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List of Abbreviations

ACF	Advocacy Coalitions Framework
CAP	Common Agricultural Policy (EU)
CECs	Contaminants of emerging concern
CJEU	European Court of Justice
DüG	Fertilizer Act (Germany)
DüV	Fertilizer Ordinance (Germany)
EC	European Commission
EU	European Union
FAZ	Frankfurter Allgemeine Zeitung
GWD	Groundwater Directive (EU)
IWRM	Integrated water resources management
ND	Nitrates Directive (EU)
NPF	Narrative Policy Framework
OGewV	Surface Water Ordinance (Germany)
WFD	Water Framework Directive (EU)

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1 Introduction

The worldwide loss of biodiversity is as catastrophic as climate change with detrimental consequences for the functioning of ecosystems and their ability to provide services to humanity (Cardinale et al., 2012; European Commission, 2020). The pollution of waters with nutrients and chemicals has been one of the reasons for degrading biodiversity in aquatic ecosystems in Germany (European Environment Agency, 2018). The last official water assessment by the European Environment Agency (2018) found only seven percent of German rivers and lakes in a good or very good ecological condition as demanded by the *EU Water Framework Directive (WFD; Directive 2000/60/EC)*. As one indicator of degrading biodiversity, scientists have observed a decrease in fish populations in numerous river systems in Europe over the last decades (Braunbeck et al., 2009; Burkhardt-Holm et al., 2005) and the pollution of surface waters with nutrients and chemicals is one of the main reasons (Keiter et al., 2009; Triebskorn et al., 2019).

Agricultural pollution represents one of the main pressures on the aquatic environment. Even though the increasing intensification of agricultural production since the Second World War provided food security, it also had adverse effects on the aquatic environment and ecosystem through the increased application of nutrients and chemical pesticides (European Environment Agency, 2020; Feindt et al., 2019: Chapter 3). Although nitrogen is an important component to enhance agricultural production, overuse of manure and artificial fertilizers have caused increasing problems for social-ecological systems (Erisman et al., 2013; Kirschke et al., 2019). Excessive nitrate concentrations in water not only result in adverse effects on the aquatic environment (Baker et al., 2017), they also threaten drinking water resources posing a direct risk to human health (European Environment Agency, 2020; van Grinsven et al., 2006). In Germany, the entry of nitrate into groundwater is a serious water quality issue (German Environment Agency, 2017) and mostly results from agricultural activities in regions with high livestock density (Kastens & Newig, 2007; Knoll et al., 2020; Möck et al., 2019). Already today, the additional costs caused by these activities to secure drinking water supply is significant (Oelmann et al., 2017).

A second pressure on the aquatic environment involves the entry of *contaminants of emerging concern (CECs)*. Recent advances in analytical techniques have enabled scientists to detect substances at very low concentrations. As a result, researchers have uncovered the presence of contaminants in the environment that are potentially harmful to living organisms, due to their toxicity or persistence, and have mostly not been regulated under environmental legislation (Petrie et al., 2015; Sauvé & Desrosiers, 2014). Detected contaminants in the environment at these very low levels¹ comprise naturally occurring or man-made chemicals including pharmaceuticals, personal care products, industrial chemicals, or pesticides (Rasheed et al., 2019). With regard to pharmaceutical contaminants, there is growing evidence

¹ Concentrations in the nanogram per liter (ng/L) to microgram per liter (µg/L) range. In comparison: the European concentration limit for nitrate in groundwater and surface waters, as set by the EU Nitrates Directive (Directive 91/676/EEC), is 50mg of nitrates per liter, which is an enormous difference in concentration levels.

that they cause adverse effects in aquatic life even at those very low concentrations found in the environment (Beek et al., 2016; Ebele et al., 2017; Patel et al., 2019; Rogall et al., 2020; Ziegler et al., 2021).

The policy issues of water pollution by agricultural nitrate and contaminants of emerging concern both have received increasing public and political attention in Germany in recent years (Schaub, 2019; Schaub & Tosun, 2019). Regarding water pollution by CECs, political-administrative actors initiated several processes at the federal and state level, such as a stakeholder consultation (“Stakeholder-Dialog zur Spurenstoffstrategie des Bundes”), and implemented policy measures, including information campaigns and funding programs for wastewater treatment upgrades (Schaub & Braunbeck, 2020; Schaub & Tosun, 2019; J. Wagner, 2020). Despite these activities, a significant change towards stricter regulation on CECs in water did not take place in Germany (Herzog, 2020; Schaub & Braunbeck, 2020). The media drew attention to the issue and mirrored the ongoing public debate. However, the debate was rather technical, dominated by political-administrative actors and scientists, and characterized by a rather low level of politicization. On the other hand, a ruling by the European Court of Justice (CJEU) against Germany in 2018 for breaching the EU Nitrates Directive (ND; Directive 91/676/EEC), a threat by the European Commission (EC) to open a second infringement procedure in 2019 and a significant policy change through the revision of fertilizer legislation in 2020 were accompanied by an increasingly politicized public debate and one of the strongest waves of farmer protests since decades (see chapters 2 and 3 of this dissertation). When comparing the two cases, it is striking that both differ with regard to the respective public debates’ level of politicization and policy change.

A growing empirical literature in political science suggests that public debates influence policymaking processes in democratic systems and has shown that analyzing public debates, or discourse networks, contributes to a better understanding of observed variation in policy outcomes (Leifeld, 2013, 2020; Leifeld & Haunss, 2012; Rinscheid, 2015; Shanahan et al., 2011; Shanahan et al., 2013; Tosun & Lang, 2016; Tosun & Schaub, 2017). This dissertation contributes to this literature by investigating the overarching research question whether analyzing the public debates on water pollution by agricultural nitrate and CECs contributes to an enhanced understanding of differences in respective policymaking. The empirical cases at hand, agricultural nitrate pollution and CECs in water in Germany, provide a promising area for empirically studying the role of public debates in the policy process and their impact on policymaking with regard to water protection, since they differ with regard to the public debate and the policy outcome.

The four articles of this cumulative dissertation are structured into two parts. In the first part, two articles engage with the empirical case of agricultural pollution of water. The first article investigates the public debate on agricultural nitrate pollution. More specifically, it analyzes how political actors structure their policy narratives and whether they adapt these strategically to influence policymaking. The second article focuses on German political parties and investigates whether their attention and positioning on agricultural pollutants in water is associated with policymaking on the issue. In the second

part, the two articles shed light on the public debate on water pollution by CECs. The first article explains the policy outcome on pharmaceutical contaminants by examining the German public debate on the issue. The second article compares the approach of discourse and policy networks and their respective empirical findings on policymaking on the issue of CECs. Both approaches have been used in public policy to explain policymaking. However, they differ in the investigated venue of policymaking and in their data sources. Whether both approaches reveal similar insights and lead to similar conclusions enhances the understanding of how strongly dynamics observed in public debates overlap or deviate from those in the formal policymaking process. Thus, the last article also makes a methodological contribution by examining the comparability of different approaches used in public policy to explain policy change. The two sets of articles have a common empirical focus by addressing the issue of water pollution and water protection in Germany. In theoretical terms, the articles investigate dynamics of agenda setting and processes of politicization within public debates.

The remainder of the introduction to this dissertation first provides some more background on the empirical cases. Subsequently, I give an overview over the central concepts used throughout the dissertation and briefly outline the main theoretical arguments. A summary of the four articles is followed by a conclusion where I compare the empirical findings, comment on the articles' contribution to the literature and point out directions for future research.

1.1 Empirical background

This section gives some more empirical background on the policy issues of water pollution by agricultural nitrate and by CECs.

1.1.1 *Water pollution by agricultural nitrate*

The quality of groundwater and surface water in Germany has come under constant threat through an increasing intensification of agriculture (European Environment Agency, 2020). Agriculture in Germany has been treated as an *exceptional* sector due to mainly two reasons: the sectors' vulnerability and food security (Daugbjerg & Feindt, 2017; Tosun, 2017). Both reasons have resulted in a state-supported, subsidy-based agricultural policy, which predominantly aims at maximizing production (Feindt et al., 2019). The intensification of agriculture has been accompanied by an increasing use of pesticides and nutrients to enhance production and by higher livestock density. The more frequent use of these substances on smaller areas has led to an increased agricultural runoff into water bodies. As a result, higher concentrations of these substances in water have led to growing pressure on ecosystems with negative impacts on biodiversity and, thereby, on the functioning of aquatic ecosystems (Abbasi et al., 2019; Carvalho, 2017; Feindt et al., 2019; Schröder et al., 2004; Wick et al., 2012). In addition, exposure to nitrate through drinking water consumption has been found to increase risk for cancer and therefore water pollution by nitrate also poses a risk to human health (van Grinsven et al., 2006).

To counter agricultural nitrate pollution of water, the EU has adopted several legislation. This includes the *EU Nitrates Directive (ND; Directive 91/676/EEC)*, the *Groundwater Directive (GWD;*

Directive 2006/118/EC) and the *Water Framework Directive (WFD; Directive 2000/60/EC)*. The ND and the GWD define a nitrate concentration limit in water, which may not be exceeded within member states. The EU member states are obliged to transpose the directives into domestic law. In Germany, the ND has been transposed into national law through the *Fertilizer Act (DüG)* and the *Fertilizer Ordinance (DüV)*. However, nitrate concentration levels in Germany have continuously exceeded the legal concentration threshold, which led the EC to accuse Germany of not adequately transposing the EU legislation and to open an infringement procedure against Germany in 2016 (European Commission, 2019). Just recently, Germany has revised its fertilizer regulation in 2020.

Over the course of the last years, a public dispute has evolved over fertilizer regulation in Germany. On the one hand, small-peasant farmers have started to protest against additional environmental standards, including those to reduce nitrate runoff into water (agrarheute, 2019). On the other hand, water associations, environmental organizations and the Green Party have tried to increase attention on the issue of water pollution by agricultural nitrate and its consequences for biodiversity and potentially for human health (BDEW, 2018; DVGW et al., 2019).

1.1.2 *Water pollution by contaminants of emerging concern*

As already explained at the beginning of this introduction, recent advances in analytical techniques have led to the discovery of potentially harmful substances in the environment at very low concentrations, termed CECs. Within the public and political debate, several other terms have been used, which possess a similar but slightly different meaning. The terms *trace pollutants*, *residues* and *micropollutants* also refer to substances detected at those very low concentrations in the nanogram or microgram per liter range (Anderson & Jinpeng, 2020; Murray et al., 2010). Per definition, the term CEC is different to these other terms in that it comprises only those substances at very low concentration levels regarded as potentially harmful. Therefore, CECs comprise of various substances, including trace pollutants, residues or micro pollutants, which are suspected of posing a potential threat to aquatic ecosystems or human health (Murray et al., 2010; Rasheed et al., 2019). The use of these terms has varied in public and political debates and there is reason to assume that actors have used these terms interchangeably, unaware of the slight differences. This also led to the usage of different terms across the articles of this dissertation. Just to clarify, I will use the term CEC throughout this introduction, also when referring to articles within this dissertation, which used micropollutants or any other of these terms.

The pollution of water by CECs represents a complex problem for several reasons (Kirschke et al., 2017). First, CECs stem from a variety of sources. They partly originate from municipal wastewater, because most currently installed wastewater treatment plants are not able to remove substances at these low concentrations (Yang et al., 2017). New technologies capable of eliminating CECs are still under development and only a few wastewater treatment plants in Germany have been upgraded with the *fourth purification stage* (Triebkorn et al., 2019). Wastewater is partly contaminated through human consumption and disposal behavior, but also by industrial wastewater or hospital effluent. In addition, CECs end up in water through diffuse pollution, such as runoff from agriculture (Halm-Lemeille &

Gomez, 2016; Rasheed et al., 2019). Consequently, there are no easy policy solutions and an effective response will need a combination of different measures addressing various target groups (Hillenbrand et al., 2016; Metz & Ingold, 2014).

Second, CECs cause issues for risk assessment and the traditional compound-by-compound approach for several reasons: There is a vast number of potentially harmful substances. These may not only have single effects but cause adverse effects through interaction with other substances (Backhaus et al., 2011; Richardson & Ternes, 2018). This makes it nearly impossible to determine the risk of every single potentially harmful substance found in low concentrations in the environment, define concentration limits and monitor their occurrence (Posthuma et al. 2020). Instead, this rather suggests a stronger use of precautionary measures, which decision makers may adopt under the precautionary principle in face of CECs' uncertain risks (Tosun, 2013).

Relevant policies exist already at the EU and the federal level. At the EU level, these include the regulation *REACH* (*Registration, Evaluation, Authorisation & Restriction of Chemicals; Regulation (EC) No 1907/2006*) and the *Regulation on Biocidal Products* (*Regulation (EU) No. 528/2012*), which aim at minimizing the release of harmful substances into the environment (European Environment Agency, 2018). In addition, the WFD is also relevant for the regulation of CECs. The directive includes a list of priority hazardous substances member states are obliged to monitor in water (Directive 2000/60/EC). At the federal level, the *German Surface Water Ordinance (OGewV)* is of main importance for addressing CECs in water. Despite existing legislation, the German response to CECs has been comparatively soft. Many potentially harmful substances are not included in monitoring lists. Moreover, the OGewV does not define specific policy measures in case legal concentration limits are exceeded. In contrast to Switzerland, upgrades of wastewater treatment plants still occur on a voluntary basis in Germany (Herzog, 2020; Metz, 2017; Schaub & Braunbeck, 2020).

Overall, the issue of water pollution by CECs is complex, characterized by various sources of pollution, many technical details and remaining scientific uncertainties. Furthermore, pollution by CECs and their effects are hidden from the human senses making the topic even more difficult for public mobilization to achieve stricter regulation.

1.2 Overview of central concepts

Several concepts play a central role in this dissertation and therefore are briefly introduced and defined within this section. Three of the four articles use *networks* to study the formation of actor coalitions and the structuring of policy narratives in the public debates on water pollution by agricultural nitrate and CECs. The network approach in policymaking is an analytical approach, which conceives policymaking as a bargaining process between various governmental and non-governmental actors (Adam & Kriesi, 2007). The approach builds on the idea that these actors not only participate in advocating and formulating policies within the policy process but also interact with each other to increase their influence on the outcome of policymaking processes (Howlett, 2002). Moreover, the network approach in public

policy research takes a *governance* perspective, which suggests that not only government actors are decisive in the process of governing but also non-governmental actors such as interest groups or political-administrative actors (Bevir, 2012). This leads further to the concept of *political actors*, defined here as organizations from inside or outside of government who participate in the formulation and implementation of public policy or regularly try to influence the policy output and policy outcome in their interest (Janning et al., 2009; Weible et al., 2020). Furthermore, the network approach is strongly connected to the idea that political actors tend to form *actor coalitions* to increase their influence in the policymaking process. The conceptualization of actor coalitions used throughout the articles of this dissertation strongly builds on the *advocacy coalition framework (ACF)*, which postulates that political actors form actor coalitions within policy-subsystems based on congruent policy beliefs (Sabatier & Jenkins-Smith, 1993; Weible et al., 2020; Weible & Sabatier, 2009). This dissertation predominantly focuses on the meso-level and investigates actor coalitions as unit of analysis.

Within the network approach, different subtypes have evolved (Adam & Kriesi, 2007). Central to this dissertation is the *discourse network* approach. The approach builds on the idea that not only the material exchange of resources between political actors but also their verbal interactions constitute important elements of political mobilization within the policymaking process (Leifeld, 2016, 2017, 2020; Leifeld & Haunss, 2012). Discourse networks represent ideational networks and are defined here as verbal interactions between political actors about a policy issue (Janning et al., 2009; Leifeld, 2016, 2017, 2020). Closely connected and central to the concept of discourse networks is the concept of *public debate*, which is defined as a space where societal and political issues are publicly debated (Peters, 2013). The public debate serves as one venue political actors use to influence policymaking (Leifeld, 2013, 2020). They can take place on various platforms, such as traditional mass media reporting (Leifeld, 2013; Schaub & Braunbeck, 2020; Tosun & Schaub, 2017) or social media (Bossner & Nagel, 2020; Gupta et al., 2016; Lybecker et al., 2015).

Public debates throughout this dissertation are investigated with regard to their degree of *politicization*. The concept of politicization is conceived here from a process-oriented perspective where the politicization of a policy issue implies that it becomes increasingly controversial over time (Feindt et al., 2020). Wilde (2011) conceives of politicization as three processes: The first process involves increasing attention on an issue, the second an increase in resources political actors invest to influence policymaking, and the third increasing *polarization*, which refers to an increasing incidence of conflicting policy demands. Investigating public debates enables an observation of mainly the first and the third process of politicization. Related to the first process of politicization is the *scope of conflict*, a notion derived from early work by Schattschneider (1960). Schattschneider postulated that political actors try to influence policy outcomes by manipulating the scope of conflict, which means that they try to either increase attention on a policy issue to involve a larger number of conflict groups in a policy conflict or diminish attention to reduce the number of conflict groups involved (Tosun & Schaub, 2017). The former is termed *issue expansion* and the latter *issue containment*. The underlying idea is that

involving a larger number of conflict groups in a policy conflict potentially leads to gaining new allies and public support, which is a strategy expected to be used predominantly by political actors who challenge a prevailing *policy monopoly*. In contrast, political actors being part of the policy monopoly and defending the respective *policy status quo* are expected to avoid attention to preserve the balance of power. Schattschneider considered the scope of conflict to be especially relevant for cases of *normal politics*, where initially *issue salience* is low and a small group of political actors is part of the *policy monopoly* (Baumgartner & Jones, 1993; Schattschneider, 1960; Stephan, 2020). Issue salience is closely related to attention: the more attention the public or specific political actors pay to a certain policy issue the higher the salience of the issue to the respective actor. Thus, one way how one can measure issue salience is media coverage or how prominently political actors address an issue in their public documents (Epstein & Segal, 2000; M. Wagner & Meyer, 2014).

Finally, a concept of central importance for this dissertation is *policy change*. Throughout this dissertation, the articles investigate whether either the politicization of a public debate is associated with a major change in policy or whether political actors use different strategies dependent on their stance towards a major policy change. The conceptualization of policy change is based on the groundbreaking framework by Hall (1993). Instances of major policy change refer to what Hall conceptualized as third-order change, which involves a shift in the overarching policy paradigm including problem definitions and the guiding policy approach to address the policy problem. This degree of policy change can be distinguished from first-order change, which comprises less controversial calibrations of policy instruments, and second-order change, where policy instruments are altered but without changing the overarching policy paradigm (Feindt et al., 2020). In contrast to first-order and second-order change, third order change occurs only rarely and is typically preceded by strong politicization (Feindt et al., 2020).

1.3 Theoretical arguments

In this section, I will sketch some of the main theoretical arguments of this dissertation. Investigating public debates rests on the assumption that these are influential in the policymaking process. Furthermore, political actors are expected to use public debate as a venue to influence policymaking and achieve their policy goals (Leifeld, 2013, 2017). In principal, public debates can influence policymaking through several mechanisms. First, public debates may have an impact on agenda-setting dynamics. There is evidence that emphasizing certain problem perceptions or policy solutions within a public debate increases their chance to be included in policy formulation (Soroka & Wlezien, 2009; Tosun & Scherer, 2020; Tosun & Triebkorn, 2020; van Aelst & Walgrave, 2011; Vliegthart et al., 2016).

Second, disseminating new information in public debates can lead to learning effects across political actors (Sabatier, 1998). This mechanism is similar to the previous as it suggests that placing information on the public discussion agenda increases their chance to influence decision agendas. The mechanism is different insofar that policy learning implies that decision makers not only incorporate the most salient

problem definitions and policy solutions but those they evaluate as best suited to achieve their policy goals, even if originally proposed by opponents in the policy subsystem. Research suggests that disseminating new information within a public debate can indeed lead to policy learning and consequently change policy outcomes (Leifeld, 2013; Leifeld & Brandenberger, 2019).

Third, public debates can have a profound impact on public opinion (Chong & Druckman, 2007; Rinscheid, 2020), which may then influence decision makers. In democratic systems, incumbents are inclined to incorporate public opinion into their policy decisions to secure an electoral benefit (Soroka & Wlezien, 2009; Strøm, 1990). Indeed, there is evidence that decision makers respond to public opinion and therefore changes in public opinion influence policy outcomes (Binzer Hobolt & Klemmensen, 2008; Shapiro, 2011; Soroka & Wlezien, 2005).

Based on Schattschneider's notion on the scope of conflict (1960), there is reason to expect that the incentive for political actors to use the public debate as a venue to influence policymaking varies (Tosun & Schaub, 2017). Especially in policy subsystems characterized by a policy monopoly and low issue salience, there is reason to expect that political actors defending the policy status quo have no interest in politicization and thus avoid participation in the public debate to contain the issue. In contrast, the public debate represents a well-suited venue for political actors advocating a major policy change to increase issue salience and expand the scope of conflict.

Regarding the case of agricultural nitrate pollution of water, the agricultural sector in Germany has benefited from *exceptional* institutional arrangements for many decades (Daugbjerg & Feindt, 2017; Feindt et al., 2019: Chapter 4; Tosun, 2017). The policy subsystem can be regarded as a policy monopoly, where farmer associations and the Union Parties have had tight control over problem definitions and policies through established corporatist structures of interest intermediation (Nischwitz & Chojnowski, 2019; Tosun, 2017). Similarly, German corporatism suggests that policies relevant for the chemical and pharmaceutical industry have been strongly influenced by industry associations and predominantly served economic interests and those of public health rather than environmental concerns (Busse et al., 2005; Rudzio, 2019). In sum, there is reason to expect that neither farmer associations nor industry representatives have an incentive to participate in public debates on water pollution as long as issue salience is low to prevent politicization, which could potentially lead to a major policy change including stricter environmental regulation.

In contrast, a strong environmental movement has formed in Germany in the last decades, including various environmental interest groups (Markham, 2008; Roose, 2003). In addition, Germany has a well-organized water sector (Kistemann, 2020; Köck, 2012), which perceives water pollution by agricultural nitrate and by CECs as an increasing threat to their responsibility to ensure high drinking water quality (BDEW, 2016; DVGW et al., 2019). Moreover, the German Green Party has become an established ecological party within the German party system and pursues a green agenda, which spans several sectors including agriculture (Debus & Tosun, 2021). Overall, there is reason to expect these actors to advocate stricter regulation to address both types of water pollution and resort to the public debate to

expand the policy issues and increase the degree of politicization in the effort to influence respective policymaking.

The *Narrative Policy Framework (NPF)* suggests that political actors not only differ in their level of activity in public debates but also in how they structure their policy narratives within the debate (Jones, 2018; Jones & McBeth, 2010; Shanahan et al., 2013). More precisely, the framework postulates that actor coalitions construct their narratives strategically to either contain or expand the scope of conflict in their effort to influence policy outcomes (Shanahan et al., 2011). The NPF regards policy narratives as narrative structures with common elements, which allows generalization across different situations and cases (Jones & McBeth, 2010). Two of these elements are *characters* and *cost-benefit frames*, which political actors use in a strategic way to manipulate the scope of conflict. The framework expects actor coalitions to differ in their use of characters and cost-benefit frames, depending on whether they perceive themselves as winning or losing on a policy issue (McBeth et al., 2007; Shanahan et al., 2013). Predominantly blaming opponents as *villains* and emphasizing how they harm particular *victims* is associated with losing and a *tale of decline* that serves to increase attention on a policy issue and involve new conflict groups. Similarly, overemphasizing the costs resulting from a policy problem and concentrating any benefits of the opposed policies to a small group of actors is also part of the tale of decline intended to expand the scope of conflict. In contrast, the NPF suggests that winning actor coalitions construct a *tale of control*, where they predominantly portray themselves or their allies as *heroes*, whose actions solve policy problems to the benefit of particular *beneficiaries*. Similarly, these actors use cost-benefit frames to overemphasize the benefit of their preferred policies and downplay any potential costs resulting from these. The tale of control is associated with an intention to contain the scope of conflict and depoliticize a policy issue (Gupta et al., 2014; Merry, 2019; Shanahan et al., 2013).

In short, both participation in the public debate and the use of narrative strategies are expected to have an impact on policy outcomes. Strong participation in the public debate and the use of expanding narrative strategies is expected to lead to an increasing politicization of a policy issue and consequently to a higher likelihood for major policy change. In contrast, low participation in the public debate and the use of containing frames is intended to prevent or decrease politicization and thereby contribute to the persistence of a policy monopoly. Consequently, a large part of this dissertation investigates public debates with regard to the participation of different political actors, differences in policy narratives and in the degree of polarization as a form of politicization in order to understand better recent policy outcomes on water protection in Germany.

1.4 Methodological approach

To study the public debates on water pollution by agricultural nitrate and CECs, articles within this dissertation apply discourse network analysis. The method has become increasingly popular to study public debates and their impact on policy outcomes in the policymaking process (Leifeld, 2016, 2020).

Discourse network analysis combines qualitative content analysis with social network analysis and has been developed to study the formation of actor coalitions based on policy beliefs political actors articulate in the public debate (Leifeld, 2016, 2017). The methodological approach builds on the idea that political actors with similar policy beliefs form coalitions and diverge from adversarial coalitions consisting of political actors with opposing policy beliefs (Leifeld, 2013; Weible & Sabatier, 2009).

The method uses text data, in this case newspaper articles and press releases, to measure political actors' policy beliefs. More precisely, actors' policy beliefs are captured based on statements where they indicate agreement or disagreement with certain *concepts*. In this case, the coding of actors' position on concepts represents a binary measurement of actors' policy beliefs, which then allows deriving various *actor networks*, which capture the similarity and/or dissimilarity in policy beliefs among political actors. One of these is the *one-mode congruence network*, which captures political actors' similarity in policy beliefs. A second actor network is the *one-mode subtract network*, which denotes both political actors' similarity and dissimilarity in policy beliefs. Based on the information inherent in these networks, it is possible to determine actor coalitions through cluster analyses (Leifeld, 2017).² The method further allows analyzing the overall coalition structure revealed by the public debate. Since actor coalitions are derived based on similar and dissimilar policy beliefs, it is possible to evaluate the degree of polarization inherent in a public debate (Leifeld, 2013). In principal, three ideal types of coalition structures can be distinguished within policy subsystems: (1) *adversarial* structures with opposing coalitions (2) *collaborative* structures with opposing but coordinated coalitions, and (3) *unitary* or *hegemonic* structures that consist of one dominant coalition (Ingold & Gschwend, 2014). Public debates characterized by adversarial coalition structures reveal a high degree of polarization, whereas those with a unitary coalition structure are characterized by a low degree of polarization (Leifeld, 2013).

Furthermore, articles of this dissertation use discourse network analysis to investigate the narrative structure of a public debate. More specifically, *one-mode concepts networks* are derived from the binary coding of political actors' policy beliefs (Leifeld, 2017; Leifeld et al., 2019). These capture the similarity and dissimilarity of articulated policy beliefs. The more political actors co-reference a pair of policy beliefs the more similar the two policy beliefs. Based on these networks, it is possible to analyze narrative structures and evaluate whether competing policy narratives, e.g. advocating for or against a major policy change, formed in the public debate. Consequently, this type of analysis can also be used to evaluate the degree of polarization inherent in a public debate. Moreover, it helps to understand better how exactly the content of the debate differed between actor coalitions and whether the differences are associated with respective policy outcomes (Leifeld et al., 2019).

This dissertation advances the application of discourse network analysis in the first article by studying relations between narrative elements within policy narratives of political actors. In this article, actors' use of characters is coded through a triangular coding scheme. The coding measures to what

² A more detailed description of the method is provided in the first article in section 2.4.

degree political actors use particular character pairs (villains and victims as well as heroes and beneficiaries) and thus not only captures the relations between political actors and narrative elements but also the relations between different elements in a policy narrative. Concept networks enable researchers to determine the similarity of narrative elements based on their co-occurrence over the course of the debate. The main difference of networks derived from the triangular coding scheme is that they capture the explicit combination of different narrative elements. In the first article, *bipartite concept networks* are derived based on this approach to study whether actor coalitions differ in how they use characters in their policy narratives. Furthermore, the article uses *one-mode actor networks* based on political actors' use of characters to determine how cohesively actor coalitions use narrative strategies in their effort to manipulate the scope of conflict.

Overall, discourse network analysis provides several possibilities to study politicization processes in public debates. First, the coding of policy beliefs and narrative elements measures how strongly political actors participate in the public debate at different points in time and thus allows evaluating whether attention on a policy issue increased over time. Second, the analysis of coalition formation based on congruent policy beliefs allows determining whether a public debate varies in the degree of polarization over time. Third, the analysis of structures within policy narratives makes it possible to analyze whether and how political actors use the public debate to mobilize for competing problem perceptions and policy solutions.

The first article focuses specifically on differences between actor coalitions in their use of narrative strategies over time. For this purpose, the article combines discourse network analysis with the use of inferential statistics. More specifically, the analysis applies t-tests and Mann-Kendall-Trend-Tests to investigate differences between coalitions and changes over time.

In contrast to the other three articles, the second article does not apply discourse network analysis. Instead, the article uses a combination of descriptive statistical analysis and qualitative analysis to determine how much attention political parties pay to agricultural water pollution and how they differ in their positioning towards an overall policy approach and specific policy instruments to address water pollution.

Regarding the case selection, the focus on Germany was predetermined by the Effect-Net research project. Case study research designs lack comparison and strictly speaking do not allow hypothesis testing. Therefore, the empirical findings of this dissertation are case specific and the empirical investigation of the theoretically derived expectations represent plausibility probes rather than hypothesis tests (Levy, 2008). Furthermore, the four articles investigate slightly different dependent variables. The first article focuses on explaining dynamics within the public debate on agricultural nitrate pollution and investigates differences and changes over time in actor coalitions' level of participation in the public debate and in their use of narrative strategies. The second article focuses on political parties' positioning on the policy issue of agricultural water pollution and investigates whether their level of attention on the issue varies over time. The third article analyzes whether a major policy

change occurred with regard to regulation on pharmaceutical contaminants and explicitly investigates whether the policy outcome can be associated with actor coalition and narrative structures identified in the public debate on the policy issue. The fourth article focuses on actor coalition structures and provides a systematic comparison between the discourse network and the policy network with regard to policymaking on water pollution by CECs.

