Actors with a ‘provider’ role are not asked for thoughts and opinions on the more general development and strategy of the network, and do therefore have no decision-making power, which negatively influences the procedural fairness (Webler & Tuler, 2006).

Third, actors can have a ‘participatory’ role. These actors generally are able to provide input and feedback on the structural progress, development and strategy of the network; this input can still be non-committal in case a lead actor in the network has the final decision-making power. However, these participatory actors can directly influence the direction of the network and have more freedom in voicing their opinions and interests (Webler & Tuler, 2006).

Consensual orientation

The danger of conflict or disagreement within governance networks is often neglected by scholars (Ansell, 2008; Robins et al., 2011). In recent years, governance networks increasingly put emphasis on creating a cooperative environment through facilitative roles of actors within the network. These *brokerage* roles are embodied by actors with ‘specific experience and capacity to build and/or facilitate’ governance networks (Stadtler & Probst, 2012, p. 32). Brokering actors can facilitate consensual orientation on disagreements by connecting otherwise unconnected actors in terms of access and trust, which also enables access to new information and resources (Granovetter, 1973; Marsden, 1982).

Stadtler & Probst (2012) argue that brokers play a role throughout the life cycle of a governance network. In the problem-setting phase, brokers identify and aim to include all relevant stakeholders; in the direction-setting phase, brokers facilitate defining a common approach and goal as well as the distribution of responsibilities and rights; during the implementation phase, brokers aim to neutralize different working cultures and enhance relationships among actors; in the review phase, brokers can guide network reviews and offer suggestions due to past experience (Stadtler & Probst, 2012). Common brokerage roles are attributed to government organisations and international organisations, such as the United Nations Environment Programme (Biermann & Siebenhüner, 2009; Brinkerhoff & Brinkerhoff, 2011).

2.3.2. Output legitimacy

Output legitimacy is defined in this thesis as 'the extent to which the rules fit the problem at hand, and are relevant for solving it effectively' (Mena & Palazzo, 2012, p. 20). This reflects 'the capacity of governance mechanisms to effectively take a regulatory role' (Mena & Palazzo, 2012, p. 536; Nanz, 2006; Risse, 2006). Regulations, standards or rules can be perceived as unfit for the socioenvironmental issue when they are not stringent enough; when they create unintended, negative externalities; or when they are too focussed on and specific for certain actor groups (e.g. Western brands, or the energy sector), which limits broad uptake (Dupuy, 1991; Mena & Palazzo, 2012; Raines, 2003; Sethi, 2003).

The latter often goes hand in hand with insufficient inclusiveness, since the absence of stakeholders can result in regulations or agreements that fit the needs of the dominant actors involved in the network (such as developed countries and Western companies) (Raines, 2003). This example shows the interlinkage between in-and output legitimacy. However, low input legitimacy, as mentioned in this example, can be balanced out by high output legitimacy, emphasizing the importance of output legitimacy (Bäckstrand, 2006).

From the definition of output legitimacy presented in the first paragraph of this section, two indicators of output legitimacy can be distilled: the stringency of standards and the level of uptake. These two indicators are common output legitimacy concepts in environmental governance literature (Bäckstrand, 2006; Mena & Palazzo, 2012; Kalfagianni & Pattberg, 2014; Van Tulder & Kolk, 2001). Monitoring is a third indicator often used when studying output legitimacy, as monitoring is used to avoid negative externalities of a networks' output (Mena & Palazzo, 2012). This study focusses only on stringency and uptake, as monitoring is predominantly relevant when studying standard-setting partnerships – the cases of this study however, do not aim for standard-setting. Both stringency and uptake are elaborated upon in the two sections below, respectively.

Stringency

Stringency is the extent to which norms or rules are 'prescriptive and comprehensive' (Gulbrandsen, 2010, p. 36). Strict regulations yield higher regulatory effectiveness compared to less prescriptive and comprehensive regulations (Fuchs & Kalfagianni, 2012). Besides yielding higher effectiveness, stringent regulations are suggested to enhance the competitiveness of actors involved (Vogel, 1997). However, as Gulbrandsen (2010) notes, high stringency can also negatively affect the effectiveness since stringent norms or rules are likely to attract less participants due to the high requirements and comprehensiveness.

Uptake

Uptake is the main output legitimacy driver and refers to the acceptance by the target group of a governance networks' output (Hall, 1998; Mena & Palazzo, 2012; Kalfagianni & Pattberg, 2014). Uptake can be analysed from several viewpoints, ranging from the number of participants in a network, the geographic coverage of these participants to their collective share of the resource for which the network is established (Kalfagianni & Pattberg, 2014).

As Mena & Palazzo (2012) set out, the level of uptake depends on the 'structural characteristics' of the first-movers (p. 19). When first-movers are involved in the network, those actors with similar structural characteristics, such as competitors, are expected to follow to avoid competitive disadvantages (Bernstein & Cashore, 2007; Husted & Allen, 2006). For example, if first-movers are predominantly actors from the energy industry, actors who implement the network output later are expected to also have a high chance to originate from the energy industry – or, small-to-medium enterprises will attract similar small-to-medium enterprises rather than multinational enterprises (Mena & Palazzo, 2012).

That first movers highly influence the uptake is further emphasized by research from Auld et al. (2008), Mattli & Büthe, (2003), Nehrt (1998) and Salop & Scheffman (1983). They argue a first-mover advantage for early participants who can knead norms and rules more flexibly to match their capacity, while laggards lack that ability and have to comply to pre-determined criteria. Because first-movers influence the content and stringency of the regulations, these regulations will also fit better for those actors with similar structural characteristics, such as size and industry.

Example

The MSC has been criticized for offering certification that is only suitable for stakeholders in the developed world due to the requirements involved (Pérez-Ramirez et al., 2012). This is reflected by the certificate's first movers, consisting of Western stakeholders (fisheries such as the Thames herring, Western Australia Rock Lobster and retailers such as Saintsbury's in the UK and Whole Foods in the USA) (Ponte, 2012). To combat this, the MSC specifically addressed the goal in 2000 to enable certification for 'all fisheries, irrespective of their nature, scale and intensity, location and country development' (Pérez-Ramirez et al., 2016, p. 2). The MSC admits however that anno 2017, Global South fisheries 'still lack the resources, data, technical knowhow and/or governance systems necessary to meet MSC requirements', highlighting the persistent influence of first mover advantages on long-term uptake (Marine Stewardship Council, 2017, p. 30).

2.4. The structure of governance networks

Research increasingly suggests a link between the structure of environmental governance networks and their legitimacy (Bodin & Crona, 2009; Prell et al., 2009; Reed et al., 2009). Social network analysis (SNA) offers a framework to assess this network structure and actor relationships (Bodin & Crona, 2009; Reed et al., 2009). SNA is used in a variety of fields where networks exist, ranging from classrooms to HIV transmission networks (Borgatti, 1995; Martinez et al., 2003). Interestingly, the theoretical concepts underlying SNA have recently gaining popularity as a framework in the field of environmental governance.

Within environmental governance networks, two structural qualities are identified that influence the level of legitimacy. First, *network centralization* concerns the level of network connectedness. Network centralization is expressed by several indicators, ranging from network-level measures such as the ratio between the total number of ties in the network and the maximum possible number of ties (*density*), the number of actor subgroups in the network (*cohesion*) and the tendency of a network to revolve around one actor (*centralization*) to actor or node-level measures such as the number of ties actors have in the network (*degree centrality*) and how many times an actor connects two otherwise unconnected actors (*betweenness centrality*) (Bodin & Crona, 2009; Prell et al., 2009; Sandström & Lundmark, 2016). These indicators are suggested to influence the collaborative and coordinating

efforts of networks, and with that, the legitimacy (Bodin & Crona, 2009; Prell et al., 2009; Reed et al., 2009). Section 2.4.1. elaborates on the indicators for network centralization.

Second, the *tie characteristics* are an important structural quality of environmental governance networks (Granovetter, 1973; Reed et al., 2009). Whereas network centralization refers to the distribution of ties among actors, tie characteristics address the *nature* of these ties. This is important to consider, as the mere existence of a tie lacks context – for example, a tie can indicate a daily or annual interaction; and it can consist of a purely financial relationship or in-depth knowledge exchange (Borgatti et al., 2013; Reed et al., 2009). Literature generally addresses the nature of ties by classifying weak and strong ties (*tie strength*). Besides the strength of a tie, it's position in the network is also important. In particular, the extent to which ties exist within a subgroup of interconnected actors (*bonding ties*) is relevant as well as ties that bridge these subgroups with different values and interests (*bridging ties*), as this enables the exchange of diverse information and opinions (Bodin & Crona, 2009; Reagans & Zuckerman, 2001; Sandström & Carlsson, 2008; Woolcock, 1998). Section 2.4.2. elaborates on the indicators for tie characteristics.

2.4.1. Network centralization

Density

The density of a network expresses the ratio between the number of ties present and the maximum theoretical number of ties. A high density is positively related to collective action, in both environmental governance literature and non-environmental governance literature (Prell et al., 2009). Especially if a significant number of ties are with diverse actors, high density stimulates broad uptake. It also positively influences deliberation within the network, with a high number of ties facilitating a constructive environment that 'encourages shared understandings' (Sandström & Lundmark, 2016, p. 447), facilitating consensual orientation by mitigating conflicts among actors (Chambers, 2003; Dryzek, 2000). It is also found that other governance goals such as knowledge development and diffusion require less ties.

Example
Sandström & Carlsson (2008) studied environmental governance networks in Sweden. They found that high density networks were positively correlated with collective action, especially when a high percentage of ties was between actors with different attributes (thus, diverse ties).

Cohesion

Cohesion expresses the extent to which a network is one uniform 'cluster' or a network of cliques. *Cliques* are groups of actors within a network that share significantly more ties among them compared to ties outside the clique. Knoke and Yang (2008) define these cliques as 'a maximal complete subgraph of three or more actors, all of which are directly connected to one another, with no other actor in the network having direct ties to every member of the clique' (p. 73).

Cliques are formed because of either practical reason (geographical distance), capacity (too many ties to develop them all) or a shared specialty within the subgroup (a common field of expertise, for example) (Bodin & Crona, 2009). Within cliques, specialized knowledge can be developed since cliques are often formed with like-minded actors. Especially with multiple cliques, these knowledge 'hotspots' can be beneficial in understanding the wicked nature that most socioenvironmental issues entail (Moller et al., 2004; Walters, 1986).

Centralization

Centralization expresses the variability of centrality among individual actors on a network level. An advantage of high centralization, visualized by a star-shaped network, is that only a few actors need to be reached to indirectly reach the whole network – while a disadvantage is that dependency on a few actors can hamper the procedural fairness, with a few actors having high influence and control over resource flows throughout the network (Dougill et al., 2006; Lockie 2006). However, high centralization also enables collective action, important for the uptake of the network output (Bodin & Crona, 2009; Olsson et al., 2004; Sandström, 2004).

A specific network structure often found in environmental governance networks is called a *core-periphery network*, determined by the centralization characteristics of the network (Bodin & Crona, 2009; Isaac et al., 2007). A core-periphery network is characterized by a few highly centralized and interconnected actors (the core), while the rest of the network (the periphery) is only connected to this core (Everett & Borgatti, 1999). Case studies from environmental governance found that core actors both have a *bridging function*, by enabling new information flows from outside the network to the core, and a *hub function*, by analysing the new information and exchanging it with the periphery actors.

The bridging function is amplified by a high number of ties from core actors with a diverse range of actors outside of the network (Ernstson et al., 2009). Due to their bridging and hub function, core actors are the most influential in agenda-setting and decision-making power in the network. This can hamper procedural fairness in core-periphery networks, since periphery actors can be marginalized by dominant core actors (Bodin & Crona, 2009; Ernstson et al,, 2009).

Example
A case study among Ghanaian agroforestry governance networks found that these networks had core-periphery structures. The core actors functioned as bridges, responsible for new resource flows from external actors, and as communication hubs who spread these resources to the periphery actors (Isaac et al., 2007).

So far, SNA concepts have been discussed that express structural characteristics on a network level. However, it is relevant to include actor-level indicators of network centralization as well, as the power and influence distribution among individual actors is closely linked to legitimacy indicators such as procedural fairness and consensual orientation (Bodin & Crona, 2009). Degree- and betweenness centrality both cover actor-level indicators.

Degree centrality

The degree centrality is equal to the number of direct ties an actor has in a network (Prell et al., 2009). A high degree centrality reflects a highly connected actor with a focal position (Knoke & Yang, 2008). This reflects the ability to diffuse resources fast throughout the network and a potentially high influence

in the network (Prell et al., 2009). However, a high number of ties indicate that a significant amount of relations must be maintained, which often results in weak ties and thus low influence on connected actors (Prell et al., 2009). With a lot of ties, focal actors may also experience retardment in their actions and decision-making because they want to consider the needs of as much as possible connected actors, indicating an overshoot of focus on consensual orientation (Frank & Yasumoto, 1998).

Betweenness centrality

Betweenness centrality reflects how many times an actor connects two other actors, who would otherwise be disconnected (Freeman et al., 1979; Wasserman and Faust, 1994). It reflects how much control and authority an actor has over relational flows within the network, which influences the level of procedural fairness (Knoke & Yang, 2008). By connecting otherwise disconnected stakeholders, actors with a high betweenness centrality have a holistic view of the problem, which enables comprehensive regulations, and thus increased stringency. Actors with a high betweenness centrality often play a brokering role in partnerships, since they bridge different views between actors with a lower centralization score (Brass, 1992; Meno & Palazzo, 2012; Prell et al., 2009; Rowley, 1997). This way, they stimulate consensual orientation. However, being tied to different network segments can also cause a dichotomy in their position or role (Krackhardt et al., 2003).

2.4.2. Tie characteristics

Collaborative relationships between two actors are defined as 'ties' in SNA. *Relational flows* elaborate on the *type* of tie that connects two actors, for example, whether they exchange money or information, among others. Besides relational flows, tie strength is generally measured through the tie frequency, or how often two actors communicate/collaborate (Prell et al., 2009). Tie strength is commonly categorized in strong ties and weak ties. Strong ties reduce disagreements, since they nurture the development and maintenance of trust and reciprocity among the involved actors (Prell et al., 2009). This way, they facilitate consensual orientation by enabling the development of social resources. Strong ties are also beneficial for exchanging complex information – however, this advantage may be countered by an abundant amount of information that actors with strong ties exchange (Reed et al., 2009).

Although the term ‘weak’ often has a negative association, weak ties have their own network advantages. Whereas strong ties reduce the innovative capacity since there is limited inflow of new resources from other actors, weak ties connect diverse actors and new information, important for inclusiveness (Prell et al., 2009; Reed et al., 2009). This can be explained by research that has shown that weak ties are generally between diverse actors, who have access to different resources and segments (Reed et al., 2009). On the other hand, weak ties can also indicate a low amount of effort, understanding and alignment between a pair of actors, decreasing the level of consensual orientation (Granovetter, 1973; Newman & Dale, 2007).

When cliques exist within a network, both *bonding* and *bridging ties* are important. Bridging ties do, as the term suggests, bridge different cliques. Without exchanging isolated, specialized knowledge to solve multidisciplinary issues, the knowledge is of limited use, which highlights the importance of bridging cliques (Newman & Dale, 2007). Enabling a holistic view of socioenvironmental issues by bringing together different knowledge hotspots, bridging ties are argued to increase stringency as well (Moller et al., 2004; Walters, 1986). Bridging ties can also facilitate mobilization and collectiveness of the network, creating support for network output, which in turn can increase uptake (Bodin & Crona, 2009).

Ties between actors within a clique are called ‘bonding ties’ (Newman & Dale, 2007). Bonding ties stimulate the development of social resources such as trust and reciprocity, facilitating consensual orientation (Ostrom, 1990). Besides, as mentioned in section 2.4.1., bonding ties within cliques enable the transfer of specialized knowledge (Moller et al., 2004; Walters, 1986).

Example

Warriner and Moul (1992) showed in a case study of a highly centralized, dense network of farmers with little bridging ties compared to bonding ties that this network was less motivated to adopt more sustainable tillage methods. The importance of bridging ties for innovation and mobilization is further shown by Krishna (2002), who found that a high level of bridging ties between external actors and rural Indian villages was a key contributor to collective action and social development.

2.5. Conceptual framework

The suggested relationships between the structure of governance networks and their legitimacy has been described in the previous sections. An overview of these possible relationships is presented in Table 1. The right 'Arrow' column refers to the conceptual framework in Figure 2. A conceptual framework is important to identify what will be included in a study, and to emphasize and visualize relationships between concepts from 'logic, theory and/or experience' (Baxter & Jack, 2008, p. 553, Huberman & Miles, 1994). The conceptual framework used for this study aims to connect the governance network structure and their legitimacy. In the left column, all network structure indicators introduced above are listed; in the right column, in- and output legitimacy are listed. The concept of bridging ties and bonding ties as introduced in section 2.4.2. is closely related to cliques. Therefore, it is not listed as a separate indicator, but is incorporated in the indicator *cohesion*.

Each arrow represents a possible relationship between the network structure and in-or output legitimacy, based on existing literature. There are only a limited number of links found for output legitimacy, since limited research has been done on that interplay. From the possible relationships between the structure of environmental governance networks and their legitimacy suggested by literature, hypotheses were formulated. These are listed under the conceptual framework.

TABLE 1 ■ An overview of possible relationships between the network structure indicators and in-or output legitimacy.