The articles use mostly similar data. Media reporting by newspapers serves to investigate the public debates in all articles except for the second article. The last two articles draw on newspaper articles published in the *Frankfurter Allgemeine Zeitung (FAZ)* and on various principal regional newspapers to cover media reporting within all German states. Similarly, the first article also uses newspaper articles published in the FAZ to study the public debate, complemented by press releases published directly by the political actors. Therefore, a combination of data sources ensures that the results are not strongly influenced by the choice of one particular data source. There might be still some bias through the predominant use of the FAZ. However, Leifeld (2016) showed in a study on the German pension reform in 2001 that there are no large differences in media reporting between the FAZ and the *Süddeutsche Zeitung*, another nation-wide German newspaper. The fourth article investigates coalition formation in the policy network based on survey data originally collected by Metz (2017). The survey data captures policy preferences of political actors involved in the legal revision of the German surface water ordinance. Finally, the second article analyzes issue attention and policy positions of German political parties based on their party manifestos published between 1998 and 2018. Party manifestos include those for federal and state elections. The data were retrieved by using *polidoc.net* (Benoit et al., 2009; Gross & Debus, 2018).

1.5 Empirical findings

This section briefly summarizes and compares the empirical findings of the four articles within this cumulative dissertation.

1.5.1 *Investigating narrative strategies by using discourse network analysis. Insights from the public debate on agricultural nitrate pollution in Germany*

The first article examines the public debate on agricultural nitrate pollution of freshwater and stricter fertilizer regulation in Germany between 2010 and 2020. More specifically, it investigates whether political actors resorted to this venue of policymaking strategically to either expand or contain the scope of conflict. Moreover, it focuses on actor coalitions and investigates whether these vary in their level of activity in the public debate on agricultural nitrate pollution, differ in how they constructed their policy narratives and whether they adapted their policy narratives strategically to influence policy outcomes, dependent on their likelihood of winning or losing on the policy issue. To invest these research questions, the article makes an important contribution to literature on policy narratives by using discourse network analysis to study both the formation of coalitions in the policy subsystem and their structuring of policy narratives. Furthermore, the study suggests that studying relative changes in

coalitions' narrative strategies in response to relative changes in the likelihood of winning or losing over time will provide more promising insights on how political actors behave strategically than comparing absolute differences. The case of agricultural nitrogen pollution of water provided an excellent case for illustrating this point: there is strong reason to assume that increasing external pressure by the EC on Germany to adopt stricter fertilizer regulation gradually changed the likelihood of winning or losing on the policy issue over the course of the observation period.

The discourse network analysis reveals an increasingly polarized public debate and the formation of two adversarial coalitions over time: one coalition mobilized for stricter fertilizer regulation and the opposing coalition advocated its liberalization. The former mainly consisted of environmental organizations, water associations, the Greens, the Left and the SPD whereas the latter comprised mostly farmer associations, joined by the CDU, the FPD and the AfD.

The empirical findings mostly confirm the expectation that political actors resorted to the public debate strategically to influence policy outcomes. The coalition in favor of stricter fertilizer regulation and, thus, policy change (pro-coalition) participated more strongly in the debate at the onset of the dispute. Political actors in the coalition opposed to stricter regulation (contra-coalition) only increased their activity in the debate in response to an increasing likelihood to lose the struggle over stricter regulation. This substantiates the argument that coalitions defending their policy monopoly and the policy status quo initially avoid the public debate to diminish attention and contain a policy issue.

Although both coalitions predominantly structured their policy narratives in ways associated with issue expansion, statistical hypothesis tests show that they differ in how strongly they used expanding cost-benefit frames and blamed opponents as villains (devil shift). Most importantly, statistical trend tests show that both coalitions changed their policy narratives over time in accordance with their expected likelihood of winning or losing on the issue. The contra-coalition increasingly diffused the costs of fertilizer regulation, concentrated its benefits and populated its narratives with villains with increasing likelihood to lose. On the contrary, the pro-coalition slowly reduced the level of expansion with increasing likelihood to win and more and more changed from diffusing the costs caused by agricultural nitrate pollution and existing regulation to diffusing the benefits of stricter fertilizer regulation and from concentrating the benefits of liberal regulation to concentrating the costs of stricter fertilizer regulation. In addition, the pro-coalition's policy narratives contained less frequently villains with increasing likelihood to win on the policy issue.

The article further shows based on discourse network and qualitative content analysis that both coalitions populated their narratives with characters in a way to attract the attention of specific target groups. The contra-coalition mostly addressed farmers when emphasizing harm caused by villains, whereas the pro-coalition focused on drawing citizens' attention to the issue. Furthermore, both coalitions increasingly competed for the support of small-scale farmers over time. Finally, results of the discourse network analysis suggest that both coalitions were very cohesive in their narrative strategies, at least in how they populated their narratives with characters.

To conclude, the article finds that both coalitions did not simply participate in the public debate on agricultural nitrate pollution. Rather, the findings suggest that political actors chose this policy venue strategically and adapted their narratives in response to changes in the likelihood of winning or losing. Thus, the article supports the argument that political actors use the public debate as a venue to influence policymaking on the issue of agricultural nitrogen pollution of water.

The findings on differences in political actors' activity in the debate are in line with those of the two articles on CECs in the second part of this dissertation. Both studies on the debate of CECs and pharmaceutical contaminants reveal a predominant presence of political actors with an interest in expanding the political conflict. On the opposite, actors with an interest in defending the policy status quo, such as industrial or farmer associations, participated only occasionally in these debates. However, studies on more salient policy issues, such as a study by Leifeld (2013) on the German pension reform in 2001, come to different conclusions. Thus, deviations between these studies may be explained by different levels in issue salience as already suggested by Schattschneider (1960).

The literature on the narrative policy framework and policy narratives has produced inconsistent results with regard to actor coalitions' use of narrative strategies. Whereas early studies identified strong differences in adversarial coalitions' of expanding or containing policy narratives (McBeth et al., 2007; Shanahan et al., 2013; Stephan, 2020), more recent studies either found a predominant use of expansion or containment. However, most of these studies were able to differentiate between coalitions based on how strongly they resorted to expansion or containment, which coincides with this study and further substantiates the argument to focus on studying relative changes over time.

1.5.2 Salient to whom? The positioning of German political parties on agricultural pollutants in water bodies

The second article investigates whether German political parties' positioning on the issue of agricultural water pollution between 1998 and 2018 reflected ideological divisions and whether these divisions are related to policymaking on the issue. It deviates to some degree from the other three articles through its analysis of party manifestos. Nevertheless, political parties disseminate their party manifestos publicly, their content is spread by the media (Merz, 2017) and positions identified in party manifestos tend to overlap with those reported in the media (Helbling & Tresch, 2011). Thus, one may also conceive of party manifestos as a resource political parties use to influence public debates.

The study was conducted and published in 2019 and, thus, before the significant revision of fertilizer regulation in March 2020, which is the reason why the study set out to explain the absence of policy change at that time. Political parties play a decisive role for policymaking since they are the central actors within democratic political systems and strongly influence policy formulation (King, 1969; Knill & Tosun, 2020). Thus, the article expected to gain an enhanced understanding of the persistence of comparatively liberal regulation before 2020 through the study of these actors' positioning on the issue of agricultural water pollution. The article investigates political parties at both the federal and state level

since the German states need to approve most changes to water legislation in Germany and, therefore, state governments have a strong influence (Berger, 2017).

Before proceeding to parties' policy positions, the article first investigates to what degree parties paid attention to the issue of agricultural water pollution. It shows that parties indeed addressed the issue in their manifestos, though predominantly at the state level. Thus, it seems that the issue had highest relevance for political parties at the state level, which is probably due to the German states' responsibility for the implementation of adopted water legislation and related agricultural legislation (Berger, 2017). Only in the most recent election years, Alliance 90/The Greens and The Left drew attention on the issue also at the federal level (see Table B.1.1 in Appendix B1). With regard to party differences, the Green Party paid most attention to the issue and both CDU and CSU least frequently. Furthermore, attention to agricultural water pollution not only differed between parties but also over time with an increasing trend in attention since 2017.

The article proceeds in two analytical steps. First, it investigates whether political parties integrated water and agricultural policy when they proposed measures to mitigate pollution. There is reason to assume that such measures are more effective when addressing agricultural pollution since insufficient integration of water protection policy with agricultural policy has been found to restrain achieving improved water quality (Vogeler et al., 2019; Zingraff-Hamed et al., 2020). The article focused on the positioning of Alliance 90/The Greens and CDU/CSU because water protection as an environmental issue should have highest relevance for the Greens as an environmental party and agriculture plays an important role for the Union since farmers have been a substantial part of their electorate (Tosun, 2017). Therefore, there is reason to assume that these two political parties play a decisive role in decision making on the issue of agricultural water pollution when in government (Tosun et al., 2019). As theoretically expected, it was mostly the Green Party who addressed the issue of agricultural water pollution not only most frequently in their party manifestos but also predominantly demanded an integration of water and agricultural policy to effectively reduce nitrogen and pesticide runoff into water bodies. In contrast, CDU and CSU did not integrate water and agricultural policy in the few cases where they addressed the issue.

In a second step, the article sheds light on differences between political parties' stance on specific policy instruments they proposed for addressing agricultural water pollution. Theoretically, the article expected parties' positioning on policy instruments to be strongly influenced by their stance on the question of economic intervention and their corresponding placement on the economic left-right dimension, which is strongly supported by the empirical findings. Both the CDU and CSU, the FDP, and the AfD mostly opposed any policy instruments to mitigate water pollution that involve strong state intervention in the agricultural sector, including command-and-control regulation and market-based instruments. Instead, they favored voluntary approaches and advocated investments in research and new agricultural technologies. In contrast, Alliance'90/The Greens and The Left predominantly advocated

policy measures involving strong state intervention in the agricultural sector. Positioning of the SPD was similar to the former parties, though its positions leaned towards the center.

Overall, the findings suggest that political parties indeed have been ideologically divided on the question of how to address agricultural water pollutants with regard to both the overarching policy approach and specific policy instruments. The divisions can be expected to represent a major barrier to reaching compromises and adopt large-scale policy reforms.

The empirical findings reveal interesting similarities compared to the observations made in the first article on the public debate on agricultural nitrate water pollution. First, the increasing trend in attention political parties drew on the issue since 2017 overlaps with the increase in media attention and political actors' disseminated press releases on nitrate pollution (compare Figure 3.1 and Figure 4.5). In addition, both articles point towards increasing political salience over time: in 2017, a year with federal elections, all parties took a position on the issue of agricultural pollution in their manifestos, at least at the state level. In the first article, this overlaps with the third observation period where, for the first time, all federal political parties participated in the debate on agricultural nitrate pollution. Second, the identified divisions between political parties based on their manifestos overlap exactly with their membership in the adversarial actor coalitions identified in the first article. Thus, there seems to be a strong association between political parties' positioning in their manifestos and their positions reflected in media reporting, which coincides with earlier findings (Helbling & Tresch, 2011; Merz, 2017). The identified division between Alliance 90/The Greens and CDU/CSU on the question whether to address agricultural pollutants in water by integrated policy measures are in accordance with findings by Tosun (2017) who identifies similar differences between these two parties regarding their support for agricultural post-exceptionalism.

1.5.3 Transition towards sustainable pharmacy? The influence of public debates on policy responses to pharmaceutical contaminants in water

The third article investigates the public debate on pharmaceutical contaminants in water in Germany between 2013 and 2017. It argues that a lack of politicization contributed to the persistence of the regulatory approach implemented in Germany to address these pollutants.

In two analytical steps, the article first examines policymaking in Germany on pharmaceutical contaminants and evaluates whether a major policy change occurred to the German regulatory approach, which would imply a transition to more sustainable pharmacy. Second, the article investigates whether the public debate was polarized since literature on public debates has shown that major policy change was often preceded by a period of polarization (Leifeld, 2013; Rinscheid, 2015; Tosun & Lang, 2016).

The article concludes that the regulatory approach to pharmaceutical contaminants in Germany did not significantly change in recent years and that the policy response to these contaminants has remained comparatively weak. Germany predominantly pursues an approach of control with strong focus on monitoring contamination levels in combination with voluntary policy instruments, which exert only

soft pressure on relevant target groups to change their production, application or consumption behavior. As explained in more detail in the second part of this introduction on the empirical cases, predominantly pursuing a control approach without complementary source and end-of-pipe approaches is likely to be ineffective due to the specific nature of pharmaceutical contaminants (Hillenbrand et al., 2016). A stakeholder consultation initiated by the federal ministry of the environment in 2016 to develop a federal strategy on trace pollutants (Stakeholder-Dialog zur Spurenstoffstrategie des Bundes) has not resulted in a significantly different regulatory approach. A few German states have been proactive in implementing end-of-pipe solutions. For instance, Baden-Württemberg has installed a competence center (Kompetenzzentrum Spurenstoffe) and initiated founding programs to enable selected municipalities to upgrade their water treatment plants with the fourth purification stage on a voluntary basis.

The second part of the article shows that the absence of major policy change coincides with a non-polarized public debate. Despite the complexity of the issue, German newspapers paid notable attention to the issue. However, political actors involved in the debate communicated similar policy positions. In contrast to the debate on agricultural nitrate pollution investigated in the first article of this dissertation, the discourse network analysis revealed a unitary coalition structure with no adversarial coalitions in the debate on pharmaceutical contaminants. The study further analyzed the debate's narrative structure to investigate whether policy narratives with conflicting policy demands competed for attention. The findings show, that such conflicting policy narratives were not present within the debate. Instead, there was one dominant narrative, which strongly overlapped with the established German policy approach on water pollution. Apparently, political actors discussed only rarely specific policy instruments, such as whether to adopt only voluntary instruments or strong command-and-control measures, which probably would have led to a more controversial debate. Overall, the article's findings suggest that the public debate on pharmaceutical contaminants rather contributed to the persistence of the existing policy response to pharmaceutical contaminants than to a major change in regulation.

When comparing the findings to those of the first article on agricultural nitrate pollution, then there is strong indication that in the case of pharmaceutical contaminants political actors with an interest in environmental protection did not make extensive use of the public debate to challenge the policy status quo. Although environmental organizations, water associations and the Green Party participated in the debate, they did not challenge the policy status quo in a way observed in the debate on agricultural nitrate pollution. Whereas the first article observed a strong bottom-up mobilization by both opponents and proponents of stricter fertilizer regulation, the findings of this third article suggest that the debate on pharmaceutical contaminants was characterized by top-down agenda setting, indicated by the strong presence of political-administrative actors. Representatives of the pharmaceutical industry or the agricultural sector did not participate actively in the debate. This is another interesting finding in comparison with the first article, since these actors are part of the policy monopoly with an incentive to contain the policy issue. Thus, their inactivity in the debate aligns well with the first article's expectation

that political actors defending the policy status quo avoid participation in the public debate when issue salience is low.

The co-occurrence of an absence of polarization in the public debate and the persistence of the policy status quo aligns with literature on public debates and policy change, which found phases of polarization to precede major policy change (Leifeld, 2013; Rinscheid, 2015; Tosun & Lang, 2016). Moreover, the findings align with previous public policy research on CECs. Based on survey data, Metz (2017) and Metz and Leifeld (2018) also find comparatively high similarity in political actors' policy positions in Swiss policymaking on the issue. Similarly, Metz (2017) studied political actors' positioning on CECs involved in the revision of the OGewV in 2011 and also found comparatively high similarity in actors' policy positions.

1.5.4 Comparing discourse and policy network approaches: evidence from water policy on micropollutants

The fourth article set out to systematically compare discourse network and policy network approaches. Both approaches use networks as an analytical approach to study interdependencies among political actors in policymaking processes and have been used to investigate coalition formation in policy subsystems to explain policy change (Fischer, 2014; Ingold, 2011; Leifeld, 2013). Although conceptually similar, both approaches utilize different data potentially leading to different results. Studies applying discourse network analysis to investigate policymaking processes mostly use media data and therefore might be biased in their focus on the public debate as one venue of policymaking. Their advantage, however, is that media data can more easily be collected over time, which allows researchers to capture the policymaking process more adequately. In contrast, policy network approaches use surveys to investigate coalition formation based on policy belief similarity and collaboration among political actors. Thus, researchers collect the data by directly questioning political actors who participated in formal decision-making, such as legislative chambers or stakeholder consultations. The disadvantage of this type of data is that surveys often capture policy positions at only one single point in time. Moreover, political actors provide answers retrospectively since the processes under study occurred mostly months or years before data collection. Political actors' policy positions are subject to change over time and therefore surveys might not adequately capture political actors' positioning during the observation period. These differences between discourse network and policy network approaches led to the idea to conduct a study where both approaches are applied to study the policymaking process on CECs in Germany and systematically investigate whether the approaches reveal similar results. Previous literature did not offer such a systematic comparison between discourse and policy networks and it was largely unknown whether both approaches lead to similar or different results.

To answer the research question of which aspects of policy change the different analytical approaches emphasize, the article investigates whether the two approaches uncover differences and similarities in the policymaking process on CECs in Germany, with regard to the participation of actors, actors'

preferences for policy solutions to address CECs and the formation of actor coalitions based on shared policy preferences. Coalition structures were investigated in two analytical steps by, first, comparing the policy network with one discourse network derived for the full observation period and, second, subdividing the discourse network into separate periods to capture possible differences over time.

The article reveals the following empirical findings: First, the two approaches uncovered differences in the participation of political actors. More specifically, they differed in their emphasis on actors expected to have an interest in issue containment and those expected to pursue issue expansion. These differences are mostly due to an unequal distribution in the discourse network with more expanding than containing actors. In contrast, the policy network comprised a larger share of political actors affiliated with the agricultural and industrial sectors. Regarding similarities, both approaches uncovered a similar share of political-administrative actors.

Second, the approaches revealed remarkable similar policy preferences despite their differences in actor participation. The article expected the policy network to emphasize more strongly the interests of corporate interests, i.e. a rejection of policy solutions targeting agriculture or industry, which is not empirically supported, however. The main difference concerns policies targeting consumers, e.g. information campaigns, which were less prominent in the policy than in the discourse network.

Third, both approaches revealed similar coalition structures when comparing the policy network with the discourse network derived for the full observation period. Both networks were similar in their finding that no adversarial coalitions with opposed policy preferences formed in the policy subsystem. Finally, subdividing the discourse network into two observation periods uncovered some smaller differences in coalition structures, which point to a decreasing polarization over time. Thus, the coalition structure observed in the first period differed to some but not significant extent from the one observed in the policy network and in the discourse network derived for the full observation period.

Overall, both approaches mostly led to similar results, which is contrary to some of the original expectations. One reason could be the low salience of CECs and the low level of conflict at that time. It is reasonable to expect significant differences in political actors' policy preferences in high salience issues or in heated political conflicts. If in these cases the two approaches also differ in their emphasis of containing and expanding actors, then there is reason to expect to observe differences in coalition structures between the two approaches.

When relating the findings of the article to the third article on the public debate on pharmaceutical contaminants, then there are two noteworthy points to take from this article: First, there was no significant difference between the debates on CECs in general and on pharmaceutical contaminants in particular. This is probably due to the debates' strong emphasis on monitoring contamination levels and improving wastewater treatment. Both approaches focus on the end of the pipe and, thus, do not incorporate different sources of pollution, which differ when comparing pharmaceutical contaminants with other CECs.

Second, the third article did not incorporate possible variation in coalition structures over time. In this sense, the findings of this article are complementary to those of the third article in that they suggest a depolarization rather than a polarization of the debate on pharmaceutical contaminants. This observation substantiates the third articles' conclusion that the persistence of the regulatory approach on pharmaceutical contaminants coincided with a non-polarized public debate. Even though depolarization was observed for the debate on CECs in general, there is reason to expect that an analysis of differences in coalition structures in the debate on pharmaceutical contaminants over time would lead to the same finding, based on the previous point.

1.6 Conclusion

This dissertation set out to investigate whether studying the public debates on water pollution by agricultural nitrate and CECs contributes to an enhanced understanding of differences in respective policymaking. Theoretically, the articles of this cumulative dissertation predominantly built on previous literature on public debates, discourse networks and narrative strategies. Empirically, the articles investigated public debates and policymaking on two cases of water pollution in Germany: nitrate water pollution caused by agricultural activities and CECs with special attention on pharmaceutical contaminants.

Both cases varied regarding the characteristics of the public debates and the policy outcomes. The debate on agricultural nitrate water pollution became increasingly polarized over time and coincided with a significant change in fertilizer regulation, whereas the persistence of comparatively liberal regulation on CECs was accompanied by a non-polarized and largely non-disputed public debate.

However, whether in both cases the public debates had a causal impact on the respective policy outcome is subject to discussion. The research designs chosen within the four articles do not allow making strong causal claims regarding an impact on the policy outcomes. The findings are case specific due to the focus on Germany. Nevertheless, the four articles reveal a co-occurrence of (non-)polarized debates and (non)significant policy change and there is reason to assume that both are related.

Reasons why the public debates on agricultural nitrate water pollution and CECs differed in polarization might be manifold. Regarding agricultural nitrate pollution, the second article suggests that the EU played a strong role. There is strong indication that environmental groups, water associations and the Green Party took the EC's move to open an infringement procedure against Germany as an opportunity to mobilize for stricter fertilizer regulation. The first article suggests further that increasing pressure by the EC might have had an impact on both the public debate and the policy outcome. Whether it was mostly the EU causing the policy change or a combination of increasing pressure by the EU and politicization of the public debate that led to the outcome is subject to discussion. Nevertheless, the first article showed convincingly that political actors resorted to the public debate in a strategic way, which at least suggests that they expected to have an impact on the policy outcome through their behavior. Regarding water pollution by CECs, pressure by the EU has been comparatively low. Although there is

relevant European legislation, until today it does not require such a strong regulatory response by member states compared to the issue of agricultural nitrate water pollution.

Another reason concerns the degree of visibility and complexity of both issues. In comparison, the issue of agricultural nitrate water pollution is comparatively simple and thus better suited for public mobilization. First, the effects of overfertilization (turbid water, algae blooms in bathing lakes, etc.) are visible for ordinary citizens and therefore easier to comprehend. In contrast, the human senses cannot detect CECs in water and thus they remain hidden for ordinary citizens. In addition, the effects of CECs are still under study and understanding their eco-toxicity is complex since adverse effects depend on differences in very low concentration levels and may depend further on interactions and the accumulation of substances. In addition, both cases differ in complexity regarding the causes of water pollution. In the case of nitrate water pollution, it is obvious that agricultural activities are responsible for runoff into water. Even though one may debate whether it is farmers' fault or rather a systemic concomitant of the European Common Agricultural Policy (CAP) with its persistent strong emphasis on fostering an efficient and productive agricultural sector (Daugbjerg & Swinbank, 2016; Feindt et al., 2019: Chapter 4), it is comparatively easy to locate the source of pollution and mobilize for respective policy solutions. In contrast, the causes for the entry of CECs into water are manifold and there is not the one target group to address (Kirschke et al., 2017). This makes it even more difficult to mobilize the issue since there are no clear 'villains' to blame and no simple policy solutions to advocate. Overall, this suggests that the issue's complexity has been a barrier so far for public mobilization.

Looking ahead, the articles of this dissertation advance the current state of research in several ways. The first article not only contributes to the still small literature on policy narratives in Europe by providing new insights on narrative strategies in public debates on environmental issues, it provides several possibilities to enhance future studies on policy narratives at the meso level. First, applying discourse network analysis helps to more clearly distinguish between processes of coalition formation and narrative strategies. More specifically, using this methodology allows identifying actor coalitions based on congruent policy beliefs and investigating their use of narrative strategies in two separate analytical steps. Second, the article illustrates how the methodology can be used to investigate not only how coalitions differ in their policy narratives but also how coherently they use narrative strategies. Third, the use of discourse network analysis in the study of policy narratives is also in so far a major contribution to literature on the NPF as it provides manifold opportunities to study the relational dimension inherent in policy narratives and study various relations between actors and narrative elements. The analyses provided in this dissertation do not cover all possibilities. For instance, intracoalitional coherence may also be determined by examining whether actors use similar combinations of narrative elements. Concept networks give room to explicitly study how strongly specific narrative elements are combined. For instance, whether political actors tend to combine certain cost-benefit-frames with different types of scientific evidence. Fourth, the article makes a conceptual contribution through integrating an argument on strategic participation in public debates into those of

strategic structuring of policy narratives. Thereby, future research may investigate differences in narrative strategies between low and high salience issues based on advanced theoretical grounds. This further enables an enhanced incorporation of differences between coalitions at the onset of political conflicts. Overall, applying the NPF with the help of discourse network analysis gives room for developing a wide range of new studies on policy narratives.

The second article advances the still limited knowledge on party support for post-exceptionalism in agriculture (Tosun, 2017). Furthermore, the article contributes to literature on policy integration (Tosun & Lang, 2017) by providing a showcase of how party manifestos can be used to determine whether and how political parties address issues in an integrative way instead of only separately measuring these actors' positioning on different policy fields. This is especially relevant in cases where different policy fields are interconnected, e.g. agriculture and water or agriculture and energy. Moreover, measuring party support for the integration of policies should help to advance our understanding of political support for policy mixes and thus contribute to the growing literature on policy mixes (Capano & Howlett, 2020; Pedersen et al., 2020; Schaub et al., forthcoming). Finally, the empirical findings of the first and the second article might be useful for literature on party positioning in that they suggest that positions postulated in party manifestos are similar to those articulated in press releases and reported in the media. Thus, using these documents or media reporting could be a good proxy for parties' positioning for cases where party manifestos are missing.

The third article advances the understanding of public debates and coalition formation processes in low salience issues. It shows that in this case the debate on pharmaceutical contaminants was largely driven by top-down agenda setting through political-administrative actors. Overall, the findings substantiate the argument that it is insightful to differentiate between low and high salience issues when investigating the role of public debates in policymaking.

The fourth article makes a major contribution to literature on coalition formation in policy subsystems. By combining the two approaches of discourse networks and policy networks, the article improves our knowledge on the comparability of empirical results on actor coalitions and policy change derived by the two separate strands of literature on discourse and policy networks. The findings of this article suggest that both approaches lead to largely similar results when investigating similar research questions and testing the same theories on coalition formation. However, this applies mostly to research on low salience politics since there is reason to expect different results when studying coalition formation in policy subsystems with high issue salience. Therefore, replicating the identified similarities and differences between the two approaches in cases of high issue salience would help to further advance our knowledge on the comparability of both approaches.

In addition to these rather theoretical and methodological contributions, the articles of this dissertation provide several empirical contributions to literature on the politics of water protection in Germany (Herzog, 2020; Metz, 2017; Vogeler et al., 2019; Vogeler et al., 2021). First, the dissertation provides a better understanding of the policy conflict between water protection and agriculture in

Germany. The analysis of policy positions articulated in the public debate and in political parties' manifestos improves our understanding of underlying conflict lines in the policy subsystem. The results suggest that ideological divisions between political parties can explain why comparatively liberal fertilizer regulation in Germany persisted for so many years. Second, the last two articles contribute to public policy literature on CECs by analyzing recent European and German regulation and policymaking processes. Their results substantiate earlier findings by Metz (2017) that the regulatory response to CECs in Germany has remained weak with only soft pressure on target groups. The empirical findings suggest that the issue's complexity represents a barrier for public mobilization. In contrast to agricultural nitrate pollution, advocates of stricter regulation to protect water resources have not initiated a concerted attempt to mobilize the public. The results however suggest that reaching effective policy solutions to reduce the entry of CECs in water will need additional external pressure, through either stronger public demands or legislative activity at the EU level. Otherwise, there is strong reason to assume that the current German approach to tackle CECs will persist in light of Germany's policy style of *exclusive incrementalism* (Zohlnhöfer & Tosun, 2021) where large-scale policy reforms in the past decades have mostly occurred in response to exogenous events or changes in public opinion only. Thus, a major change in Germany's regulatory response to CECs in anticipation of potential environmental and human health issues is rather unlikely, despite the recent top-down activities by political-administrative actors at the federal and state levels. If the aim is to achieve more effective and sustainable policy solutions to reduce the entry of CECs in water, a stronger focus on mobilizing the public or on influencing policymaking at the EU level might lead to more success.

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2 Investigating narrative strategies by using discourse network analysis. Insights from the public debate on agricultural nitrate pollution in Germany

Research article

Abstract. The overuse of fertilizers in agriculture has led to problematic levels of nitrate concentrations in groundwater in parts of Germany. After the country had repeatedly been found to breach the EU Nitrates Directive, Germany tightened its fertilizer regulation in 2020. The change in policy was preceded by an intense public dispute over nitrate pollution and fertilizer regulation in Germany. Empirical research on the narrative policy framework (NPF) has shown how actor coalitions structure their policy narratives to influence policymaking. In this article, I apply discourse network analysis to study the formation of actor coalitions over time and their use of narrative strategies within the German public debate on nitrate water pollution between 2010 and 2020. The empirical results demonstrate how two opposing actor coalitions with congruent policy beliefs became manifest within the public debate. These not only diverged in their policy beliefs but also differed in their use of narrative strategies to expand or contain the policy issue. More precisely, the coalitions adapted their narratives over time in response to changes in the likelihood to win or lose on the policy issue. Furthermore, the results suggest the coalition in favor of stricter fertilizer regulation was more sophisticated in mobilizing specific target groups through their use of narrative characters. Overall, the article provides a valuable contribution to the literature on the NPF by combining research on coalition formation and policy narratives in an innovative way.