Network structure indicator	Legitimacy indicator	Explanation	Source(s)	Arrow
Density	Consensual orientation	A high number of ties facilitate a constructive environment that 'encourages shared understandings', by mitigating conflicts among actors.	Chambers, 2003; Dryzek, 2000	1
	Uptake	Collective action increases with a high density, especially if a significant number of ties are with diverse actors	Prell et al., 2009	2
Cohesion	Consensual orientation	Bonding ties in cliques stimulate social resources such as trust and reciprocity, facilitating consensual orientation.	Ostrom, 1990	3

	Stringency	Cliques can be beneficial in understanding the wicked nature of socioenvironmental issues. Stringency is therefore suggested to be impaired by cohesion, as cohesion increases with a decreasing number of cliques.	Moller et al., 2004; Walters, 1986	4
	Uptake	Bridging ties can facilitate mobilization and collectiveness of the network, creating support for decisions or regulations, which in turn can increase uptake.	Bodin & Crona, 2009	
Centralization	Procedural fairness	High centralization is suggested to reduce procedural fairness, as it reflects a dependency on a few actors that have a high influence over resource flows in the network.	Dougill et al., 2006; Lockie 2006	5
	Uptake	High centralization enables collective action as the central actor can act as the driving force for and mobilization of the rest of the network	Bodin & Crona, 2009; Olsson et al., 2004; Sandström, 2004	6
Degree centrality	Procedural fairness	With a lot of ties, actors have a potentially high influence over the network and the ability to diffuse resources fast throughout the network.	Prell et al., 2009	7
	Consensual orientation	Actos with a high degree centrality may want to consider the needs of as much as possible connected actors.	Frank & Yasumoto, 1998	
Betweenness centrality	Procedural fairness	When predominantly connecting otherwise unconnected actors, a high betweenness centrality is suggested to reflect a high control and authority.	Knoke & Yang, 2008	8
	Consensual orientation	Actors with a high betweenness centrality often play a brokering role in partnerships, since they bridge actors with different views and expectations.	Brass, 1992; Rowley, 1997	
	Stringency	Actors with a high betweenness centrality have a holistic view of the problem which enables comprehensive network output.	Prell et al., 2009	9
Tie strength	Inclusiveness	Weak ties connect diverse actors.	Prell et al., 2009; Reed et al., 2009	10
	Consensual orientation	Strong ties are a way to reduce disagreements, since they nurture the development of trust and reciprocity.	Prell et al., 2009	

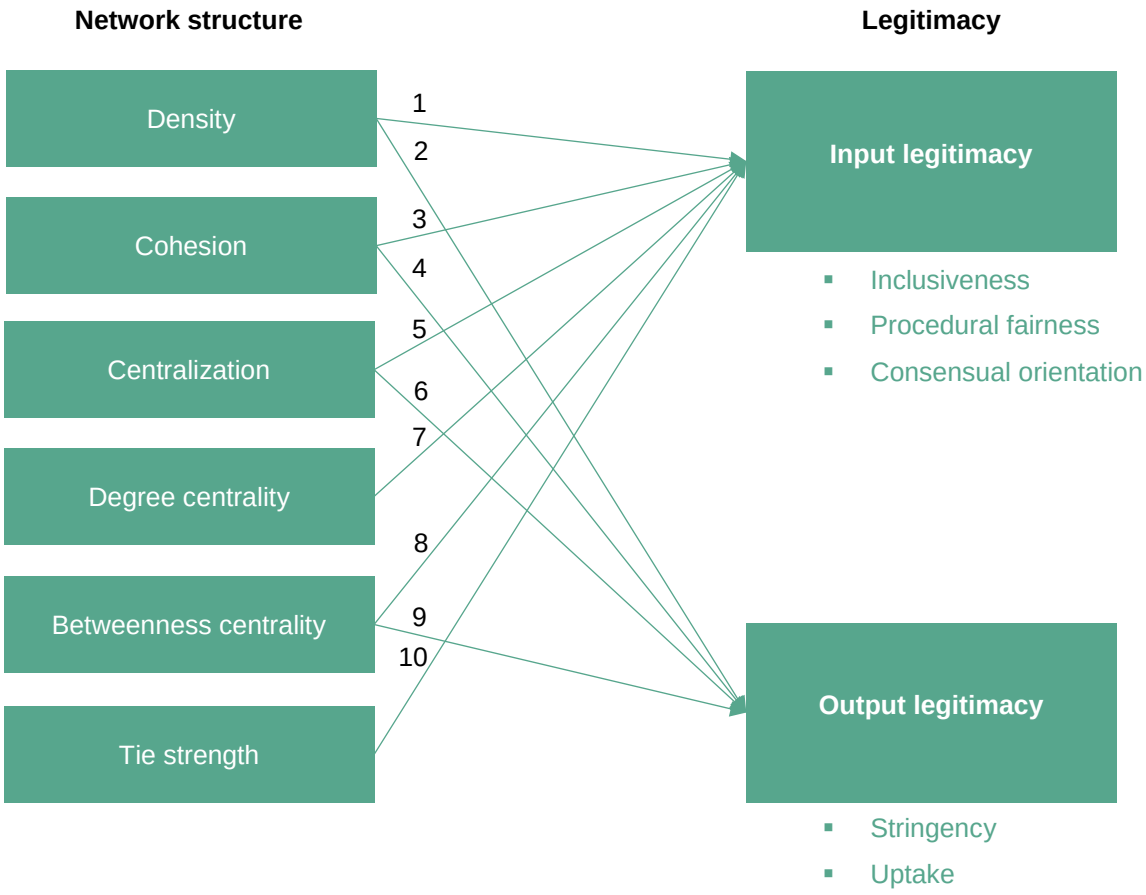

FIGURE 2 The conceptual framework combining network structure indicators and in-and output legitimacy. Each arrow represents a possible relationship, based on existing literature. Each arrow is explained in Table 1.

By summarizing all the interlinked concepts in this framework, several hypotheses were distilled. These hypotheses were formulated based on trends across multiple indicators, rather than selecting one-on-one indicator relationships. This way, the validity of multiple indicators can be tested which increases relevance. A second strategy that was used when establishing hypotheses was to cover not only multiple indicators in one hypothesis, but also to aim to cover all network structure- and legitimacy indicators once across the hypotheses. Based on this approach, two hypotheses were formulated on a network-level (H1 and H2), and two hypotheses on a node-level (H3 and H4).

H1 and H2 are formulated on an indicator-level for legitimacy to avoid unfounded generalization. H3 and H4 are formulated on an actor-level for the network indicators for the same reason – however, legitimacy is formulated at a concept level (*legitimacy* in general for H3 and *input legitimacy* for H4) as the majority of the indicators of each concept is covered by the respective network indicator (four out

of five indicators for *legitimacy* in H3 and two out of three indicators for *input legitimacy* in H4) In numerical order, they are listed below:

- **H1: Centralized networks are negatively related to the procedural fairness of governance processes**

  Arrow 5, 7 and 8 in Table 1 and Figure 2

  Centralized networks have a high centralization score, which indicates a few actors with a high degree centrality and betweenness centrality. With a high centralization, focal actors in the network have a high influence, power and authority compared to the rest of the network (Dougill et al., 2006; Knoke & Yang, 2008; Lockie 2006; Prell et al., 2009). For procedural fairness however, it is important for all actors to have an equal influence on decision-making, ideally, as they all represent different stakeholder groups (Mena & Palazzo, 2012).

- **H2: Network-level indicators are related to the level of uptake**

  Arrow 2, 4 and 6 in Table 1 and Figure 2

  Based on the theory presented above, it is expected that a high density and low centralization, as well as sufficient bridging ties (part of the indicator *cohesion*) facilitate collective action (Bodin & Crona, 2009; Olsson et al., 2004; Prell et al., 2009; Sandström, 2004). These are all reflected on a network-level rather than node-level concepts. It is argued in this study that collective action indicates a high involvement of all actors, including those who are the target group of the network output. This involvement also trickles down to those (initially) non-involved stakeholders, facilitating high uptake.

- **H3: Actors with a high betweenness centrality have a high influence on a networks' input legitimacy**

  Arrow 8 in Table 1 and Figure 2

  As can be seen in the framework, actors with a high betweenness centrality can influence procedural fairness by having authority and control, consensual orientation by bridging different views and opinions, stringency by having a holistic view of the issue and uptake by enabling and stimulating collective action (Knoke & Yang, 2008; Prell et al., 2009). No link was

found in the literature review for inclusiveness. Still, a high betweenness centrality corresponds with four legitimacy indicators. Therefore, it is argued that actors with a high betweenness centrality have a high influence on a networks' legitimacy.

- **H4: Weak and strong ties support the input legitimacy of a network**

  Arrow 10 in Table 1 and Figure 2

  Weak ties are important to link diverse actors from different sectors, which reflects inclusiveness (Prell et al., 2009). Strong ties however are suggested to stimulate consensual orientation, since they facilitate increased understanding among actors with different views, values and opinions (Reed et al., 2009). Therefore, both strong and weak ties are expected to be important for input legitimacy.

Since combining governance legitimacy and SNA is novel, this study aims to exploratively test and further establish these suggested links. For four governance networks, the indicators as listed in the conceptual framework are analysed. The research design and methodology behind this analysis will be explained in the next section.

3. METHODOLOGY

3.1. Research design

This thesis aims to shed light on how environmental governance network structures influence the legitimacy of these networks. Current knowledge on the interplay between these two variables is still limited in the field of environmental governance (Prell et al., 2009). This makes a case study research design a suitable approach for this thesis (Baxter & Jack, 2008; Bryman, 2012). Besides, analysing two variables where one (legitimacy) is influenced by the other (network structure), is best suited with a case study approach (Yin, 2017). In this thesis, four environmental governance networks are the unit of analysis.

A comparative multi-case study is used to increase the scientific and social relevance through identification of patterns and outliers among multiple cases, which enables a more robust generalization (Baxter & Jack, 2008; Herriott & Firestone, 1983; Yin, 2017). With exogenous variables in this thesis that cannot (or only partly) be controlled (such as stakeholders and the socioenvironmental issue at hand), a multi-case design is also best suited from a SNA perspective (Borgatti et al., 2013).

A literature review was performed to build the conceptual framework. Afterwards, selection criteria were established for case selection as well as network boundaries (section 3.2.). An operationalization was established for each indicator to ensure valid measurability (section 3.3.). For each case, primary data was collected (semi-structured interviews with actors to analyse the legitimacy; a survey among all actors to map the network structure) as well as grey literature (websites, documents) (section 3.4.). The interviews were transcribed and coded, while the survey was imported into UCINET for data analysis and Gephi for data visualisation (section 3.5.). Conclusions based on the cases were ultimately collected through a cross-case analysis (section 3.6.).

3.2. Case and network boundaries

The cases for this thesis were selected based on case boundaries, which are important to ensure the cases (and the study) remain reasonable in scope (Stake, 1995; Yin, 2003). Case boundaries in this thesis were based on the definitions and context of the cases (Huberman & Miles, 1994). Each case had to fulfil the three case boundaries mentioned below:

- The network had to include at least 10 actors to be perceived as a *network*.
- The network had to include at least two sectors out of three (public, private, government) to be perceived a *governance* network.
- The network had to address a socioenvironmental issue to be considered a form of *environmental* governance.

Four cases were chosen based on these criteria (see Table 2). A short background for each case is given in section 4.

TABLE 2 ■ The applied selection criteria for each case.

#	Case	Abbreviation	No. of sectors	No. of actors	Socioenvironmental goal
1	One Planet Thinking	OPT	3	13	Incorporating ecological thresholds in corporate sustainability performance
2	Context-Based Water Targets initiative	CBWTi	3	16	Contextualizing corporate water stewardship and water security
3	Embedding Project	EP	2	15	Contextualizing corporate sustainability and organizational change for sustainability
4	Biodiversity Monitor	BM	2	13	Tool development for agricultural stakeholders to stimulate biodiversity restoration

It is important for analytical purposes to define the network boundaries of each case, since this enables the identification of a fixed set of actors (Newig et al., 2010). In this thesis, a combination of a nominalist approach (boundaries based on the researcher's standpoint) and a realist approach (boundaries based on the actors' perceptions) is used to ensure a network boundary that was widely agreed upon (Laumann et al., 1983). The normalist criteria for the network boundaries were as follows:

- Actors have a contractual agreement with other actors on the partnership at hand;
- Actors are embedded in a governance structure *within* the network, such as a steering committee, advisory group or executive board.

One of the two criteria above had to be fulfilled. Those who do not fulfil one of the normalist criteria, but 'are regarded by the majority as members of the network' (a realist approach), were also considered actors (Newig et al., 2010, p. 24; Wasserman & Faust, 1994).

To further define the network boundaries, it is important to elaborate what an 'actor' is (Newig et al., 2010). In SNA, actors can be individuals, organisations or other groups. Actors in this thesis were defined as 'corporate or collective' entities (Newig et al., 2010, p. 24). An 'entity' entails an organization, either non-profit or for-profit, with a registered trademark or a governmental organization. Overarching alliances or networks of organizations were not seen as *one* actor, but as separate actors since they do operate independently. For example, WWF operates in over 200 countries, with most countries having their own registered national office, such as WWF-NL or WWF-DE. These national offices were regarded as an 'entity', while the overarching, global WWF-network was not.

3.3. Operationalization

Legitimacy and the network structure are concepts that need to be transformed into measurable indicators through a nominal definition and an operational definition. The latter is also called 'operationalization' (De Vaus & De Vaus, 2001). The nominal definition entails how you define a concept (and thus the scope of the study). This has been touched upon for all concepts in the theory section but will be shortly revisited in this section. The operational definition entails how this definition of the concept becomes measurable – which indicator you use to assess the concept at hand (De Vaus & De Vaus, 2001). This is described in the section below.

3.3.1. Legitimacy operationalization

Inclusiveness

The operationalization of this indicator was inspired by Kalfagianni & Pattberg (2013), who assess the access to decision-making by stakeholders by the distribution of actors in different sectors (public, private, government) and geographic representation (North-South) in each case. For this study however, geographic representation was left out – since most actors in this thesis did operate on a global scale, with activities in both the Northern and Southern hemisphere. A second difference in methodology is that this thesis used the *relative* share of public actors in the network rather than the

absolute number as done by Kalfagianni & Pattberg (2013). This thesis argues that a relative scoring represents a more reliable image of inclusiveness as it corrects for the size of the network. This method is novel and therefore also tests the applicability of this operationalization for governance networks.

Three categories were suggested that represent an increasing level of inclusiveness. Based on theory, ideally, the public sector is equally or more represented compared to the government and private sector (≥ 1/3 of network actors is from the public sector). This was therefore the highest inclusiveness score, this thesis argues. This thesis further divided the range below a public share of 1/3 into two equal ranges. When the ratio of public actors compared to non-public actors was between 0 and 1/6, the case scored low on inclusiveness; and a public actor share in the network between 1/6 and 1/3 scored medium (see Table 3). The public sector consists of actors who represent the voice of dependent stakeholders, without shareholders (the private sector) or legal and juridical power to create and enforce rules (the government sector).

TABLE 3 ■ Inclusiveness operationalization.

Inclusion of public sector	Score
< 1/6 of network actors were from public sector	Low
Between 1/6 ≤ and < 1/3 of network actors were from public sector	Medium
≥ 1/3 of network actors were from public sector	High

Procedural fairness

As mentioned in the theory section, an equal level of participation is reflected by the distribution of roles in the network (Webler & Tuler, 2006). Generally, three actor roles can be distilled in governance networks based on the distribution of decision-making power: a leadership role, a 'provider' role and an 'participatory' role. The first two roles indicate a low procedural fairness, as both roles reflect above average and below average decision-making power compared to the rest of the network, respectively; the third role indicates a higher procedural fairness, as a participatory actor has the possibility to

actively influence high-level decision-making processes (Webler & Tuler, 2006). Therefore, procedural fairness was ranked by the ab- or presence of these roles by actors in the network. Actors were asked through interviews how they described their role and the role of other actors in the network and what those roles entailed. From their responses, it was analysed whether there was *one* actor in each network with a perceived leadership role; and what the occurrence of provider and participatory roles was. See Table 4 for the operationalization.

TABLE 4 ■ Procedural fairness operationalization.

Procedural fairness	Score
One leadership role and a majority of the other network actors (>50%) had provider roles	Low
One leadership role and a majority of the other network actors (>50%) had participatory roles	Medium
No leadership role and a majority of the network actors (>50%) had participatory roles	HIgh

Consensual orientation

Consensual orientation is high when there is room for discussions, and when ideally consensus is met (Mena & Palazzo, 2012). To facilitate a consensual environment, brokers are important and have a function in every stage of a network (Stadtler & Probst, 2012). As mentioned in the theory section, brokers play a role by identifying and aiming to include all relevant stakeholders; facilitating the definition of a common approach and goal as well as the distribution of responsibilities and rights; and by aiming to neutralize different working cultures and enhance relationships among actors (Stadtler & Probst, 2012). Actor(s) with one or more roles as described above were defined as brokers. The ab- or presence of these roles was assessed by asking interviewees if they perceived certain actors to be brokers and by asking examples of disagreements, and how they were dealt with. Based on the theory presented above, this thesis assumed that more brokers increase consensual orientation (see Table 5).

TABLE 5 ■ Consensual orientation operationalization.

Presence of brokers	Score
No brokers	Low
One broker	Medium
More than one broker	High

Stringency

Kalfagianni & Pattberg (2013) identify five criteria with equal weight to operationalize the stringency. First, the level of *detail* of regulations, norms and rules by the network. 'Detailed' is defined as 'when [a network] develops at least 3 indicators specifying each of the overarching principles and criteria' (Kafalgianni,& Pattberg, 2013, p. 126). Second, *ambition*, defined as to what extent the network 'goes beyond existing regulation (when such regulation exists) and/or it envisions greater environmental change' relative to other governance networks in the same field (Kalfagianni & Pattberg, 2013, p. 126). Third, if performance targets incorporated the *actual* performance; fourth, the regulations required *management targets* that included the development of a sustainable management plan for long-term improved sustainability performance by the participant; fifth, whether performance targets and management targets were *quantifiable* (Kalfagianni & Pattberg, 2013). The criteria were assessed based on grey literature available on each case. How the operationalization of stringency was linked to these five indicators, is mentioned in Table 6. The full stringency analysis for each case can be found in the Appendix (Table A4 to A7).

Uptake

Operationalization of uptake through assessing and comparing the current uptake of the networks among cases in this thesis was unreliable and lacked meaning, since (1) the network cases were young and (2) had different target groups. For example, the CBWTi was targeted towards private actors active in water basins while the BM was targeted towards government- and private actors active

TABLE 6 ■ Stringency operationalization.

Stringency criteria	Score
1. The level of detail 2. Ambition 3. Performance targets 4. Management targets 5. Quantifiability of these targets	
Two or less criteria were satisfied	Low
Three or four criteria were satisfied	Medium
All five criteria were satisfied	High

within the dairy- and agriculture industry. Therefore, an alternative approach was used based on the argument that long-term uptake of agreements, regulations or rules of a governance network depend on the first-movers, as elaborated upon in the theory section. This argument was the basis of the uptake operationalization in this thesis. Despite its scientific origin, the operationalization as done in this thesis was new. The implications of this are discussed in the discussion (section 6).

To operationalize uptake, some concepts needed to be further defined:

- *Network output*: the 'product' of a network. In each network, the output was different; for OPT, the output was the implementation of a sustainability strategy for private actors that incorporates ecological thresholds; for CBWTi, the output was a methodology for context-based corporate water target-setting; for EP, the output was a multitude of tools ranging from 'the Embedding Framework' to 'Sustainability Storytelling'; for BM, the output was the Biodiversity Monitor.
- *First-mover*: an actor in the current network that was implementing or adopting, or has implemented or adopted the output of the network in the past.

- *Desired uptake*: future, theoretical actors (that are not part of the current network) that actors within the current network ideally saw to implement or adopt the output.
- *Structural characteristics*: characteristics of actors, predominantly the size and industry (Mena & Palazzo, 2012).

As mentioned in the theory section, structural characteristics of first-movers were suggested to reflect long-term uptake due to the influence of first-movers. In this thesis, the uptake was assessed by first analysing the structural characteristics of first-movers. This thesis argued that the current uptake of each case can be considered to consist of first-movers, since each network was 6 years or younger. Two structural characteristics of the first-movers were studied: the industry and size of the actors (Mena & Palazzo, 2012). Both characteristics were categorized in pre-determined groups to ensure consistency (see Table 7). Consequently, through semi-structured interviews with actors, it was qualitatively assessed how actors viewed the desired uptake in five years in terms of industry and size of actors. In turn, the industry and size of the first-movers were compared to the industry and size of the desired uptake (see Table 8). The full uptake analysis for each case can be found in the Appendix (Table A8 to A11).

TABLE 7 ■ The structural characteristics of the uptake. The size of actors was based on their annual turnover (European Commission, 2003) while the industry classification was based on the Global Industry Classification Standard (GICS) (MSCI, 2016).