2.1 Introduction

Intensification of agriculture is increasingly causing problems for water protection (Baker et al., 2017; van Grinsven et al., 2006). Although nitrogen is an important component in agriculture to enhance production, overuse of manure and artificial fertilizers has many negative impacts on social-ecological systems (Erisman et al., 2013; Kirschke et al., 2019). Fertilizer overuse threatens the health of water resources. Runoff into surface waters causes eutrophication (excessive growth of plants and algae) which harms biodiversity (Baker et al., 2017), while increased nitrate levels in groundwater pose growing problems to drinking water production (van Grinsven et al., 2006).

The conflict between water protection and agricultural interests has led to intense public dispute over fertilizer regulation in Germany in the last years. In fact, Germany has recently experienced one of the strongest waves of farmer protests since decades. Especially small-peasant farmers mobilized and protested against higher environmental standards, including stricter fertilizer regulation (agrarheute, 2019; Spiegel Online, 2019). This group of farmers has come under significant economic pressure, documented by a constant decrease in the number of small family farms and increased consolidation of the German agricultural sector (BMEL, 2019). On the other side, a coalition of water associations and environmental organizations started a joined public campaign to raise awareness on freshwater pollution from agricultural nitrates and mobilize for stricter fertilizer regulation (BDEW, 2018; BUND, 2019).

The surrounding public debate changed over the course of a decade from rather technical to political, characterized by emotion and blame.

The *narrative policy framework (NPF)* provides a useful framework to investigate how political actors use public debate as an arena to influence policymaking (Jones, 2018; Jones & McBeth, 2010; McBeth et al., 2010; Shanahan et al., 2013). The framework suggests that political actors structure their policy narratives strategically to influence policy outcomes (Shanahan et al., 2011). The NPF is therefore well suited to analyze the public dispute over agricultural nitrate pollution of freshwater in Germany and investigate whether and how supporters and opponents of stricter fertilizer regulation participated strategically in the public debate to influence the policy-outcome in their interest.

To this end, the article builds on previous research on the NPF, public mobilization and coalition formation, and poses the following two research questions: Are there differences between actor coalitions in their participation in the public debate and use of narrative strategies? Do coalitions adapt their behavior over time in response to changes in likelihood of winning or losing on the policy issue?

Several objectives are pursued in this article. Theoretically, it incorporates arguments on strategic participation in public debates into the study of policy narratives and narrative strategies. There is reason to expect that actor coalitions differ in how actively they participate in the public debate (Tosun & Schaub, 2017), which may have an impact on the observed policy narratives. Based on earlier work by Schattschneider (1960) and Baumgartner and Jones (1993), I argue that coalitions differ in their incentive to participate in the public debate depending on whether they seek to defend a policy monopoly or mobilize for policy change, which should be especially relevant in cases of low issue salience at the onset of political conflicts.

Conceptually, this study adds clarity to the use of the NPF at the meso-level by more clearly distinguishing between the analysis of coalition formation and coalitions' use of narrative strategies. I argue that the formation of coalitions should be measured separately from narrative strategy, e.g. based on congruent belief systems (Weible et al., 2020). Previous studies often measured coalition formation based on actors' usage of narrative policy elements, such as characters, policy symbols or frames. However, actors with congruent policy beliefs do not necessarily engage in concerted action to achieve their policy goals (Nohrstedt & Olofsson, 2016; Weible et al., 2020).

To achieve the former, the article makes a major methodological contribution. Building on earlier suggestions (Leifeld, 2017; Shanahan et al., 2013; Weible et al., 2016), this study shows that *discourse network analysis* is a useful method to analyze coalition formation within a policy subsystem, identify members of clearly separable coalitions and investigate whether coalitions differ in their level of activity in the public debate and their use of narrative strategies. Discourse network analysis has been developed explicitly to study coalition formation based on congruent policy beliefs (Leifeld, 2016) and has been applied in the study of various policy subsystems (Leifeld, 2013, 2020; Rinscheid, 2020; Tobin et al.,

2018; Tosun & Schaub, 2017). Investigating discourse networks and the relationships between actors and narrative elements enables an enhanced analysis of the relational dimension inherent in the NPF.

Finally, the study makes an empirical contribution on the nexus of water and agriculture in Germany. It contributes to better understanding existing conflict lines in the German policy subsystem of agricultural nitrate water pollution, provides a systematic analysis of the different positions taken in the public debate, and provides insight on how supporters and opponents of stricter fertilizer regulation try to influence policymaking in Germany.

The article proceeds by introducing the empirical case of agricultural nitrate pollution in Germany. It subsequently presents the theoretical argument on participation in the public debate, coalition formation and narrative strategies and derives theoretical hypotheses. Then, after explaining the methodology used to collect and analyze the empirical data, the article presents and discusses the empirical findings. The final section provides concluding remarks and points for further research.

2.2 Empirical case: Agricultural Nitrate Pollution of Freshwater in Germany

Agricultural nitrate pollution has increasingly become a salient environmental and agricultural policy issue in Germany over the last decade. While media reporting on the issue was low in 2010, it has sharply increased over time.³ The public debate reflected by media coverage has been characterized by a growing adversarial dispute between different stakeholders: environmental groups, water associations and the Green Party mobilizing for stricter regulation, and mainly farmer associations opposing stricter regulation and advocating liberalization of legal provisions.

Nitrate runoff in Germany mostly results from agricultural activities (Knoll et al., 2020; Kunkel et al., 2017), is especially high in regions with high livestock density (Kastens & Newig, 2007) and places significant pressure on German ground- and surface waters (European Environment Agency, 2018). To counter nitrate water pollution in all European member states, the EU passed several directives: the *Water Framework Directive (WFD; Directive 2000/60/EC)*, the *Nitrates Directive (ND; Directive 91/676/EEC)* and the *Groundwater Directive (GWD; Directive 2006/118/EC)* define nitrate concentration limits for groundwater bodies and request EU member states to reduce the level of agricultural nitrate pollution in case the limits are exceeded. The *German Surface Water Ordinance (OGewV)*, adopted in 2011, and the *Federal Water Act (WHG)*, adopted in 2009, represent the main water legislation at the federal level and transpose the WFD into domestic law (Berger, 2017). The *Fertilizer Act (DüG)* and the *Fertilizer Ordinance (DüV)* transpose the ND into German law. The DüG regulates the manufacture, placing on the market and application of fertilizers and the DüV sets out the usage criteria in accordance with good agricultural practice and, thus, defines how the DüG is put into practice (Umweltbundesamt, 2019b). The DüV has mostly been subject of the debate on stricter fertilizer

³ This is indicated by the news coverage of the *Frankfurter Allgemeine Zeitung (FAZ)* on the issue. See also Figure 2.5.

regulation to reduce nitrate pollution and meet the required nitrate concentration levels since it defines in detail how reduction is to be achieved.

Although Germany has adopted legislation on fertilizer use and water protection, nitrate concentration levels in Germany have exceeded legal concentration limits (European Environment Agency, 2018). Consequently, the *European Commission (EC)* has repeatedly accused Germany of not sufficiently addressing agricultural nitrate pollution and failing to adequately transpose the EU directives on nitrate pollution into domestic law (European Commission, 2019).

Changes to the German fertilizer legislation occurred only gradually after increasing pressure by the EC. In fact, policymaking in Germany on the issue of agricultural nitrate pollution exemplifies well what Zohlnhöfer and Tosun (2021) describe as the new German policy style of *exclusive incrementalism*, where existing policies are mostly changed incrementally and in response to exogenous events or public opinion. In July 2014, the EC opened a first infringement procedure against Germany for failing to meet obligations under the ND. After Germany did not respond adequately, the EC referred the case to the *Court of Justice of the European Union (CJEU)* in April 2016 (European Commission, 2019). In response, Germany revised the DüV in June 2017, but did not significantly change the criteria on fertilizer use in agriculture (Härtel, 2018; Taube, 2018). In the meantime, a first ruling by the CJEU in June 2018 found implemented measures in the DüV prior to its legal revision insufficient⁴. The CJEU ruling and the EC evaluation of the DüV as insufficient led the EC to threaten Germany with a second infringement procedure. The EC sent a second letter of formal notice in July 2019 urging Germany to implement adequate regulation until May 2020. This represents a turning point in recent policymaking on nitrate pollution in Germany. The threat to initiate a second infringement proceeding (potentially resulting in fines of up to 850,000 € per day) led to an immediate response by the federal ministry of agriculture (BMU) and the federal ministry of the environment (BMEL) which promised to propose a significant revision to the DüV. The ministries are typically divided on conflicts between agricultural and environmental policy goals (Tosun et al., 2019) and have been divided on the issue of nitrate pollution. For the first time, both ministries started to publish joined press releases after July 2019 on nitrate pollution, with later agreement on a revision proposal for the DüV in September 2019. Only after the EC finally signaled its satisfaction with the proposal, both German chambers of parliament adopted a revised DüV in March 2020.

The increase in issue salience and the temporal change in external conditions make the empirical case very well suited for investigating coalition formation in the policy subsystem and the adaptation of narrative strategies to influence policy outcomes. This study therefore focuses on the German public debate on agricultural nitrate water pollution between January 2010 and December 2020.

⁴ The CJEU based its ruling on the fertilizer regulation prior to the revision in 2017. However, a procedure based on the revised DüV probably would not have resulted in a different ruling by the CJEU Härtel (2018).

2.3 Theoretical approach

In general, the public debate represents one venue political actors use to influence policymaking (Leifeld, 2013, 2020). Research has identified several ways in which participation in public debates may be influential: First, research on agenda-setting shows that emphasizing certain problem perceptions or policy solutions increases a topic's likelihood to be discussed in legislative institutions (Baumgartner & Jones, 2009; Soroka & Wlezien, 2009; Tosun & Scherer, 2020; Tosun & Varone, 2020). Second, disseminating new information in public debates can lead to policy learning across political actors, which may trigger policy change (Leifeld & Brandenberger, 2019; Sabatier, 1998). Third, influencing public debates can affect public opinion, which has been found to affect the behavior of decision makers (Burstein, 2003; Mühlböck & Tosun, 2018; Shapiro, 2011; Soroka & Wlezien, 2009). To achieve these policy goals, political actors use social media to directly participate in the public debate (Bossner & Nagel, 2020; Gupta et al., 2016; Lybecker et al., 2015; Merry, 2016, 2018) or they publish press releases with content intended to be reproduced and disseminated by traditional mass media, such as newspapers (Leifeld, 2013; Merry, 2019; Schaub & Braunbeck, 2020). Political actors' use of media is well reasoned, as it evidently affects public opinion and agenda-setting (McCombs & Valenzuela, 2021).

Whether and how political actors participate depends on strategic considerations (Schaub & Braunbeck, 2020; Schaub & Metz, 2020; Shanahan et al., 2011; Tosun & Schaub, 2017). The NPF is a useful framework for understanding *how* political actors participate in public debates. The framework builds on the idea that political actors construct their policy narratives strategically to influence policymaking. Moreover, it has been developed by a group of scholars to investigate the role of policy narratives at different levels, from micro to macro-level (Boscarino, 2019; Jones, 2018; Jones & McBeth, 2010; McBeth et al., 2007; Shanahan et al., 2011, 2018). At the meso-level, research on the NPF investigates the behavior of actor coalitions. The framework strongly builds on the *advocacy coalition framework (ACF)* in its conceptualization of coalitions (Shanahan et al., 2011). It adopts the idea that political actors form actor coalitions within policy-subsystems based on congruent policy beliefs and their preferred policy outcome (Sabatier & Jenkins-Smith, 1993; Shanahan et al., 2011).

The NPF assumes that political narratives, created by a variety of political actors, play an important role in policy processes and transmit political actors' policy beliefs and policy goals into policy outputs (Shanahan et al., 2011). Conceptualized from a structuralist perspective, policy narratives are characterized by common elements and can be generalized across different situations. These elements also define a policy narrative and make it distinguishable from other non-political communication, e.g. technical reports. A policy narrative typically is situated within a specific setting or policy context, has a plot, contains several characters, includes a policy stance (such as an endorsement for or rejection of a policy solution), policy beliefs and is disseminated by political actors to attain their preferred policy outcome (Jones & McBeth, 2010). It may further contain additional narrative elements, such as policy symbols, policy surrogates, different causal mechanisms, evidence, or cost-benefit frames (Jones, 2018; Jones & McBeth, 2010; Shanahan et al., 2013). A policy narrative's plot ties these various narrative

elements together. For instance, it connects different characters: *villains* are accused of harming *victims* and *heroes* are portrayed to solve problems for certain *beneficiaries* (Jones & McBeth, 2010; Weible et al., 2016).

A central idea of the NPF is that political actors use these narrative elements as a form of *narrative strategy* to expand or contain the *scope of conflict*, a notion derived from classical work by Schattschneider (1960). Political actors with an interest in policy change are expected to try to expand the political conflict by increasing attention on a policy issue. Thereby, they hope to gain new political allies and public support. In contrast, actors defending the policy status quo will try to contain the political conflict and diminish attention. This is especially relevant for cases Schattschneider considered as *normal politics*, where initially issue salience is low and a small group of political actors, who control the definition of the policy problem and the policy outcome, try to defend their *policy monopoly* (Baumgartner & Jones, 1993; Schattschneider, 1960; Stephan, 2020). Similarly, the NPF assumes policy narratives to contain mainly two broad types of plots based on work by Stone (2002): a *plot of decline*, which spins a tale of a deteriorating situation to expand a policy conflict, and a *plot of control*, constructed to contain a policy conflict. The latter is intended to convey the message that a situation is under control and does not need further attention or any other policy solutions. Constructing a plot of decline is associated with actors perceiving themselves as losing on a policy issue whereas the plot of control is expected to coincide with the perception of winning (Shanahan et al., 2013).

2.3.1 Coalition formation and participation in the public debate

Before turning to *how* coalitions differ in their use of narrative strategies, I argue that it is important to first investigate *whether* political actors participate in the public debate or avoid participation for strategic reasons. In fact, I contend that we can expect coalitions to differ in how strongly they resort to the public debate as a venue to influence policymaking. Also based on Schattschneider's *scope of conflict* and further work by Baumgartner and Jones (1993), Tosun and Schaub (2017) and Schaub and Metz (2020) suggest that coalitions with an interest in defending a policy monopoly and preserving the policy status quo *initially* avoid participation in the public debate to keep the level of public attention low. Instead, they may incline to other, less noisy venues, e.g. lobbying, to influence policymaking. In contrast, coalitions with an interest in policy change should participate more actively in the public debate to create attention on a policy issue and break the policy monopoly. In addition, policy actors within the latter coalition often possess only limited access to decision makers or find themselves in a weak bargaining position, which makes public debates a comparatively easy venue to access (Johannesson & Weinryb, 2021; Schaub & Metz, 2020). Thus, we should observe differences between coalitions in how actively they participate in the public debate at the onset of political conflicts when issue salience is still low.

Regarding the empirical case at hand, it is reasonable to expect the formation of two main adversarial coalitions over time: one mobilizing for and the other against stricter fertilizer regulation. Since

legislation on the issue was comparatively liberal in 2010, the *contra stricter fertilizer regulation coalition* should be less inclined to participate in the public debate in order to diminish attention and preserve the policy status quo at this time. In contrast, the *pro stricter fertilizer regulation coalition* should have a stronger incentive to resort to the public debate to increase attention on the issue. These considerations lead to the first hypothesis:

H1a: The coalition mobilizing for stricter regulation will participate more strongly in the public debate than the coalition defending the policy status quo at the onset of a political conflict.

Initially, the *contra-coalition* should perceive itself as more likely to defend the policy status quo and win on the policy issue, since policy monopolies tend to be stable over time (Baumgartner & Jones, 1993). Agricultural policy in Germany has predominantly served the interests of farmers in recent decades and has strongly been determined by *exceptional* institutional arrangements (Daugbjerg & Feindt, 2017; Feindt, 2018; Tosun, 2017). Therefore, the chance of the *pro-coalition* breaking the policy monopoly are low and this coalition should perceive itself as more likely to lose on the policy issue. Contrary to the *contra-coalition*, the *pro-coalition* has nothing to lose and can only win when participating in the public debate.

Following this reasoning, a change in a coalition's perception of whether it is losing or winning on a policy issue also changes their rationale to participate strongly in a public debate or reduce their participation. The more the *contra-coalition* fears it is losing on a policy issue, the more strongly it should be inclined to change its behavior toward expanding the scope of conflict and participating more frequently in the public debate. In contrast, the more the *pro-coalition* perceives itself to be winning on the issue, the more it will be inclined to contain the scope of conflict.

Regarding the empirical case, the increasing pressure exerted by the EC to adopt stricter fertilizer regulation over time gradually increases the likelihood for significant policy change and, thus, the *contra-coalition's* chance to lose and the *pro-coalition's* chance to win on the policy issue. Consequently, the gradual change in the external conditions should decrease the *contra-coalition's* perceived likelihood to win on the policy issue. In contrast, the changing conditions should increase the *pro-coalition's* likelihood for winning. Consequently, the *contra-coalition* will be more and more inclined to participate in the public debate whereas the *pro-coalition* will tend to reduce its activity. These considerations lead to the next two hypotheses:

H1b: An increase in a coalition's perceived likelihood to lose on a policy issue will lead to more frequent participation in the public debate.

H1c: An increase in a coalition's perceived likelihood to win on a policy issue will lead to less frequent participation in the public debate.

2.3.2 Narrative strategies

The NPF suggests that coalitions differ not only in their level of participation in the public debate, but also in *how* they participate in the debate. More specifically, the NPF suggests that coalitions construct

their policy narratives in a way to either expand or contain the policy conflict, and that coalitions differ in these narrative strategies depending on whether they perceive themselves as winning or losing on a policy issue (Gupta et al., 2014; Merry, 2019; Shanahan et al., 2013).

This study focuses on two types of narrative strategies, which have repeatedly been found to be used by coalitions to shape the scope of conflict: first, cost-benefit frames and, second, the use of characters (Gupta et al., 2014; McBeth et al., 2007; Merry, 2019; Shanahan et al., 2013).

Cost-benefit frames

Political actors frame issues in a strategic way to convince others of their views and interpretations. The use of frames is based on the idea that these actors do not simply communicate political or social realities, but construct realities by selecting and highlighting certain aspects of an issue, such as a particular problem perception or causal interpretation, in a way to persuade others of their views (Entman, 1993; Matthes, 2012). The use of frames in communication evidently impacts issue salience and public opinion (Druckman et al., 2012; Vreese et al., 2011).

Research on policy narratives shows political actors use cost-benefit frames to shape the scope of conflict (McBeth et al., 2007; Shanahan et al., 2011; Stephan, 2020). Coalitions perceiving themselves as losing on a policy issue tend to *diffuse the costs* and *concentrate the benefits* of an opposed policy solution to expand political conflict. When *diffusing costs*, coalitions overemphasize the costs inflicted upon the broader public interest to involve more stakeholders in the policy conflict and gain their support (McBeth et al., 2007; Shanahan et al., 2011; Stone, 2002). In the present case, the pro-coalition may portray nitrate pollution of water bodies as not only a problem for water providers or ecosystems, but also for citizens (taxpayers) or future generations due to potential contamination of drinking water resources. In contrast, the contra-coalition may accentuate costs resulting from stricter fertilizer regulation by overemphasizing consequences for food security in Germany. When *concentrating benefits*, any potential benefits of the opposed policy solution are downplayed and attributed to narrow special interests to demobilize the opposition (McBeth et al., 2007; Shanahan et al., 2011; Stone, 2002). This specific combination of frames is typically part of a *plot of decline* and termed the *loser's tale* as it is usually associated with coalitions who perceive themselves as losing on a policy issue (McBeth et al., 2007). In contrast, the *winner's tale* involves strategies to contain political conflict. Coalitions perceiving themselves as winning tend to *diffuse the benefits* of their advocated policy outcome and *concentrate the costs*. When *diffusing benefits*, coalitions portray their preferred policy solution as one that serves the public interest and they downplay any disadvantages by *concentrating the costs*. The winner's tale is typically part of a *plot of control* to diminish attention on a policy issue (Jones & McBeth, 2010; McBeth et al., 2007; Shanahan et al., 2011).

Table 2.1 gives an overview of the eight different frames coalitions may use to either expand or contain the scope of conflict, depending on whether they perceive themselves as losing or winning on the policy issue and whether they mobilize for stricter regulation or advocate liberalization.

Table 2.1. Cost-benefit frames as narrative strategies

	<i>Support stricter regulation</i>	<i>Support liberalization</i>
<i>Expansion (loser's tale)</i>	Diffuse costs of liberalization Concentrate benefits of liberalization	Diffuse costs of stricter regulation Concentrate benefits of stricter regulation
<i>Containment (winner's tale)</i>	Diffuse benefits of stricter regulation Concentrate costs of stricter regulation	Diffuse benefits of liberalization Concentrate costs of liberalization

Note: based on Shanahan et al. (2011) and Shanahan et al. (2013).

The above reasoning leads to the following hypothesis:

H2a: Coalitions which are likely to lose on a policy issue will predominantly use expanding cost-benefit frames and those who are likely to win on a policy issue will predominantly use containing cost-benefit frames.

Similar to changing their participation in the public debate in response to a variation in the perceived likelihood to win or lose on a policy issue, coalitions are expected to adapt their narrative strategies as well. An increase in the perceived likelihood to lose on the policy issue should urge coalitions to attract attention on the issue by increasing the use of expanding frames and reducing containing frames. In contrast, an increase in the perceived likelihood to win on the policy issue should lead coalitions to reduce their efforts to attract attention on the issue, by reducing the use of expanding frames and increasing containing frames. This leads to two complementary hypotheses:

H2b: An increase in a coalition's perceived likelihood to lose on a policy issue will lead the coalition to use expanding frames more frequently and containing frames less frequently in their policy narratives;

H2c: An increase in a coalition's perceived likelihood to win on a policy issue will lead the coalition to use containing frames more frequently and expanding frames less frequently in their policy narratives.

Characters

The second type of narrative strategy used to shape the scope of conflict relates to how coalitions populate their policy narratives with characters. Here, two strategies are distinguished: on the one hand, coalitions might make use of a *devil shift* when they feel threatened and likely to lose on the policy issue (Schlauffer, 2018; Shanahan et al., 2013). The devil shift is a notion borrowed from the ACF, which describes a situation where opposing coalitions overemphasize the power and the *evilness* of their opponents (Sabatier et al., 1987; Shanahan et al., 2013). Thus, the NPF suggests that policy narratives characterized by a devil shift predominantly emphasize the role of villains who cause problems and inflict damage upon victims, connected through a plot of decline (Shanahan et al., 2013). Casting the opposition as villains aims at demobilizing the opposition while emphasizing the harm caused to victims is intended to generally increase attention on the issue and to gain victims' support (Shanahan et al.

2013). Since the devil shift is used to expand the political conflict, coalitions which perceive themselves as losing are more likely to use this strategy.

In contrast, winning coalitions are associated with an *angel shift*, where they predominantly portray themselves or their allies as heroes who are able to fix the problem to the benefit of certain beneficiaries (Shanahan et al., 2013; Weible et al., 2016). Emphasizing the role of heroes while avoiding the use of villains is part of a plot of control aimed at containing a policy issue. It is used to convey the message that everything is under control and the coalition is able to solve the policy issue (Shanahan et al., 2013). The above reasoning leads to the following hypothesis:

H3a: Coalitions which are likely to lose on a policy issue will use the devil shift and coalitions which are likely to win on a policy issue will use the angel shift.

Analogously to hypotheses 2b and 2c, coalitions are expected to change their use of characters in response to changes to their perceived likelihood to win or lose on the policy issue. An increase in the perceived likelihood to win on the policy issue should allure coalitions to use heroes and beneficiaries more frequently and an increase in the perceived likelihood to lose to emphasize harm caused by villains to victims. This leads to an additional pair of complementary hypotheses:

H3b: An increase in a coalition's perceived likelihood to lose on a policy issue will lead the coalition to use villains and victims more frequently and heroes and beneficiaries less frequently in their policy narrative;

H3c: An increase in a coalition's perceived likelihood to win on a policy issue will lead the coalition to use heroes and beneficiaries more frequently and villains and victims less frequently in their policy narratives.

2.4 Data and methods

This study uses a longitudinal case study to test the hypotheses on coalition formation and coalitions' use of narrative strategies derived in the previous section. The observation period ranges from January 2010 until December 2020. The starting point was chosen based on the criteria of issue salience and media coverage. While collecting the data, it proved that both issue salience and media coverage were low before 2010 (see Figure 2.5 for media coverage within the observation period). The ending point represents the most recent data. The observation period is subdivided into four separate periods for analytical reasons. Three different criteria with successive levels of priority guided the identification of these periods: First and most importantly, changes in the external environment, which are expected to change coalitions' perceptions of their chances to win or lose on the policy issue, mark the start and/or end of each period. Second, every period needs sufficient observations to measure coalition formation and test differences between coalitions' narrative strategies robustly. Third, the period lengths should be about equal. This led to four different periods: a first period from the beginning of January 2010 until the end of June 2014, which marks the start of the first infringement proceeding against Germany. The second period starts in July 2014 and ends in March 2017 when the first revision of the fertilizer

ordinance was adopted. The third period starts in April 2017 and ends on 24. July 2019 when the EC threatened to open a second infringement procedure. The fourth period subsequently begins on 25 July 2019 and covers the debate until the end of December 2020.

The German case on agricultural nitrate pollution of water bodies represents a very good case for investigating and illustrating the expected differences between coalitions and changes in their behavior over time for several reasons. First, investigating the association between winning or losing on a policy issue and narrative strategies has been difficult, because it requires the measurement of a coalitions' perceived likelihood to win or lose, which is complicated (Gottlieb et al., 2018). The great advantage of the case at hand is the gradual change in the external environment: the increasing pressure by the EC to tighten the fertilizer regulation should have led to respective changes in both coalitions' perceived likelihood to win or lose over time. As portrayed in section two on the empirical case, there is large support for this assumption. Therefore, it is possible to investigate whether coalitions responded to this change in likelihood by adapting their narrative strategies over time. Consequently, it is not necessary to *absolutely* determine which coalition was winning or losing at a certain point in time. If coalitions consistently adapted their behavior at points in time *relative* to previous points in time (more expansion in response to higher likelihood to lose; more containment in response to higher likelihood to win), then this would indicate a possible causal association between the likelihood to win or lose and narrative strategies (hypotheses 2b, 2c, 3b and 3c). The same applies for the expected association between the likelihood to win or lose and changes in participation in the public debate (hypotheses 1b and 1c). Second, the course of the public debate is well suited to investigate coalition formation. The debate became increasingly politicized and polarized over time. Therefore, it is well suited to observe the participation of political actors in the public debate and identify adversarial coalitions. Third, the politicization of the debate was accompanied by an increasing number of disseminated policy narratives, which enables an analysis of narrative strategies. Fourth, the observation period captures the begin of the public dispute and, therefore, allows the investigation of the expected differences between coalitions at the onset of the political conflict (hypothesis 1a).

2.4.1 Data collection

The data for the analysis was collected in two steps. First, newspaper articles published in the *Frankfurter Allgemeine Zeitung (FAZ)* served to determine political actors in the public debate on nitrate pollution in Germany between January 2010 and December 2020. The *FAZ* represents one of the principal nation-wide newspapers in Germany, corresponds well with the "quality press" criterion of wide circulation, reputation and moderate political positioning (Barranco & Wisler, 1999), and has proven to be a reliable data source for discourse network analysis in Germany (Leifeld, 2013; Schaub & Braunbeck, 2020; Tosun & Lang, 2016). A keyword search was used to select only newspaper articles

dealing with the issue of nitrate pollution of water bodies in Germany⁵. The final sample consists of 190 newspaper articles. Within these articles, 31 political actors were identified based on the following definition: political actors are organizations from inside or outside of government who participate in the formulation and implementation of public policy or regularly try to influence the policy output and policy outcome in their interest (Janning et al., 2009; Weible et al., 2020). Since the study is interested in actors' behavior in the public debate over time, the final sample included only those political actors who regularly participated in the public debate. As a prerequisite for this, actors needed to make a public statement on nitrate pollution at least at two different points in time during the observation period (see also Leifeld (2017) on selecting actors in the study of public debates).

The newspaper articles were complemented by press releases published by the 31 political actors. These are better suited to capture political actors' narrative strategies since they contain original, unabridged text written by the actors themselves. Newspaper articles often do not fully cover the different narrative elements since they mostly reproduce only short text excerpts. In total, 554 press releases were added to the 190 newspaper articles resulting in a final sample of 744 documents.

2.4.2 Data analysis

Methodologically, the study proceeded in two main steps. First, *discourse network analysis* (Leifeld, 2016, 2017) was applied to analyze coalition formation within the policy subsystem and whether identified coalitions differed in their participation in the public debate (hypotheses 1a – 1c). Second, the study used a mix of quantitative and qualitative analysis to investigate how the actor coalitions determined in the first step constructed their policy narratives (hypotheses 2a – 3c).

First part of the empirical analysis: Coalition formation over time

The first part of this study used discourse network analysis to study coalition formation and determine political actors' membership in coalitions based on their policy beliefs. The method combines qualitative content analysis with social network analysis and was explicitly developed to identify actor coalitions within policy subsystems based on political actors' congruent policy beliefs (Leifeld, 2016). Actors' policy beliefs were measured via *statements* they articulated in the public debate at different points in time. Therefore, discourse network analysis not only allows determining the number of coalitions and their cohesiveness, but also how these coalitions change over time. *Statements* are text portions where actors indicate support for or opposition to different *concepts* (Leifeld, 2013). In this case, actors' positions towards *concepts* represented a measure of their policy beliefs.