Size		**Industry**	
Category	*Annual turnover*	Energy	Financials
Large	> € 50 m	Materials	Information technology
Medium	≤ € 50 m	Industrials	Telecommunication services
Small	≤ € 10 m	Consumer discretionary	Utilities
Micro	≤ € 2 m	Consumer staples	Real estate
		Health Care	

TABLE 8 ■ Uptake operationalization.

First-mover versus desired uptake	Score
Size *and* industry were *different* for first-movers and desired uptake	Low
Size *or* industry was *different* between first-movers and desired uptake	Medium
Size *and* industry weree *similar* for first-movers and desired uptake	High

An overview of the legitimacy operationalization is shown in Table 9.

TABLE 9 ■ Legitimacy operationalization overview.

Concept	Indicator	Conceptualization	Operationalization	
Input legitimacy	Inclusiveness	Ratio of public actors in the network	Low	< 1/6 of network actors were from public sector
			Medium	Between 1/6 ≤ and < 1/3 of network actors were from public sector
			High	≥ 1/3 of network actors were from public sector
	Procedural fairness	The occurrence of roles in the network (leadership role; provider role; participatory role)	Low	One leadership role and a majority of the other network actors (>50%) had provider roles
			Medium	One leadership role and a majority of the other network actors (>50%) had participatory roles
			High	No leadership role and a majority of the network actors (>50%) had participatory roles

	Consensual orientation	The presence of a(n) actor(s) with a brokering function	Low	No brokers
			Medium	One broker
			High	More than one broker
Output legitimacy	Stringency	1. The level of detail 2. Ambition 3. Performance targets 4. Management targets 5. Quantifiability of these targets	Low	Two or less indicators were satisfied
			Medium	Three or four indicators were satisfied
			High	All five indicators were satisfied
	Uptake	Difference in 1. Size 2. Industry Between first-movers (current uptake) and desired uptake (uptake in five years)	Low	Size *and* industry were *different* for first-movers and desired uptake
			Medium	Size *or* industry was *different* between first-movers and desired uptake
			High	Size *and* industry weree *similar* for first-movers and desired uptake

3.3.2. Network structure operationalization

The indicators for the network structure introduced in the theory section were operationalized as well. First, at the actor- or node-level indicators will be operationalized, followed by the network-level indicators. Degree- and betweenness centrality were normalized to enable cross-case analysis. *Normalized degree centrality* was equal to the number of direct ties an actor has in the network divided by the total number of ties in the network. *Normalized betweenness centrality* was defined and operationalized by how many times an actor connected two other actors, who would otherwise be disconnected, divided by the maximum betweenness centrality in the network (Freeman et al., 1979; Wasserman and Faust, 1994).

The indicator of the *tie strength* is less defined and operationalized differently in different studies (Marsden, 1990). Other network studies in environmental governance operationalize tie strength by the frequency of the tie (Prell et al., 2009). However, this thesis argues that this type of operationalization neglects the *content* of the tie – two actors with a *weekly* interaction may only communicate about an agenda, while two other actors in the network with a *monthly* interaction may communicate about technical knowledge and the strategy of the network. The latter tie can be viewed as a more in-depth relational flow requiring more effort. Therefore, this study aims to combine both the tie frequency and relational flow as it is argued that this presents a more representative and whole image of the tie strengths.

Tie frequency was operationalized in absolute categories, making it less prone to subjective interpretation compared to a relative question format (see Table 10) (Borgatti et al., 2013; Prell et al., 2009). Increasing weight was given to increased tie frequency. Five possible relational flows were identified for each tie, based on interviews with actors. The number of flows that each tie contains was summed up by the weight of the tie frequency, to get one number that represented the overall tie strength. With five tie frequency categories and five possible relational flows, the maximum tie strength was 10 and the minimum was 0. This value range was used to categorize the tie strength into four possible strengths with an equal range of 2.5, ranging from *extremely weak* to *extremely strong* (see Table 11).

Looking at network level characteristics, *density* was defined and operationalized by dividing the number of ties in a network by the maximum number of possible ties. *Cohesion* was expressed as to what extent a network was one uniform cluster or a network of cohesive cliques. Cliques were defined in this thesis as 'a maximal complete subgraph of three or more actors, all of which are directly connected to one another, with no other actor in the network having direct ties to every member of the clique' (Knoke and Yang, 2008, p. 73). Cohesion was therefore operationalized based on the number of cliques in each network. To enable cross-case analysis, normalized cohesion was operationalized by dividing the number of cliques by the number of actors to correct for the size of the network. The output of this calculation reflects the probability of an average actor in the network to be part of a clique. As cliques decrease the cohesion, the final calculation was *1 – probability value*.

TABLE 10 ■ Calculation of the tie strength using the sum of tie frequency and type of relational flow. Both variables are found throughout primary data collection (a survey distributed among all network actors in each case).

Tie frequency		Relational flow	
Category	*Weight*	*Category*	*Definition*
Once a year or less	1	Strategy dialogue	Communication on the development of [network X] and/or the long-term strategy and/or the goals of [network X].
Every few months	2	Joint project	Collaboration with one or more actors on [network X]-related projects or groups.
Monthly	3	Technical knowledge	Specialized, in-depth knowledge transfer on specific subjects.
Weekly	4	Financing	Financial exchange as either a donor or receiver on a periodic and/or structural basis (such as (a) contract- or membership fee(s)). An incidental transaction does not count.
Daily	5	Other	Relational flows with an actor that is not described by the other categories listed above.

TABLE 11 ■ Tie strength operationalization.

Tie strength	Sum of tie frequency weight and number of relational flows (x)
Extremely strong	$x \geq 7{,}5$
Strong	$5 \leq x \leq 7{,}5$
Weak	$2{,}5 \leq x \leq 5$
Extremely weak	$x \leq 2{,}5$

Looking at network level characteristics, *density* was defined and operationalized by dividing the number of ties in a network by the maximum number of possible ties. *Cohesion* was expressed as to what extent a network was one uniform cluster or a network of cohesive cliques. Cliques were defined in this thesis as 'a maximal complete subgraph of three or more actors, all of which are directly connected to one another, with no other actor in the network having direct ties to every member of the clique' (Knoke and Yang, 2008, p. 73). Cohesion was therefore operationalized based on the number of cliques in each network. To enable cross-case analysis, normalized cohesion was operationalized by dividing the number of cliques by the number of actors to correct for the size of the network. The output of this calculation reflects the probability of an average actor in the network to be part of a clique. As cliques decrease the cohesion, the final calculation was *1 – probability value*.

Centralization is the relative level of interconnectedness in the network. The standardized approach to operationalize centralization is by measuring the degree centrality of each actor in the network, to consequently 'sum the difference between each node's degree centrality and the degree centrality of the most central node' (the actor with the highest degree centrality measure) (Borgatti et al., 2013, p. 160; Freeman et al., 1979). As a last step, the sum of degree centrality differences is divided by the maximum possible sum of degree centrality differences, which is a star-shaped network (Borgatti et al., 2013). This operationalization method for centralization was also used in this thesis. An overview of the network structure operationalization can be found in Table 12.

TABLE 12 ■ Network structure operationalization overview.

Concept	Indicator	Operationalization
Network structure	Tie strength	Sum of tie frequency (once a year or less, every few months, monthly, weekly or daily) and number of relational flow(s) (strategy dialogue, joint project, technical knowledge, financing and/or other), categorized in: • Extremely strong ($x \geq 7,5$) • Strong ($5 \leq x \leq 7,5$) • Weak ($2,5 \leq x \leq 5$) • Extremely weak ($x \leq 2,5$)
	Normalized degree centrality	Number of ties for each actor divided by the maximum number of ties for each actor
	Normalized betweenness centrality	Number of actors that are connected through a specific actor, who would otherwise be disconnected, divided by the maximum betweenness centrality value
	Density	Number of ties in the network divided by the maximum number of ties in the network
	Cohesion	1 – (number of cliques/number of actors)
	Centralization	(1) Sum of the differences between each actors' degree centrality and the actor with the highest degree centrality; (2) Sum of the differences between each actors' lowest possible degree centrality and the highest possible degree centrality (a star-shaped network); (3) Followed by a division of the first sum by the second sum.

3.4. Data collection

Four data sources were used for data collection: scientific literature, grey literature (secondary data), semi-structured interviews and a survey (primary data). Both secondary and primary data collection is explained in a separate section below.

3.4.1. Secondary data collection

To create a conceptual framework, scientific literature was collected for conceptualization, to assess the scope and to analyse how this thesis could add both scientific and societal value (Creswell, 1994). Which literature was used was based on the relevance to this thesis, the quality of studies (peer-reviewed where possible) and the date of publication (precedence for recent studies). For each case, grey literature was also collected to gain insight in the governance structure and output legitimacy of the network. Grey literature consisted of websites, public and confidential documents.

3.4.2. Primary data collection

Semi-structured interviews

Legitimacy is generally analysed through qualitative methods due to its social nature. Semi-structured interviews were used in this thesis, since a semi-structured environment enables interviewees to elaborate on topics that are unidentified by the researcher, which increases the understanding of the topic at hand (Miles & Gilbert, 2011). Each interview ranged between 30 and 60 minutes and was anonymized (both the individual and the actor they represent), to further stimulate an explorative environment where interviewees felt comfortable to speak freely.

The interviews were performed either face-to-face, by phone or through video-calling, depending on the location and preference of interviewees. Interviews with non-Dutch interviewees were performed in English – interviews with Dutch interviewees were performed in Dutch, and translated afterwards by the researcher. Interviews were recorded with permission of the interviewees. The research scope and interview guide were send beforehand for interviewees to think on the subject matter and discuss possible unclarities. For the use of quotes, permission of interviewees was asked beforehand.

Five actors were interviewed per case, out of which:

- At least one interviewee from the public sector and one interviewee from the private or government sector, to get a proper view on *inclusiveness*. Inclusiveness is influenced by the distribution of sectors among actors in the network, especially the public sector, as shown in the operationalization section.
- At least two different roles (leadership; provider; participatory) among interviewees. It can be argued that different roles among interviewees are related to different agendas, expectations, and values, which are common causes of disagreements. In turn, it can be assessed whether there is a brokering party to mediate or avoid this. This reflects *consensual orientation*. Actors in the network with different roles will have a different experience in terms of leadership, and decision power. Therefore, it is relevant for *procedural fairness*.

These two criteria for interviewees could overlap. For example, interviewee X could be a private actor who has an advisory role, whereas interviewee Y could be a public actor with a lead role. This way, both the interview criteria for inclusiveness and procedural fairness were accounted. A list of interviewees can be found in Table A3 of the Appendix.

The interview guide consisted of three main parts: first, some open questions to get a general sense of the actor's view on the network and create a comfortable environment. Second, input legitimacy concepts were explored through open questions. Third, output legitimacy concepts were touched upon, followed by a closing question (see Table A1 in the Appendix).

Survey

Social network analysis is generally executed through survey methods (Carrington et al., 2005; Wasserman and Faust, 1994). To map the network structure in each case for this thesis, an online survey was send out to all actors in each network. There were three observational units of the survey: with which actors does [actor X] interact? (1); how frequent? (2); and about what? (3). These units are reflected in the survey questions, as seen in the survey guide (Table A2 in the Appendix). A *saturation survey* or *full network approach* was used, where all actors within the network were sent the survey

with a list of all network actors, since this approach is useful for smaller networks (< 50 actors) studied in this thesis (Hawe et al., 2004).

The survey was distributed to all actors in each network by either the lead actor of the partnership or the researcher of this study, depending on the time of- and cooperation with the lead actor. The survey was sent to a contact person at each actor in the network. In most cases one individual at an actor was actively involved in the network, which was therefore also the contact person for the survey. In case multiple people from one actor were involved in the network, the contact person was that individual with the highest involvement (as perceived by the researcher) – since it is argued that they have the best oversight of their actors' relationship with other actors in the network.

As mentioned before, a *saturation survey* approach was used where all actors in a network indicate their (possible) interaction with other actors. This indicates a desired response rate of 100%, which is a common problem in social network analysis. A survey response rate of at least 80% was used as a minimum requirement in this thesis for survey data to have sufficient quality (Kleiner, 2002; Lesser & Prusak, 2004). This is also reflected by the response rates of social network surveys in current environmental governance research (Prell et al., 2009). Weekly reminders were sent to non-respondents to ensure a response rate of 80% or higher. Table 13 shows the response rates in each case.

TABLE 13 ■ Survey response rates for each case.

Case	Abbreviation	Actors	Survey respondents	Response rate (%)
1	OPT	13	11	85%
2	CBWTi	16	13	81%
3	EP	15	12	80%
4	BM	13	11	85%

3.5. Data analysis

3.5.1. Semi-structured interviews

The semi-structured interviews were recorded, transcribed and coded after the interview was executed to ensure high data reliability. Coding of qualitative data is important as the data is 'broken down, conceptualized, and put back together in new ways' (Strauss and Corbin, 1990, p. 57). Predefined codes were used, and was based on a combination of set legitimacy indicators from the literature review and the semi-structured interview guide (see Figure 2 and Table A3 in the Appendix). This is line with the deductive research design of this thesis, where primary data was used to test a theoretical framework (Holloway, 1997). Table 14 shows how the used coding relates to the legitimacy indicators:

TABLE 14 ■ Coding overview for data analysis of semi-structured interviews.

Coding	Indicator
Composition of the network	Inclusiveness
Desired composition of the network	
Role distribution in the network	Procedural fairness
Meeting, agenda and discussion examples	
Information availability	
Disagreement and settlement examples	Consensual orientation
Presence of a broker	
Ambition	Stringency
Desired five-year uptake	Uptake

The coded parts for each legitimacy concept were analysed by assessing whether they confirmed, rejected or didn't shed information on the indicator at hand. If a certain indicator was satisfied, was based on what the majority of the interviewees expressed. Based on the coding results from the semi-structured interviews, the operationalization and scoring of legitimacy took place.

3.5.2. Survey

The results of the survey were imported in Microsoft Excel. First, a one-mode full matrix format was created in Microsoft Excel, meaning that the matrix rows and columns were the same list and order of actors. The matrix entries did not solely consist of 0's (no tie) and 1's (tie), but also indicate the strength of ties based on the operationalization. This meant that matrix entries ranged from 0 (no tie) to 4 (extremely strong tie). Each tie between two actors was assumed to be reciprocated in this study, indicating that ties were symmetrical. This assumption was based on the definition for the tie strength in this study, which highlights that two connected actors exchange a resource, even at the lowest tie strength level. Because of tie reciprocity, each case dataset was symmetrized.

Missing input data due to non-respondents is common in network surveys. Although a researcher can choose to eliminate non-responding actors from the network analysis, this creates a misleading network and a loss of valuable data from respondents who indicated a tie with the non-responding actor (Borgatti et al., 2013). Therefore, this thesis retained non-responding actors in the network. Especially with symmetric ties as in this thesis, keeping non-respondents in the network is common since symmetric ties assume that the non-respondent would have listed the same ties as respondents that indicated a tie with the non-respondent (Borgatti et al., 2013).

Conflicting input data can be caused by, among others, different interpretations of the question at hand or a different recollection of memories (Borgatti et al., 2013). In this thesis, in case of small conflicts in data (when the difference in tie strength between two actors was 1 category), additional sources of data were used to verify which respondent had the highest quality. These sources included other interviews within the case and grey literature. In case of bigger conflicts (when the difference in tie strength between two actors differs was more than 2 categories), the findings were double checked with the respective respondents to ensure data correctness and quality.

This matrix was imported in UCINET to calculate the normalized degree and betweenness centrality, as well as density and centralization values and the number of cliques. Visualization of the network was done by importing the data in Gephi. As is common in social network analysis, the tie strength was visualized by the thickness of the tie between two actors. For the positioning of actors in the network, a *force-directed algorithm* was used (ForceAtlas2). This algorithm visualizes networks in an aesthetically pleasing way by minimizing the amount of crossing ties, which enables a clearer view on the networks' structure (Kobourov, 2012).

3.6. Cross-case analysis

As mentioned in the research design, this thesis aims to find patterns across four cases of environmental governance networks. This is also called a 'cross-case analysis', defined as 'a method that facilitates the comparison of commonalities and differences' among cases (Cruzes et al., 2015, p. 1639). This analysis was executed after the legitimacy and network structure had been operationalized and analysed for each case. Using a cross-case analysis, the researcher develops expertise by case-based reasoning and cross-connectedness among theoretical concepts (Ausubel et al., 1978; Flyvbjerg, 2001; Khan & Van Wynsberghe, 2008).

The hypotheses derived in Section 2 were tested in a cross-case analysis. A variable-oriented approach was used (Ragin, 2004). The variable in these four cases, legitimacy, was the centre of analysis. In a variable-oriented approach goal is to explain *why* the variable legitimacy differs across cases, based on the network structure (Ragin, 2004). Most variable-oriented methods focus on establishing a causal relationship. However, this is criticized by scholars, because it is unclear what the *extent* is to which generalizations can be made when patterns are found across an *x* number of cases; and because social science studies are fundamentally influenced by processes outside the research scope; in this case, stakeholders and the socioenvironmental issue at hand, among others (George & Bennett, 2005; George & McKeown, 1985).

Therefore, this thesis used a more nuanced method proposed by King et al., (1994). In their method, both the independent variable (the network structure) and the dependent variable (legitimacy) were operationalized. Processes that occurred outside the independent and dependent variable, were acknowledged, but because of the complexity of these processes and the scope of this thesis, these

processes were put in a ‘black box’. In other words, the hypotheses were tested across cases, to either confirm or question existing evidence in literature. This is similar to the common Mill’s method of agreement, a technique where ‘a similarity in the independent variable’ is ‘associated with a common outcome in two or more cases’ (Khan & Van Wynsberghe, 2008; Mills, 1843). In this thesis, similar network structure characteristics (the independent variable) across cases were associated with certain legitimacy outcomes. In case hypotheses did not hold up, possible explanations were offered based on processes within the black box (see Figure 3).

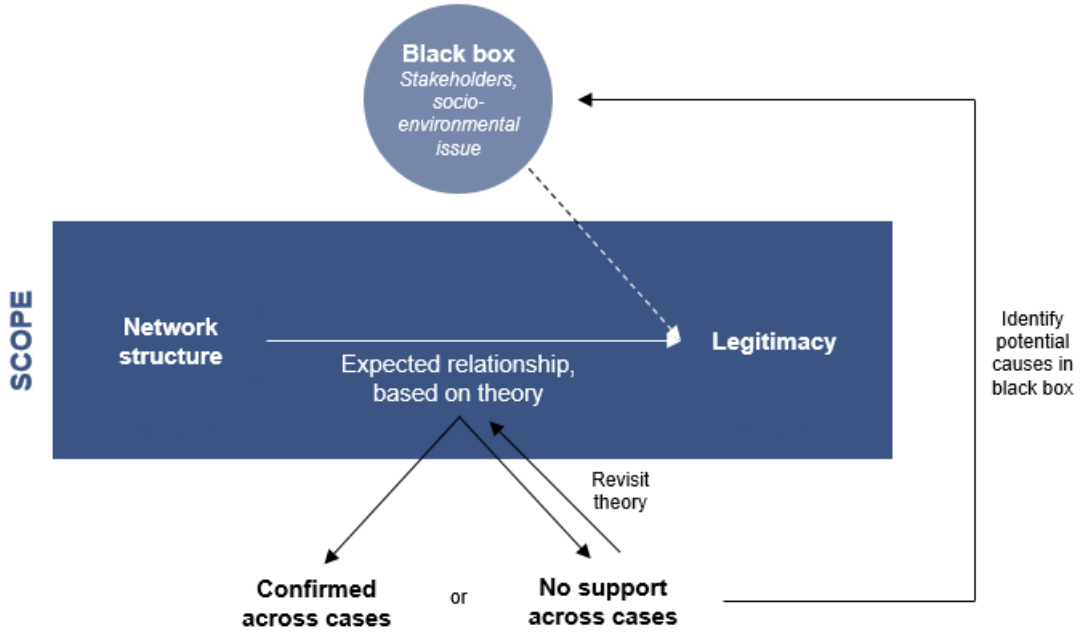

FIGURE 3 ■ The method proposed by King et al. (1994).