This study identified coalitions based on two of the three types of policy beliefs originally put forth by the ACF: actors' *policy core beliefs* and *secondary (or instrumental) beliefs* (Sabatier, 1998). Policy core beliefs tend to be stable over time, are related to a specific policy subsystem and can be normative

⁵ The following term was used to extract relevant newspaper articles from the *FAZ archive*: “(dünges\$, nährstoff\$, gülle\$, nitrat\$, phosphor\$) + (\$wasser\$, \$gewässer\$, fluss, flüsse, seen, verunreinig\$)”

and empirical in nature. Typical examples of policy core beliefs are problem perceptions, causal understandings and policy positions. Secondary beliefs are at a more specific level and refer to the means of achieving policy goals, such as specific policy instruments. These beliefs are more likely to change over time (Sabatier, 1998; Weible & Jenkins-Smith, 2016).

Table 2.2 lists the different policy beliefs coded in this study. These were captured through binary variables indicating agreement or disagreement with a certain problem perception, causal understanding, policy position or implementation of a policy instrument. For instance, one actor could state that nutrient runoff resulting from conventional farming and its entry into waterways threatens the quality of drinking water. Another actor could disagree with this problem perception and would then have an opposed policy core belief.

Table 2.2. Operationalization of actors' policy beliefs

<i>Policy core beliefs</i>	
Conventional farming threatens drinking water quality	<i>Problem perception</i>
Conventional farming threatens surface water quality	<i>Problem perception</i>
Environmental protection needs organic agriculture	<i>Causal understanding</i>
Tighten Federal Water Act (WHG)	<i>Policy position</i>
Tighten Fertilizer Act (DüG)	<i>Policy position</i>
Tighten Fertilizer Ordinance (DüV)	<i>Policy position</i>
Tighten Fertilizer Regulation (DüMV)	<i>Policy position</i>
Tighten regulation on area designation (AVV GeA)	<i>Policy position</i>
Tighten regulation on farm gate balance (StoffBilV)	<i>Policy position</i>
<i>Secondary aspects</i>	
Limit livestock production to pasture	<i>Policy instrument</i>
Mandatory field-based nutrient accounting	<i>Policy instrument</i>
Prohibit fertilizer application on ecological compensation areas	<i>Policy instrument</i>
Stricter blocking periods for fertilizer application	<i>Policy instrument</i>
Riparian buffer strips	<i>Policy instrument</i>
General upper limit on fertilizer application	<i>Policy instrument</i>
Farm gate balance	<i>Policy instrument</i>
Dung exchange („Gülle-Börse“)	<i>Policy instrument</i>
Environmental tax on nitrate surplus	<i>Policy instrument</i>
Internal differentiation	<i>Policy instrument</i>

Note: Policy beliefs identified in newspaper articles and press releases.

The final list of policy beliefs was identified deductively based on the conceptual definition of policy core beliefs and secondary aspects while reading the documents and coding the data. An iterative coding procedure ensured that every policy belief was coded. The author and two research assistants coded all

documents manually with the help of the software *Discourse Network Analyzer* (Leifeld et al., 2019). To ensure intercoder reliability, all three coders coded a sample independently and then compared the coding in order to identify and clarify differences between coders before the final rounds of coding. The final coding entails 2085 statements where actors express their policy beliefs.

Discourse network analysis was then used to analyze coalition formation based on similarity and dissimilarity of actors' policy beliefs. In a first step, *one-mode adjacency matrices* with actors in rows and columns were derived from the data for the four periods separately. More precisely, these are *one-mode subtract networks*, which combine *congruence networks* and *conflict networks*. Social network analysis uses the term *edge* to indicate the relationship between two actors. In *congruence networks*, two actors are linked with an *edge* (indicated by cell values greater than 0) if they both share at least one belief, i.e. mutual agreement or disagreement with a problem perception or policy position. The more beliefs two actors share, the higher their *edge weight*. In *conflict networks*, two actors are linked with an edge if they have opposing positions regarding at least one belief. The more conflicting beliefs two actors have, the higher their edge weight in the conflict network. The subtract network combines both approaches by subtracting conflict network edges weights from congruence network edge weights (Leifeld, 2017). In this study, the edge weights of the subtract network consider the number of different beliefs two actors share or explicitly do not share. The frequency of belief expression was not included in the computation of the edge weights (duplicate statements indicating identical beliefs were filtered across each time range).

To control for different levels of activity in the debate, the edge weights were normalized using the average-activity algorithm. The following example serves to illustrate the reason for normalizing networks: If two actors frequently express their beliefs in a debate, the measurement of their belief similarity will be closer to their *true* belief similarity compared to a pair of actors who are not as active in the debate with some of their beliefs remaining concealed. Consequently, the measurement indicates higher similarity for the first pair compared to the second, which in reality might not be true. Instead, the observed differences in belief similarity between the two actor pairs might just result from their different level of activity. The average-activity algorithm controls for this potential bias by dividing each edge weight by the mean number of beliefs two actors revealed in their statements. Normalizing networks is especially important if the aim is to identify clusters based on similarity (Leifeld, 2017). The final subtract adjacency-matrix contains actors in rows and columns, with cell values ranging from -1 to 1. Higher values indicate higher belief similarity and lower values indicate higher belief dissimilarity.

Actor coalitions were determined by conducting cluster analyses separately for each period and therefore based on four separate subtract networks. The great advantage of subtract networks is that they consider both similarity and dissimilarity. In these networks, strong polarization is characterized by many positive edges (high similarity) within clusters and many negative edges (high dissimilarity) between clusters (Neal, 2020). See Figure 2.1 for a graphical illustration.

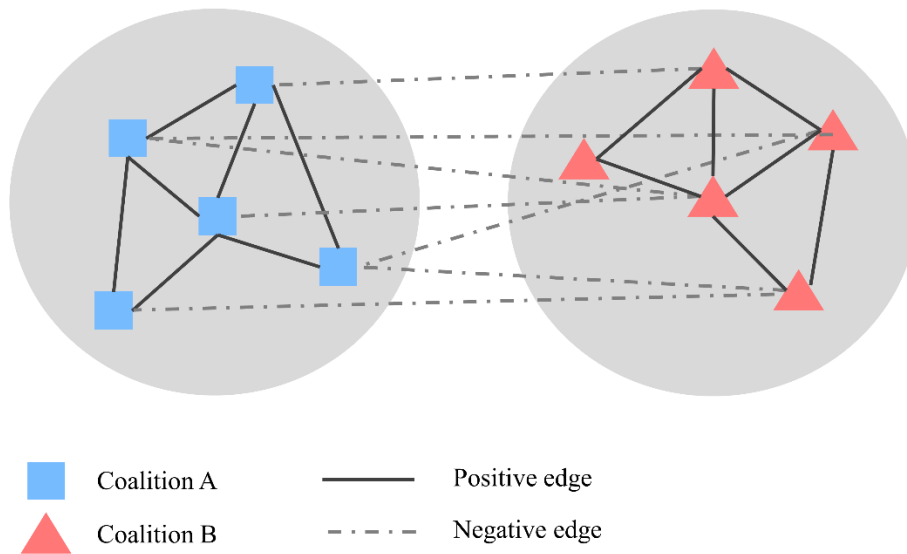


Figure 2.1. Coalition formation in polarized signed networks.

Note: Graph created based on Neal (2020).

Analyses of these *signed weighted networks* are still limited and methods are in active development (Harrigan et al., 2020; Hua et al., 2020; Traag et al., 2020). This study applied the *Spinglass algorithm* to determine coalitions as it can be used for the analysis of signed networks and has been implemented within the R language (Reichardt et al., 2020). The function identifies clusters characterized by many positive edges and few negative edges within a cluster, and many negative edges and only few positive edges with actors outside the cluster (Reichardt & Bornholdt, 2006; Traag & Bruggeman, 2009). The method is based on the measure of *modularity*, which compares the distribution of edges in a given network with the distribution of edges expected by random chance. The measure also serves as an overall indicator of how strongly a network is characterized by cluster formation. A modularity score of 0 indicates that cluster formation in a network is not statistically surprising and might result from random chance. In case of values larger than 0, cluster formation in a network deviates from random chance. Empirically, it has been shown that values larger than 0.3 denote statistically significant clusters in a network (Leicht & Newman, 2008; Newman, 2004).

The cluster analysis was complemented by a graphical analysis to evaluate the robustness of the results. For this purpose, the four networks were visualized as network graphs by placing the actors as *nodes* in a two-dimensional space based on their similarity using the *Fruchterman–Reingold force-directed placement algorithm*. The algorithm is commonly applied in social network analysis and places groups of nodes, characterized by higher edge weights, closer together. Compared with other placing algorithms, it has the advantage of simultaneously improving the readability of the graph by reducing the overlap of nodes (Fruchterman & Reingold, 1991). As the algorithm can only consider positive edge weights, negative cell values in the subtract adjacency matrices were removed beforehand. Therefore, the approach does not fully incorporate the dissimilarity of actors. Nevertheless, the edge weights still indicate actors' level of belief similarity controlled by their level of belief dissimilarity. Since actors

with higher belief similarity are positioned closer to each other, this graphical approach allows the evaluation of the overall network structure and the identification of actor coalitions (Leifeld, 2013).

Finally, hypotheses 1a, 1b and 1c on differences between coalitions in their participation in the public debate are evaluated based on the number of press releases they disseminate on the policy issue.

Second part of the empirical analysis: Narrative strategies

The analysis of narrative strategies builds on the previous identification of actor coalitions. More specifically, the study used statistical methods to investigate whether the identified coalitions differed in their use of characters and cost-benefit frames and whether they adapted these narrative strategies over time. In addition, discourse network analysis was used to investigate how cohesively coalitions constructed narrative strategies based on their use of characters. The data source for these analyses was restricted to actors' press releases. The software *discourse network analyzer* was used again to code characters and cost-benefit frames within actors' press releases based on a codebook (provided in Appendix A.2), which was derived deductively from the theoretical approach presented in the theory section.

In this second part of the analysis, the study first investigated whether actor coalitions differed in their use of frames to contain or expand the policy subsystem (hypothesis 2a). Actor coalitions' use of frames was operationalized by their use of the eight different frames depicted in Table 2.1 in the theory section. The study used the ratio of containing frames to expanding frames to measure the degree to which a coalition tried to reduce or increase attention to the policy issue. More specifically, a ratio of containing frames to expanding frames with a continuous scale from -1 to +1 was calculated where values below zero indicate a predominant use of expanding frames and values above zero the predominance of containing frames. The *contain-expand ratio* was attained by subtracting the sum of expanding frames from the sum of containing frames and dividing the result by the total number of frames used in a press release (the unit of observation). Two-sample t-tests served to explicitly test differences in the use of containing and expanding frames between coalitions. The differences were tested within each period to incorporate the expected time dynamics.

Hypotheses 2b and 2c expect actors to adapt their use of frames over time. To investigate these expected changes, time series of coalitions' contain-expand ratios were tested for statistically significant trends using *Mann-Kendall Trend Tests*, where a positive trend indicates an increasing level of containment (or decreasing level of expansion) and a negative trend an increasing level of expansion (or decreasing level of containment). The trend test was conducted using aggregated time-series data with mean contain-expand ratios per month.

In a second step, the study analyzed differences and changes in actor coalitions' use of characters. Hypothesis 3a expects coalitions likely to lose on the policy issue to use the devil shift and those likely to win the angel shift. The *devil shift-angel shift* was operationalized by actors' use of heroes and villains in their policy narratives. More specifically, the ratio of heroes to villains with a continuous scale from

-1 to +1 was calculated where values below zero indicate a devil shift and values above zero indicate an angel shift. The ratio was attained by subtracting the number of villains from the number of heroes and dividing the result by the total number of characters used in a press release (Shanahan et al., 2013; Shanahan et al., 2018). Two-sample t-tests were used to explicitly test differences in the use of heroes to villains between coalitions. The tests used actors' press releases as units of observation and differences between coalitions are tested for the four periods separately.

Changes in the use of characters over time, as expected by hypotheses 3b and 3c, were investigated by using the same approach already described for analyzing actor coalitions' use of frames: time series of coalitions' hero-villain ratio were tested for statistically significant trends using *Mann-Kendall Trend Tests*, where a significant positive trend indicates an increasing angel shift (or decreasing devil shift) and a significant negative trend an increasing devil shift (or decreasing angel shift). The trend test was conducted using aggregated time-series data with mean hero-villain ratios per month.

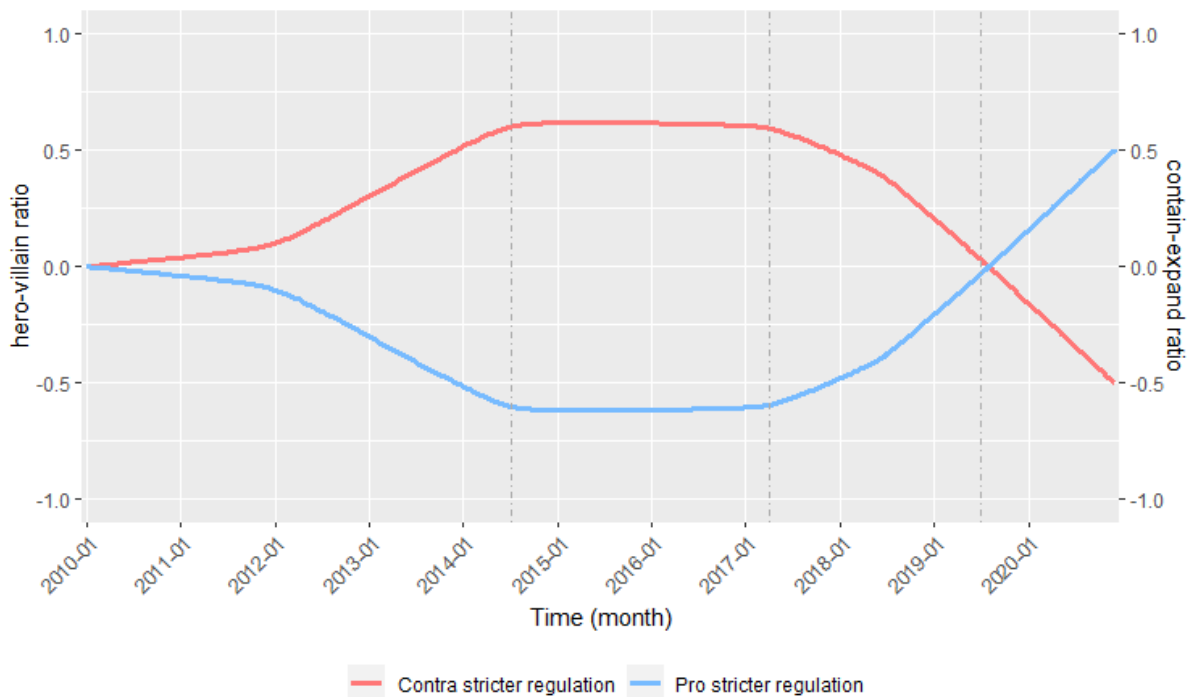


Figure 2.2. Expected differences and change in coalitions' use of narrative strategies

Note: The two curves represent approximate curves to visualize the operationalized theoretical expectations on coalitions' use of frames and characters. The graph is not based on empirical data; the dashed vertical lines subdivide the graph into the four observation periods.

Figure 2.2 visualizes the operationalization of hypotheses 2a to 3c on narrative strategies by drawing approximate curves of the expected contain-expand ratio and the hero-villain ratio. Both ratios are expected to be positive for the contra-coalition and negative for the pro-coalition in the first three periods. The positive and negative slope in the first period incorporate the onset of the dispute: the debate was rather technical in the beginning and became more and more politicized, which should be reflected in both coalitions' documents (from technical reports to policy narratives). With increasing likelihood

for the adoption of stricter fertilizer regulation, we can expect a decreasing trend for the contra-coalitions' ratio of containing to expanding frames and in their ratio of heroes to villains. Simultaneously, we should observe an increasing trend in both ratios for the pro-coalition. Theoretically, the curves are expected to cross as soon as the pro-coalition perceives a win on the policy issue more likely than the contra-coalition. The ratios should then remain positive for the pro-coalition and negative for the contra-coalition as long as the former feels likely to defend the stricter fertilizer regulation and the latter unlikely to liberalize the legal provisions.

The quantitative analysis of coalitions' use of characters was complemented by a more qualitative discourse network analysis, which should contribute to an increased understanding of how coalitions deploy characters to expand or contain the scope of conflict. To this end, the coding of characters captured how the actors combined different villains with victims and heroes with beneficiaries (see Figure 2.3 for a visualization). Based on the collected data, *bipartite networks* were derived for the coalitions separately to investigate which villainous and heroic causal relationships both coalitions predominantly deployed. A first set of these networks contains villains in rows and victims in columns (villainous) and a second set consists of heroes in rows and beneficiaries in columns (heroic). In all of these networks, two characters are linked by an edge if they were co-referenced by at least one actor. The more often two characters were co-referenced, the higher their edge weight. *Bipartite network graphs* visualize the use of villainous and heroic relationships for both coalitions separately.

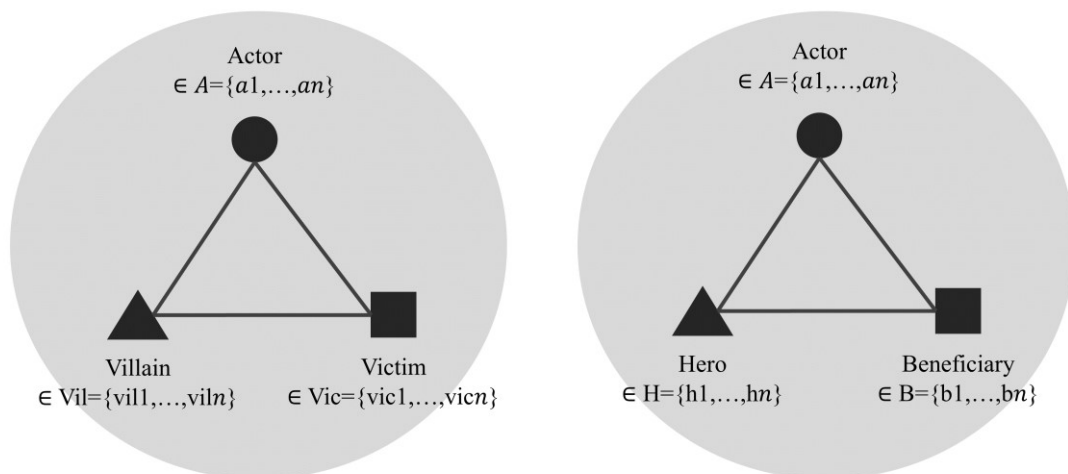


Figure 2.3. Visualization of character coding

To check whether members within coalitions differed in their use of characters, the final part of the analysis investigated *one-mode congruence networks* derived separately for both coalitions, where actors are linked by an edge if they used at least one identical character. The more often two actors deployed identical characters in their policy narratives, the higher their edge weight. Thus, the edge weights not only incorporate the number of identical characters two actors used within a period, but also

how frequently they co-referenced identical characters. The final edge weights were normalized by average-activity to control for different levels of activity. Computation of the networks' *density* and *modularity* allows for evaluating how cohesive coalitions are in their use of characters. Density is a measure used to capture how strongly connected actors are in a network. It is obtained by dividing the number of edges present in a network by the maximum possible number of edges in a network. The higher the density, the more connected a network is, and in this case, the more cohesive a coalition is in its use of characters. Since the density measure does not consider edge weights, the networks' modularity was computed as well. Cohesive coalitions are characterized by the absence of any clusters of actors within the coalition. Thus, a low modularity score can be interpreted as an indication of high cohesiveness.

2.5 Results

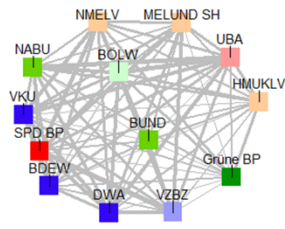
This section first reports the findings on the coalition formation within the policy subsystem (hypotheses 1a – 1c) and then presents the results of the analyses of actor coalitions' use of narrative strategies (hypotheses 2a – 3c).

2.5.1 Coalition formation and participation in the public debate on fertilizer regulation

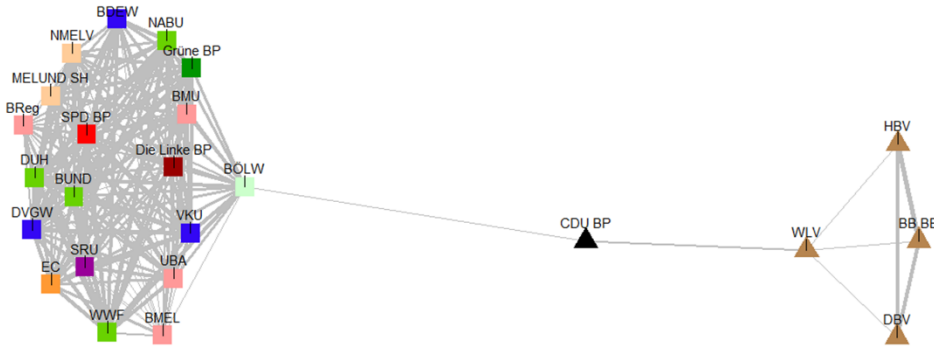
The results of the discourse network analysis on coalition formation show that the German public debate on agricultural nitrate pollution of freshwater between 2010 and 2020 was characterized by increasing polarization over time and the formation of two adversarial actor coalitions. Figure 2.4 visualizes the actor networks in each period by plotting the actors as nodes and their degree of similarity as edges in a two-dimensional space. The thicker the edges, the greater two actors' similarity. Node colors indicate an actor's affiliation, such as environmental or agricultural organization. The shape of nodes (rectangles and triangles) visualizes the results of the cluster analysis.

Figure 2.4 shows that actors cluster into two densely connected groups with only a few similarity edges between the clusters in all of the four periods. The visually identified groups concur with those determined by the cluster analysis. The group plotted on the left-hand side in each graph was in favor of stricter regulation on fertilizer use in agriculture and will subsequently be termed the *pro stricter fertilizer regulation coalition*. The coalition mostly consisted of environmental organizations, water associations and the Green party. In addition, some governmental actors at the state, federal and European level as well as center-left and leftist parties joined the coalition over time. The group plotted on the right-hand side opposed stricter regulation and thus will be referred to as the *contra stricter fertilizer regulation coalition*. The coalition predominantly consisted of farmer associations. Interestingly, the coalition grew over time: new established farmer associations, such as the *LSV* or *Freie Bauern* (former *BB BB*) and political parties including the *CDU*, *FDP*, and *AfD* join the coalition. The first two parties are no surprise since the *CDU* has always been farmers' main political representative and the neo-liberal *FDP* usually opposes stricter state regulation (Tosun, 2017). The *AfD* joined farmers' side to win the votes of frustrated former *CDU* and *CSU* supporting farmers (FAZ, 2020a, 2020b).

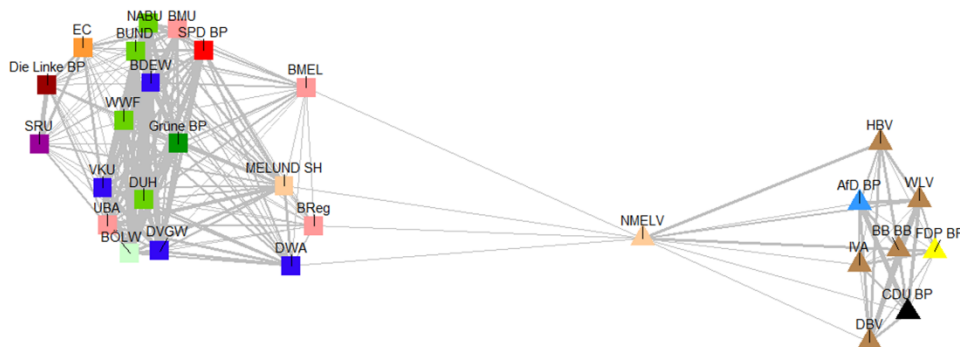
First period: 01.01.2010 – 30.06.2014



Second period: 01.07.2014 - 31.03.2017



Third period: 01.04.2017 – 24.07.2019



Fourth period: 25.07.2019 – 31.12.2020

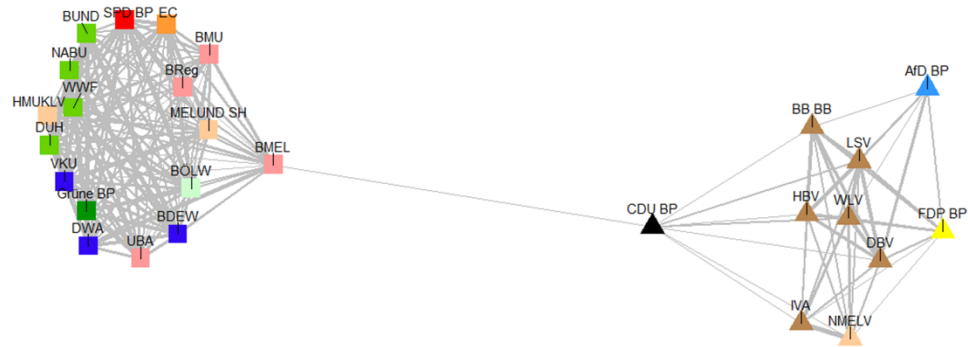


Figure 2.4. Actor coalitions determined through discourse network analysis. Note: The graph shows subtract actor networks normalized by average activity. See Table A.1.1 for full list of actors.

Both coalitions were mostly congruent in their beliefs with only a few deviations (see Table A.1.2 and Table A.1.3 in Appendix A.1 for a detailed overview on actors' articulated beliefs). The deviations mostly concern governmental actors. The BMEL plays a special role here since it is responsible for drafting regulation on the issue and was led by CSU and CDU between 2010 and 2020. On the one hand, the BMEL has always leaned towards farmers' interests when led by one of these two parties since farmers represent an important part of their electorate (Tosun, 2017). On the other hand, increasing pressure by the EC to tighten regulation on fertilizers seems to have affected the BMEL's position on the issue. The ministry further tended to take ambiguous positions in the second half of the observation period, where it appeared as a *policy broker* rather than a member of any of the two coalitions. Research on policy brokerage has shown that these actors are distinct from other actors. They tend to moderate between adversarial coalitions with an interest in reaching feasible policy outputs (Christopoulos & Ingold, 2015).

The results of the discourse network analysis further indicate that the policy subsystem was characterized by increasing polarization. First, the computed modularity score for the whole network increases over time (0.17, 0.18, 0.31, 0.37). Second, actors mostly stayed within their coalition. The state ministry for agriculture of Lower Saxony (NMELV) was the only exception. The state ministry changed sides in the third period, which can be explained by a change in government in Lower Saxony in November 2017. The state ministry had been in charge by the Greens and was then led by the CDU after the election.

The identified coalitions differed in how strongly they participated within the debate. Figure 2.5 reports the number of newspaper articles and press releases published by both coalitions over time. Press releases published by the pro-coalition increased over time until March 2020 and clearly outnumbered those of the contra-coalition (383 to 171 press releases). Both, the higher number of press releases published by the pro-coalition and the larger number of actors present in the debate at the onset of the conflict, provide support for hypothesis 1a, which expected the coalition challenging the status quo to resort to the arena of public debate more strongly.

The number of press releases published by the contra-coalition increased significantly with the start of the fourth period in July 2019, and even outnumbered those of the pro-coalition in the first half of 2020. Figure 2.4 already showed that the contra-coalition grew in members over time. Both observations support hypothesis 1b, which expected the contra-coalition to increase its level of participation in the public debate with increasing likelihood to lose on the policy issue. However, the pattern for the pro-coalition is not as clear. Although their number of press releases decreased in the fourth period, the coalition still participated actively in the debate. Thus, support for hypothesis 1c is only limited, which expected coalitions to reduce their level of participation in the public debate in response to an increase in the likelihood to win on the policy issue.

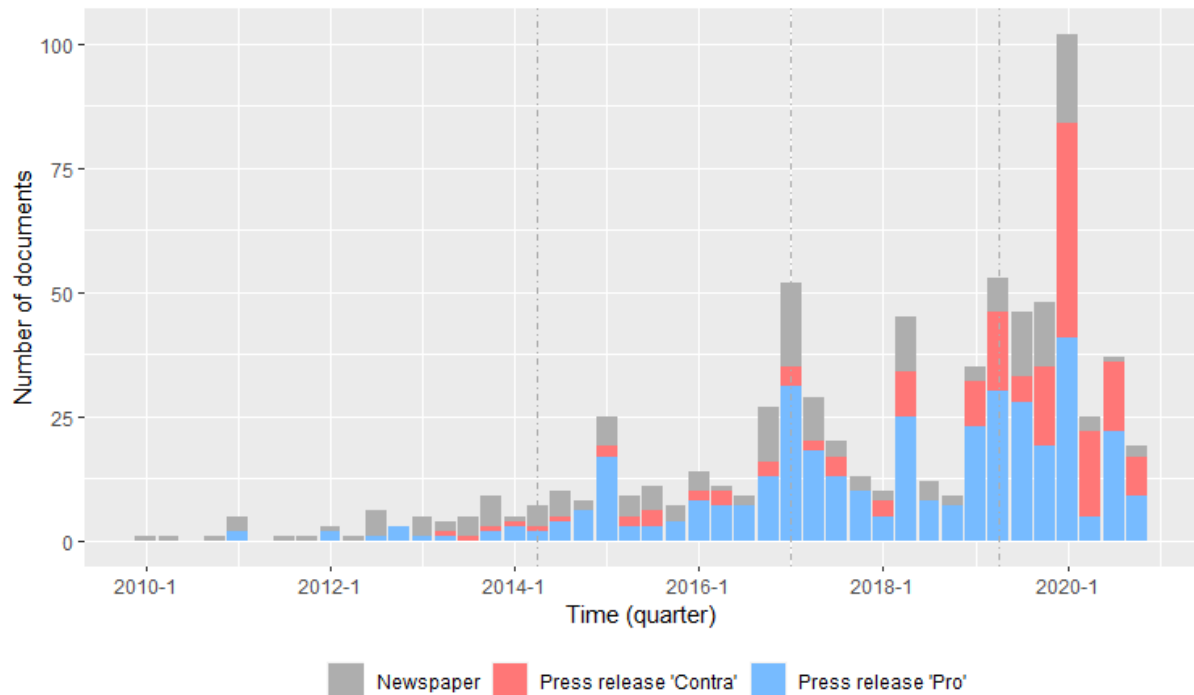


Figure 2.5. Change in salience of the policy issue indicated by news coverage and the number of press releases published by the actor coalitions.