4. RESULTS OF INDIVIDUAL CASES

This section will elaborate on the results of the data analysis for each case. The four subsections below are each dedicated to a case. Each subsection consists of a short introduction to the case, followed analysis of the network structure and legitimacy. In-text references to normalized betweenness centrality, normalized degree centrality or normalized cohesion will from now onwards be mentioned without including the word ‘normalized’, to stimulate readability.

4.1. Case 1: One Planet Thinking

4.1.1. Introduction

OPT is a partnership established in 2012 by WWF-NL, Eneco and Ecofys. The aim of the program is to stimulate the development of tools to measure the environmental impact of companies based on ecological thresholds, rather than relative improvements compared to past performance or doing better than competitors. Currently, the lead organisations of OPT are WWF-NL and IUCN-NL, supported by consultancies who provide additional technical in-depth knowledge for pilot cases with private actors. An overview of the OPT network is presented in Figure 4 (see Table 15 for the abbreviations); Table 15 presents the involved actors in OPT and their node-level indicators; Table 16 shows the network-level indicator and legitimacy indicator results.

4.1.2. Analysis of the network structure and legitimacy

Generally, we can assume that the inclusiveness of governance networks increases with the number of public actors (Bäckstrand, 2006). In the OPT network, five out of 13 actors originate from the public sector. Therefore, the OPT network consist for OPT ranks '*high*' on inclusiveness. Based on interviews with actors in the network, one of these public actors, WWF-NL, is suggested to have a focal position in the network with a leadership role. From a governance perspective, this is reflected by two developments within OPT. First, as WWF-NL assigns the Program Head and Program Officer, it receives an overarching program role (WWF-NL, 2017). Second, in the beginning of 2018, the course of OPT was structurally redefined. WWF-NL started this discussion as they foresaw different expectations from the two lead organizations (WWF-NL and IUCN-NL) on the future of OPT and wanted to secure a common ground (Interview 1[1]). A higher agenda-setting power from WWF-NL's side was observed as well, as they initiated the meeting and were chairman (Interview 2). As one interviewee noted (*next page*):

[1] Interview references and detailed information on the interviews of each case can be found in the interview list in Table A3 in the Appendix.

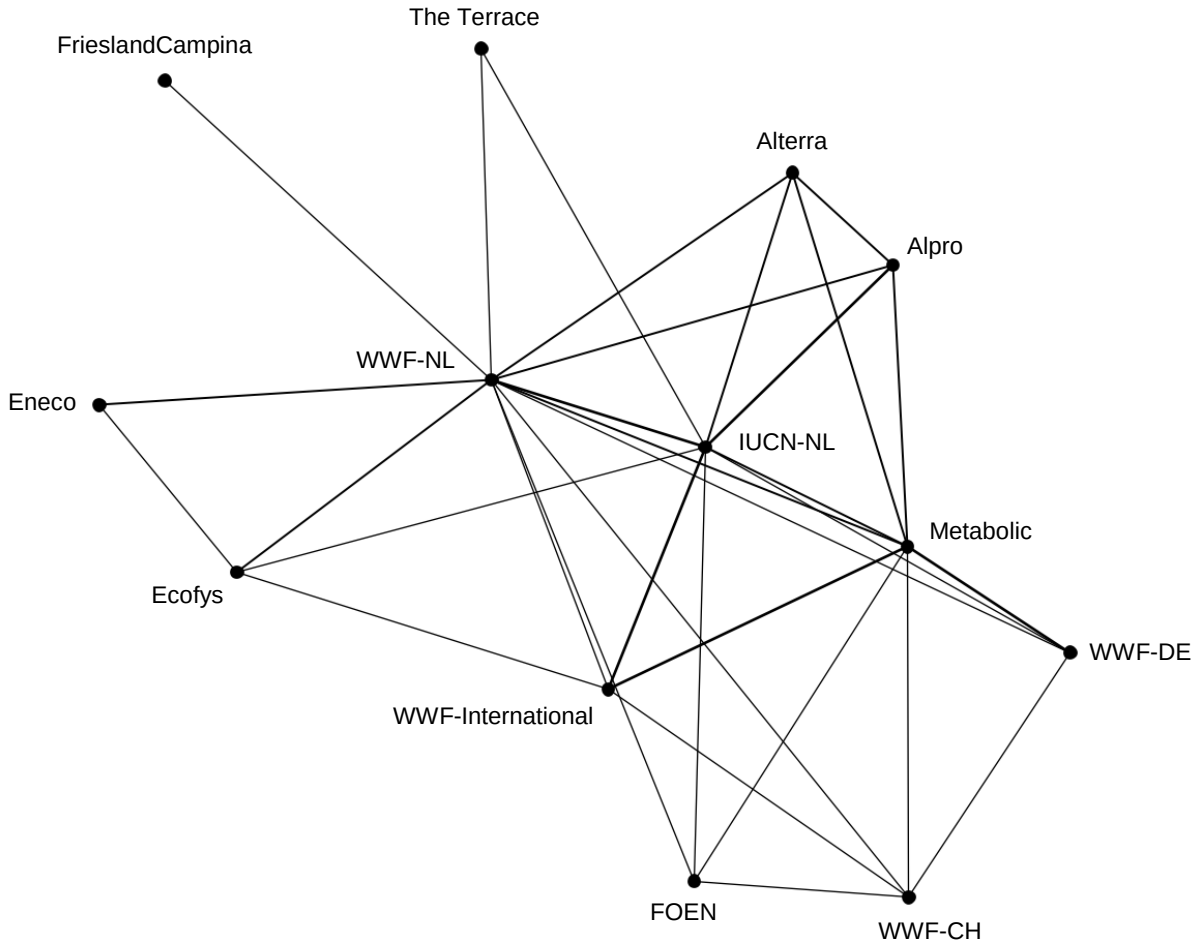

FIGURE 4 ■ The network of OPT.

> "[WWF-NL] pushed this change, of course. It was WWF-NL who deemed it to high of a risk. OPT promised too much."
>
> - *Interview 1*

Other governance aspects further highlight this dominant position of WWF-NL. First, the coordinator of OPT was contracted by WWF-NL, and was looking for a rollout within the global WWF network and was also stimulated to seek alignment with WWF's global agenda. Second, 'One Planet' is

trademarked by WWF International, indicating juridical decision-making power on WWF-NL's side (Interview 1). Third, while WWF is represented by four actors who are involved in the OPT network (WWF-NL, WWF-DE, WWF-CH, WWF-International), IUCN is only represented by their Dutch office despite having international offices as well.

The prominent role of WWF-NL is also reflected by the network indicators. WWF-NL has the highest degree and betweenness centrality as well as the highest average tie strength. These indicate a high connectedness, control and authority by the actor, and a holistic picture of different views, opinions and resources in the network (Knoke & Yang, 2008; Reed et al., 2009). Besides, WWF-NL is the only actor in all cliques (see Table 16). This suggests that WWF-NL has the highest influence over resource transfer (information, knowledge) across these cliques through *bridging ties* (also reflected by the high betweenness centrality). Having access do all the 'knowledge hotspots' it can be argued that WWF-NL has the most holistic view over the resources in the network and the socioenvironmental issue at hand.

In contrast to the leadership of WWF-NL, other actors take either consulting role (Metabolic, The Terrace, WUR) or a feedback role in the network (FrieslandCampina, Eneco, Alpro) (Interview 1 and 3). Therefore, OPT scores '*low*' on procedural fairness. Despite the leadership role, WWF-NL ensures that decisions are agreed upon by both WWF-NL and IUCN-NL. A high level of constructiveness has been expressed by both parties (Interview 1 and 2). This is further emphasized by the notion that there is a cooperative environment during meetings, with room to (re)visit topics in case of unclarities and disagreements (Interview 2). Both parties acknowledge the need of each other, which, despite the disagreements, is indicated to be the motivation for this constructive, consensual environment. To facilitate this, both actors emphasize the current governance focus on transparency, expectation management and frequent communication to avoid conflicts (Interview 1 and 2).

> "I think it is very important to work agile and be transparent. Clear expectation management. Otherwise we are all doing things, only to hit the brake in the end."
>
> - *Interview 1*

With an outspoken and clear vision on how to facilitate a consensual environment for both leads, and with interviewees expressing a constructive attitude to ensure alignment, both WWF-NL and IUCN-NL can be perceived as brokers, this thesis argues. Therefore, OPT ranks '*high*' on consensual orientation. Not coincidentally, WWF-NL and IUCN-NL have the highest and second-highest degree centrality, betweenness centrality and tie strength, respectively. These characteristics enable the two actors to consider the needs and expectations of most actors in the network who would otherwise be unconnected, while having a high level of trust and reciprocity with these actors (Frank & Yasumoto, 1998; Prell et al., 2009).

Without a high level of comprehensiveness and prescriptiveness of a network output, the effectiveness of a network is impaired as it results in either a high uptake with low impact, or a low uptake due to criticism from stakeholders (Gulbrandsen, 2010). Satisfying three out of five indicators, OPT scores 'medium' on stringency (see Table A4 in the Appendix). Looking at the low uptake, the frequent change in direction and composition in the network are perceived as the cause for having only one first-mover (Interview 3). Looking at the desired uptake, interviewees mention the preference for large-sized, agri-food, commodity-based companies to join the program (Interview 2 and 3). Size- and industry-wise, first-mover Alpro reflects both structural characteristics of the desired-uptake (see Table A8 in the Appendix). Therefore, OPT ranks *high* on the uptake indicator. However, with one first-mover, this prediction is prone to more uncertainty compared to the other cases in this thesis.

TABLE 15 ■ An overview of actors involved in the OPT network, with their corresponding sector, normalized degree centrality, normalized betweenness centrality and average tie strength.

Actor	Sector	Interview	Normalized degree centralit	Normalized betweenness centrality	Acerage tie strength
Alpro	Private	●	0.33	0	1
Ecofys	Private	●	0.33	0	0.9
Eneco	Private	●	0.33	0.02	0.7
Swiss Federal Office for the Environment (FOEN)	State		0.17	0	0.5
FrieslandCampina	Private		0.33	0	0.6
IUCN-Netherlands (IUCN-NL)	Public/State	●	0.08	0.13	0.2
Metabolic	Private		0.75	0.06	2
The Terrace	Private		0.67	0	1.8
Wageningen University & Research (WUR)	Private		0.17	0	0.3
WWF-Switzerland (WWF-CH)	Public		0.42	0.01	0.8
WWF-Germany (WWF-DE)	Public		0.33	0	0.6
WWF-International	Public		0.42	0.02	1.1
WWF-Netherlands (WWF-NL)	Public	●	1	0.46	2.5

Note 1: In this section (4.1.), each interview is assigned a randomized number from 1 to 5.

Note 2: The normalized degree centrality indicates how many ties an actor has, divided by the maximum number of ties an actor can have; The normalized betweenness centrality reflects how many times an actor connects two otherwise unconnected actors divided by the maximum betweenness centrality; the average tie strength is the sum of all tie strengths of an actor divided by the number of ties, where the strength itself is assessed through the level of frequency and resource flow(s) of a tie.

TABLE 16 ■ Results for the network-level indicators and legitimacy indicators.

Network indicator	Result	Main findings
Density	0.41	
Cohesion	0.23	*Clique composition*: 1: Alpro – Alterra - IUCN-NL - Metabolic - WWF-NL; 2: FOEN - IUCN-NL - Metabolic - WWF-NL; 3: IUCN-NL – Metabolic - WWF-DE - WWF-NL; 4: IUCN-NL – Metabolic - WWF-INT - WWF-NL; 5: Ecofys - IUCN-NL - WWF-INT - WWF-NL; 6: IUCN-NL - The Terrace - WWF-NL; 7: Ecofys – Eneco - WWF-NL; 8: FOEN - Metabolic - WWF-CH - WWF-NL; 9: Metabolic - WWF-CH - WWF-DE - WWF-NL; 10: Metabolic - WWF-CH - WWF-INT - WWF-NL
Centralization	0.64	
Legitimacy indicator		
Inclusiveness	High	5 out of 13 actors from the public sector (38%)
Procedural fairness	Low	Leadership role from WWF-NL; others have a provider role
Consensual orientation	High	2 brokers: WWF-NL and IUCN-NL
Stringency	Medium	No sufficient *level of detail* and no *management targets*. 3 out of 5 criteria satisfied.
Uptake	High	Desired size (large) and industry (agri-food) of uptake match first-mover Alpro.

Note: Density reflects the level of connectedness in the network through a ratio of how many ties there are in the network compared to the maximum theoretical number of ties; Cohesion indicates whether cliques exist (of 3 actors or more) that are all connected to each other, while no other actor in the network is connected to each actor in the clique; Centralization shows, in contrast to density, how centralized the network is around one or a few actors.

4.2. Case 2: Embedding Project

4.2.1. Introduction

The EP was first developed in 2010, and identifies and develops practical tools that help companies embed sustainability factors throughout their supply chain and decision-making. The development of these tools is done by a core team of researchers (the Embedding Project team), together with continuous feedback from private actors throughout peer-to-peer networks and communities of practice. The tools developed by the EP cover multiple themes, from contextualizing strategies and goals to storytelling for sustainability. An overview of the network is presented in Figure 5; Table 17 presents the involved actors in the EP and their node-level indicators; Table 18 shows the network-level indicator and legitimacy indicator results.

** The case is called 'the Embedding Project', but there is also one actor defined as the 'Embedding Project team'. Interviewees identified the group of people responsible for the functioning (both administrative and decision-making) of the Embedding Project as an actor, and is therefore taken into account in the network based on the realist approach mentioned in the methodology (section 3). If this section mentioned the specific actor, it will be written in full (Embedding Project team) compared to when the network in general is mentioned (EP) to avoid confusion.*

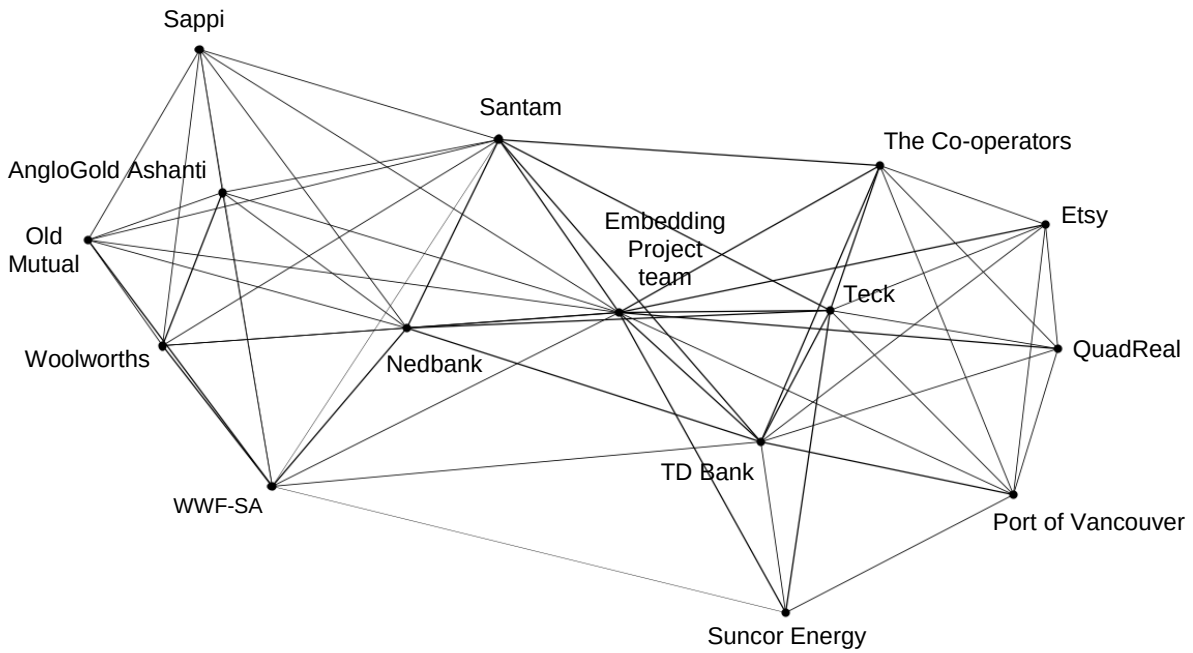

FIGURE 5 ■ The network of the EP.

4.2.2. Analysis of the network structure and legitimacy

A low number of public actors is argued to counteract proper inclusiveness, as marginalized groups (the environment, indigenous communities) generally rely on public actors to represent their voices (Bäckstrand, 2006). The EP network consists predominantly of private actors and only one public actor. With less than 1/6 of the network consisting of public actors, the EP scores '*low*' on inclusiveness. Interviewees mention that the goal is to include their target group (the private sector) as much as possible in the development of the project to ensure support and applicability, which explains the high number of private actors (Interview 11 and 12).

Whereas inclusiveness reflects the extent to which all stakeholders are represented, procedural fairness emphasizes *how* they are represented (Mena & Palazzo, 2012). The power distribution in the EP network is heavily centralized around the Embedding Project team. The EP network was established by Stephanie Bertels, who, together with sustainability experts and supporting staff forms the Embedding Project team that provides guidance to companies who seek to embed sustainability in their operations and strategy. Interviewees mention that Stephanie is responsible for the strategy and direction of the project, indicating a clear leadership role (Interview 11, 12, 14). As one interviewee mentioned:

> "She [Stephanie Bertels] is very much kind of the driving force for the direction."
>
> - *Interview 12*

This is in line with the network structure results and literature, as the Embedding Project scores highest on both degree and betweenness centrality (see Table 17). This suggests that it has a central role in mapping the different views, expectations and information from most actors in the network, and ensuring the right resources are shared with other actors. The Embedding Project team is also present in all cliques (see Table 18). Having a bridging function across cliques, we can assume the Embedding Project team has the most comprehensive view of the collective of resources circulating

within the network (Bodin & Crona, 2009). It is interesting that the rest of the actors in the network have a degree centrality with low variation, which reflects that aside from the Embedding Project team, the actors all have a similar connectedness.

All actors in the network are part of one or two governance groups: the peer-to-peer networks (PtP) or/and communities of practice (CoP). There are two PtP groups (South Africa and North America), who both meet up twice a year for two days (Interview 14). The PtP group and CoP are also reflected in the cliques, as the first clique contains those actors involved in the South African PtP group, the third clique consists of actors involved in the CoP for 'contextual strategy-making for sustainability', while the fifth clique contains those actors involved in the North American PtP network.

These group meetings are the main way of communication for actors in the network. This explains the low tie strength range among the actors (see Table 17), as the majority of actors see each other during the same meetings of the PtP groups and CoP. The PtP groups and CoP offer a possibility for private actors to provide not only feedback on the development of tools, but also to give input on the research agenda and direction of the EP network (Interview 11, 12, 14 and 15). Interviewees mention an environment open for discussions and for sharing opinions during these meetings (Interview 12 and 14). As one interviewees mentioned:

> ""She [Stephanie Bertels] is also very willing to share everyone's opinions and take the time to, if you don't share the same opinion, help get you to in a position where there is enough alignment."
>
> - *Interview 12*

Concluding, a clear leadership role from the Embedding Project team can be observed, and specifically from Stephanie Bertels. This authority is democratised by giving other actors the possibility to provide not only feedback on progress, but also input on the direction of the project and broader strategy. With a leadership role within the network, and other actors having a participatory role, the EP network ranks '*medium*' on procedural fairness.

Even though the Embedding Project team *aims* to create alignment, reaching consensus is not a *prerequisite* for decision-making. Because of this, a broker is not essential in the network – and is therefore also not existent in the EP network (Interview 12, 13 and 15). As a result, the EP network scores '*low*' on consensual orientation. Despite the high betweenness centrality score of the Embedding Project team, no clear brokering role can be identified. The Embedding Project team does, in correspondence with literature, bridge different views between actors with a lower centralization score by listening and implementing their input and feedback, but this does not lead to a brokering role as they are the sole lead in the network.

Without comprehensive and prescriptive output, a governance network may lack support from stakeholders and actors (Kaflagianni & Pattberg, 2013). The EP satisfies two out of five stringency indicators and therefore scores '*low*' on stringency (see Table A5 in the Appendix). This can be explained by the EPs aim to make the framework as widely applicable as possible, which requires lacking a certain level of thoroughness in terms of target-setting and quantifiability, because those aspects are often sector-and size-specific.

Actors of the EP have an outspoken view on the desired uptake of the network output. The emphasis is on creating tools that are applicable to a wide range of industries to ensure a high impact (Interview 11 and 12). This diverse industry uptake is reflected by the first-movers, who represent 7 out of 11 industries (see Table A9 in the Appendix). Interviewees also mention the preference for large-sized companies, which is also reflected by the first-movers (Interview 11). With the first-movers reflecting both the industry and size of the desired uptake, the EP network scores '*high*' on uptake.

TABLE 17 ■ An overview of actors involved in the EP network, with their corresponding sector, normalized degree centrality, normalized betweenness centrality and average tie strength.

Actor	Sector	Interview	Normalized degree centrality	Normalized betweenness centrality	Average tie strength
AngloGold Ashanti	Private		0.50	0	1.88
Etsy	Private		0.43	0	2.17
Nedbank	Private		0.64	0.03	2.56
Old Mutual	Private		0.50	0	2.14
Port of Vancouver	Private		0.50	0.01	2.14
QuadReal	Private	●	0.43	0	2.17
Santam	Private		0.71	0.06	2.40
Sappi	Private		0.50	0	1.86
Suncor Energy	Private		0.36	0.01	2.20
Teck	Private		0.64	0.04	2.67
The Co-operators	Private		0.50	0.01	2.57
Embedding Project team*	Public	● ●	1	0.26	2.64
TD Bank	Private	●	0.71	0.06	2.60
Woolworths	Private		0.50	0	2.14
WWF-South Africa (WWF-SA)	Public	●	0.64	0.04	2

Note 1: In this section (4.2.), each interview is assigned a randomized number from 11 to 15.

Note 2: The normalized degree centrality indicates how many ties an actor has, divided by the maximum number of ties an actor can have; The normalized betweenness centrality reflects how many times an actor connects two otherwise unconnected actors

divided by the maximum betweenness centrality; the average tie strength is the sum of all tie strengths of an actor divided by the number of ties, where the strength itself is assessed through the level of frequency and resource flow(s) of a tie.

TABLE 18 ■ Results for the network-level indicators and legitimacy indicators.

Network indicator	Result	Main findings
Density	0.57	
Cohesion	0.53	*Clique composition*: 1: AngloGold Ashanti – Nedbank - Old Mutual – Santam – Sappi - The Embedding Project team - Woolworths - WWF-South Africa; 2: Nedbank – Santam - The Embedding Project team - Toronto-Dominion Bank - WWF-South Africa; 3: Nedbank - Santam - Teck - The Embedding Project team - Toronto-Dominion Bank; 4: The Co-operators – Santam – Teck - The Embedding Project team - Toronto-Dominion Bank; 5: The Co-operators - Etsy - Port of Vancouver – QuadReal – Teck - The Embedding Project team - Toronto-Dominion Bank; 6: Port of Vancouver - Suncor Energy - Teck - The Embedding Project team - Toronto-Dominion Bank; 7: Suncor Energy - The Embedding Project team - Toronto-Dominion Bank - WWF-South Africa
Centralization	0.46	
Legitimacy indicator		
Inclusiveness	Low	2 out of 15 actors from the public sector (13%)
Procedural fairness	Medium	Leadership role from the Embedding Project team, others have participatory role
Consensual orientation	Low	No brokers identified
Stringency	Low	No *performance targets*, *management targets* and therefore also no *quantifiability* of these targets. 2 out of 5 criteria satisfied.
Uptake	High	Desired size (large) and industry (diverse) of uptake matches first-movers.

Note: Density reflects the level of connectedness in the network through a ratio of how many ties there are in the network compared to the maximum theoretical number of ties; Cohesion indicates whether cliques exist (of 3 actors or more) that are all connected to each other, while no other actor in the network is connected to each actor in the clique; Centralization shows, in contrast to density, how centralized the network is around one or a few actors.

4.3. Case 3: Context-Based Water Targets initiative

4.3.1. Introduction

The CBWTi was established in 2016 by the Pacific Institute, Carbon Disclosure Project (CDP), The Nature Conservancy (TNC), World Resources Institute (WRI), and WWF International. CBWTi aims to provide guidance to companies with a significant water impact, to stimulate corporate water stewardship and water security. This guidance consists of a still-developing approach that includes incorporating hydro-ecological conditions at the basin level, contextual social needs and alignment with public policy. Currently, several companies have been active in the development of the CBWT, most of them with a substantial water footprint. An overview of the network is presented in Figure 6 (see Table 19 for the abbreviations); Table 19 presents the involved actors in the CBWTi and their node-level indicators; Table 20 shows the network-level indicator and legitimacy indicator results.

4.3.2. Analysis of network structure and legitimacy

An equal composition of sectors in a governance network is important to ensure that all representative stakeholders have an equal voice in network processes (Mena & Palazzo, 2012). The CBWTi consists of five core partners, all non-profit organizations (WWF-International, WRI, CDP, TNC, the Pacific Institute). Although there are more private actors than public actors involved, they serve as an advisory group and have no steering power in the initiative (interview 8). The absence of government actors can be explained by the focus of the CBWTi on *corporate* water stewardship (Interview 6). With 7 out of 16 actors in the network originating from the public sector, inclusiveness is ranked as '*high*'.

The power of the five focal actors is reflected by their node-level network structure indicators, which are noticeably higher compared to the rest of the network (where WRI and WWF-International score the highest and second-highest, respectively). The focal position for WRI is also observed in their clique saturation: WRI is present in all cliques, while the other core partners are less present. These bridging ties enable the exchange of specialized knowledge, which avoids the fragmentation of resources and information. With a high number of strong ties that connect diverse actors, the core partners have influence over the flow of resources in the network, while also being able to identify different views, expectations and possible disagreements (Prell et al., 2009).

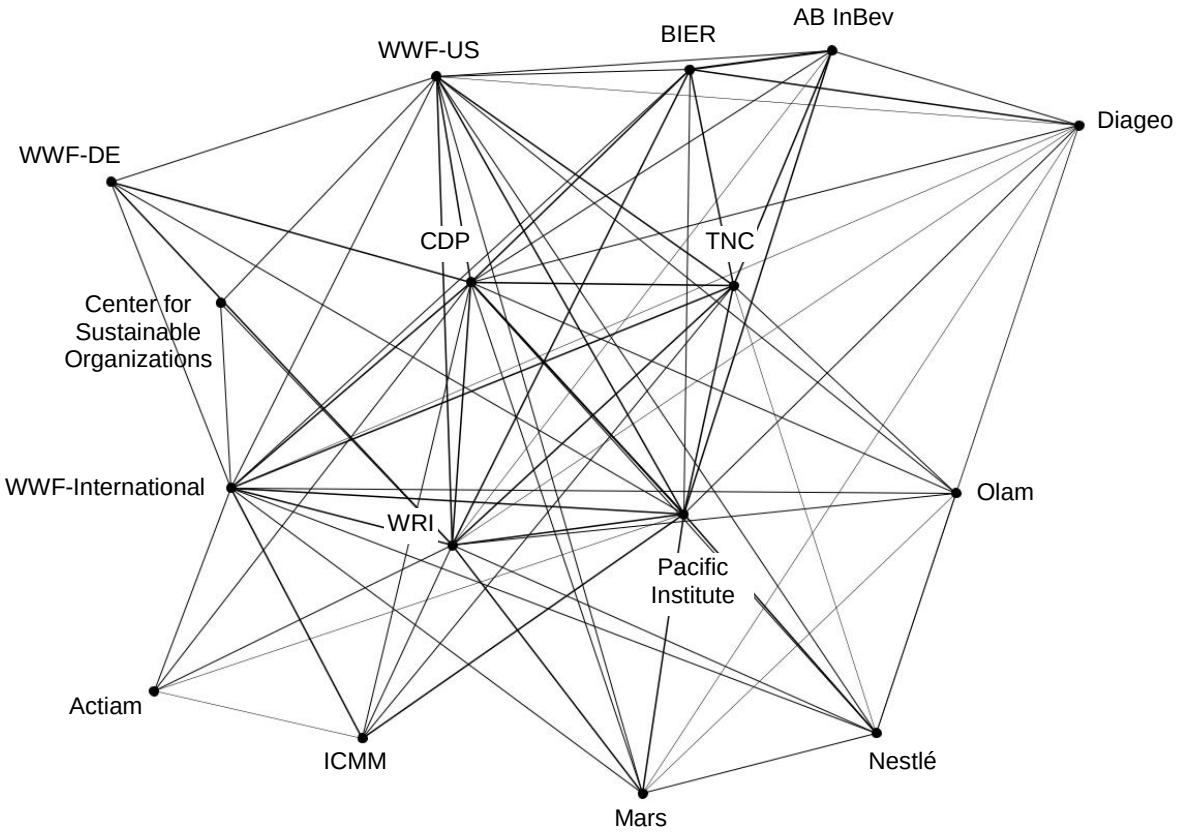

FIGURE 6 ■ The network of the CBWTi.

The five core partners have joint decision-making power and the 11 private partners have an advisory role (Interview 6, 8 and 9). The private partners provide technical knowledge, feedback on progress and recommendations (Interview 9, 10). This consulting role ensures a proper stringency and fit with the intended uptake group (Interview 8). The notion that the private actors predominantly serve as a feedback board is reflected by their low scores on all node level characteristics, especially betweenness centrality. This highlights a network structure that has characteristics of a core-periphery network structure where the five core partners form the core and the private actors can overall be perceived as the periphery. The force-directed network visualization in Figure 6 supports this notion.

Within the core partners, the Pacific Institute is viewed as having a coordinating role. This role manifests not in decision-making power, but rather in acquiring funding, connecting actors and coordinating progress and deadlines (interview 6). Because this role does not translate to increased decision-making power but rather functions as a coordinator and administrative body, the Pacific Institute is not regarded as a leader in the CBWTi network. With no clear leadership role by one actor, but also no participatory role by actors outside the core of WRI, WWF-International, CDP, TNC and the Pacific Institute, the procedural fairness of the CBWTi is ranked as '*medium*'.

Whereas procedural fairness elaborates on whether actors have an equal voice, consensual orientation reflects the extent to which these different voices are incorporated in the decision-making. The CBWTi has a strong focus on creating consensus among its core partners and is one of the initiative's guiding principles (CBWTi, 2018a). This approach is agreed upon by all five actors to drive alignment and consensus among them, as influential non-profit players active in corporate water target-setting (Interview 6, 7 and 8). As one interviewee mentioned:

> "We worked together on previous projects with these organizations and the people involved have a really good professional relationship. So, there is a certain degree of trust. Given that we all know each other from previous work, we knew that we went into this project aiming for consensus."
>
> - *Interview 8*

Thus, because of the trust that was built up over time, a strong focus on consensual orientation was both feasible and desirable. With the five partners having agreed to this consensus model, the *consensual orientation* is ranked '*high*'. For consensual orientation, a certain level of social resources, such as trust and reciprocity, is required and literature suggests that this is stimulated through strong ties. The high average tie strength of the five core partners compared to the rest of the network supports this (see Table 19).

The level of descriptiveness and comprehensiveness of a networks' output can be assessed through stringency (Kalfagianni and Pattberg, 2013). As can be seen in Table A3 in the Appendix, the CBWTi fulfils four out of five stringency indicators and is therefore scores 'medium' on *stringency*. Private

actors are the desired target group of the CBWTi, as the two stated purposes of the initiative both focus on companies. The first-movers consists of a wide range of industries (five industries), but with a similar size (large) (see Table A10 in the Appendix). Interviewees all expressed the importance of including diverse private actors. Three interviewees explicitly expressed the wish to make the CBWTi output accessible not only to a wide range of industries – but also to different sized companies. However, so far, only large-sized first-movers have been active. With one structural characteristic matching the first-movers and the desired uptake (industry), and one not (size), the CBWTi ranks '*medium*' on uptake.

TABLE 19 ■ An overview of actors involved in the CBWTi network, with their corresponding sector, normalized degree centrality, normalized betweenness centrality and average tie strength.

Actor	Sector	Interview	Normalized degree centrality	Normalized betweennes s centrality	Average tie strength
AB InBev	Private		0.46	0	1.1
Actiam	Private		0.33	0	0.5
Beverage Industry Environmental Roundtable (BIER)	Private	●	0.53	0	1.4
Carbon Disclosure Project (CDP)	Public		0.93	0.06	2.3
Center for Sustainable Organizations	Private		0.20	0	0.4
Diageo	Private		0.67	0.01	0.9
International Council on Mining and Metals (ICMM)	Private		0.40	0	0.8
Mars	Private		0.53	0	1.0
Nestlé	Private		0.60	0	1.1
Olam	Private	●	0.53	0	0.9
Pacific Institute	Public/Government	●	0.87	0.06	2.2
The Nature Conservancy (TNC)	Public		0.67	0.02	1.6
World Resources Institute (WRI)	Public	●	1	0.11	2.3
WWF-Germany (DE)	Public		0.33	0	0.8
WWF-International	Public	●	0.93	0.10	2.0
WWF-United States (WWF-US)	Public		0.87	0.06	1.8

Note 1: In this section (4.3.), each interview is assigned a randomized number from 6 to 10.

Note 2: The normalized degree centrality indicates how many ties an actor has, divided by the maximum number of ties an actor can have; The normalized betweenness centrality reflects how many times an actor connects two otherwise unconnected actors divided by the maximum betweenness centrality; the average tie strength is the sum of all tie strengths of an actor divided by the number of ties, where the strength itself is assessed through the level of frequency and resource flow(s) of a tie.

TABLE 20 ■ Results for the network-level indicators and legitimacy indicators.

Network indicator	Result	Main findings
Density	0.6	
Cohesion	0.25	*Clique composition*: 1: CDP - Diageo - Mars – Nestlé - Pacific Institute - WRI - WWF-Int - WWF-US; 2: CDP - Nestlé - Pacific Institute - TNC - WRI - WWF-Int - WWF-US; 3: BIER - CDP - Pacific Institute - TNC – WRI - WWF-Int - WWF-US; 4: BIER - CDP - Diageo - Pacific Institute - WRI - WWF-Int - WWF-US; 5: CDP - Pacific Institute - WRI - WWF-DE - WWF-Int - WWF-US; 6: CDP - ICMM - Pacific Institute - TNC - WRI - WWF-Int; 7: Actiam - CDP - ICMM - Pacific Institute – WRI - WWF-Int; 8: AB InBev - BIER - CDP - Diageo - Pacific Institute - WRI - WWF-US; 9: AB InBev - BIER - CDP - Pacific Institute - TNC - WRI - WWF-US; 10: CDP - Diageo - Mars – Nestlé - Olam – WRI - WWF-Int - WWF-US; 11: CDP – Nestlé - Olam – TNC - WRI - WWF-Int - WWF-US; 12: Center for Sustainable Organizations - WRI - WWF-Int - WWF-US
Centralization	0.4	
Legitimacy indicator		
Inclusiveness	High	7 out of 16 actors are from the public sector (44%)
Procedural fairness	Medium	No leadership role; private actors have a provider role.
Consensual orientation	High	5 brokers: CDP, TNC, The Pacific Institute, WRI and WWF-International
Stringency	Medium	No sufficient *level of detail*. 4 out of 5 criteria satisfied.
Uptake	Medium	Desired size (diverse) does not match first-movers (all are large); desired industry (diverse) does match first-movers.

Note: Density reflects the level of connectedness in the network through a ratio of how many ties there are in the network compared to the maximum theoretical number of ties; Cohesion indicates whether cliques exist (of 3 actors or more) that are all connected to each other, while no other actor in the network is connected to each actor in the clique; Centralization shows, in contrast to density, how centralized the network is around one or a few actors.

4.4. Case 4: Biodiversity Monitor

4.4.1. Introduction

The Biodiversity Monitor (Dutch: '*Biodiversiteitsmonitor*') is an initiative by WWF-NL, Rabobank and FrieslandCampina. The BM has the goal to stimulate biodiversity restoration in the Dutch agriculture industry through the development of a tool that measures the biodiversity status of agricultural land. In turn, this tool aims to create a new revenue model for agricultural stakeholders where they are rewarded for biodiversity restoration. This not only stimulates an increased biodiversity on agricultural land, but also makes agricultural stakeholders less dependent on subsidies. The three founders of this initiative developed a network of technical experts and stakeholders to develop the tool and to ensure broad support. An overview of the network is presented in Figure 7 (see Table 21 for the abbreviations); Table 21 presents the involved actors in the BM and their node-level indicators; Table 22 shows the network-level indicator and legitimacy indicator results.

4.4.2. Analysis of the network structure and legitimacy

Public actors are responsible for voicing the interests of stakeholders who lack the power to do so themselves. Based on the current distribution of sectors, only one public actor is participating in the network (WWF-NL). Most private actors originate from either a consultancy background or private actors from the dairy industry. Interviewees mentioned the wish to include more diverse actors in the network from both public and government sector, to increase the perceived legitimacy by stakeholders. However, at this young stage, the network scores '*low*' on inclusiveness.