Note: The vertical dash lines indicate the end of each period.

To summarize, two adversarial coalitions formed in the public dispute on agricultural nitrate pollution of water, who mobilize for and against stricter fertilizer regulation. The various political actors can be assigned clearly to either of the two coalitions, except for governmental actors who tended to be less consistent in the articulation of their policy beliefs. The contra-coalition participated less actively at the onset of the dispute, which confirms hypothesis 1a. In line with hypothesis 1b, the contra-coalition then increasingly resorted to the public debate with increasing likelihood to lose on the issue. The pro-coalition reduced its level of participation in the debate only moderately despite the increased likelihood to win, which supports hypothesis 1c only to some extent.

2.5.2 Narrative strategies

The second empirical part of this study investigates the narrative strategies employed by the previously identified coalitions. By doing so, it only investigates the narrative strategies of non-governmental actors of both coalitions. The decision to exclude governmental actors (such as the EC, federal or state ministries) has been made based on the findings of a first preliminary empirical analysis, which suggested that governmental actors behave differently regarding their narrative strategies. In contrast to non-governmental actors, the results suggested that governmental actors tend to contain the scope of conflict, by predominantly using containing frames and heroic causal relationships, independent of their coalitional membership, i.e. their policy beliefs and preferred policy outcome. One reason could be their responsibility for dealing with the policy issue and, therefore, an incentive to narrate a plot of control, where they overemphasize their role as successful problem-solvers, diffuse their actions' benefits and

concentrate any associated costs, to cast a good light on their own actions. In addition, results of the analysis on coalition formation already suggested that governmental actors tend to articulate their policy beliefs less consistently and might pursue different aims, such as reaching achievable policy compromises. Finally, the decision is substantiated by a recent contribution by Weible et al. (2020) who argue for a differentiation between distinct types of coalition members. In this sense, the study focuses on the behavior of principal coalition members in the subsequent analysis.

Cost-Benefit-Frames used to contain or expand the scope of conflict

The first part of the analysis of coalitions' narrative strategies investigates their use of cost-benefit frames to either contain or expand the scope of conflict. Hypotheses 2a–2c expect coalitions to differ in their use of frames dependent on the likelihood to win on the policy issue, where a likelihood to win is associated with containing frames and a likelihood to lose with expanding frames. Table 2.3 gives an initial overview on coalitions' use of frames by reporting their absolute number and relative frequency for both coalitions separately for the whole observation period.

Table 2.3. Cost-benefit frames used by the two coalitions

	<i>Contra</i>		<i>Pro</i>	
	<i>stricter regulation</i>		<i>stricter regulation</i>	
	Σ	%	Σ	%
<i>Diffuse costs of stricter regulation</i>	70	72.2	0	0
<i>Concentrate benefits of stricter regulation</i>	3	3.1	0	0
<i>Diffuse benefits of liberalization</i>	1	1.0	0	0
<i>Concentrate costs of liberalization</i>	23	23.7	0	0
<i>Diffuse costs of liberalization</i>	0	0	194	86.6
<i>Concentrate benefits of liberalization</i>	0	0	5	2.2
<i>Diffuse benefits of stricter regulation</i>	0	0	20	8.9
<i>Concentrate costs of stricter regulation</i>	0	0	5	2.2
<i>Sum</i>	<i>97</i>	<i>100</i>	<i>224</i>	<i>100</i>

Note: The table reports the absolute number of frames and their relative frequency for both coalitions separately.

In general, both coalitions used frames according to their preferred policy outcome (liberalization vs. stricter regulation). Members of the contra-coalition diffused the costs of stricter regulation (72.2% percent of their frames) and concentrated its benefits (3.1%). For instance, the LSV diffused the costs of stricter fertilizer regulation to the German population when it wrote in March 2020 at the onset of the COVID-19 pandemic: “The revision of the fertilizer ordinance must be stopped. It would lead to a situation where farmers can no longer guarantee basic food supplies.” The Freie Bauern concentrated the benefits of stricter regulation by stating in May 2020: “Svenja Schulze [...] is part of the Federal Government, which systematically disadvantages domestic agriculture for the benefit of industrial

export interests.” On the other hand, the contra-coalition diffused the benefits of liberalization (1%) and concentrated its costs (23.7%). An example for the diffusion of benefits of liberalization is the following statement by the DBV in January 2015: “The ‘sweeping demonization’ of nitrogen fertilization is not helpful. Nitrogen makes an important contribution to world nutrition.” The predominant way in which the coalition downplayed the costs of liberalization was to narrow nitrate pollution down to few geographical areas. For instance, the Freie Bauern stated in August 2019: “Tightening fertilizer regulation is not necessary for more than 95 percent of German agricultural land. Only a few selected regions with high livestock density need to be looked at more closely.”

Members of the pro-coalition diffused the costs of liberalization (86.6%) and concentrated its benefits (2.2%). For instance, Alliance ‘90/The Greens diffused the costs of nitrate pollution by writing in August 2017: “According to a study by the UBA, nitrate concentration limits in drinking water are often only achieved through costly water treatment. Ensuring clean drinking water involves costs to society of up to 25 billion euros per year. If we do not counteract nitrate pollution, we will all pay the price.” An example for concentrating the benefits of liberalization was also provided by the Green Party, which stated in July 2018: “The interest of factory farmers may not have higher priority than water protection.” On the other hand, the pro-coalition diffused the benefits of stricter regulation (8.9%) and concentrated its costs (2.2%). An example for the diffusion of the benefits of stricter regulation was provided by the SPD in March 2020: “Today, the Bundesrat approved the necessary revision of the fertilizer ordinance [...], and, thereby, set the course for the sustainable supply of clean drinking water.” The DUH concentrated the costs of stricter fertilizer regulation by stating in June 2020: “Implementing the new fertilizer legislation will cost German agriculture only a fraction of the penalty Germany would have had to pay in case of a second EU infringement procedure.”

Table 2.3 shows that both coalitions predominantly used expanding frames (contra-coalition: 75.3%; pro-coalition: 88.8%) and substantially less frequently containing frames (24.7% and 12.2%). With this in mind, the subsequent analyses show that differences between coalitions and changes over time are mostly related to how strongly both coalitions used expanding frames in their press releases.

The analysis of coalitions’ use of frames mostly support the theoretical expectations of hypotheses 2a, 2b and 2c. Both coalitions differed in their ratio of containing to expanding frames and adapted their use of frames in response to changes in the likelihood to win or lose. Figure 2.6 plots the mean ratio of containing frames to expanding frames within actors’ press releases in each period for the two coalitions separately. As expected by hypothesis 2a, the pro-coalition’s narratives were more strongly characterized by expanding than containing frames at the onset of the conflict, which is indicated by the negative ratio in the first period. Over time, the pro-coalition increased the ratio of containing frames to expanding frames, which is in line with the expectation of hypothesis 2c on changes in response to an increasing likelihood of winning. However, the pro-coalition continued to use more expanding than containing frames in the fourth period, despite the change in likelihood to win on the issue. This is not

in line with hypothesis 2a, which expected the pro-coalition to predominantly use containing frames as soon as it is more likely to win on the issue.

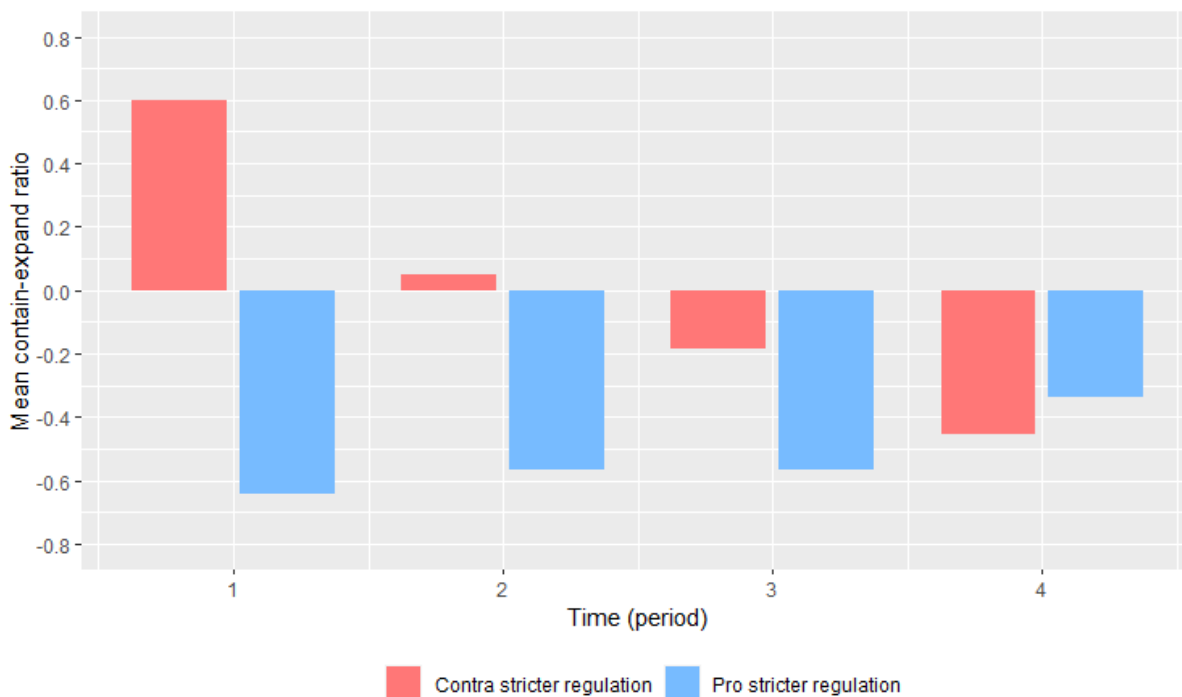


Figure 2.6. Coalitions' use of expanding and containing frames in each period.

Note: The graph reports mean ratios of containing frames to expanding frames within documents per period.

The results of the conducted t-tests mostly confirm the observed differences between coalitions (see Table A.3.2 in Appendix A.2 for details on the test results). In the first period, the contra-coalition had a statistically significant higher ratio of containing frames to expanding frames compared to the pro-coalition ($p < 0.01$). The difference in means remained statistically significant in the second and third period (both $p < 0.01$). Only the small difference in the fourth period is not statistically significant ($p > 0.1$).

Figure 2.7 gives a more detailed insight into coalitions' use of frames over time. More specifically, it plots smoothing lines for each coalition based on the ratio of containing frames to expanding frames per document aggregated by month. The smoothing lines were estimated by applying the non-parametric LOESS (locally estimated scatterplot smoothing) method, which is commonly used to find a curve of best fit in time-series data. The graph already shows that the empirically estimated lines resemble the theoretically derived and approximately drawn curves in Figure 2.2 quite well. The two lines diverge in the first period and then cross in the fourth period.

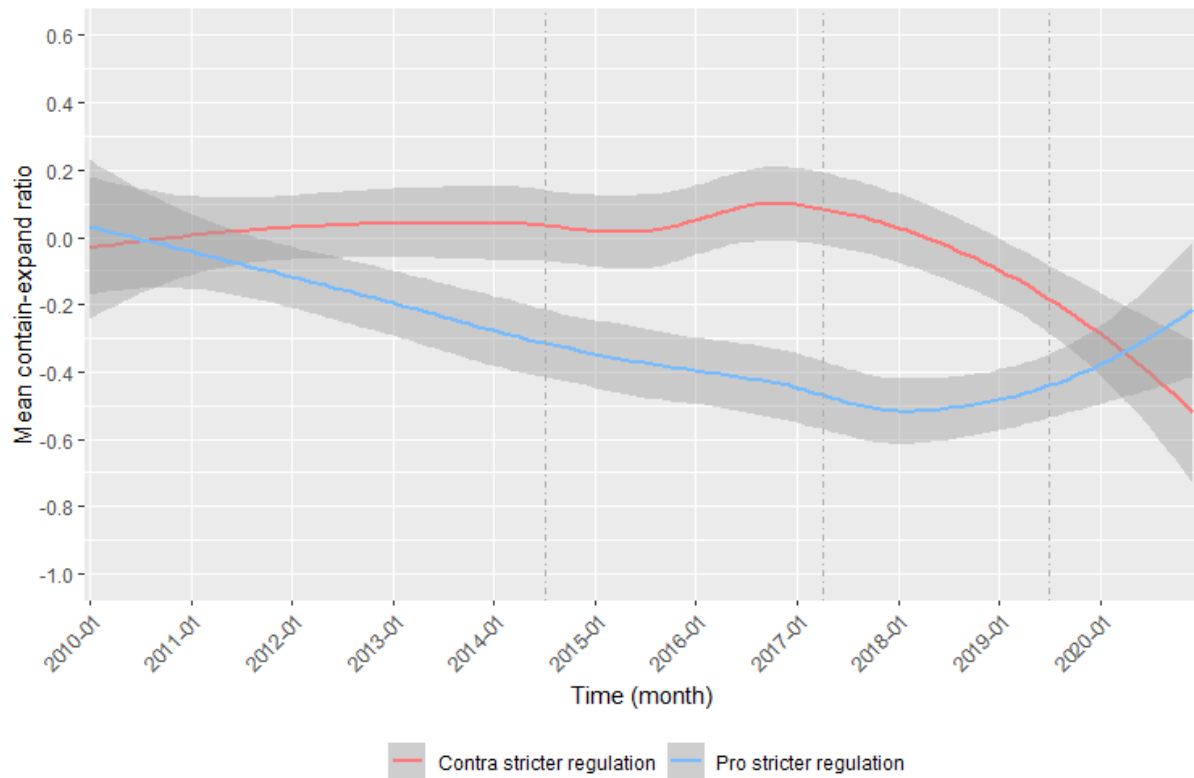


Figure 2.7. Changes in coalitions' use of cost-benefit frames over time.

Note: The graph reports smoothing lines estimated by using the non-parametric LOESS (locally estimated scatterplot smoothing) method based on mean ratios of containing to expanding frames within documents per month. The grey shaded areas around the lines represent 90% confidence intervals.

Results of the Mann-Kendall-Trend Tests based on the monthly time series-data confirm the observed changes in frame use over time for both coalitions and substantiate the findings on hypotheses 2b and 2c (see Table A.3.1 in Appendix A.2 for detailed results). Regarding the pro-coalition, the trend test suggests a statistically significant negative trend in the first two periods ($p < 0.01$). The coalition's use of frames changed in the third and fourth period, indicated by an increase in the ratio of containing frames to expanding frames ($p < 0.1$). In fact, the coalition reduced their use of expanding frames per document in these periods (see Figure A.3.1 in Appendix A.2) whereas the level of containing frames remained about equal (see Figure A.3.3 in Appendix A.2). The turn in the third period aligns well with hypothesis 2c. The first ruling by the CJEU in June 2018, which found Germany to be in breach of its obligations in implementing the nitrate directive, and the official warning letter sent from the European Commission in July 2019 increased the likelihood for stricter regulation significantly. In accordance with these events and the increased likelihood to win on this policy issue, members of the pro-coalition decreased their efforts to expand the policy issue.

Regarding the contra-coalition, Figure 2.7 suggests that the ratio of containing frames to expanding frames remained constant around 0 in the first two periods, indicating no clear tendency towards containment or expansion. The Mann-Kendall Trend Test confirms the absence of a negative or positive

trend in these first two periods ($p > 0.1$). This is not in line with hypothesis 2a and the previous observation of a strong use of containing frames in the first period. One reason for the deviation could be the low number of observations in this period (only five press releases for the contra-coalition). Nevertheless, there is support for hypothesis 2b: the smoothing line in Figure 2.7 points to a turn in the coalition's use of frames already at the end of the second period, followed by a negative trend in the ratio ($p < 0.01$). The decrease in the ratio of containing frames to expanding frames in the last two periods is both due to an increase in the use of expanding (see Figure A.3.1 in Appendix A.2) and a decrease in the use of containing frames per document (see Figure A.3.1 in Appendix A.2). Thus, the contra-coalition responded to an increasing likelihood to lose on the policy issue as expected by hypothesis 2b.

To summarize, there is support for hypotheses 2b and 2c: both the coalition mobilizing for stricter regulation and the coalition advocating liberalization adapted their use of frames in accordance with the likelihood to win or lose on the policy issue. Evidence for hypothesis 2a is mixed: both coalitions did not predominantly use containing frames during phases in which they were expected to perceive a higher chance of winning. Rather, it appears that both coalitions differed in how strongly they resorted to expanding frames dependent on how likely they were to win or lose on the issue.

Use of characters to contain or expand the scope of conflict

The second part of the analysis of coalitions' narrative strategies investigates their use of villains and heroes to either contain or expand the scope of conflict. Figure 2.8 plots the mean ratio of heroes to villains within actors' press releases in each period for the two coalitions separately.

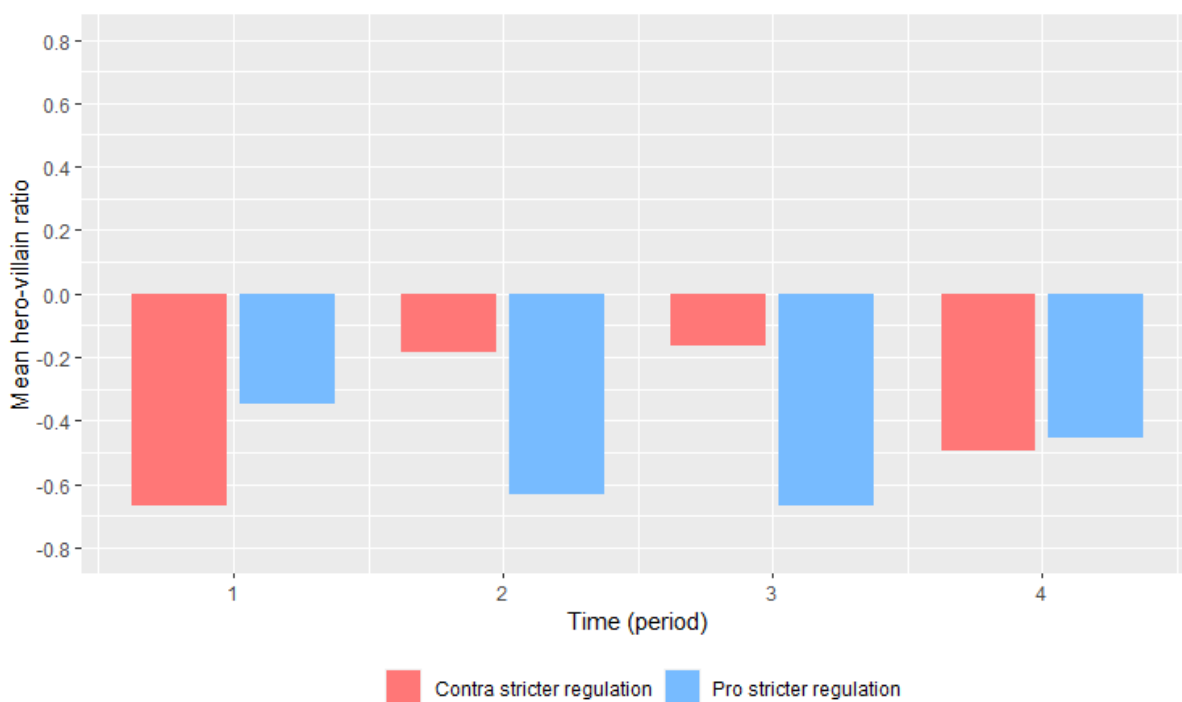


Figure 2.8. Coalitions' use of heroes and villains in each period.

Note: The graph reports mean ratios of heroes to villains within documents per period.

The policy narratives were generally characterized by a devil shift: both coalitions predominantly used villains in all periods. This is contrary to hypothesis 3a, which expected the coalition with a higher likelihood of winning to use predominantly heroic causal relationships (angel shift). Similar to the cost-benefit frames, coalitions rather differed in how strongly they populated their narratives with villains, dependent on how likely they were to win on the issue (see also Figure A.4.1 and Figure A.4.3 in Appendix A.4 for differences in mean numbers of villains and heroes per period). In general, both coalitions used heroes only rarely compared to villains (see Figure A.4.2 and Figure A.4.4 in Appendix A.4 for absolute numbers of villains and heroes in each period).

When looking at the differences between coalitions, the mean hero-villain ratios observed in the last three periods are in principle in line with hypothesis 3a: The pro-coalition resorted more strongly to villains in the second and third period compared to the contra-coalition, which corresponds with its lower likelihood to win on the issue at this time. The observed differences in means are statistically significant ($p < 0.01$) in these two periods (see Table A.4.1 in Appendix A.4 for full results). In accordance with the higher likelihood to lose on the policy issue in the fourth period, the contra-coalitions' policy narratives became more villainous. In contrast, those of the pro-coalition changed to being less villainous compared to the previous period. Consequently, both ratios converged with no statistically significant differences ($p < 0.1$). Only the first period does not fit the expectations, where the observed difference in this period is counter-intuitive: the contra-coalition should have been more likely to win and, therefore, less frequently blame its opponents in their narratives than the pro-coalition. However, the number of observations in this period is small (as we know already from the analysis of cost-benefit frames) and the t-test is not statistically significant ($p > 0.1$). Thus, the observed difference is likely a result of random chance.

Figure 2.9 provides more detailed insight into coalitions' use of characters over time by plotting smoothing lines for each coalition based on the monthly mean ratio of heroes to villains, similar to Figure 2.7 in the analysis of cost-benefit frames. Results of the Mann-Kendall Trend Tests on the monthly data mostly confirm the changes in coalitions' use of villains and heroes over time as expected by hypotheses 3b and 3c (see Table A.4.2 in Appendix A.4 for full results). When looking at the pro-coalition separately, Figure 2.9 shows a negative trend in the hero-villain ratio in the first two periods, which is confirmed by the trend test ($p < 0.01$). The pro-coalition used more villains than heroes pointing towards an increasing level of antagonism, which is aligned with the coalition's lower likelihood to win on the issue. Members of the coalition were especially dissatisfied with the revision of the fertilizer ordinance in March 2017 and consequently disseminated many villainous press releases around this time. The pro-coalition then changed its behavior in the third period. From 2018, the trend became positive indicating decreasing levels of antagonism over time ($p < 0.01$). At that time, the coalition's likelihood to win on the issue increased considerably through the CJEU's decision against Germany and

later through the EC's threat to open a second infringement procedure. Thus, this change in the pro-coalition's use of characters aligns well with hypothesis 3c and coincides with its change in the use of cost-benefit frames at the same time as observed before.

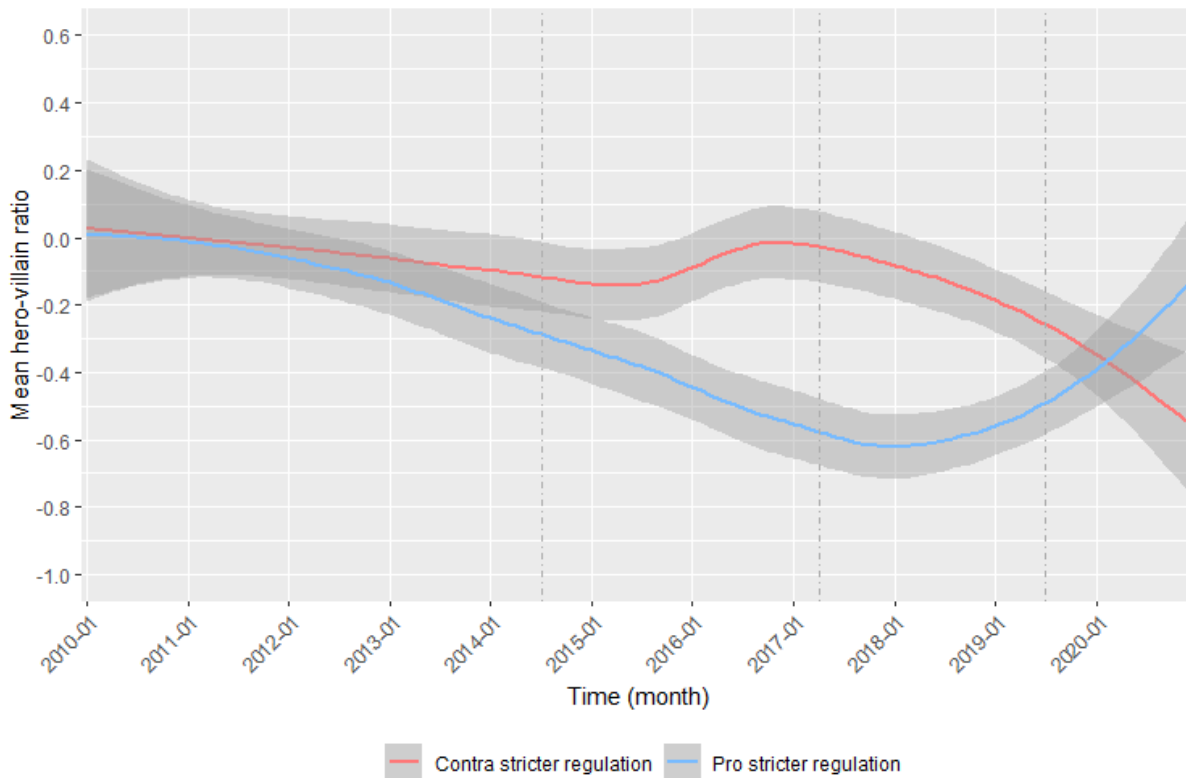


Figure 2.9. Changes in coalitions' use of characters over time.

Note: The graph reports smoothing lines estimated by using the non-parametric LOESS (locally estimated scatterplot smoothing) method based on mean hero-villain ratios within documents per month. The grey shaded areas around the lines represent 90% confidence intervals.

Regarding the contra-coalition, Figure 2.9 also suggests a negative trend in the first period, followed by an upward trend in the second period. The results of the Mann-Kendall Trend Test point toward a negative trend within the first two periods ($p < 0.05$), which is not in line with the theoretical expectations. This finding rather indicates an increasing level of antagonism for the contra-coalition simultaneous to an increasing level of polarization of the debate. Complementary to the change in the pro-coalition's behavior, the Mann-Kendall Trend points towards a proceeding negative in trend in the contra-coalition's hero-villain ratio within the last two periods ($p < 0.01$). Thus, the contra-coalition disseminated increasingly villainous policy narratives in response to increasing likelihood to lose on the issue, which aligns well with hypothesis 3b.

To summarize, coalitions' use of characters was similar to their use of cost-benefit frames. Both coalitions predominantly used villains and only occasionally heroes, i.e. they only resorted to the devil shift. Thus, there is no support for hypothesis 3a regarding its expectation on the angel shift. Nevertheless, the results suggest that coalitions differed in how strongly they used the devil shift

depending on the likelihood to lose or win on the issue. In addition, both coalitions adapted their use of characters over time, which supports hypotheses 3b and 3c.

Qualitative analysis of coalitions' use of characters

Complementary to the quantitative analysis of coalitions' use of characters, this part of the empirical analysis sheds light on how coalitions differed qualitatively in their use of characters. It focuses on the villain-victim relationships due to the low occurrence of heroes and beneficiaries (for the sake of completeness, see Figure A.4.6 and Figure A.4.7 in Appendix A.4 for a visualization of hero-beneficiary relationships). The analysis of these relations is insightful since it shows how the two coalitions try to win different target groups' favor in their aim to expand the scope of conflict.

Figure 2.10 and Figure 2.11 show bipartite network graphs for each period to visualize how the two coalitions used villains and victims in their narratives to blame opponents and emphasize how they harm various target groups⁶. Percentages reported on the left-hand side of each graph denote how frequently a coalition named a certain actor or category as a villain. Analogously, percentages on the right-hand side of each graph report the frequency of named victims. The size of the interacting area between a villain and victim pair indicates the frequency of their combination. To give one example on how to read the figures, the graph in the upper-left corner in Figure 2.10 shows that in the first period members of the pro-coalition most frequently blamed *intensive agriculture* for causing harm (42.1%) to *drinking water* resources, *surface water*, *groundwater*, *ecosystems*, and *farmers*⁷. On the other hand, the pro-coalition most frequently pointed to harm caused to *drinking water* resources (31.6%) by *intensive agriculture* and *farmers* in general. The bars and interacting areas are colored by the type of the associated victim.

When looking at the pro-coalition's use of villainous causal relationships in Figure 2.10, it is apparent that its members addressed two specific target groups to increase attention on the issue: citizens and farmers. Gaining stronger citizen support can be influential, either directly through a larger vote share in an upcoming election or indirectly through public opinion, which may influence the behavior of decision makers (McCombs & Valenzuela, 2021; Soroka & Wlezien, 2009). One way coalition members tried to win citizen attention was highlighting the risks posed to drinking water resources and associated health issues. For instance, the Greens stated in January 2019: "The protection of groundwater and, thus, human health, needs highest priority. The inaction by Julia Klöckner is irresponsible."⁸

⁶ Oftentimes, actors refer to superordinate categories as characters rather than to specific actors. These categories are marked by hashtags in front of the denomination, e.g. *#intensive agriculture*, *#groundwater* or *#biodiversity*.

⁷ The coalition argues that intensive agriculture threatens farmers' own means of existence by polluting water and soil and harming ecosystems.