WWF-NL, Rabobank and FrieslandCampina decided to use consultancies (Louis Bolk Instituut and WUR) to find a shared definition of 'biodiversity' by working on a biodiversity indicator where each of the three actors could voice their perspective on what biodiversity entails in relationship to Dutch agriculture (Interview 16 and 17). By working collectively on an objective, science-based biodiversity monitor, an equal and fair power relationship between the three founding actors was stimulated (Interview 17). As one interviewee mentioned (*next page*):

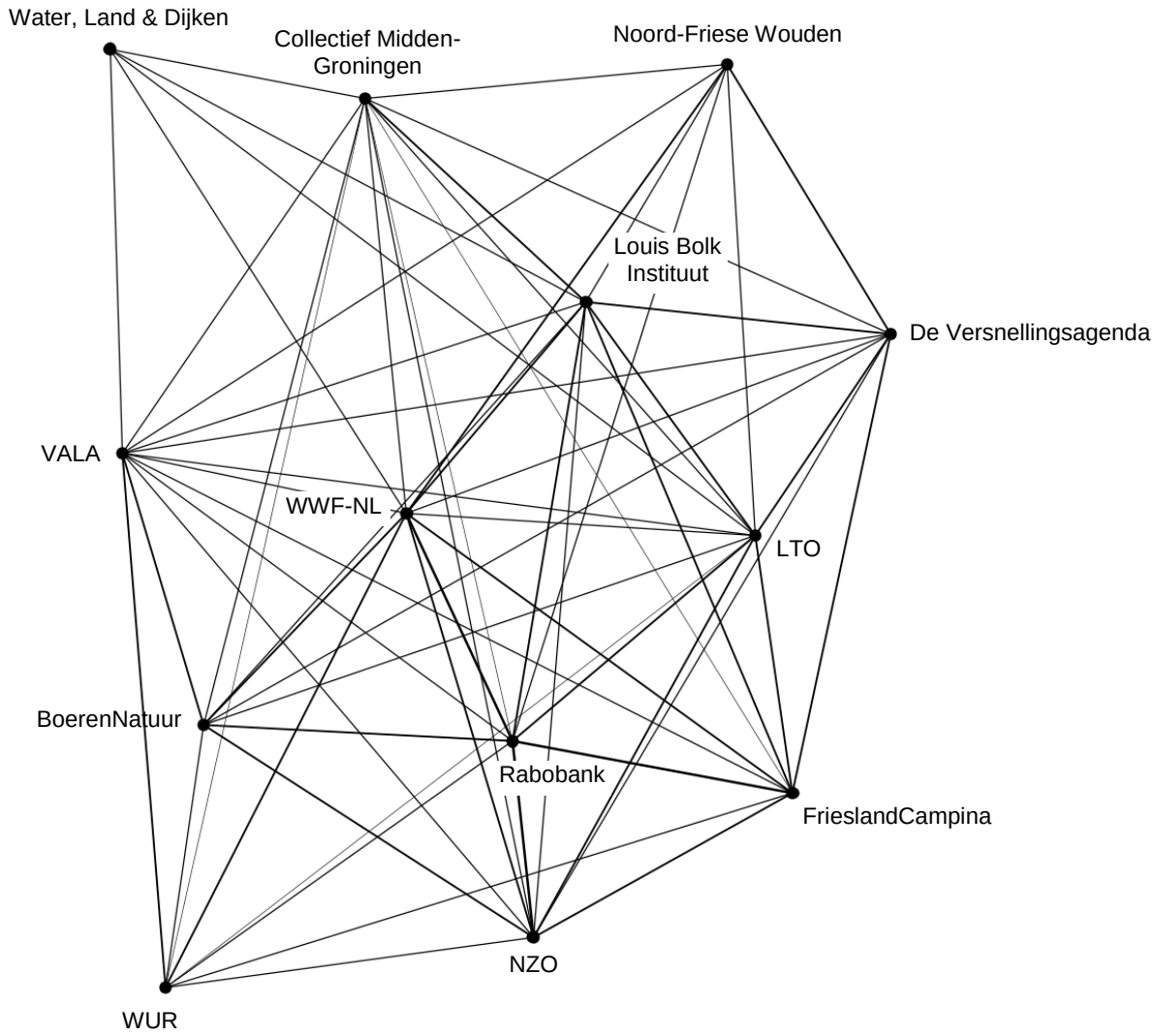

FIGURE 7 ■ The network of the BM.

> "*How would you describe the role and influence distribution among the three parties?* Totally equal. We each had a mission, and you join that mission with different values, of course. But there was a shared mission that we wanted to strengthen biodiversity."
>
> - *Interview 16*

An equal role for all three actors was further formalized and embedded in the governance structure as the steering group of the BM consisted of one representative from FrieslandCampina, WWF-NL and Rabobank (Interview 16 and 17). This indicates that among the three founding partners there is no leadership role. Two actors provide scientific robustness of the tool and function as 'providers' (Louis Bolk Instituut and WUR), but most actors are part of pilots and steering input and therefore act as 'participators' (Interview 18,19 and 20). Combining the absence of a leadership role with mostly participatory roles, the BM scores '*high*' on procedural fairness.

The high density and low network centralization reflect this equal distribution of power among actors in the network, as there is no dependence on a few actors having high influence over resource flows throughout the network (Dougill et al. 2006; Lockie 2006). The node-level indicators reflect this as well, as all actors have a relatively high degree- and betweenness (see Table 21). This suggests that the actors have an equal overview of diverse actors with different views, opinions and expectations and are therefore equally aware of these challenges. As all interviewees voiced similar concerns, such as different agendas and different-paced core partners, this network structure observation is reflected by the interviews (Interview 16, 17, 18, 19 and 20).

The equal decision-making power among the three founding partners is important as they have different agendas (Interview 16, 17, 19 and 20). With these differences, it can be expected that reaching alignment and consensus is challenging. Yet, despite their differences, part of the motivation for this collaboration is that the parties depend on one another for an effective output (Interview 16, 17). A second motivation to work together is that the combination of the size and background of each founder is perceived as crucial for the legitimacy of the BM (Interview 16, 17, 19 and 20):

> "These parties are leading parties. I estimate that their output sustains compared to the output of a collective. Qualitatively, what the collective develops can be better, but with the stakeholders behind the current formation, it is more likely that it will become a standard."
>
> - *Interview 20*

Interviewees strengthen this notion, as they indicate a consensual environment (Interview 16 and 17). Discussions are seen as constructive and there is no voting mechanism among the three parties – all decisions are made in consensus (Interview 16 and 17). Therefore, it is argued, all three parties act as brokers since they see the importance of reaching alignment, both for the effectiveness and credibility of the BM. With multiple brokers facilitating a consensual environment, the BM scores '*high*' on consensual orientation.

This is also emphasized by a relatively high average tie strength for each of the three brokers. Strong ties facilitate consensual orientation by enabling the development of social resources such as trust and reciprocity, that in turn reduce disagreements (Prell et al., 2009). The link suggested in literature between a high betweenness centrality and a brokering role does not become apparent in this case, as the three brokers do not have an outspoken normalized betweenness centrality compared to other actors in the network. A possible explanation for this could be that the link between betweenness centrality and a brokerage function may lie in a high betweenness centrality rather than a high *difference* compared to the rest of the network.

Besides support from stakeholders and actors through participation, the quality of the network output also determines the support of stakeholders and actors. A common output legitimacy indicator is stringency, which can be operationalized through five criteria (Kalfagianni & Pattberg, 2013). Satisfying three out of five criteria for stringency, the level of stringency is ranked as '*medium*' (See Table A3 in the Appendix). The BM also aims to include a wide range of sectors and stakeholders involved in the agricultural and dairy industry in the implementation of the BM (Interview 16). Because only two industries are covered, and no state actors are involved yet that interviewees deem as essential for the uptake (Interview 16, 19), the 'industry' of the first-movers is argued to not reflect the desired uptake (see Table A11 in the Appendix). In accordance with industry variety, applicability of the BM to different-sized stakeholders is also seen as important. However, the three first-movers are categorized as 'large' – which is a deliberate choice by the founding partners to increase the legitimacy of the 'proof of concept' (Interview 17). Therefore, the BM ranks '*low'* on uptake. However, in such a young stage of the network, it is important to mention that the uptake analysis is prone to uncertainty.

TABLE 21 ■ An overview of actors involved in the BM network, with their corresponding sector, normalized degree centrality, normalized betweenness centrality and average tie strength.

Actor	Sector	Interview	Normalized degree centrality	Normalized betweennes s centrality	Average tie strength
BoerenNatuur	Private		0.75	0	1.7
Collectief Midden-Groningen	Private		1	0.03	1.6
De Versnellingsagenda	Private	●	0.83	0.01	1.6
FrieslandCampina	Private		0.75	0	1.8
Louis Bolk Instituut	Private		1	0.03	2.3
Land- en Tuinbouw-organisatie (LTO)	Private		1	0.03	2.2
Noord-Friese Wouden	Private		0.58	0	1.2
Nederlandse Zuivel Organisatie (NZO)	Private		0.83	0	2.1
Rabobank	Private		0.83	0.01	2.2
Vereniging Agrarisch Landschap Achterhoek (VALA)	Private	●	1	0.03	2.0
Wageningen University and Research (WUR)	Private	●	0.83	0	1.7
Water, Land & Dijken (WLD)	Private		0.42	0	0.8
WWF-NL	Public	● ●	1	0.03	2.5

Note 1: In this section (4.4.), each interview is assigned a randomized number from 16 to 20.

Note2: The normalized degree centrality indicates how many ties an actor has, divided by the maximum number of ties an actor can have; The normalized betweenness centrality reflects how many times an actor connects two otherwise unconnected actors divided by the maximum betweenness centrality; the average tie strength is the sum of all tie strengths of an actor divided by the number of ties, where the strength itself is assessed through the level of frequency and resource flow(s) of a tie.

TABLE 22 ■ Results for the network-level indicators and legitimacy indicators.

Network indicator	Result	Main findings
Density	0.9	
Cohesion	0.46	*Clique composition*: 1:WWF-NL - Rabobank - Louis Bolk Instituut – WUR - Collectief Midden-Groningen - VALA - NZO - BoerenNatuur – LTO; 2: WWF-NL - Rabobank - FrieslandCampina - Louis Bolk Instituut - WUR - Collectief Midden-Groningen - VALA – NZO – LTO; 3: WWF-NL - Rabobank - Louis Bolk Instituut - Collectief Midden-Groningen - Noord-Friese Wouden - VALA – LTO; 4: WWF-NL - Louis Bolk Instituut - Collectief Midden-Groningen - VALA - Water, Land & Dijken – LTO; 5: WWF-NL - FrieslandCampina - Louis Bolk Instituut - Collectief Midden-Groningen - VALA - NZO - De Versnellingsagenda – LTO; 6: WWF-NL - Louis Bolk Instituut - Collectief Midden-Groningen - VALA - NZO - De Versnellingsagenda - BoerenNatuur – LTO; 7: WWF-NL - Louis Bolk Instituut - Collectief Midden-Groningen - Noord-Friese Wouden - VALA - De Versnellingsagenda - LTO
Centralization	0.2	
Legitimacy indicator		
Inclusiveness	Low	1 out of 13 actors from the public sector (8%)
Procedural fairness	High	No leadership role; actors have a participatory role
Consensual orientation	High	3 brokers: FrieslandCampina, Rabobank and WWF-NL
Stringency	Medium	Insufficient *level of detail* and *management targets*. 3 out of 5 criteria satisfied.
Uptake	Low	

Note: Density reflects the level of connectedness in the network through a ratio of how many ties there are in the network compared to the maximum theoretical number of ties; Cohesion indicates whether cliques exist (of 3 actors or more) that are all connected to each other, while no other actor in the network is connected to each actor in the clique; Centralization shows, in contrast to density, how centralized the network is around one or a few actors.

5. CROSS–CASE ANALYSIS

In this section, results are combined from each case. Each section is dedicated to a hypothesis from the theory section that connects certain network and legitimacy indicators in more detail. The hypotheses are reflected against the cross-case results in similar order as in section 2.5.

5.1. The relationship between network centralization and procedural fairness

The first hypothesis (H1) suggests that, based on existing literature, procedural fairness is negatively related to centralized networks. Centralized networks are those networks with a high centralization score, which indicates a few actors with high degree centrality and betweenness centrality scores. This causes a centralized influence and authority power by these actors (Bodin & Crona, 2009; Prell et al., 2009). Ideally, all actors who represent a stakeholder group have an equal influence and authority.

A link between the level of procedural fairness and the centralization of the network can be observed in the cross-case analysis (see Figure 8). The only case with a '*high*' score on procedural fairness, the BM, has the highest range in degree centrality score (when looking at the median and lower and upper quartile values), the lowest centralization score, as well as the lowest betweenness centrality range (when looking at the median and lower and upper quartile values) among the cases. A high degree centrality indicates that actors are well-connected in the network, and a low betweenness centrality shows that only a few actors act as a bridging tie between otherwise unconnected actors; both are generally the case in highly connected networks.

The EP and CBWTi score '*medium*' on procedural fairness. This correlates with a medium network centralization score. Both cases also have medium values for the degree centrality with a median close to 0.5. The betweenness centrality of the EP and CBWTi is also higher compared to that of BM (when looking at the median and upper quartile value), which also reflects a more centralized network. The only case that ranks '*low*' on procedural fairness, OPT, has the highest centralization score of all cases and the lowest betweenness centrality (when looking at the median and the lower and upper quartile values), which also indicates a more centralized network compared to the other cases.

Overall, the findings point to a link between a networks' centralization and its procedural fairness can be seen in the results of these cases. The network with the highest procedural fairness (BM) has the highest degree centrality and the lowest centralization and betweenness centrality; the cases with medium procedural fairness score (EP and CBWTi) average on centralization and degree centrality; the case with a low (OPT) procedural fairness has the highest network centralization and the lowest degree centrality.

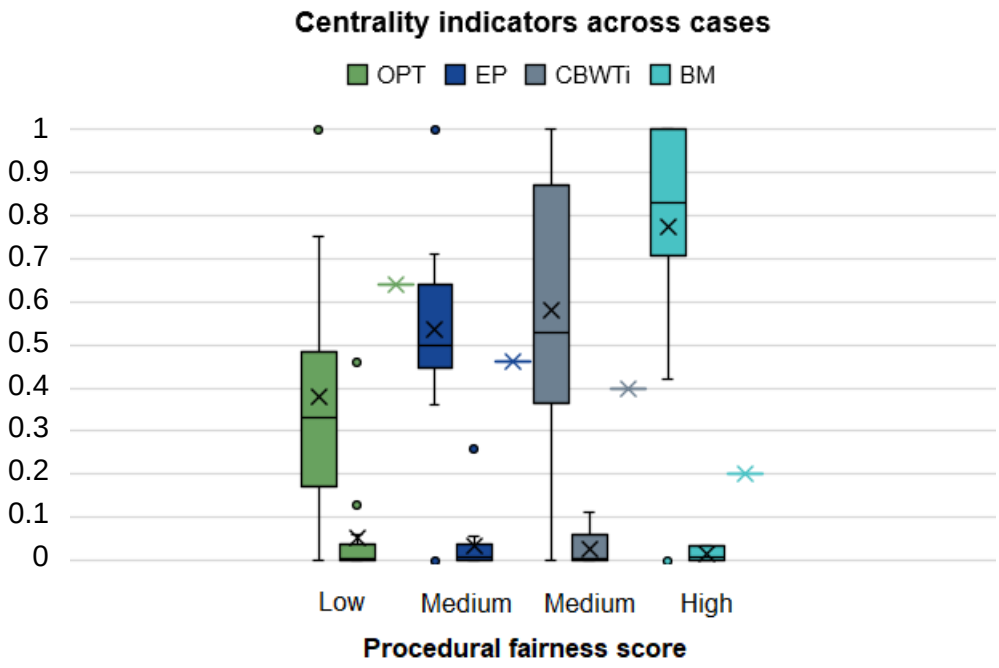

FIGURE 8 ■ Cross-case results for the centrality indicators. For each case, the first boxplot represents the normalized degree centrality; the second boxplot the normalized betweenness centrality; and the third value is the centralization score. On the x-axis, the level of procedural fairness is shown for each case. The horizontal line within the box represents the median; the 'X' within the box represents the mean; the box edges represent the lower and upper quartile; the whisker edges represent the lowest and highest observation (excluding outliers). Outliers are represented by a dot outside the whisker area.

From these results, it can be argued that centralized networks negatively influence the procedural fairness of the governance processes, thus finding descriptive alignment with the first hypothesis. An observation however is that betweenness centrality does not show a link as clear as the centralization and degree centrality indicators. This can possibly be explained by the fact that it is less directly related to the centralization of the overall network compared to the other two centrality measures (Bodin & Crona, 2009; Prell et al., 2009).

5.2. The relationship between network-level centrality and uptake

Based on theory, the second hypothesis argues that a high density and low centralization, as well as sufficient bridging ties (part of the indicator cohesion) facilitate collective action. These are all reflected on a network level rather than node level concepts. It is argued in this study that collective action indicates a high involvement of all actors, including those who are the target group of rules or regulations. This involvement also trickles down to those (initially) not-involved stakeholders, facilitating high uptake (Bodin & Crona, 2009; Olsson et al., 2004; Sandström, 2004). Table 23 summarizes the cross-case findings on the network-level indicators.

TABLE 23 ■ Cross-case results for the network level indicators and uptake.

	OPT	EP	CBWTi	BM
Uptake	High	High	Medium	Low
Density	0.41	0.57	0.60	0.90
Cohesion	0.23	0.53	0.25	0.46
Centralization	0.64	0.46	0.40	0.20

The relationship between density and uptake is not supported by the cross-case analysis, as the uptake of the cases increases with decreasing density (see Table 23). The other relationship from the conceptual framework is that centralization increases uptake as the central actor can mobilize the network for collective action. The cross-case analysis supports this with a tentative link between increasing uptake scores and increased centralization.

The level of bridging ties is also argued to potentially increase uptake as they facilitate mobilization and collectiveness of the network, creating support for decisions or regulations, which in turn can increase uptake (Bodin & Crona, 2009). However, similar to density, no observable relationship can be found in this cross-case analysis. BM has the highest level of bridiging ties, with four actors being part

of all 7 cliques (see Table 22), while scoring lowest on uptake. The EP has the lowest level of bridging ties with only the Embedding Project team linking all cliques (see Table 17), while scoring highest on uptake. Compared to OPT ('*high*' on uptake), the CBWTi ('*medium*' on uptake) contains more bridging ties as well, predominantly from the five core partners.

These results suggest only one out of three proposed relationships (network centralization) is observable in this cross-case analysis. This indicates no to weak support for hypothesis four (H4). Besides, the BM is still under development while the other cases have been active for more than five years, which causes a lag in uptake compared to the other three cases. Therefore, this case has limited reliability in terms of analysis. With only three suitable cases to distil results from in terms of uptake, the conclusion of this section should be met with a safe level of precaution and uncertainty.

5.3. The relationship between betweenness centrality and input legitimacy

The third hypothesis argues that actors with a high betweenness centrality have a high influence on a networks' input legitimacy. On the one hand, actors with a high betweenness centrality can negatively influence procedural fairness by exerting more power and authority compared to the rest of the network. On the other hand, actors with a high betweenness centrality enable consensual orientation, as they are a unique bridge between actors with different views, and thus exert a positive influence on procedural fairness (Knoke & Yang, 2008; Meno & Palazzo, 2012; Prell et al., 2009).

Looking at Figure 9, we can see that in two cases there are actors with a high betweenness centrality compared to the rest of the network. These are the actors visualized in Figure 9 by a dot outside of the whisker and are regarded as an outlier compared to the rest of the network. In the case of EP, the Embedding Project team is the clear outlier with a high betweenness centrality of 0.26; OPT shows two clear outliers from IUCN-NL and WWF-NL, with a betweenness centrality of 0.13 and 0.46, respectively. The only cases where there is little variation in betweenness centrality, and thus no actors with an emphasized higher betweenness centrality compared to the other network actors, is the CBWTi and BM.

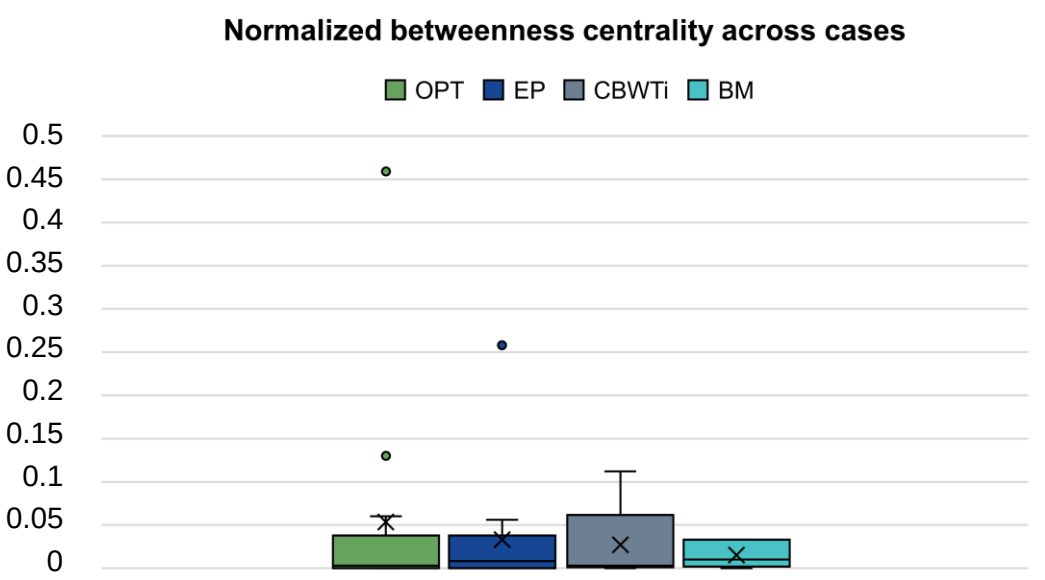

FIGURE 9 ■ The normalized betweenness centrality among the four cases. The horizontal line within the box represents the median; the 'X' within the box represents the mean; the box edges represent the lower and upper quartile; the whisker edges represent the lowest and highest observation (excluding outliers). Outliers are represented by a dot outside the whisker area.

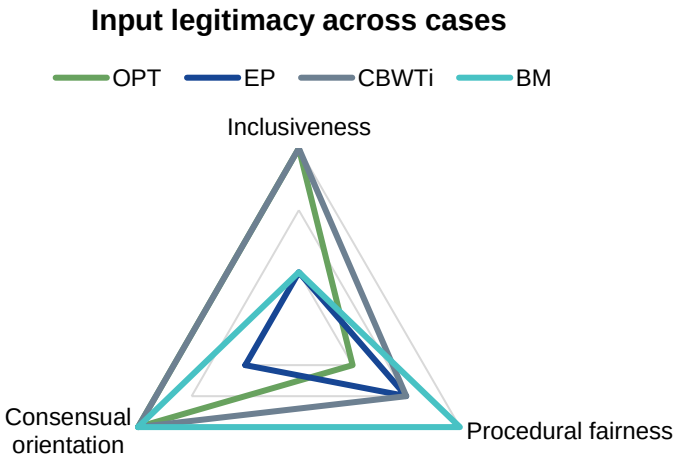

FIGURE 10 ■ The scores or each input legitimacy indicator.

The legitimacy of the EP case is highly influenced by the Embedding Project team compared to other actors in the network, as they are the only public actor (*inclusiveness*), have a leadership role (*procedural fairness*) and this role was perceived as the main cause for a lack of (a) broker(s) (*consensual orientation*). A similar observation can be made in the OPT case. WWF-NL and IUCN-NL highly influence the inclusiveness as they are two out of the five public actors in the network (*inclusiveness*). WWF-NL also has an emphasized leadership role (*procedural fairness*). Both WWF-NL and IUCN-NL act as a broker (*consensual orientation*). With WWF-NL and IUCN-NL directly influencing all input legitimacy indicators, both actors have a significantly higher influence compared to other actors in the network.

In both cases, the actor(s) with an emphasized higher betweenness centrality compared to the rest of the network were the lead of the network. The two cases with no betweenness centrality outliers did not have a leadership role by one of the actors: in the case of BM and the CBWTi it was an equal and joint effort of WWF-NL, Rabobank and FrieslandCampina; and WWF-International, WRI, Pacific Institute, CDP and TNC, respectively. As explained above, actors with a leadership role have determined or directly influenced the scoring of inclusiveness; procedural fairness; and consensual orientation. From these results, it can be argued that actors with a high betweenness centrality have a leadership role that highly influence on a networks' input legitimacy, thus suggesting support for the hypothesis.

5.4. The relationship between the tie strength and input legitimacy

The fourth hypothesis suggests that for a network to have a high input legitimacy, both weak and strong ties are necessary. Strong ties positively influence consensual orientation, is expected, since they facilitate increased understanding among actors (Prell et al., 2009). Weak ties however are important to link diverse actors from different sectors, which reflects inclusiveness (Reed et al., 2009). This can be explained by research that has shown weak ties are generally between dissimilar actors, who have access to different resources and segments (Reed et al., 2009). From Figure 11, it can be concluded that the CBWTi has the widest range of tie strength values in the network. The OPT case shows a wider range in average tie strength across the network, but their box is smaller, indicating less differentiation in tie strength with the combined upper and lower quartile values.

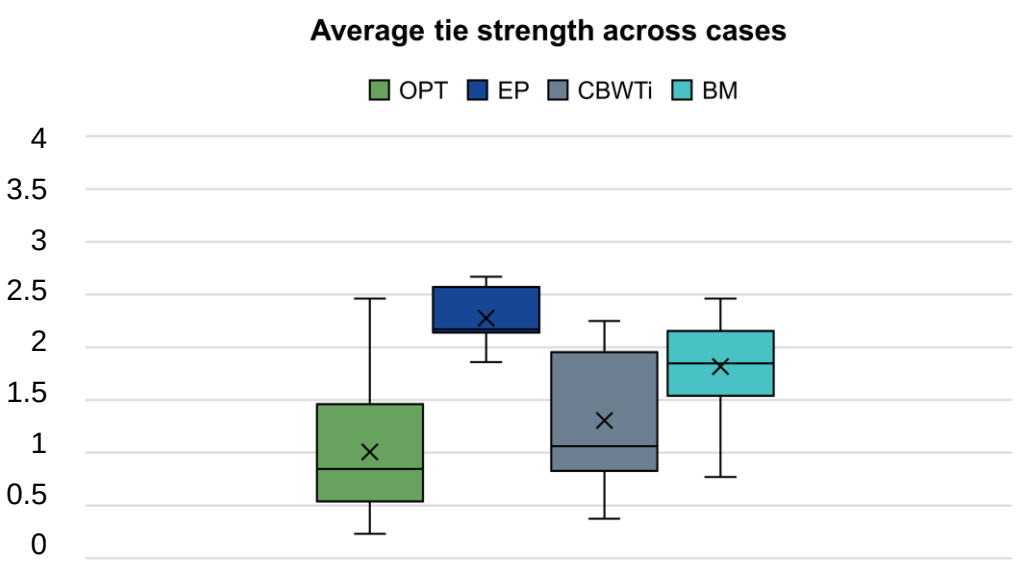

FIGURE 11 The average tie strength among the four cases. The horizontal line within the box represents the median; the 'X' within the box represents the mean; the box edges represent the lower and upper quartile; the whisker edges represent the lowest and highest observation (excluding outliers). Outliers are represented by a dot outside the whisker area.

When combining these results with the input legitimacy scores (see Figure 10), a link is observable between a high variation in tie strength and high input legitimacy. The CBWTi has the highest input legitimacy score, being the only case scoring 'high' on two indicators and 'medium' on one, and the highest tie strength variation across the network. EP has a significantly lower input legitimacy outcome, scoring 'medium' on one indicator and 'low' on two indicators. In particular these two extremes show a link between the tie strength and their input legitimacy: EP has an outspoken lower input legitimacy and tie strength differentiation across the network compared to the other cases.

The two in-between cases (OPT and BM) also have an in-between level of weak and strong tie range in the network. However, the tie strength differentiation of OPT and CBWTi does not differ significantly (CBWTi has a better range of strong and weak ties, while OPT has a slightly bigger tie strength range). From these results, it can be argued that actors with a high tie strength differentiation in the network, and thus with a fair range of weak and strong ties, have a high influence on a networks' input legitimacy. This interpretation of the results is similar to the theoretical implications from the hypothesis.

5.5. Additional cross-case results

As mentioned in section 2.5., the hypotheses aimed to aggregate all network structure indicators and legitimacy indicators – ideally on a concept level such as 'input legitimacy' rather than individual indicators. Yet, due to multitude of suggested relationships by literature are, not all are captured by the hypotheses formulated. Therefore, this section is dedicated to interesting results that were not covered by the hypotheses.

Literature suggests that actors with a high betweenness centrality positively affect consensual orientation, as they bridge different views between actors with a lower centralization score (Brass, 1992; Mena & Palazzo, 2012; Prell et al., 2009; Rowley, 1997). Looking at the OPT case, both WWF-NL and IUCN-NL act as brokers and do have a significantly higher betweenness centrality score. However, for the other cases, no clear link can be found between actors with a high betweenness centrality and a brokering function.

This might be explained by the notion that not only high betweenness centrality is suggested to reflect a brokering role, but rather a high degree centrality (see Figure 12). Those actors often need to consider the needs of a high number of actors, playing an essential role in enabling consensual orientation (Frank & Yasumoto, 1998). The three cases with (a) brokering actor(s) indicate that those actors have a high degree centrality, which is especially emphasized in more centralized networks such as OPT, therefore suggesting support for the link in literature between degree centrality and a brokerage role.

A high tie strength for actors is also suggested to facilitate consensual orientation as they nurture the development and maintenance of trust and reciprocity among the involved actors, therefore reducing disagreements (Prell et al., 2009). The cross-case analysis and Figure 13 find a similar relationship where brokering actors score high on their average tie strength compared for the rest of the network. This suggests that having a high number of strong ties (both degree centrality and tie strength) is more important for a brokering role compared to bridging otherwise disconnected actors (betweenness centrality). Therefore, it can be argued, that in case of disagreements or misalignments, those actors with strong ties to most actors in the network are expected to best facilitate a consensual orientation.

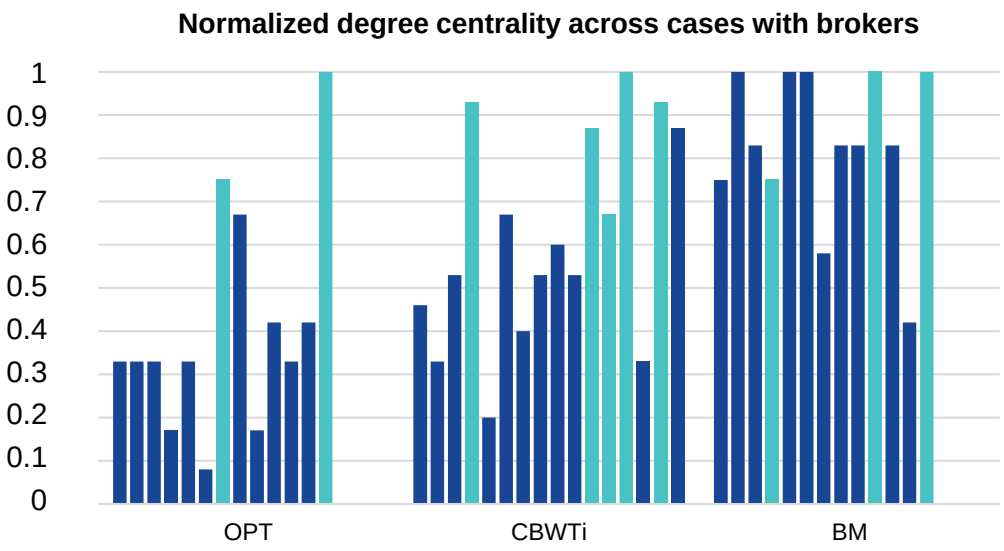

FIGURE 12 ■ Normalized degree centrality for all actors (dark blue) in each case with brokers (light blue), as identified for each case in their respective 'consensual orientation' section.

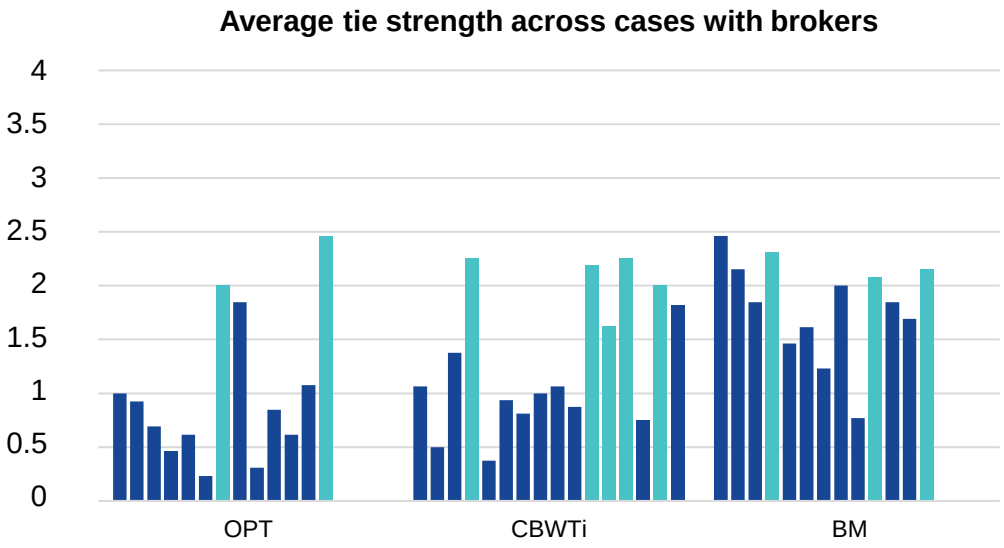

FIGURE 13 ■ Average tie strength of all actors (dark blue) in each case with brokers (light blue), as identified for each case in their respective 'consensual orientation' section.

5. DISCUSSION

This thesis aims to validate findings and uncertainties in the novel field of environmental governance and social network analysis as well as contribute by incorporating output legitimacy. Through a cross-case analysis, input legitimacy and output legitimacy indicators are analysed, and aligned with network structure indicators to see if the hypotheses that originated from existing literature hold up. This section elaborates on how the cross-case analysis contributes to existing theory and what critical theoretical and methodological limitations can be identified, and what they imply for future research.

6.1. Input legitimacy limitations

Environmental governance literature is increasingly paying attention to the importance of proper input legitimacy, as an inclusive, equal and fair collaboration with all relevant stakeholders is argued to be important for broad support and effectiveness (Mena & Palazzo, 2012). However, several interviewees in this thesis emphasize their preference for a governance network with a low input legitimacy, for example in the form of a central lead or low decision-making involvement.

In each case, there is one 'coordinating unit' with significantly more decision-making power compared to the rest of the network (for OPT, this unit consists of WWF-NL and IUCN-NL; for EP, the EP team; for BM, WWF-NL, Rabobank and FrieslandCampina; for the CBWTi, WRI, WWF-International, TNC, CDP and the Pacific Institute). Actors outside this 'coordinating unit' do generally not perceived this coordinating unit as a disadvantage. The perceived drawback of this overemphasis on including everyone in decision-making is also found in existing literature and is coined a participation fatigue (Tewdwr-Jones & Allmendinger, 1998). A motivation for this perception is that a 'coordinating unit' enables the network to make decisions at a faster pace, which avoids a loss of momentum.

> "It is already complex enough with these three parties. If you have to take into account everyone in the decision-making, I am not sure if there ever will be a decision."
>
> - *Interview 19*

A focus on consensus is often seen as a *disadvantage* (Interview 7, 16, 17). The disadvantage is two-fold: first, progress is significantly impaired since every decision needs to be negotiated. A more critical disadvantage of consensus mentioned is that these decisions are often a watered-down version of original ideas since frequently several actors are critical towards new ideas. It can be argued that this negatively affects the stringency of a networks' output, as 'the worst of class' determines the ambition level (Interview 8, 17). As one interviewee mentioned (*next page*):

> “If you’re trying to agree on something around a consensus model, you essentially reduce down to your lowest common denominator.”
>
> - *Interview 7*

Overall, inclusiveness of public actors is perceived as important to ensure a high level of ambition and stringency. On the other hand, consensual orientation within these ‘coordinating units’ is seen as important for in-and external support of the network output, despite its time-consuming cost and possible lower stringency of output. Procedural fairness is generally perceived as least important, as the coordinating units were seen as positive by actors outside the ‘unit’; and those actors with a clear leadership role were not seen as a barrier for the networks’ output or effectiveness. Further research should therefore shed more light on the importance of consensual orientation and procedural fairness for the effectiveness of environmental governance networks.

6.2. Output legitimacy limitations

The output legitimacy indicators show less support for their suggested links to the network structure compared to the input legitimacy. This can partly be traced back to the lack of existing literature on the effects of the network structure on output legitimacy, which resulted in more uncertainty when establishing the conceptual framework. The two main assumptions at the basis of this uncertainty are that specialized knowledge creation and sharing increases stringency, as more facets of socioenvironmental problems are given attention; and that collective action results in an increased uptake.

It is also possible that the operationalization of stringency and uptake in this thesis do not properly capture their theoretical concept. Environmental governance literature in general has struggled and acknowledged the issues related to analysing the output of governance processes (Kolk, 2013; Van Tulder et al., 2016). Although stringency operationalization in this thesis is based on Kalfagianni & Pattberg (2013), some criteria used are prone to subjectivity. For example, the level of ambition is determined by the extent to which ‘the standard goes beyond existing regulation (when such regulation exists) and/or it envisions greater environmental change relative to other private standards’

(Kalfagianni & Pattberg, 2013, p. 126). Whether a case satisfies this criterium is dependent on the researchers' knowledge of existing regulation and standards. Also, the BM and CBWTi were still developing their output, which resulted in the use of assumptions based on grey literature to operationalize their stringency.

The uptake operationalization used in this thesis is new, as existing methods to operationalize uptake were not fit for the cross-case analysis at hand (see section 3.3.). The assumption at the basis of uptake operationalization that first-movers influence the output of a network to such an extent that their structural characteristics reflect long-term uptake, is supported by interviews with several first-movers whose motivation for joining a network was to make sure the output was fit for their organisational characteristics (Interview 6, 10, 13 and 18). This suggests that, despite no relationship being found with the network structure, the novel operationalization method for the uptake might be a relevant alternative to assess the output potential of new environmental governance networks. Despite this, the operationalization in this thesis is still prone to uncertainty as the analysis was based on a few first-movers in the case of OTP and BM.