⁸ Groundwater represents the most important source for drinking water in Germany Umweltbundesamt (2019a).

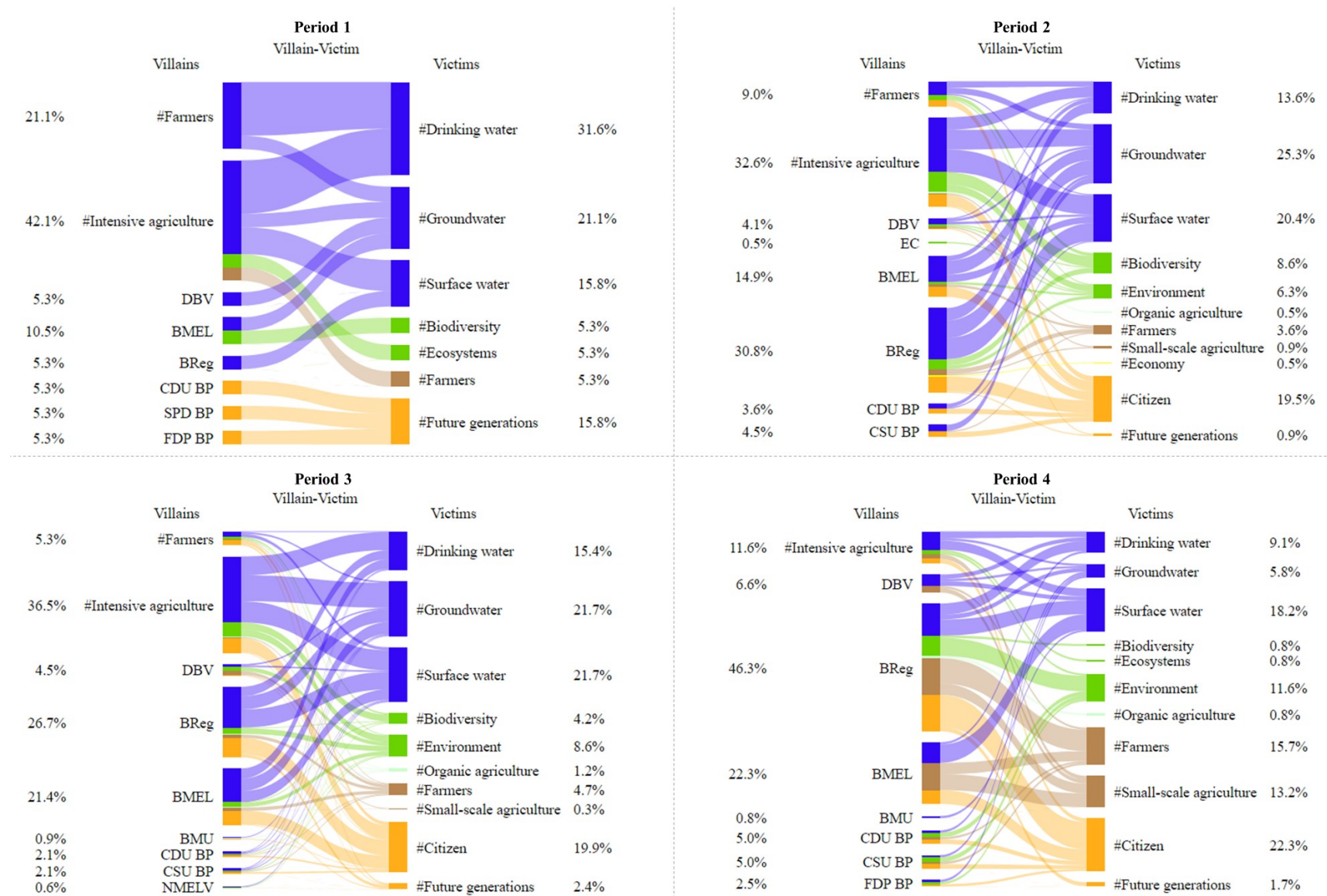


Figure 2.10. Use of villains and victims by the pro-coalition. Note: See Table A.1.1 in Appendix A.1 for full list of actors.

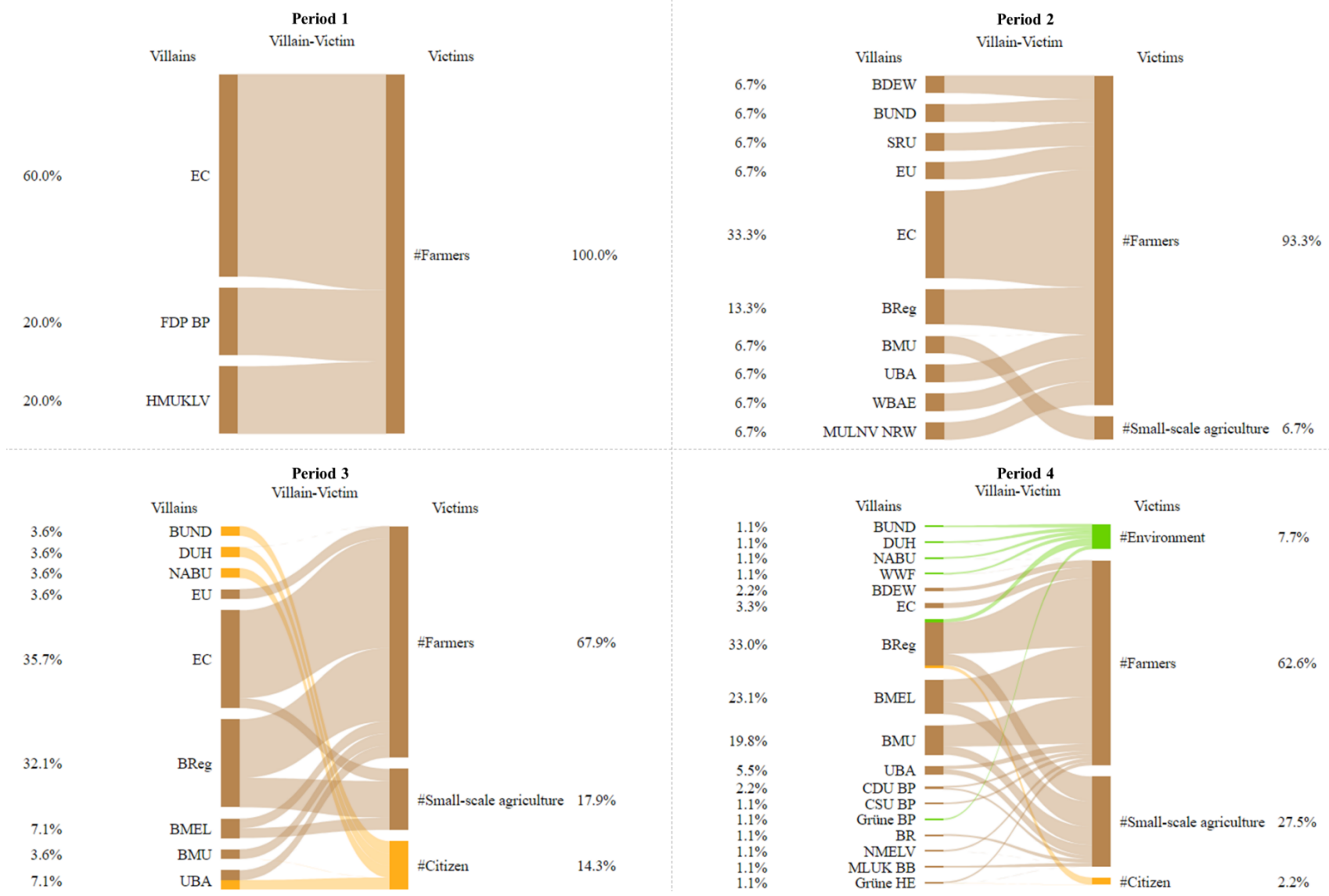


Figure 2.11. Use of villains and victims by the contra-coalition. Note: See Table A.1.1 in Appendix A.1 for full list of actors.

Another way was to highlight the financial burden taxpayers carry for securing high quality drinking water and the costs they would have had to pay in case of a second decision by the CJEU against Germany. For instance, the BUND stated in October 2014: “Overuse of fertilizers in intensive agriculture already results in up to 25 billion euros yearly to secure clean drinking water. These external costs produced by industrialized agriculture are currently not paid by the polluter but by the consumer. There will be millions of Euros of additional penalty payments to be paid to the EU if the federal government and the states continue breaching European water protection law.” A third way to address citizens was to stress the importance for future generations, which made the issue personally relevant for many citizens (many have children, will have grandchildren, etc.). The BDEW, for example, mobilized for a significant change in fertilizer regulation in March 2019 by stating: “Every approach, which only aims at repair in waterworks, is at the expense of future generations. For this reason, we need effective fertilizer legislation and strict monitoring of its compliance.”

Apart from citizens, members of the pro-coalition appealed to farmers in small-scale agriculture. At first, this seems counter-intuitive. However, members of the pro-coalition, e.g. the Green Party, argued that farmers’ livelihoods were not necessarily threatened by stricter fertilizer regulation, but by the sudden need to adapt their farming practices to new regulations, which, in their view, was only caused by the continued inaction of the federal government to transpose the ND into domestic law. For instance, the Green party declared in June 2018: “The federal government has given in to the insinuations by the agricultural lobby represented by the DBV and the Union [CDU and CSU] for years and nothing has happened. Instead, the federal government has been putting off the problems and has even ignored scientific advice on how to improve fertilizer regulations. Now the consequences of this mistaken policy become apparent: Taxpayers and those farms, who contributed to the protection of the environment and groundwater through professional and responsible practice, are now paying the price.” Farmers mentioned in this statement included those in organic agriculture. Thus, the Green party was joined by the BÖLW, Germany’s main representative of organic agriculture. The organization stated in January 2020: “We are sick of the ministry of agriculture’s tokenism! The federal government is responsible for the death of farms [Höfesterben] and the frustration in rural areas. 130.000 farms had to close down since 2005 when Angela Merkel became chancellor – this is on average one family farm per hour.” When looking at the portrayal of villains, the pro-coalition mostly conveyed a clear picture of whom it regarded responsible for the harm caused to citizens, farmers, water quality and the environment: intensive agriculture and the DBV on the one hand and the influence of CDU and CSU in the federal government, especially in the BMEL, on the other hand. This was mostly consistent over the four periods.

Finally, the pro-coalition was also very cohesive in how it blamed villains for harming victims. Modularity in the derived one-mode congruence networks is very low with a modularity score around zero in all periods suggesting no significant differences between members of the coalition (see Table A.4.3 in Appendix A.4 for detailed results). High levels of density support the impression of high

cohesiveness. The density levels are a bit lower in the first and fourth period, which is mostly due to outliers who only rarely used villains or victims in their press releases and share no edges with any other members of the coalition.

Figure 2.11 visualizes the use of villains and victims by the contra-coalition. The frequencies reported in the first two periods need to be interpreted with caution due to a comparatively small number of villains and victims in these two periods. Overall, members of the contra-coalition mostly focused on farmers when portraying the harm caused to victims by villains. Since farmer associations represented most members of the contra-coalition, this is not surprising. Nevertheless, there is an interesting change over time: the coalition increasingly focused on small-scale agriculture (from 0% to 27.5%). The change is partly due to *LSV*, who formed only in October 2019 as a new organization to represent the interests of small-scale farmers, and the move of *BB BB* to become the nationwide organization *Freie Bauern*, which also is a representative of small-scale farmer interests. In addition, political parties jumped on the bandwagon. One of them was the *FDP*. Agriculture and water protection do not represent key policy fields for the party, which is also indicated by no published press releases on the issue of nitrate pollution before 2019. In October 2019, however, the *FDP* wrote in a press release: “We support the reasonable protests of thousands of farmers. They show how the agricultural policy of both federal ministers [...] threatens to deprive a whole branch of their means of existence and leads to unfair competitive conditions for German agriculture.” The *AfD* was the second party suddenly starting to mobilize for the interests of small-peasant farms at the end of 2018. For instance, they stated in a press release in January 2020: “Especially part-time farmers and the small family farms will not be able to compensate the additional costs resulting from the stricter fertilizer ordinance. There is the threat of a massive structural upheaval, which would be followed by a tremendous concentration process in agriculture. The *AfD* federal parliamentary group clearly professes to take sides with peasant agriculture. Therefore, we clearly refuse the destruction of livelihoods of thousands of family farms through an unfounded tightening of the fertilizer ordinance.”

Members of the contra-coalition also portrayed citizens as victims of stricter regulation, though less frequently and only in the last two periods. Nevertheless, it showed some effort in trying to gain their favor. One occasion is related to the outbreak of the corona pandemic and sudden fears on security of supply. The organization *LSV* wrote in March 2020: “Suspend the drafted fertilizer ordinance. Corona has Germany under control [...]. German agriculture is one of the cornerstones of our society. Even if this has become self-evident and has been perceived unconsciously in the past, supplying the population with high quality food is our very own function. We therefore call on the federal government to shift their focus on agriculture’s role for security of supply, so we will still be able to fulfil our function. Everyone should be aware of the systematic relevance.”

The contra-coalition portrayed mostly three groups as villains. The first one comprised EU institutions and this mostly relates to the *EC*. Over time, there was a shift towards German governmental actors on the federal level, including the *BMEL*, the *BMU* and the federal government in general. The

third group comprised environmental organizations and water associations. Most of these accused villains were part of the pro-coalition. However, there were also occasions where actors were being accused as villains who were part of their own coalition or at least had been allies in the past. One of this relates to a press release by the *Freie Bauern* in March 2020 where they expressed their frustration about the adoption of the new fertilizer ordinance and blamed the CDU for their responsibility in this case.

Nevertheless, the results of the congruence networks indicate a high cohesiveness of the contra-coalition in their use of villains and victims. The modularity is around 0 and the density high in all periods (see Table A.4.3 in Appendix A.4). The density varies more strongly between periods. However, this is very likely due to the small number of observations in the first two periods (only 3 and 5 actors respectively).

To summarize, both coalitions populated their narratives with characters in a way to attract the attention of specific target groups. The contra-coalition mostly appealed to farmers, whereas the pro-coalition focused on gaining citizens' attention. Over time, both coalitions started to compete over the support of small-scale farmers. Finally, both coalitions were very cohesive in their use of villains and victims as a narrative strategy to expand the scope of conflict.

2.6 Discussion

The empirical analysis mostly supports the theoretical expectations on coalition formation and narrative strategies. In this section, the findings are discussed with regard to two strands of literature. The first includes studies on coalition formation in public debates. The second involves literature on policy narratives.

The finding that the coalition in favor of stricter regulation participates more actively in the public debate aligns well with studies on a similar policy issue: the pollution of water by micropollutants. Schaub and Metz (2020) compare coalition formation in discourse and policy networks on a similar German policy subsystem on micropollutants in surface waters. They find that actors with an interest in expanding the scope of conflict are more active in the public debate. Similarly, Schaub and Braunbeck (2020) focus on the German public debate on pharmaceutical residues and find that actors with an interest in containing the scope of conflict, such as the pharmaceutical industry, resort substantially less often to this arena. However, there is also research with different findings. For instance, Leifeld (2013) shows in a study on the German pension reform in 2001 that the public debate in this case was initially dominated by the coalition favoring the policy status quo. An explanation for these differences could be differences in issue salience. Compared to other policy areas, media attention on water protection in Germany has been generally low. In the case of agricultural nitrate pollution, issue salience only increased in the last few years. As Stephan (2020) notes, Schattschneider (1960) already suggested that the dynamics of issue containment and expansion are most likely to occur in policy areas with initially low salience where the start of a widespread debate and increasing public attention would pose a threat

to the policy monopoly. Thus, for those who defend the policy status quo, the incentive to avoid the public debate is greater in policy areas with low salience, compared to salient policy areas where public attention is already high. Regarding changes in participation in the public debate, this study finds that the increase in issue salience and likelihood to lose on the issue coincides with increasing participation by the coalition advocating against stricter fertilizer regulation. This not only fits the theoretical expectations, but is also in line with Weible et al. (2020), who generally expect coalitions to grow in size with increasing salience and level of conflict in a policy subsystem. Empirically, the findings on coalition formation are supported by Vogeler et al. (2021), who apply discourse network analysis to investigate the public debate on agricultural nitrate pollution in a region in northwestern Germany between August 2016 and February 2019. They identify two main coalitions: an agrarian coalition and an environmental coalition, which have very similar actor types compared to those observed at the federal level. Finally, the observed politicization of the German public debate on agricultural nitrate water pollution supports the expectation proposed by Feindt et al. (2020) that in the era of *post-exceptionalism* with increasing priority of environmental protection (Daugbjerg & Feindt, 2017) agricultural politics will become increasingly politicized.

Turning to narrative strategies, the coalitions in this study use both narrative strategies (cost-benefit frames and characters) substantially less frequently to contain the scope of conflict than to expand it. This is not in line with earlier studies on the NPF: McBeth et al. (2007) found that losing coalitions tend to use expanding frames and winning coalitions containing frames in a case study in the US on conflicts over the Yellowstone National Park. Similarly, Shanahan et al. (2013) show in a case study in the US how winning groups in a dispute over wind-farms predominantly use containing frames and the angel shift and losing groups expanding frames and the devil shift. Schlaufer (2018) finds in a Swiss case study that coalitions mobilizing for school reforms tend to use the angel shift whereas those advocating against the reforms resort to the devil shift. However, there are also more recent studies which deviate from this pattern. Merry (2019) finds a predominant use of the angel shift by both winning and losing coalitions in a study on gun control in the US. Other studies do not find associations between winning/losing and containing/expanding strategies (Gottlieb et al., 2018; Heikkila et al., 2014; Stephan, 2020). Nevertheless, many of the studies on the NPF can still identify coalitions based on their narratives. What they have in common is that they can distinguish between coalitions based on their *relative* use of frames and characters. The findings of this study suggest that coalitions differ in how strongly they resort to expanding frames and the devil shift, depending on how likely they are to win or lose on the policy issue.

Similarly to this study, Stephan (2020) observes a predominant use of expanding frames and the devil shift in the Scottish debate on fracking technology. He concludes that efforts of conflict expansion may overshadow those of conflict containment once a political conflict has become *mature* and the debate has gained too much momentum to be closed down. Nevertheless, this does not provide an explanation for the rare use of containing strategies by the contra-coalition at the very beginning of the observation

period in this study. Instead, the low frequency of containing narratives at the onset of the conflict might be better explained by the low participation of the contra-coalition at this stage: members of the coalition seem to try to contain the issue by not participating in the debate rather than by disseminating containing policy narratives.

Although the pro-coalition changes its behavior over time according to its likelihood to win, its sustained high activity in the debate and continued use of expanding frames at the end of the observation period does not fully align with the theoretical expectations. There might be at least two reasons for this. First, the empirical observation period might not consider the full dynamic developments. One can only speculate, but differences between coalitions might become larger after 2020 in case the stricter regulation will persist. The trends observed in both coalitions' use of narrative strategies in the last observation period substantiate this thought. Another explanation is borrowed from Stephan (2020) and Pralle (2006): There is indication that both coalitions are not satisfied with the policy status quo in 2020 and both try to expand the scope of conflict to mobilize for policy change, but in different *directions*: the pro-coalition advocates for even stricter regulation and the contra-coalition mobilizes for a liberalization of the legal provisions.

Overall, there is evidence provided by this study and some of the previous literature that coalitions use different narrative strategies to achieve their policy goals. In this study, this is most apparent by how both coalitions adapt their narrative strategies in response to a changing likelihood to win or lose. Finally, the discourse network analysis of coalitions' use of villains and victims suggests that members of both coalitions are cohesive in their use of narrative strategies. This is line with Shanahan et al. (2013) who also find high intra-coalitional cohesion in the use of narrative strategies.

2.7 Conclusion

This article set out to investigate the policy conflict over agricultural nitrate pollution of freshwater and stricter fertilizer regulation in Germany between 2010 and 2020. More specifically, it investigated whether actor coalitions differ in their participation in the public debate and their use of narrative strategies to influence policy outcomes and whether they adapt their behavior over time in response to changes in the likelihood to win or lose on a policy issue.

The study reveals that the debate on agricultural nitrate pollution of water bodies in Germany became increasingly politicized over the last years. The debate was characterized by an adversarial coalition structure with one actor coalition advocating stricter fertilizer regulation to counter pollution and another mobilizing against the tightening of the regulation. Based on the NPF and early work by Schattschneider (1960) and Baumgartner and Jones (1993), this study suggests that political actors participated strategically in the public debate in their effort to affect policymaking. Both the level of participation and the use of narrative strategies differed between the coalitions. There is strong support that both identified coalitions adapted their narrative strategies over time in response to changes in the likelihood

to win or lose on the policy issue resulting from increasing pressure of the EC to adopt stricter fertilizer regulation.

The article provides several important contributions to the study of the NPF. First, it shows that incorporating the study of strategic participation in public debates into the study of policy narratives contributes to a better understanding of differences in narrative strategies between coalitions, especially at the onset of political conflicts. The theoretical argument on strategic participation is based on Schattschneider (1960) and therefore similar to the NPF's arguments on narrative strategies regarding the scope of conflict. Thus, future studies on the NPF might consider taking up this idea. Furthermore, the article enhances the study of the NPF by more clearly distinguishing between the identification of coalitions and analyzing differences in their narrative strategies. This is achieved through a major methodological contribution. Based on earlier suggestions (Leifeld, 2017; Shanahan et al., 2013; Weible et al., 2016), this study shows that discourse network analysis is a fruitful method to study both coalition formation in a policy subsystem and coalitions' use of policy narratives. Furthermore, the method not only helps identify coalitions systematically based on congruent policy beliefs, it can also be used to elaborate on the relations between actors and narrative elements, and to investigate how cohesively coalitions construct their policy narratives.

Empirically, the study provides a better understanding of the policy conflict between water protection and the agriculture sector in Germany. It shows how mainly two coalitions, one mobilizing for and the other against stricter fertilizer regulation, try to influence policymaking. Furthermore, it provides a systematic analysis of political actors' positions on the issue over the course of a decade.

Despite the insights provided, the study has some limitations. First, the findings are based on a single case study. Therefore, they might be case-specific to some extent. Second, narrative strategies are only investigated for non-governmental actors. Thus, the findings on narrative strategies do not apply to governmental actors. A preliminary analysis suggested that governmental actors generally use containing narratives, independent of their membership in one of the two identified coalitions. Thus, comparing governmental and non-governmental actors in their use of narrative strategies by a future study might be insightful. On a similar note, it might be helpful not only to differentiate between different coalitions, but also between different types of coalition members, dependent on their degree of involvement within a coalition as suggested by Weible et al. (2020). This could as well lead to more nuanced findings on political actors' use of narrative strategies. Third, this study investigates political actors' strategic behavior as a dependent variable. Thus, the findings do not allow any conclusions of a causal association between this behavior and the policy outcomes in the policy-field. However, future research could build on this study and investigate whether political actors' efforts in influencing the policy process also have an effect on policy outcomes.

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3 Salient to whom? The positioning of German political parties on agricultural pollutants in water bodies

*Research article**

Abstract: Scholars have increasingly argued for an integration of policies on agriculture and water due to their strong interlinkage. The entry of agricultural pollutants into water represents one of the main pressures on Europe's ground and surface waters. This not only poses a risk to the environment and human health but also jeopardizes meeting the targets set by the EU Water Framework Directive. Research on the political agenda setting has shown that issue salience is key for triggering policy change. Nevertheless, Germany has repeatedly failed to adopt adequate policy measures despite the salience of the issue among the German public and increasing pressure by the EU. In this study, I shed light on the positioning of political parties in Germany on agricultural pollutants to explain the absence of policy change. More specifically, I ask whether there is an ideological division between political parties that hampers the adoption of effective, integrated policy measures. A qualitative content analysis of election manifestos published between 1998 and 2018 finds that political parties' policy positions are predominantly influenced by their placement on an environmental and an economic ideological dimension. As a result, political parties in Germany advocate conflictive policy approaches, which is detrimental to the adoption of effective policy measures.

3.1 Introduction

Agriculture and water are strongly interlinked, functionally and politically. Not only is the agricultural sector heavily dependent on the availability of water, agricultural activities also have an impact on water quality (Assar et al., 2019; Foley et al., 2005; Tian et al., 2018; Tójar-Hurtado et al., 2017; Yousuf et al., 2018). In fact, intensive agriculture represents one of the main pressures on ground and surface waters (European Environment Agency, 2018; Evans et al., 2019; Feindt et al., 2019: Chapter 3). Pollution of water bodies by nitrate represents one of the biggest water quality issues in Germany (German Environment Agency, 2017). Increasing nitrate concentrations in water bodies, which result from the intensive use of manure as organic fertilizer, are not only harmful to the aquatic ecosystem but also pose a risk to human health (Baker et al., 2017; Parvizishad et al., 2017).

Levels of nitrate concentration in groundwater in Germany have been exceeding legal thresholds set by the European Union (EU) for almost two decades. The European Commission sent an official warning letter to the German ministry of environment in July 2019, requesting a proposal for adequate mitigating policy measures within eight weeks. Failure in compliance would entail a second proceeding before the European Court of Justice, which could result in fines of up to 850,000 € per day (Euractiv, 2019). A first ruling by the court in 2018 found implemented measures and Germany's revision efforts insufficient. Germany has repeatedly breached the *EU Nitrates Directive (ND; Directive 91/676/EEC)*,

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which forms a central part of the *EU Water Framework Directive (WFD; Directive 2000/60/EC)* and represents one of the key instruments in the protection of water bodies against agricultural pollutants (European Commission, 2019). The warning letter in July 2019 thus represents a further step by the European Commission in an ongoing dispute, which potentially now entails costly consequences for Germany.

The case at hand represents an empirical puzzle for several reasons. Environmental policy in the European Union has been strongly influenced by a few member states. Among others, Germany was one of the *green* environmental leader states who shaped EU environmental policy in the 1980s and early 1990s based on their comparatively stringent domestic legislation (Andersen & Liefferink, 1999; Eckley & Selin, 2004; Liefferink & Andersen, 1998; Tosun, 2018). In addition, Germany was the driving force behind the application of the precautionary principle as a binding principle for dealing with uncertain risks, including risks posed by chemicals or other substances to the environment or human health (Tosun, 2013a, 2013b). In other cases, such as brominated flame retardants (BFRs), polychlorinated biphenyls (PCBs), or genetically modified organisms (GMOs), Germany was among the first EU member states to take precautionary measures and issue application bans (Eckley & Selin, 2004; Hartung & Schaub, 2018; Tosun, 2013b; Tosun & Shikano, 2015).

Consequently, one would expect Germany to be one of the leading EU member states in adopting policy measures against nitrate pollution, considering the uncertain risks to human health and the environment. However, this is not the case. For many years, Germany largely ignored the threshold for nitrate concentrations in groundwaters. Only when the EU Commission sent a first letter of formal notice in 2013, urging the German government to implement adequate policy measures, did the German federal government begin revising the German regulation of fertilizers application (Euractiv, 2019; European Commission, 2019). Nevertheless, the revision process has been strongly influenced by Germany's influential agricultural lobby (Nischwitz & Chojnowski, 2019). After its adoption in 2017, the new regulation was largely criticized by environmental organizations and the Greens, Germany's green party, for not being strict enough (Deutscher Bundestag, 2017; NABU, 2018). More importantly, the revision did not satisfy the European Commission, who threatened to initiate a second infringement procedure in July 2019. The European Court of Justice (CJEU) had already ruled against Germany based on the old fertilizer regulation in 2018, which marked the end of the first infringement procedure the EC had initiated in 2013 (European Commission, 2019).

Evidently, the absence of adequate policy outputs has resulted in increasing pressure on Germany to react. Furthermore, the pollution of groundwater by nitrate is not the only issue with regard to agricultural pollutants. Germany not only fails to transpose the ND but also risks failing to achieve the overall objectives of the WFD. In 2015, only 7% of German water bodies were in a good or very good ecological condition, as demanded by the directive. Agricultural pollutants represent one of the main causes for the sub-par ecological conditions of the other water bodies. This is not only due to the entry of nitrate but also due to increasing levels of other agricultural pollutants, among them pesticides,

artificial fertilizers, and pharmaceutical contaminants from veterinary medicine (Bach et al., 2010; German Environment Agency, 2019; Müller et al., 2002).

Furthermore, the level of media attention and public opinion polls point towards an existing salience of the issue in the last couple of years. Comparative politics literature on public opinion has repeatedly shown that the salience of issues to voters has an impact on the policy positions of political parties and ultimately on policy outputs (Soroka, 2003). Results of the eurobarometer, a survey continuously carried out by the European Commission among European citizens, show an existing awareness of the issue. Asked in 2012 on what the main focus should be for safeguarding water resources, 43% of German respondents chose pollution from agriculture as the second most important water quality issue after pollution by the industrial sector (European Commission, 2012). Another eurobarometer carried out in 2014 asked respondents to choose the five environmental issues they considered most important from a choice of ten. In Germany, 54% of respondents picked pollution of rivers, lakes, and groundwater and 35% chose agricultural pollution by pesticides and fertilizers (European Commission, 2014). In 2017, 35% of respondents chose pollution of rivers, lakes, and groundwater and 40% chose agricultural pollution by pesticides and fertilizers when asked to pick the four most important issues (European Commission, 2017). Although these numbers cannot directly be compared, due to the slightly different designs of the survey questions, they nonetheless show that the German public has continuously assigned a certain level of attention and priority to the issue of water quality and agricultural pollution. Nevertheless, it seems as if this attention did not have a strong impact on decision-making.

In a nutshell, Germany has repeatedly failed to adopt adequate policy measures to mitigate pollution by nitrate (European Commission, 2019), pesticides, and other agricultural pollutants, despite the originally leading role it played in EU environmental policy, increasing pressure by the European Union, as well as the salience of the issue among the German public. Since none of these factors correspond with the absence of policy change, other factors need to be considered.