Further research is needed to confirm whether the knowledge creation and sharing, as well as collective action, are misattributed to certain network characteristics in current literature, or whether the network structure does not affect output legitimacy as significantly as input legitimacy. Future studies on output legitimacy can also further test and validate the novel operationalization method for uptake proposed in this thesis, through assessing the output potential of young environmental governance networks.

6.3. Methodological limitations

Several methodological limitations exist in the research design of this thesis. Concerning research design and scope, scholars have frequently highlighted the challenges associated with operationalizing legitimacy. This results in definitional ambiguity, different legitimacy indicators and different operationalization methods across literature and fields (Kolk, 2013; Van Tulder et al., 2016). The cross-case research design applied in this thesis requires a comparison across cases, which implies a normalization of legitimacy indicators through categorization (in this thesis, low, medium, high). Operationalization of social sciences concepts inevitably results in a loss of depth of the

concepts as boundaries need to be established for what entails certain indicators. Because of this, the extent to which each legitimacy indicator operationalization covers the depth and width of its original concept, can be contested. However, this thesis aimed to base the operationalization of each legitimacy indicator on recent and relevant governance literature, to avoid a loss of context and depth.

A second methodological drawback is that the network survey response rate variated between 80% and 85%. This implicates that several actors in each network did not participate and therefore, the network structure operationalization, and the interpretation thereof, should be met with caution. A third drawback, also related to the methodology, is related to the semi-structured interviews. Input legitimacy covers aspects that can be perceived as sensitive to some actors, such as the distribution of influence and authority in the network. To stimulate an open environment, both the individual and the representative organization were anonymized. Despite these efforts, it cannot be ensured that interviewees refrained from certain statements.

Another method used to deal with the limited response rate and number of interviews was to have a uniform approach for each case of five interviews and a response rate between 80% and 85%, as a similar quality and quantity of data of each case increases comparability (Yin, 2009). A disadvantage of the descriptive methodology combined with only a few cases does not allow for a statistical cross-case analysis, which decreases the strength of the hypotheses validation as the results are prone to interpretational subjectivity (Yin, 2009). This thesis acknowledges that by aiming to use careful descriptions of findings and by recommending future research to incorporate larger case studies that enable statistical analysis.

Setting network boundaries remains a difficulty in the field of social network analysis (Newig et al., 2010). Several approaches exist, from setting a pre-defined actor limit to only including official members of a network. On the one hand, a strict approach like the aforementioned boundaries ensures an equal and objective treatment of each case, but can cause a lack of depth and context as reality is often more complicated. Therefore, this thesis aimed to incorporate both objective boundaries (part of a governance structure and/or a contractual agreement) and a contextual boundary (using the realist approach), to ensure both methodological uniformity across cases through objectivity and case-dependent depth through context (Newig et al., 2010; Wasserman and Faust, 1994).

7. CONCLUSION

The effectiveness of environmental governance networks is influenced by the extent to which stakeholders perceive the actions of the network as 'desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions', also defined as the credibility or legitimacy (Suchman, 1995, p. 574). Low legitimacy can result in low support and uptake from stakeholders, as well as (public) criticism, and is a common problem identified by studies who evaluate environmental governance networks (Bäckstrand, 2006; Kolk, 2013; Liese & Beisheim, 2011; Marx & Cuypers, 2010; Pieth, 2007; Mena & Palazzo, 2012; Pattberg, 2005; Szulecki et al., 2011).

Input legitimacy refers to the level of participation by stakeholders in the governance network (Scharpf, 1997:1999). The level of participation is assessed by assessing who is included in the network (*inclusiveness*), if network actors have an equal say in decision-making (*procedural fairness*), and if there is room to discuss disagreements and find alignment (*consensual orientation*). The 'capacity of governance mechanisms to effectively take a regulatory role' is also known as output legitimacy (Mena & Palazzo, 2012, p. 14). How many actors use or implement the output of the network, such as rules, regulations, standards (*uptake*), and the level of prescriptiveness and comprehensiveness of the output (*stringency*) reflects output legitimacy.

Research suggests the legitimacy of environmental governance networks is influenced by the social network structure (Bodin & Crona, 2009; Newig et al., 2010; Prell et al., 2009; Sandström & Rova, 2010; Newman & Dale, 2007). Environmental governance networks can exist in various structures. These structures affect the distribution of resources (such as knowledge) across the network, as well as authority, collective action, trust and power, among others (Bodin & Crona, 2009; Prell et al., 2009). This thesis aims to increase scientific understanding on the effect of the structure of environmental governance networks on their in- and output legitimacy, and by that, shed light on how the effectiveness of governance networks can be improved.

An extensive literature review was performed, which formed the basis of a conceptual framework and the hypotheses. A multi-case study (four cases) was used to validate these hypotheses. Semi-structured interviews were conducted with multiple actors in each case, as well as a survey among all actors as primary data to assess the legitimacy and network structure of each case. Afterwards, a cross-case analysis was performed. Cross-case research design increases the scientific and social

relevance through identification of patterns and outliers (Baxter & Jack, 2008; Herriott & Firestone, 1983; Yin, 2017). Case-based reasoning and cross-connectedness among theoretical concepts increases the researchers' expertise (Ausubel et al., 1978; Flyvbjerg, 2001; Khan & Van Wynsberghe, 2008). The following conclusions can be drawn from the hypothesis:

1. **Centralized networks are suggested to decrease procedural fairness.**

   The cross-case analysis supports existing literature that suggests that a high centralization indicates one dominant actor with more influence compared to other actors in the network, which impairs equal decision-making power among actors. Decentralized networks also have more ties and thus more equal access to the same information and resources for each actor. This suggested relationship is supported by all four cases in the cross-case analysis, and predominantly observable for degree centrality and network centralization.

2. **Weak and strong ties are observed to stimulate high input legitimacy.**

   One the one hand, strong ties enhance a consensual orientation due to the development of social resources such as trust and reciprocity. This is aligned with the results and cross-case analysis (see point 2). On the other hand, weak ties are good for connecting diverse actors, therefore stimulating inclusiveness. The cross-case analysis reflected this, as those networks scoring high on inclusiveness were characterized by the presence of weak ties.

3. **Actors with a high degree centrality and strong ties are observed to have a high influence on the level of consensual orientation.**

   From an environmental governance perspective, actors who facilitate and stimulate consensual orientation are brokers, and function as a bridge between actors with different agendas, values and norms. From the cross-case analysis, it follows that brokers identified through this definition are characterized by an above average high degree centrality compared to the rest of the network. This indicates that they are connected to a lot of actors with different expectations and norms. Besides being well-connected, the cross-case analysis supported the theoretical relationship between brokers and a high tie strength, which reflects a high level of trust and cooperation with those actors. Both a high degree centrality and tie strength are

needed to have an overview of different agendas and values, and to consequently enable a deliberative environment to reach alignment.

4. **Actors with a high betweenness centrality are suggested to reflect an influential position for a networks' legitimacy.**

   The cross-case analysis suggests that actors with a high betweenness centrality have a high influence on the legitimacy compared to other actors in the network. They connect otherwise disconnected actors and therefore function as a bridge. The cases show that actors with a high betweenness centrality are generally a lead actor in the network if one is present, and therefore (negatively) influence the procedural fairness. The actors in each case with a high betweenness centrality also functioning as a bridge between different cliques, enabling the sharing of resources and knowledge between otherwise disconnected 'hubs'. By stimulating bridging ties on the one hand, but decreasing procedural fairness, a high betweenness centrality offers a trade-off for environmental governance networks. Depending on the aim of the network, this thesis suggests that actors with a high betweenness centrality can be either beneficial or disadvantageous (for example, if the objective is to increase knowledge on a specific issue, the advantage of bridging different cliques may compensate for lower procedural fairness).

5. **No observed relationship between the network structure and a networks' output legitimacy.**

   This research aimed to link output legitimacy to the network structure of governance networks as well. However no reliable descriptive relationship could be found for the suggested relationships from theory. The implications of this misalignment for future research are discussed below.

Based on these conclusions, practical recommendations can be formulated for WWF-NL, and theoretical recommendations for future research. Both will be discussed in below.

Practical recommendations

Three recommendations can be distilled for WWF-NL and other organisations active in environmental governance networks, who aim to increase legitimacy. The recommendations provide tangible touchpoints to improve the legitimacy of future governance networks by reflecting on the social network structure.

1. **Stimulate and facilitate interaction among *all* actors of a network.**
   In a highly connected network, actors have access to similar resources without one actor, or a few, to have control and authority over these resources. Besides, in a non-centralized network, actors create ties with equal levels of social resources such as trust and reciprocity, which facilitates consensual orientation. Lastly, having ties to (ideally) all actors in the network enables actors to have an overview of different views, opinions and expectations in the network that are often at the basis of conflict.

2. **Create both strong ties and bridging ties in a network**.
   Strong ties enable a consensual environment by building trust and reciprocity, while bridging ties are necessary between cliques to facilitate knowledge sharing rather than creating fragmentized knowledge hubs. This way, actors in the network have a holistic picture of the socioenvironmental issue at hand, as well as knowledge and resources within the network. For example, the cases used in this thesis aimed to create and share new knowledge on specific socioenvironmental issues, which emphasizes the importance of bridging ties.

3. **Aim for a shared 'coordinating unit' rather than sole leadership in a network**.
   By equalizing decision-making power across actors, both alignment and support in the network is stimulated, as well as an environment where there is more room to voice values, opinions and discuss uncertainties.

Theoretical recommendations

The cross-case analysis linked several network structure and legitimacy indicators through a descriptive methodology, to validate findings in the still novel field of SNA and environmental governance. However, this thesis also identifies three main research recommendations:

1. No observable link between output legitimacy and the network structure was found through the descriptive analysis. Further research is needed to confirm whether the assumptions behind the output legitimacy operationalization of this thesis are flawed, and if the missing link can therefore be explained by a methodological limitation. Besides, the novel method of operationalization for uptake proposed in this thesis deserves a wider application as both literature and interviewees support the assumption that first-movers influence and reflect the long-term uptake.

2. This thesis uses a multi-case research design of four cases, which is too small for a statistical comparison (Yin, 2009). The validation of hypotheses based on these patterns might be weak and subject to interpretation. Future cross-level analyses with more cases and a statistical research design can increase certainty on the suggested relationships in this thesis.

3. Based on the support for a relationship between input legitimacy and the network structure of governance networks, it can be argued that the network structure and concepts related to legitimacy, such as accountability and transparency, are also linked. Therefore, these concepts deserve a research agenda of their own.

Overall, this thesis contributes to existing literature by combining the fields of social networks and environmental governance, and validating links suggested by the novel literature that exists on SNA and environmental governance. The methodology also proposes new ways to operationalize certain indicators based on existing literature, that deserve further validation on their robustness.

Environmental governance networks enable us to deal with socioenvironmental issues by offering multidisciplinary collaborations and solutions. But without support from stakeholders, these networks have a low effectiveness. Support of stakeholders is crucial, and this thesis highlights the importance and influence of network connectedness for stakeholder credibility.

APPENDIX

TABLE A1 ■ Interview guide.

#	Question	Indicator
1	Why did you choose to work with [network X]?	*Introductory questions*
2	Is the performance of [network X] in line with your expectations? If not, are there reasons for this?	
3	Which actors were involved during the development process of the network, and who had what role? How was this distribution of roles decided?	Inclusiveness Procedural fairness Consensual orientation
4	How is the influence in decision-making distributed among the actors, in your opinion? What is your opinion on this distribution of influence?	Procedural fairness
5	Could you name an example of both a decision from the project that you agree with and one that you do not agree with? How was dealt with that disagreement?	Consensual orientation
6	How well-structured were meetings in your opinion? Did you experience any unclarities or points that were not answered during meetings? If so, what was the reason for this? And how was it dealt with?	Procedural fairness
7	How ambitious do you think [network X] is?	Stringency
8	Where would you ideally see [network X] in five years?	Uptake
9	How can [case X] be improved?	*Closing question*

TABLE A2 ■ Survey guide.

#	Question	Indicator
1	What actor do you represent? *(one answer possible)*	*Introductory question*
2	What kind of exchange between you and the other partners of the CBWTi takes place? *(multiple answers possible: strategy dialogue; joint project; technical knowledge; financing; other)*	Tie strength
3	Did you keep the category 'financing' confidential in question 2?	
4	On average, how often do you communicate with the partners you interact with as indicated in question 2? *(one answer possible: daily; weekly; monthly; every few months; once a year*	Degree centrality,

	or less)	betweenness centrality, density, cohesion, centralization
5	Is there anything you would like to add? *(open question)*	*Closing question*

TABLE A3 ■ List of interviewees for each case.

Case	Name	Interview	Date	Interviewees (in randomized order)	Representing actor	Sector
1*	OPT	1	12-09-17	Jorien van Hoogen	WWF-NL	Public
		2	17-04-18	Romie Goedicke	IUCN-NL	Public/Government
		3	23-01-18	Aurora Flement	Alpro	Private
		4	25-01-18	Gerben Meijer*	Eneco	Public
		5	05-04-18	Giel Linthorst*	Ecofys	Private
2	CBWTi	6	17-07-18	Tien Shiao	Pacific Institute	Public/Government
		7	23-04-18	Rylan Dobson	WWF-International	Public
		8	02-05-18	Paul Reig	WRI	Public
		9	05-04-18	Nick Martin	BIER	Private
		10	30-04-18	Chris Brown	Olam	Public
3	EP	11	04-05-18	Stephanie Bertels	The Embedding Project team	Public
		12	20-02-18	Rylan Dobson	The Embedding Project team	Public
		13	27-06-18	Stephen Wetmore	WWF-SA	Public
		14	04-07-18	Rachel Guthrie	Toronto-Dominion Bank	Private
		15	28-06-18	Jamie Gray	QuadReal	Private
4	BM	16	12-06-18	Jacomijn Kuijpers	WWF-NL	Public
		17	02-07-18	Natasja Oerlemans	WWF-NL	Public
		18	06-07-18	Dick Looman	VALA	Private
		19	04-07-18	Gerda van Eck	De Versnellingsagenda	Private
		20	29-06-18	Anne van Doorn	WUR	Private

**: N. Sticzay was leading these interviews. The transcription and analysis of the interviews were done by the author of this thesis.*

TABLE A4 ■ Stringency score for OPT.

Criterium	Satisfied	Comments	Source
Detail	No	Out of three categories (climate change; particulate matter; resource availability), one category (particulate matter) was operationalized with 1 indicator.	Eneco (2013)
Ambition	Yes	Operationalizing ecological thresholds has only been done in a few scientific studies so far and in	Putt del Pino et al. (2016)
Performance targets	Yes	Eneco's 2014 targets were based on their 2012 performance.	Eneco (2013)
Management targets	No	Annual report from 2013 formulated KPI's not further than 2014.	Eneco (2013)
Quantifiability of targets	Yes	Targets and corresponding indicators are quantifiable.	Eneco (2013)

Note: OPT is a project with no standardized output – meaning that the tools and methodologies they offer are tailor-made for each actor that is part of the uptake. One case has been completed thus far (with Eneco). Because of this, the assessment of stringency is based on this case.

TABLE A5 ■ Stringency score for the EP.

Criterium	Satisfied	Comments	Source
Detail	Yes	The 'Embedding Framework' defines 13 categories or 'pathways' with each 3 indicators or more.	Bertels & Schulschenk (2015)
Ambition	Yes		
Performance targets	No	The EP offers a guideline how to deal with targets once they are set (measure, report, verify targets) but not how these targets should be developed.	Bertels & Schulschenk (2015)
Management targets	No	The 'Embedding Framework' does not elaborate on how to set management targets other than implementing standards such as ISO14000.	Bertels & Schulschenk (2015)
Quantifiability of targets	No	Qualitative self-assessment for the 'Embedding Framework'	Bertels (2014)

TABLE A6 ■ Stringency score for the CBWTi.

Criterium	Satisfied	Comments	Source
Detail	No	Five categories or 'water challenges' are assessed out of which one category has two indicators.	CBWTi, 2018b
Ambition	Yes	The CBWTi uses a context-based methodology that is a new approach to socioenvironmental issues.	CBWTi, 2018a: 2018b
Performance targets	Yes	Main objective of the CBWTi with actual, quantifiabile targets. Four ot of the five 'water challenges' concern performance targets.	CBWTi, 2018b
Management targets	Yes	The last 'water challenge' concerns a sustainable management plan, where 5 out of 8 indicators of this challenge concern sustainable management targets.	CBWTi, 2018b
Quantifiability of targets	Yes	The indicators for the performance targets of each 'water challenge' are quantifiabile.	CBWTi, 2018b

TABLE A7 ■ Stringency score for the BM.

Criterium	Satisfied	Comments	Source
Detail	No	Four categories or 'pillars' of biodiversity are established out of which two 'pillars' have less than 3 indicators.	Biodiversiteitsmonitor Melkveehouderij, 2018
Ambition	Yes	It aims for a more holistic impact (creating a new business and revenue model for the agriculture- and dairy industry) compared to other biodiversity tools such as the Biodiversity Footprint Tool.	Biodiversiteitsmonitor Melkveehouderij, 2018
Performance targets	Yes	The BM will use a 'backcasting approach' that requires the incorporation of the actual performance in target-setting.	Holmberg & Robèrt, 2000; Biodiversiteitsmonitor Melkveehouderij, 2018
Management targets	No	Still under development; a negative attitude from farmers towards a management plan and the absence of management targets in current pilots are argued to reflect that no managerial target-setting will be incorporated in the BM.	Interview 17, 19, 20
Quantifiability of targets	Yes	Performance targets are based on optimal- and threshold values for each KPI. By definition, KPI's are quantifiable.	Biodiversiteitsmonitor Melkveehouderij, 2018

TABLE A8 ■ Uptake score for OPT.

Actor	Industry	Size
Alpro	Consumer staples	Large

TABLE A9 ■ Stringency score for the EP.

Actor	Industry	Size
AngloGold Ashanti	Materials	
Etsy	Consumer discretionary	
Nedbank	Financials	
Old Mutual	Real estate	
Port of Vancouver	Industrials	
QuadReal	Real estate	
Santam	Financials	Large
Sappi	Materials	
Suncor Energy	Energy	
Teck	Materials	
The Co-operators	Financials	
TD Bank	Financials	
Woolworths	Consumer staples	

TABLE A10 ■ Uptake score for the CBWTi.

First-mover	Industry	Size
AB InBev	Consumer staples	
BIER	Consumer staples	
Diageo	Consumer staples	
Nestlé	Consumer staples	
Olam	Consumer staples	Large
Mars	Consumer staples	
ICMM	Energy, Materials	
Actiam	Financials	

TABLE A11 ■ Uptake score for the BM.

Actor	Industry	Size
FrieslandCampina	Consumer staples	
VALA	Consumer staples	Large
Rabobank	Financials	

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Note: Scientific references are presented in the list below. Grey literature (websites and non-scientific documents) is presented in a separate list afterwards.

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