In the following, I will argue that the answer lies in deeper ideological divisions between the German political parties. The first ideological difference refers to the so-called *new politics* cleavage that added an environmental dimension to agricultural policy (Carter, 2013, 2018). The second division concerns political parties' basic idea of the state's role in the economy. Both help to explain why political parties in Germany have different positions on how to deal with agricultural pollutants in water bodies and why they struggle to agree on integrated policy measures or other adequate policy instruments requested by the European Commission and the European Court of Justice.

Political parties represent crucial actors within democratic political systems and strongly influence policy formulation (Bomberg, 1998; King, 1969; Knill et al., 2010). Through the introduction of the Common Agricultural Policy (CAP), EU member states gained greater control over agricultural policy. State governments' competencies also increased in federal political systems (Gladrow et al., 2015; Weingarten, 2010). In Germany, the German states have a significant influence on policies, including water quality protection and agriculture (Reutter, 2005; Tietz, 2007). Consequently, political parties at

both the federal and state levels embody influential actors when dealing with the issue of agricultural pollutants in Germany.

To further investigate the argument posed above, I will analyze political parties' positions on agricultural pollutants in water bodies in Germany. The basis for this investigation will be party manifestos published during federal and state elections between 1998 and 2018.

The empirical analysis is guided by the following research questions: Do political parties in Germany address the issue of agricultural pollutants in water bodies? When addressing the issue, do parties refer to the interlinkage between water quality protection and agricultural policy? To what degree can ideological divisions between parties explain different positionings on the issue?

Literature on agricultural pollutants in water bodies within the social sciences is still limited. Studies addressing the interlinkage between water quality protection and agriculture mainly take two perspectives. The first strand of literature approaches the issue from a governance perspective. Most of these studies shed light on the role of public participation (Fish et al., 2010; Jager et al., 2016; Kastens & Newig, 2007; Kirschke et al., 2019; Kirschke, Borchardt, & Newig, 2017; Kirschke, Newig, et al., 2017; Pahl-Wostl et al., 2008; Schütze & Kochskämper, 2018). The second strand analyzes agricultural pollution from a nexus perspective, paying special attention to coordination challenges between different policy fields (Benson et al., 2015; Meergans & Lenschow, 2018; Pahl-Wostl, 2019). The role of political parties in dealing with agricultural pollutants in water bodies has not yet been addressed.

This study proceeds by discussing the integrated water management (IWRM) as an approach to mitigate pollution. Subsequently, theoretical expectations of political parties' positions on agricultural pollutants are derived. This part is followed by a short section on the data and methods used. Afterwards, the empirical findings of a qualitative analysis of political parties' positioning on agricultural pollutants are presented. The paper ends with a discussion of the empirical findings.

3.2 Integrating water and agricultural policy

The literature has increasingly argued for an integration of policies when dealing with environmental protection issues (Graversgaard et al., 2018; Hering & Ingold, 2012; Jordan & Lenschow, 2010; Metz & Glaus, 2019; Visseren-Hamakers, 2015). With regard to water quality protection, the integrated water resource management principle has become one of the guiding principles of water management. The principle can be defined as “a process which promotes the coordinated development and management of water, land and related resources in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (Jøneh-Clausen, 2004). The overarching aim is the sustainable preservation of multiple functionalities of the resource water. Water issues typically stem from activities exogenous to the water sector, necessitating an integration between water protection and other policy fields. This tends to be termed *horizontal integration* (Tosun & Lang, 2017; Trein et al., 2018; Waylen et al., 2019).

Water pollutants typically originate from different economic sectors. An issue with the increasing attention is the entry of micropollutants into water bodies. Micropollutants occur at very small concentrations, with a maximum of around one microgram per liter, which differentiates them from other pollutants (Stamm et al., 2016). They can be traced back to a diverse set of entry points from many different sectors, including agriculture, energy (mainly heavy metals from coal energy (Drevnick et al., 2015; Fricke et al., 2015; Nedellec & Rabl, 2016; Streets et al., 2018), or the pharmaceutical industry (through communal wastewater (Bartrons & Peñuelas, 2017; Deo & Halden, 2013; Ebele et al., 2017; Halm-Lemeille & Gomez, 2016; Jacob et al., 2019; Kümmerer, 2009; Ortiz de García et al., 2013)). (Bartrons & Peñuelas, 2017; Deo & Halden, 2013; Ebele et al., 2017; Halm-Lemeille & Gomez, 2016; Jacob et al., 2019; Kümmerer, 2009; Ortiz de García et al., 2013) When designing policies to ensure water protection and improve water quality, these sectors must be addressed as well in order to find effective and sustainable solutions.

This article focuses on the intersection between water quality protection and the agricultural sector. In particular, it sheds light on agricultural pollutants in water bodies, which represents one of the most severe issues for water protection in Europe (European Environment Agency, 2018; Foley et al., 2005; Smith, 2003; Vörösmarty et al., 2010). The discharge of nitrate into ground and surface waters is one of the biggest water quality issues in Germany (European Commission, 2019). In addition, water bodies are increasingly being polluted by agricultural micropollutants, such as pesticides or artificial fertilizers, which has potentially detrimental effects on the aquatic ecosystem. The pollution of ground and surface waters by these substances can be traced back directly to agricultural activities, especially to intensive industrial agriculture. Agricultural pollutants represent a complex problem that is especially difficult to address due to interactions, uncertainty, and interdependencies among diverse and competing interests (Fish et al., 2010, 2016). The main interests in agriculture are food security and the protection of farmers' livelihoods. However, the promotion of these interests often conflicts with the interests of environment and water resource protection (Bouwer, 2000; Ferreyra et al., 2008; Olsson, 2013).

When formalizing the IWRM, and more recently, when developing the *nexus* approach, scholars as well as policy makers with an interest in environmental protection and sustainability have argued for the integration of agriculture and water quality protection (Benson et al., 2015; Hoff, 2011; Olsson, 2013).

3.3 Theoretical considerations

Currently, there is insufficient empirical research on the positioning of political parties on pollutants that stem from agricultural activities, such as pesticides, artificial fertilizers, or nitrate. It remains open whether these actors address agricultural pollution, whether they refer to both water quality protection and agriculture in an integrative way, and what positions on policy measures they take in case the issue is addressed.

In order to derive theoretical expectations of political parties' positions on agricultural pollutants, it is conducive to refer to existing research on agricultural paradigms and the positioning of political

parties on agricultural policy (Daugbjerg & Feindt, 2017; Daugbjerg & Swinbank, 2012; Fearne, 1997; Muirhead & Almås, 2012; Tosun, 2017).

Agriculture in Europe has been treated as an exceptional sector, mainly due to two reasons: The sectors' vulnerability and food security. Both lead to a state-supported, subsidy-based agricultural policy primarily aimed at maximizing yield. Farmers played an important role, their interests were mostly prioritized, and policies predominantly served their needs (Daugbjerg & Feindt, 2017; Fearne, 1997; Muirhead & Almås, 2012). The paradigm of agricultural *exceptionalism* not only led to higher yields and increased food security, it also increased industrialization of the agricultural sector and intensified livestock production, which in turn led to an increased use of pesticides, fertilizers, and manure. As a result, the entry of these substances into ground and surface waters also increased, detrimentally affecting water quality and the functioning of the aquatic ecosystem (Abbasi et al., 2019; Carvalho, 2017; Cruz et al., 2019; Kumar et al., 2019; Nicolopoulou-Stamati et al., 2016; Schröder et al., 2004; Wick et al., 2012).

Post-exceptionalism emerged as a new agricultural paradigm out of the increasing awareness for climate, environmental protection, and sustainability. Food security remained central, but further aspects, including climate, environmental protection, and biodiversity, were included as reasons for the agricultural sector's exceptional state support. Farmers remained of special importance for food production but now also for mitigating climate change, preserving biodiversity, and protecting the environment (Daugbjerg & Feindt, 2017; Ewert et al., 2018; Muirhead & Almås, 2012). In addition, new actors relevant to achieving these aims within agricultural policy were included, including processors, wholesalers, environmental organizations, and water associations (Daugbjerg & Swinbank, 2012; Metz, 2017; Tosun, 2017).

With regard to water, it was not only the pollution of ground and surface waters that increased in connection with *exceptionalism*. The protection of water resources had no priority in agricultural policy and was rather neglected. This changed with *post-exceptionalism*. Although the intensification of agricultural activities continued, water became relevant as an issue to biodiversity, climate and environmental protection, and sustainability. New actors, namely environmental organizations, water associations, and green political parties, entered agricultural politics and demanded that the protection of water resources be included within agricultural policy.

Following cleavage theory, party systems in Western democracies evolved along social cleavages—among others along an economic left–right *capital vs. worker* cleavage (Lipset & Rokkan, 1967). These cleavages not only lead to distinct party families but also to relatively stable policy ideas that are advocated by political parties (Tosun, 2017). Socio-cultural changes in the second half of the 20th century resulted in a *new politics* cleavage that also included an environmental dimension, with green parties divided from most other parties (Carter, 2013, 2018; Inglehart, 1990; Knutsen, 1988).

In light of *post-exceptionalism* and *new politics*, agricultural policy became relevant not only for agrarian and conservative parties but also for green parties (Tosun, 2017). Based on these considerations, political parties can be expected to differ in their positions on agricultural policy with regard to whether they have strong ties to farmers' interests and whether they prioritize environmental protection. Especially, green parties characterized by a strong emphasis on environmental protection should favor an integrated policy approach to water protection and agriculture and support corresponding policy measures.

In Germany, the Christian Democratic Union (CDU) and the Christian Social Union (CSU) represent strong supporters of the agricultural sector and are both associated with the idea of *exceptionalism*. Conventional farmers represent an important part of their constituency and both parties have prioritized their interests. Furthermore, Germany's conventional farmers associations are powerful and have strongly influenced both parties (Ewert et al., 2018). In government, CDU or CSU also typically lead the ministry of agriculture, which also indicates that farmers represent a high priority to both parties (Pappi et al., 2008; Tosun, 2017). Representing conventional farmers' interests and protecting their livelihoods, therefore, is of high priority for both German Christian democratic parties. Adopting policy measures within agricultural policy that aim at protecting the environment typically entails costs for conventional farmers. Therefore, I expect both parties to neglect environmental aspects when taking positions on agricultural policy.

Expectation 1a: The CDU/CSU do not address the issue of agricultural pollutants and do not refer to an integration of water protection and agricultural policy.

Germany's green party, Alliance'90/The Greens, is expected to take a contrary position on the issue. Environmental protection is the party's most central topic. The party generally favors policy approaches that aim at sustainable outcomes and, therefore, is more inclined towards the paradigm of *post-exceptionalism* (Tosun, 2017). Furthermore, the party tends to prioritize consumer interests over the interest of farmers (Feindt & Kleinschmit, 2011). Links to conventional farmers are comparatively weak. Instead, the party has strong ties to environmental protection organizations. In general, the Greens favor a fundamental paradigm shift in agricultural policy towards organic agriculture (Ewert et al., 2018; Tosun, 2017).

Expectation 1b: Alliance'90/The Greens address the issue of agricultural pollutants and refer to an integration of water protection and agricultural policy.

Apart from the *new politics* cleavage, the more traditional economic left–right dimension is relevant to the positioning of political parties on the issue of agricultural pollutants as well. This dimension refers to parties' positions on the economy and whether they support state intervention or market liberalism. Center and right-wing parties typically oppose strong state intervention. Instead, these parties believe in the viability of the free market (Tosun, 2017). In Germany, CDU/CSU, the liberal Free Democratic Party (FDP) as well as the right-wing party Alternative for Germany (AfD) can be located on this side

of the divide (Franzmann, 2019). Even in cases where these parties advocate for environmental protection or sustainability, they oppose hard regulations and instead promote technological progress as a means to achieve more efficient and sustainable solutions. Therefore, these parties can be expected to oppose any policy measures that intervene strongly in the economy (such as prohibitions or taxes) and instead advocate measures promoting technological progress.

Expectation 2a: The CDU/CSU, FDP, and the AfD oppose any policy measures aimed at reducing the entry of agricultural pollutants into water bodies that involve strong state intervention in the agricultural sector.

In contrast, center-left and left-wing parties believe in the necessity of intervention in the economy due to negative externalities and, therefore, generally favor strong state intervention (Tosun, 2017). Alliance'90/The Greens can be classified as a center-left party due to their origin and the positions they take on various policies. In terms of agricultural policy, the party's demand for a forced paradigm shift to organic agriculture involving strong state intervention further indicates their position on the divide. Therefore, Alliance'90/The Greens can be expected to be in favor of policy measures that include strong state intervention in the economy.

Expectation 2b: Alliance'90/The Greens emphasize the need for strong state intervention in the agricultural sector in order to reduce the entry of agricultural pollutants into water bodies and demand equivalent policy measures.

The Left, Germany's strongest left-wing party, and the Social Democratic Party (SPD) typically are located along the workers-vs.-employer cleavage. Environmental policy is only of minor importance to both parties. Consequently, these parties will probably not address the issue of agricultural pollutants. However, in cases where other factors might lead these parties to take a position on the topic, they can be expected to support policy measures that promote a strong state.

Expectation 2c: The Left and the SPD will support policy measures that include strong state intervention when dealing with the issue of agricultural pollutants.

To sum up, differences between political parties are expected regarding the salience of the issue of agricultural pollutants, the addressal of water protection and agricultural policy together in an integrative way, and the positioning towards specific policy measures. I expect these differences to be due to party ideology and the location of political parties along the *new politics* cleavage and the *left-right* economic dimension.

3.4 Materials and methods

In order to investigate political parties' positioning on agricultural pollutants and empirically examine the theoretical expectations postulated above, this study analyzed party manifestos published between 1998 and 2018. These included federal as well as state elections. The data were retrieved by using *polidoc.net*, a collection of party manifestos (Benoit et al., 2009; Gross & Debus, 2018).

Analyzing party manifestos for this purpose assumes that these documents adequately reflect political parties' policy positions and the prioritization of policy issues. This appears to be a credible assumption as parties select and articulate policy positions within these documents in order to gain voter support and secure power (Däubler, 2012; Elias et al., 2015; Tosun, 2017).

There are different approaches to determining party positions from party manifestos. The *Manifesto Project* represents the leading source for data on political party positioning (Volkens et al., 2018). The project provides a dataset on parties' positioning on a variety of policy issues based on the coding of quasi-sentences within manifestos. The salience of an issue or a party's position on a topic can then be determined by the frequency of respectively coded quasi-sentences within manifestos (Volkens et al., 2014). A more quantitative approach is to code party positions based on the frequency of specific words used within party manifestos (Debus, 2009; Laver et al., 2003; Pappi & Seher, 2009). An alternative means of measuring policy positions within party manifestos is to conduct expert surveys (Bakker et al., 2015).

This study used a combination of descriptive statistics and qualitative content analysis based on political manifestos. In order to determine the salience of the issue of agricultural pollutants, the frequency of manifestos containing at least one section or paragraph on the interlinkage between agricultural policy and water quality was determined. Policy approaches to address the issue and positions on specific policy measures were then determined qualitatively by text interpretation.

3.5 Results

In this chapter, I proceed in three analytical steps. First, I shed light on the salience of agricultural pollutants in Germany. This first part of the analysis provides insights into the attention political parties pay to the issue over time and the differences between party types. Second, I examine the first set of theoretical expectations by investigating whether parties mentioning the issue in their party manifestos also refer to the integration of water protection and agricultural policy. Third, I examine the second set of expectations and analyze political parties' positioning on types of policy measures in more detail guided by the expectation that political parties will position themselves along an economic dimension.

3.5.1 *Attention towards pollutants in water bodies*

Political parties in Germany address the issue of agricultural pollutants repeatedly in their party manifestos. Both the overload of organic fertilizers, such as nitrates, and the entry of pesticides and artificial fertilizers into water bodies were discussed in most of the manifestos dealing with agricultural pollutants (see Table B.1.1 in Appendix B for a detailed overview). Figure 3.1 provides insights into the level of attention that German parties have paid to the issue between 1998 and 2018. The graph reports the percentage of party manifestos mentioning agricultural pollutants per year. In 1998, 10% of party manifestos dealt with the issue. Party attention peaked for the first time in 2000, with nearly 38% of manifestos dealing with agricultural pollutants during election campaigns in North Rhine-Westphalia and Schleswig-Holstein. Since then, levels of attention varied between 0% and 45% in 2013. In 2017,

attention peaked with nearly 82% of party manifestos discussing agricultural pollutants. It is important to be aware that these numbers are very likely influenced by regional differences between German states as different state elections took place each year.

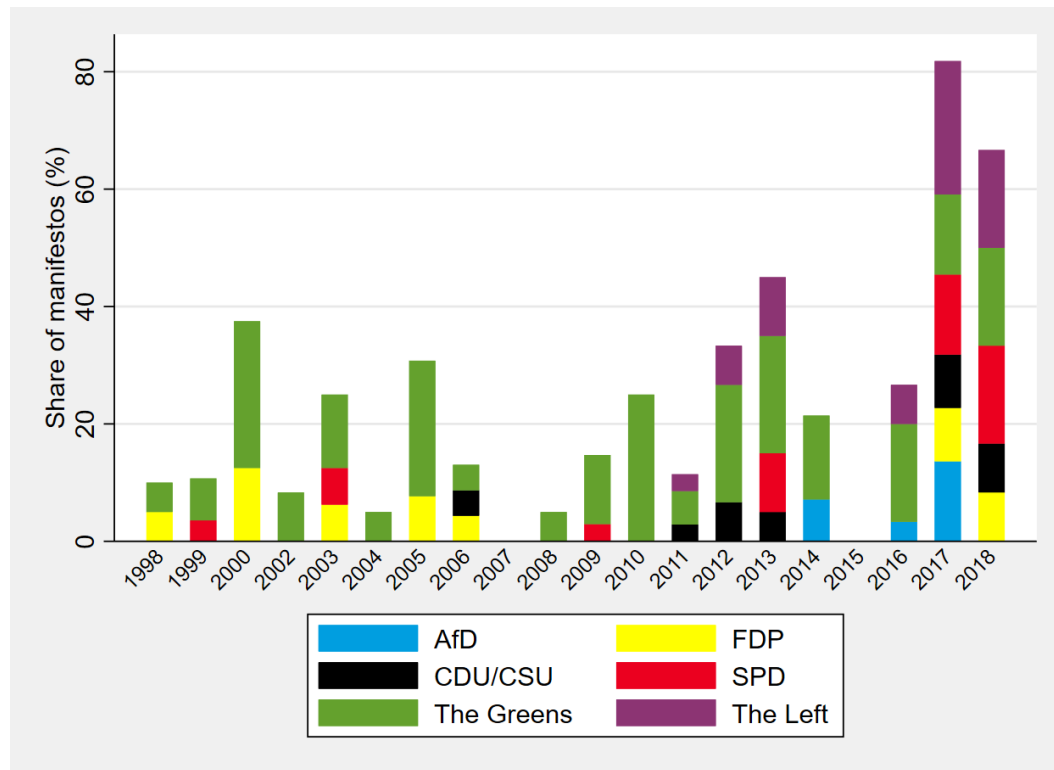


Figure 3.1. Share of manifestos mentioning agricultural pollutants in water bodies by parties.

Note: Due to the varying numbers of elections per year, this graph reports the percentage of manifestos mentioning agricultural pollutants per year instead of reporting total numbers. Years without numbers indicate that elections took place, but agricultural pollutants were not mentioned.

Figure 3.1 further elucidates the level that each of the German parties pays to the entry of agricultural pollutants into water bodies. As expected, Alliance'90/The Greens addresses the issue continuously. However, all other parties pay attention to some degree as well. The liberal party mentions the issue mainly in the first half of the observation period whereas the Left turns to the topic in the second half. CDU/CSU and SPD refer to the issue at various points in time and the AfD since 2014, one year after the party's foundation in 2013.

Overall, German political parties pay attention to agricultural pollutants in water bodies. Attention varies in time and between parties. An upward trend in salience can be observed since 2017.

3.5.2 *Integration of water protection and agricultural policy?*

In a further step, I analyzed whether political parties in Germany refer to agricultural policy when dealing with the issue of agricultural pollutants in water bodies and, in this regard, integrate water quality protection and agricultural policy.

Table 3.1 gives an overview of the total number of manifestos under analysis and the number of manifestos that refer to agricultural pollutants per political party. In total, the analysis includes 395 party manifestos. The column on the far right reports the percentage of manifestos dealing with agricultural pollutants per party. The numbers fit the theoretical expectations very well. Alliance 90/the Greens pay the most attention to the issue by mentioning agricultural pollutants in around 49% of their party manifestos. On the other hand, CDU/CSU mention the issue in only around 9% of their manifestos, even though agricultural policy plays a central role in the party union's manifestos.

Table 3.1. Agricultural pollutants mentioned in party manifestos.

<i>Party</i>	<i>Manifestos total (number)</i>	<i>Agricultural pollutants (number)</i>	<i>Agricultural pollutants (row percentage)</i>
AfD	19	5	26.32
CDU/CSU	82	7	8.54
FDP	82	8	9.76
The Greens	82	40	48.78
The Left	48	13	27.08
SPD	82	10	12.20
Sum	395	83	21.01

To further evaluate the first set of theoretical expectations, a qualitative content analysis was conducted in order to investigate whether political parties refer to an integration of water protection and agricultural policy when dealing with agricultural pollutants in their manifestos. Manifestos were classified as comprising an integrated approach if the respective political party not only mentions pollution of water bodies by fertilizers, pesticides, or nitrates but also explicitly points towards agricultural policy and policy measures to be taken in this sector in order to reduce the entry of agricultural pollutants.

CDU and CSU refer to agricultural pollutants rarely. The party union also mostly does not mention mitigating policy measures within the agricultural sector when pointing towards the entry of these substances into water bodies. Instead, the union stresses the importance of protecting economic interests if any mitigating measures were to be taken. A text passage within the manifesto of the CDU in Saxony-Anhalt in 2006 serves as a good example. Although the party states, “the EU Water Framework Directive’s objectives are to be met through sustainable agriculture”, it does not mention any agricultural policy measures to be taken in order to achieve sustainability and meet the directive’s targets. Instead, the party affirms, “implementation has to incorporate economic and regional conditions.” The CDU Hessen’s manifesto in 2018 represents the only significant exception from this pattern. In fact, the CDU’s position on water pollution by agriculture is very similar to the Greens’ position in Hessen. This might be because both parties formed a coalition government in Hessen from 2014 until 2018. Therefore, the CDU’s position in 2018 might be influenced by the Greens through previous collaboration. Overall, the Christian Democratic Union’s manifestos mostly do not address the issue of agricultural pollutants

and, even if they do not refer to an integration of water protection and agricultural policy. This observation supports theoretical expectation 1a.

In contrast, Alliance'90/The Greens not only addresses agricultural pollutants in nearly half of their manifestos but also mostly approaches the issue in an integrative way by explicitly referring to agricultural policy and the connection between the agricultural sector and water quality protection. The Greens convey a clear vision of how to shape the agricultural sector in order to mitigate water pollution and secure water quality protection. This is apparent in most manifestos where the party demands a shift towards organic agriculture. Alliance'90/The Greens in Saxony-Anhalt in 2006, for example, states, "organic agriculture represents [the party's] guiding principle, because it preserves our natural basis of life by not using chemical plant protection as well as mineral fertilizers and protects soil and groundwater instead through closed nutrient circulation." The Bavarian Green party in 2008 is even more specific in describing the linkage between organic agriculture and water quality protection. The party stated, "only permanent organic agriculture characterized by small family farms will be able to preserve the basis of life for future generations, [...] including fertile soil and clean water as our top priority resource. These are considerably influenced by the type of agriculture. Misguided agricultural policy forced many farmers to refrain from sustainable agriculture in recent decades [...]. A water-protection-offensive is needed in order to protect riverbanks and wetlands and improve the ecological condition of water bodies. For this purpose, *extensifying* agriculture as well as renaturation measures are necessary [...]. We need to reduce the entry of plant protection products and nitrate significantly."

Contrary to CDU/CSU, the Greens not only mention the problem of agricultural pollutants but are also very specific regarding how to react to the issue, demanding specific mitigating policy measures. For example, Alliance'90/The Greens in Schleswig-Holstein declares in 2012: "one hundred percent of drinking water is extracted from groundwater in this state. More than half of the groundwater bodies are contaminated so heavily that immediate action is required. Pollution mainly stems from nitrate and phosphate due to the use of artificial fertilizers and dung as well as pesticides [...]. We demand the implementation of good agricultural practice in order to protect groundwater bodies. It means *extensifying* agriculture nationwide and in turn *intensifying* organic agriculture. This includes better cattle distribution, including a size limit for stalls, reducing the use of agrochemicals, as well as changing cultivation conditions and land conversion. We aim at significantly increasing the earmarked share of the groundwater fee."

The Greens in Bavaria are even more explicit in linking agricultural policy ideas, issues in water quality protection, and specific policy measures. In 2018, the party not only advocated for organic agriculture but also for the preservation of small-scale family farming in order to achieve better water quality: "Industrialized agriculture relying on increasing exports, increasing stall size, and more and more agrochemicals, is not a sustainable strategy [...]. We need agriculture that treats animals and nature in a responsible way. We advocate for reforming agricultural aid, so that public money is provided only for public services. It is about preserving small-scale family farming as only this kind of farming can

serve as a basis for a healthy agricultural structure [...]. Increasing use of agrochemicals wipes out animal and plant species, pollutes groundwater bodies and threatens human health [...]. Organic farming is the silver bullet.” The party then is very explicit in how it intends to achieve this shift towards organic agriculture: “We aim at organic cultivation on 30 percent of Bavarian agricultural land. [...] To this end, we will raise financial incentives and promote research. We will integrate organic farming as a full-fledged alternative to conventional farming into training programs. Furthermore, we will improve counseling by agricultural government agencies and establish state marketing for organic agriculture.” Finally, the party clearly links the issue of water quality protection with agriculture and demands specific policy measures related to both: “Water is the basis of life. Therefore, protecting groundwater bodies and surface waters has top priority. We need to ensure today that our water is free from contaminants like microplastics, pharmaceuticals, nitrate, glyphosate and multi-resistant germs in the future. To this end, action is required primarily in agriculture. We will establish mandatory buffer strips along water courses to prevent the entry of nitrate into creeks and rivers, we will create large water protection areas and more severely penalize violation against fertilization legislation. The Greens promote area-based livestock farming. In principle, we want animal feed to be produced locally.”

Overall, Alliance’90/The Greens addresses agricultural pollutants not only most often compared to other parties but also refer to the issue in an integrative way, linking water protection and agricultural policy. These insights support expectation 1b.

3.5.3 *Positions on policy measures to mitigate agricultural pollutants*

Empirical analysis further supports the expectation that the second ideological dimension, parties’ notion of the role of the state in economic affairs, explains differences in the positioning of political parties on policy solutions for mitigating agricultural pollutants.

Positioning of the CDU/CSU, FDP, and the AfD

As expected, CDU/CSU and the FDP oppose any policy solutions involving strong interference of the state in the agricultural sector. Instead, these parties mostly support the notion of the free market and proclaim technological progress within the sector as the best approach to mitigating pollutants.

The CDU in Niedersachsen, for example, conveys the clear message that ensuring food security and farmers’ competitiveness is of the highest priority and that the party opposes any interference from the state in these goals. This is demonstrated by the parties’ positioning on the implementation of new EU regulation. The regulation includes so-called *greening-requirements*, which farmers must comply with in order to receive financial support from the EU. These include crop diversification, maintaining permanent grassland, and keeping a share of arable land as an ecological focus area (European Commission, 2019). In 2013, the party first stated that it supported the protection of biodiversity as well as water quality protection when addressing the *greening-requirements*. However, the party then advocated a “practice-oriented implementation of greening-requirements that pays tribute to local conditions in order not to deteriorate agricultural production inappropriately [...]. We do not tolerate

significant impacts on production due to the [obligatory] provision of seven percent priority land under organic cultivation in light of increasing demand for agricultural products and renewable raw materials [...]. Agricultural policy needs to ensure farmers' competitiveness and may not weaken their position within the international market through special requirements and unnecessary red tape." Reading between the lines, the party clearly expresses its resentment towards the interference of EU regulations in the agricultural market. The party's belief in the functioning of the market is then further expressed by emphasizing the implementation of a *manure exchange*, whereby farmers can buy and sell their dung.

The FDP's opposition towards regulatory interference in the agricultural sector is even more explicit. In 1998, the FDP in Bavaria stated, "too much state regulation, permanent misguided state control, and a massive misuse and waste of billions of Deutsche Mark have discredited the agricultural sector. The FDP does not punt on bureaucrats' *wisdom* or the *cleverness* of quotas, regulations, and forms. The FDP punts on Bavarian farmers' entrepreneurial capability. These do not only produce food but also preserve the cultural landscape and take care of drinking water reservoirs [...]. Provided that the agricultural system provides support and does not force them to behave unnaturally." In 2018, the FDP in Hessen declared its opposition towards state support for organic agriculture by stating, "organic agriculture gains access to the market if the customer is convinced by the quality of its products. We, the liberal party, intend to reestablish fairness between conventional and organic agriculture and end the biased paternalism of a small part of the agricultural sector." Instead, the party advocates for "practice-oriented and non-bureaucratic implementation of legislation on manure use" and "efficient use of nutrients" by "primarily providing counseling, promotion of efficiency-raising measures and voluntary cooperation with water suppliers." The FDP in Schleswig-Holstein is even more explicit in its opposition towards regulation on water quality protection. In 2017, the party clarified that the "use of restrictions adversarial to property and production, such as the buffer-strips-bureaucracy, has to be eased."

The positioning of the AfD towards state intervention is similar. When dealing with the issue, the party emphasizes the need to reduce the entry of pollutants into water bodies. However, the party opposes state intervention as it disapproves of "biased restrictions, unnecessary bureaucracy, as well as EU-regulations that impede effective cultivation". Instead, the party promotes "voluntary cooperation between farmers and water suppliers", as stated by the AfD in North Rhine-Westphalia in 2017. The party also opposes a forced shift towards organic agriculture as stated by the AfD in Baden-Württemberg in 2016: "We dislike the general disparagement of our farmers through the slogan of *green agricultural turnaround*. Organic and conventional agriculture must not be played off against each other." Therefore, the party promotes improved training and counseling in order to help farmers to reduce the use of fertilizers, though it also supports the systematic control of fertilizer use.

These parties' belief in technological progress as a means to mitigate agricultural pollution is also striking. Among the technological advancements they promote in order to reduce the use of pesticides and fertilizers are green biotechnology and *digital agriculture*. The CDU in Schleswig-Holstein stated in 2017, "research and progress represent our engine for a sustainable agriculture [...]. We will advocate

for the use of fertilizers and plant protection that safeguard groundwater as well as soil fertility. Thus, we trust in modern, innovative technology to solve these problems.” The FDP in particular promotes the potential of digital agriculture to enhance agricultural production and also mitigate the entry of substances into water bodies. In 2017, the FDP in Hessen stated, “modern plant protection is indispensable to ensure high quality products. We want to enhance good practice in the use of modern substances and promote precise spreading technology in order to reduce discharge [...]. We see great potential in the use of digital data for precision farming. The application of sensors, drones, satellites, and linkage of yield maps, weather forecasts and soil analysis can increase efficiency in plant cultivation to a large degree.”

Overall, CDU/CSU, FDP, and the AfD mostly oppose mitigating policy measures involving strong state intervention in the agricultural sector, such as regulations, prohibitions, or taxes, which is in line with theoretical expectation 2a. Instead, CDU/CSU and the FDP promote technological progress as a means for solving the issue of agricultural pollution and advocate investment in research and the application of new agricultural technologies.

Positioning of Alliance'90/The Greens

Alliance'90/The Greens takes a contrary position. The party advocates strong state intervention in order to mitigate agricultural pollution. Proposed policy measures include financial incentives, mostly to support a transition from conventional to organic agriculture, stricter restrictions, and prohibitions of certain pesticides. The Greens in Schleswig-Holstein, for example, stated in 2012, “organic agriculture represents our guiding principle. We want to protect its promotion and, therefore, reintroduce financial support for transition to and perpetuation of organic cultivation as well as cut subsidies for conventional farmers.” As political parties' leeway is limited at the state level, state-level parties try to influence decision-making at the federal and European level. The Greens in Saxony-Anhalt, for example, stated in 2016, “we work towards an increased ecological premium at the federal level. In Baden-Württemberg, the Greens demand “a shift in agricultural subsidies from the first to second pillar (Support for farmers through the European Union is based on two pillars within the CAP. The first pillar includes direct payments to farmers, whereas the second pillar is more flexible and aims at supporting rural development, quality of life as well as environmental protection (European Parliament, 2018) – for example from a flat-rate premium to a performance-related, environmental premium – and an alignment of all funding programs with ecological criteria. Farmers must receive an economic incentive for organic and sustainable cultivation.” The party not only asks for environmentally beneficial behavior to be rewarded but also for the sanctioning of farmers who do not meet certain environmental standards. In order to deal with the issue of water pollution by pesticides and nitrate on the short-term, the Greens demand restrictions for conventional agriculture, including a ban of certain pesticides, such as glyphosate, shorelines for water protection, or seasonal prohibitions of pesticide use. With specific regard to nitrate pollution, the party advocates a further restriction that entails land-related crop

cultivation and livestock production (regarding land-related livestock production, livestock size is coupled with farm size, which allows the amount of manure produced in a certain area to be controlled).

Overall, Alliance'90/The Greens predominantly propose policy measures involving strong state intervention in the agricultural sector in order to reduce the entry of agricultural pollutants into water bodies and demand equivalent policy measures. This supports theoretical expectation 2b.

Positioning of the Left and SPD

Finally, the analysis sheds some light on the positions the Left as well as the SPD take on policy measures when dealing with agricultural pollution. As expected, both parties propose policy measures involving strong state intervention. In fact, the Left's position is very similar to the Greens', whereas the SPD's is characterized by a more diverse mixture of policy measures and is, therefore, less polarized.

The Left in Hessen in 2018, for instance, demanded "a change in direction for agricultural policy. ... Food must be produced more socially and environmentally friendly. Thus, society needs to reward all ecological services such as groundwater, biodiversity and climate protection." The Left in Schleswig-Holstein in 2017 more specifically demanded "a fee on the use of plant protection products as well as nitrogen and phosphate fertilizer due to the critical condition of water bodies [...]. These financial resources will then be used to expand organic agriculture." The Left in Bavaria in 2018 added, "an immediate prohibition of pesticides evidently causing decline in insects ... and substitution of conventional plant protection by ecological crop protection [is necessary]."

Policy measures advocated by the SPD overlap to a large degree. The party also supports the reduction of pesticide use and of manure production by prohibiting the use of certain pesticides, promoting diversified crop rotations, and research on alternative plant protection, land-related livestock production, and buffer strips along shorelines. However, the party's positioning is closer to the position of CDU/CSU as the party advocates for increasing organic cultivation but does not demand a forced transition from conventional to organic agriculture. Furthermore, the party also proposes some of the policy measures typically advocated by CDU/CSU and FDP, such as promoting the application of *digital agriculture*.

Overall, the Left and the SPD support policy measures that include strong state intervention when dealing with agricultural pollutants. Thus, both parties take a similar position to the Greens with regard to the economic dimension, which supports theoretical expectation 2c.

To conclude, all political parties in Germany address the issue of agricultural pollutants in water to some degree in their election manifestos. Nevertheless, attention varies between parties. The analysis of parties' positioning on the issue largely supports all theoretical expectations. The Greens' overall policy approach for dealing with the issue predominantly represents an integration of water quality protection and agricultural policy. Contrarily, the Christian Democratic Union addresses the issue only rarely and, in these cases, mostly does not follow an integrative approach. Regarding specific policy measures, contrasting conceptions of the state's role in the economy become apparent. The Greens and the Left

advocate strong state intervention to support an agricultural paradigm shift to organic cultivation, whereas the approaches of the CDU/CSU, FDP, and AfD are largely characterized by the idea of technological progress and opposition towards interference in the agricultural sector. The SPD can be located in the middle as policy instruments proposed by the party represent a mixture of both positions.

3.6 Discussion and conclusion

This study set out to investigate the interlinkage between water quality protection and agricultural policy. More specifically, it examined the issue of agricultural pollution of water bodies by nitrate, pesticides, or artificial fertilizers in Germany. The country has repeatedly breached the ND due to a failure to implement adequate mitigating policy measures, which will potentially lead to costly consequences.

I argue that ideological divisions within the German political party system determine parties' positioning on the issue of agricultural pollutants and explain the lack of a policy response to a large degree. Empirical findings of a qualitative content analysis of election manifestos published between 1998 and 2018 supports the argument and corresponding theoretical expectations. All political parties addressed the issue to some extent and in principle agree on the need to mitigate agricultural pollutants. However, levels of attention and overall approaches of proposed policy measures vary significantly. The way the Greens approach the issue is closest to the integrated water resource management principle and the idea of horizontal policy integration. The party explicitly proposes policy measures within the agricultural sector in order to improve water quality. Contrarily, the Christian Democratic Union pays only limited attention to the issue and lacks an integrated approach.

In general, political parties' positioning on various policy measures occurs along an ideological economic dimension. The Christian Democratic Union, the Free Liberal Party, and the AfD mostly oppose measures involving strong interference from the state in the agricultural sector. In contrast, the Greens and the Left advocate a strong role of the state in the agricultural sector in order to transform conventional agriculture into organic agriculture, which would subsequently reduce pollution.

Overall, the impression prevails that CDU/CSU and FDP mostly advocate technical solutions in order to mitigate pollution, whereas the Greens, SPD, and the Left support a more radical paradigm shift in agricultural practice, which, in their perspective, means tackling the issue at its source instead of merely dealing with the symptoms of a deficient agricultural system. The Christian Democratic Union's policy position on agricultural pollutants and the fact that it has been in charge of the federal agricultural ministry since 2005 probably also explains Germany's failure to adopt adequate policy measures to mitigate nitrate pollution to a large degree.

The Greens are gaining momentum in Germany and future coalition governments between the Greens party and the Christian Democrats at the state as well as the federal level are becoming more likely. However, disagreement on these key topics – environmental protection for the Greens and protecting farmers' livelihoods for the Christian Democrats – might impede coalition building. On the

other hand, the need to collaborate in order to remain in government might also lead these parties to converge their positions. As can be observed for the CDU in Hessen, whose policy position in 2018 largely resembled the Greens' positioning on water pollution from agriculture.

To put the empirical findings into a broader context, the results suggest that the implementation of policy measures involving the integration of policy fields, as laid down by the IWRM, needs support from key decision-makers, such as political parties. Conflicts of interest due to ideological divisions will very likely hamper the adoption of more stringent policy outputs.

The insights offered by this study face two main limitations. First, the study is based on only one type of data source: Electoral manifestos. Further research could use other sources of data, such as interviews with party officials, to cross-check party positions. Second, the findings are only based on the application of one method. Alternatively, quantitative content analysis or network analysis can be applied to check the robustness of the results.

The study has mostly produced descriptive insights on the positioning of political parties on the issue of agricultural pollution. Further research could build on these initial findings and shed more light on the causal mechanism connecting problem pressure, public opinion, parties' policy positions, and policy outputs. For example, it would be interesting to analyze policies on agricultural pollutants adopted at the federal level and in the different German states and relate them to the governing political parties and their policy positions.

Furthermore, other influential governance actors besides political parties exist in this field, such as farmers' associations and environmental groups. Analyzing how these actors shape policy formulation should lead to interesting findings. Finally, future research could investigate how political parties develop their policy positions and whether their motivation is mainly based on serving the interest of their electorate or on policy seeking. An interesting case study could shed light on the CDU's positioning on agricultural pollutants in Hessen and analyze whether it was influenced by a coalition government with the Greens, thereby contributing to the literature on the *greening* of party politics. Finally, future research could examine the issue of agricultural pollutants from the perspective of *post-normal science* and investigate how science is translated into policies (Funtowicz & Ravetz, 2018; Ravetz, 2006). More specifically, it would be insightful to gain a better understanding of how political parties deal with the complex and uncertain nature of the risks posed by agricultural pollutants and how this affects their policy positions.

3.7 References

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4 Transition towards sustainable pharmacy? The influence of public debates on policy responses to pharmaceutical contaminants in water

*Research article written with Thomas Braunbeck**

Abstract. Background: Despite clear-cut scientific evidence for pharmaceutical contaminants causing adverse effects in aquatic life, the regulatory response in Germany has been weak. In principle, there are different policy approaches to address pharmaceutical contaminants: German water protection policies mostly follows a control approach, complemented by end-of-pipe solutions in some German states. The approach leaves the activities of key target groups, such as the pharmaceutical industry, largely unaffected. A stakeholder consultation initiated in 2016 by the German Federal Ministry of the Environment did not lead to significant changes in regulation. Empirical research in political science has shown that analyzing the public debate can be helpful in explaining policy responses and, in particular, policy change. This study follows this approach and investigates whether the German policy response to pharmaceutical contaminants can be explained by characteristics of the public debate on the issue.

Results: A discourse network analysis based on newspaper reporting in Germany was conducted between 2013 and 2017 to investigate the public debate on pharmaceutical contaminants. German newspapers actually paid considerable attention to the issue. In fact, the debate was not controversial, and participating organizations expressed similar views with regard to the risk of the contaminants, the causes of contamination and the approaches to be taken to mitigate the release of contaminants to the environment. The main narrative in the debate was supportive to the current policy approach applied in Germany. There were no concerted efforts by organizations such as environmental organizations or ecological parties to mobilize for an alternative policy approach.

Conclusions: The low level of polarization in the policy subsystem and the absence of a strong narrative mobilizing a major policy change may explain the persistence of the policy approach to pharmaceutical contaminants applied in Germany. A significant change to the current approach in the near future seems unlikely. Nevertheless, literature in political science shows that a polarized public debate and a strong pro-change actor coalition often preceded policy change. Actors with an interest in stricter regulation might want to reconsider their mobilization strategies.

4.1 Introduction

Despite significant improvements in wastewater treatment and water quality protection, the majority of European surface waters (rivers, lakes, transitional and coastal waters) is not in a good ecological condition (European Environment Agency, 2018) as required by the European Water Framework Directive (Directive 2000/60/EC). Over the last 20 years, a decrease in fish populations has been documented for numerous river systems in Europe and North America (Braunbeck et al., 2009;

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Burkhardt-Holm et al., 2005; Cook et al., 2003), and further ecotoxicological studies revealed that pollution within rivers “is, indeed, significant enough to potentially affect fish populations” (Keiter et al., 2009).

There is growing evidence that pharmaceutical residues in surface waters cause adverse effects in aquatic life (Beek et al., 2016; Ebele et al., 2017; Klatte et al., 2017; Patel et al., 2019; Rogall et al., 2020). Pharmaceuticals have been designed as biologically active agents to cure diseases and to manipulate biological processes within living organisms. Therefore, it comes with no surprise that such substances are likely to have an effect on non-target organisms in aquatic ecosystems, when present in surface waters even at very low concentrations. Although knowledge on how pharmaceutical residues affect fauna and flora is still limited, several studies indicate adverse effects (Desbiolles et al., 2018; Fabbri, 2015; Gaw et al., 2014; Mezzelani et al., 2018; Nkoom et al., 2018). Examples of substances with a high potential for ecotoxicological effects commonly detected in aquatic systems include analgesics such as diclofenac (Oaks et al., 2004; Triebskorn et al., 2007), hormones such as 17 α -ethinylestradiol and other steroids (Adeel et al., 2017; Santos et al., 2017; Zhao et al., 2019), antibiotics, antidepressants or antitumor agents (for reviews, see Küster and Adler (2014) as well as Beek et al. (2016)). Pharmaceutical contaminants can meanwhile be detected in almost any environmental matrix all over the world (Patel et al., 2019). They partly originate from municipal wastewater, since most currently installed wastewater treatment plants have not been designed to remove such trace contaminants (P. M. Fisher & Borland, 2003; Ternes et al., 2004; Vidal-Dorsch et al., 2012; Yang et al., 2017). New technologies capable of eliminating these contaminants are still under development, and the number of wastewater treatment plants upgraded to such advanced purification technologies is still small (Li et al., 2019; Triebskorn et al., 2019).

Despite the evidence for adverse effects in aquatic life caused by pharmaceutical contaminants, the regulatory response in Germany has been weak (Herzog, 2020; Metz, 2017). In principle, stricter measures could be adopted by policy-makers since the precautionary principle, which is the guiding principle of the European Union for addressing uncertain risks, enables policy-makers to take regulatory action if preliminary evidence suggests that certain activities or substances are harmful to the environment or human health (see e.g. (Tosun, 2013)). It remains open why the given scientific evidence in combination with the precautionary principle, which allows stronger regulatory measures, have not lead to a stricter policy response. The present contribution aims to better understand policy formation in this policy field by investigating the research question whether the public debate had an impact on the policy response to pharmaceutical contaminants in Germany. Empirical research in political science has repeatedly shown that the public debate can influence policymaking processes in democratic systems (D. R. Fisher et al., 2013; Leifeld, 2013, 2020; Shanahan et al., 2011; Tosun & Lang, 2016; Tosun & Schaub, 2017). The public debate represents a space where societal and political issues are publicly debated (Peters, 2013). For instance, this space can be provided by the media such as newspapers. Within the public debate, political actors interact verbally about a given policy issue (Leifeld, 2017). In this

study, we argue that the presence of a non-disputed public debate, characterized by a hegemonic actor coalition and the absence of a strong actor coalition mobilizing for major policy change, contributed to the persistence of the weak policy response to pharmaceutical contaminants.

In a first step, we present our theoretical argument on the relationship between the public debate and policy responses to pharmaceutical contaminants. The section concludes with two rivalling theoretical expectations. We then explain the data gathering process and the methodology used to investigate the formulated expectations. Subsequently, we present and discuss our empirical results on the relationship between the public debate and the policy response to pharmaceutical contaminants in Germany. Finally, we present concluding remarks and point to avenues for further research.

4.2 Theoretical considerations on the impact of the public debate on policy formation

Different policy responses to pharmaceutical contaminants in water are possible. These differ in the addressed target groups responsible for contamination and in the level of pressure exerted on the addressees. Policy responses can be based on different policy approaches, which vary with regard to the target groups addressed. Source-directed solutions focus on preventing contamination from the onset. They can address consumers, for instance by encouraging them to change to a more sustainable behavior, the agricultural sector or the pharmaceutical industry directly. One possibility is to target already the production of pharmaceuticals, e.g. by incentivizing or encouraging the production of sustainable, environmentally friendlier pharmaceuticals (Kümmerer & Hempel, 2010). Research termed *green pharmacy* or *green toxicology* aims at developing novel production processes that follow a life-cycle approach and incorporate environmentally relevant properties, such as biodegradability, already when designing a new substance (Crawford et al., 2017; Kümmerer, 2007; Kümmerer et al., 2019). For instance, Rastogi et al. (2015) illustrate that it is also possible to redesign many existing pharmaceuticals and improve their environmental biodegradability through small molecular modifications. Moreover, new predictive toxicology methods that apply in silico approaches could be used to predict the ecotoxicology of pharmaceuticals already when designing new substances (Kar et al., 2020). End-of-pipe solutions aim at removing contaminants from water, mainly by improving wastewater treatment. These solutions mostly target the wastewater treatment sector. However, the costs for upgrading wastewater treatment can also be passed to the other target groups. Control approaches represent preliminary strategies to monitor the level of contamination. Based on the monitoring, policy-makers may take further policy actions if deemed necessary (Metz & Leifeld, 2018).

In order to implement these approaches, different types of policy instruments can be used, which differ in the level of pressure exerted on the target groups. Relevant policy instruments can be categorized as voluntary, command-end-control, and market-based instruments (Metz & Leifeld, 2018; Tosun, Schaub, & Fleig, 2020). Voluntary instruments aim at changing behavior without exercising coercion, for example by raising problem awareness among consumers or by negotiating voluntary agreements with the industrial sector (Weiss & Tschirhart, 1994). These instruments typically exert only

soft pressure on target groups, as non-compliance does not entail any direct consequences. Command-and-control instruments directly regulate or impose a desired behavior, for example by increasing the strictness of authorization procedures or by banning certain substances (Lemaire, 1998). Here, the pressure on target groups is strong, since these are forced to comply with the rules. Market-based-instruments aim at encouraging a desired behavior through *positive* or *negative* financial incentives (Olmstead, 2010; Rogers et al., 2002). Subsidies for the development of more environmentally friendly production processes are an example for a positive incentive, whereas imposing taxes on less environmentally friendly products represents a negative incentive. The level of pressure on target groups can be regarded as intermediate, since these are not forced to comply with rules, but face certain economic disadvantages (Metz & Leifeld, 2018).

We argue that a change in the overall policy approach, i.e. from a control to a source-directed approach, or a significant change in the pressure put on target groups, i.e. from *soft* voluntary measures to *hard* command-and-control regulation, can be classified as a major policy change in this policy subsystem.

4.2.1 *Coalition formation based on policy beliefs*

In order to analyze the impact of the public debate on policy formation, we draw on theories of policy process. Empirical research in political science has shown that analyzing the public debate can be helpful for explaining policy change (Leifeld, 2013, 2017). Policymaking takes place in a complex and intertwined setting that includes a variety of public and private actors with an interest in shaping public policy (Knill & Tosun, 2020). Policy process theories, most prominently the *Advocacy Coalitions Framework* (Sabatier & Jenkins-Smith, 1999), suggest that these political actors express their policy beliefs in policy debates and form *actor coalitions* based on competing policy beliefs. Thus, actors' policy beliefs structure coalitions in a policy subsystem. Actors with similar policy beliefs form coalitions and diverge from other coalitions of actors with opposing policy beliefs (Leifeld, 2013; Sabatier, 1987; Varone et al., 2017; Weible & Sabatier, 2009). Coalition formation can, therefore, be measured empirically based on the policy beliefs actors articulate in the public debate in the media or other arenas (Leifeld, 2013).

4.2.2 *Why do political actors reveal their policy beliefs in the public debate?*

The different policy approaches and instruments discussed before address the behavior of different actors. Most prominently, these include actors from the industrial sector, the agricultural sector, the water treatment sector, or consumers and consumer protection organizations as their representatives. Depending on the choice of policy instruments and their respective addressees, these actors are confronted with additional costs. Therefore, the different actors should have an interest in influencing the policymaking process proactively either to promote their preferred solutions or to prevent undesired policy instruments from being adopted. In addition, there are actors with an intrinsic interest in

protecting the environment, such as environmental groups or ecological political parties that may evaluate certain policy approaches to be more effective than others.

Political actors use the public debate as a venue to influence policymaking (Leifeld, 2013, 2017). In fact, these actors participate in the public debate and articulate their policy beliefs for strategic reasons (Shanahan et al., 2011; Tosun & Schaub, 2017). There are various arguments in literature on how participation in the public debate can be influential on policy formation: First, new information can lead to policy learning, which has been identified as a driving force for policy change (Leifeld, 2013; Leifeld & Brandenberger, 2019; Sabatier, 1987). Thus, political actors participate in the debate in order to put forth their arguments or new information in order to trigger policy learning across coalitions. Second, through emphasizing certain policy issues and solutions, but neglecting others, the public debate may have a profound impact on agenda-setting, making some policy issues and solutions more likely to be discussed in parliament than others (Baumgartner & Jones, 2009; Soroka & Wlezien, 2005; Tosun & Scherer, 2020; Tosun & Varone, 2020). Third, the public debate can shape public opinion (Rinscheid, 2020), which may then affect politicians in their decision-making (Strøm, 1990). In democratic systems, political actors are inclined to respond to public demands in order to secure an electoral benefit (Binzer Hobolt & Klemmensen, 2008; Soroka & Wlezien, 2005, 2009).

4.2.3 Which coalition structures make policy change more likely?

Depending on the participation of political actors and their articulated policy beliefs, different coalition formation structures arise. One can differentiate between three ideal types of coalition formation structures: (1) *adversarial* or *polarized* structures with opposing coalitions and little coordination, (2) *collaborative* structures with opposing but coordinated coalitions, and (3) *unitary* or *hegemonic* structures that consist of one dominant coalition (Ingold & Gschwend, 2014). See Figure 4.1 for an illustration of the different coalition structures. Adversarial structures are typical for conflictual subsystems, whereas a unitary structure is indicative for the absence of conflict in policy formation (Leifeld, 2013).

Unitary coalition structures are usually stable over time (Baumgartner & Jones, 1991, 2009). In a subsystem characterized by a unitary coalition structure, the hegemonic coalition has determined policy formation and, therefore, the current policy status quo. The structure will remain stable unless political actors outside the hegemonic coalition challenge the status quo and start to mobilize for a policy change (Howlett & Ramesh, 1998). This challenge would lead to a polarized coalition structure, which in turn could result in policy learning, a change in agenda-setting of parliaments, and increase pressure on decision-makers to respond to potential unfavorable public opinion. Thus, major policy change should be preceded by a polarization of the coalition structure. Complementary, the persistence of a unitary coalition structure should make a change to the policy status quo less likely (Leifeld, 2013).

These theoretical considerations lead to the following two competing expectations, which we will investigate in the remainder of this study:

Expectation 1a: The presence of a disputed public debate that is characterized by an adversarial or collaborative network structure and an actor coalition that advocates a change in the policy status quo increases the likelihood for a major policy change.

Expectation 1b: The presence of a non-disputed public debate that is characterized by a unitary network structure and a hegemonic coalition that supports the policy status quo decreases the likelihood for a major policy change.

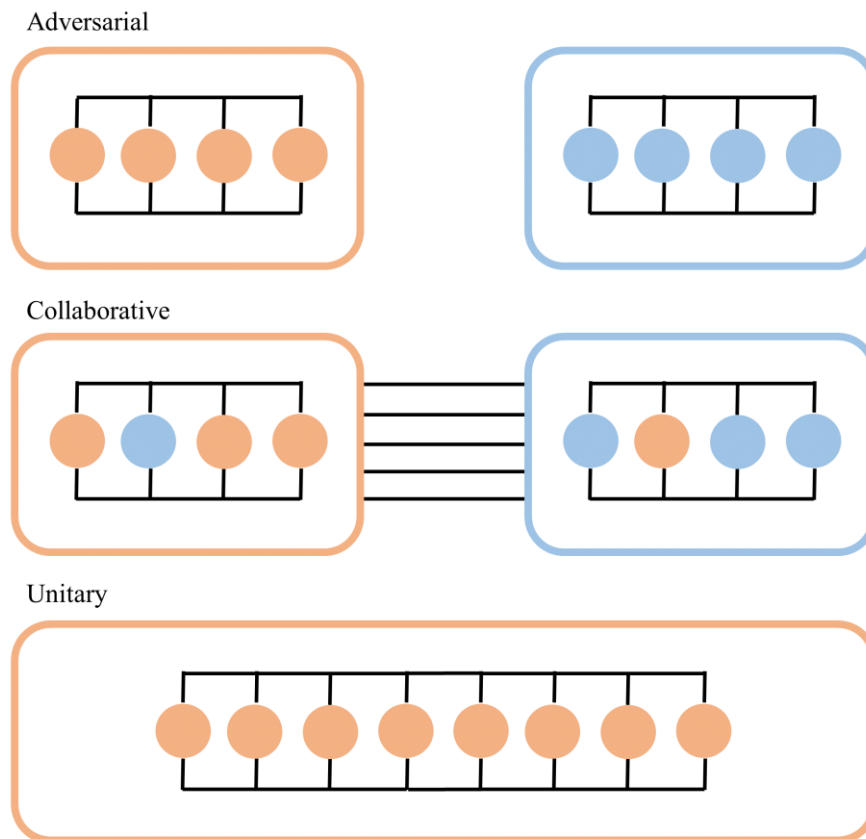


Figure 4.1. Three coalition structures. Based on Metz (2017)

4.3 Methods applied in the present study

We applied a discourse network analysis (Leifeld, 2016, 2017, 2020) to test the plausibility of our theoretical expectations formulated in the previous section. Due to the small-N research design, we conduct a plausibility probe, which may then guide future theory development (Levy, 2008). Discourse network analysis has repeatedly and successfully been applied in the study of policy formation and policy change (D. R. Fisher et al., 2013; Leifeld, 2013, 2016; Osička et al., 2018; Rinscheid, 2015; Schaub & Metz, 2020; Tosun & Schaub, 2017). The process of policymaking is inherently a relational phenomenon where actors depend on each other to make collective decisions. Discourse network analysis can be used to investigate interdependencies between the actors that participate in policymaking. The approach combines qualitative content analysis with social network analysis and allows to analyze these interdependencies based on the policy beliefs actors articulate in policy debates

(Leifeld, 2013). Actors' policy beliefs are measured via statements they formulate in the public debate. These statements are text portions where actors indicate support of or opposition to a concept (Leifeld, 2013). Therefore, actors' positions towards certain concepts, such as their stance on a policy approach or a policy instrument, represent an operationalization of their policy beliefs. In this study, we defined actors as organizations that participated in the policy debate on pharmaceutical contaminants such as environmental organizations, political parties, government agencies, or companies. Network analysis then allows analyzing coalition formation based on these organizations' shared policy beliefs (Leifeld, 2013).

We selected newspaper articles as data source for our analysis, because our research interest focused on the public debate. For clarity, we underline that these newspaper articles served as a data source to measure actors' publicly articulated policy beliefs. We are not interested in how the media might present or frame the issue of pharmaceutical contaminants. Following Leifeld (Leifeld, 2013), we used the *Frankfurter Allgemeine Zeitung* (FAZ), which is one of the principal nation-wide newspapers in Germany, as primary data source.⁹ We further included articles from at least one principal regional newspaper from each of the German states (leading to 23 sources in total) in order to secure a sufficiently fine-meshed coverage (for an overview see Table C.1.1 and Figure C.1.1 in Appendix C). We identified relevant articles by using a keyword search within the respective newspapers.¹⁰ This search strategy resulted in 826 newspaper articles that dealt with pharmaceutical contaminants in surface waters published between January 2013 and December 2017. Within these articles, we coded 666 statements where organizations expressed relevant policy beliefs by using the software *Discourse Network Analyzer* (Leifeld et al., 2019). All articles were encoded manually by one of the authors and two research assistants. In order to measure actors' policy beliefs, we coded their stance on four different types of policy aspects relevant for this policy subsystem (see Figure 4.2 for an overview).

First, we coded actors' risk perception in order to capture whether they framed the issue of pharmaceutical contaminants in certain ways in order to increase or diminish attention to the topic. This included whether actors agree or disagree that pharmaceutical contaminants represent a risk to the environment or to human health or whether the risk is unknown. Second, we captured how responsibility for the entry of contaminants is attributed. More specifically, we coded whether actors assign responsibility either to the pharmaceutical industry, the agricultural sector, the consumers, or to the wastewater treatment sector. Third, we coded actors' positions towards possible policy approaches. Actors referred to three different target groups when mentioning source-directed approaches: the pharmaceutical industry, the agricultural sector and consumers. In addition, actors referred to the wastewater treatment sector when discussing an end-of-pipe approach.

⁹ The FAZ corresponds well with the *quality press* criterion of wide circulation and being politically moderate and reputable (Barranco and Wisler, 1999).

¹⁰ A full list of these combinations is provided in Table C.2.1 in Appendix C.

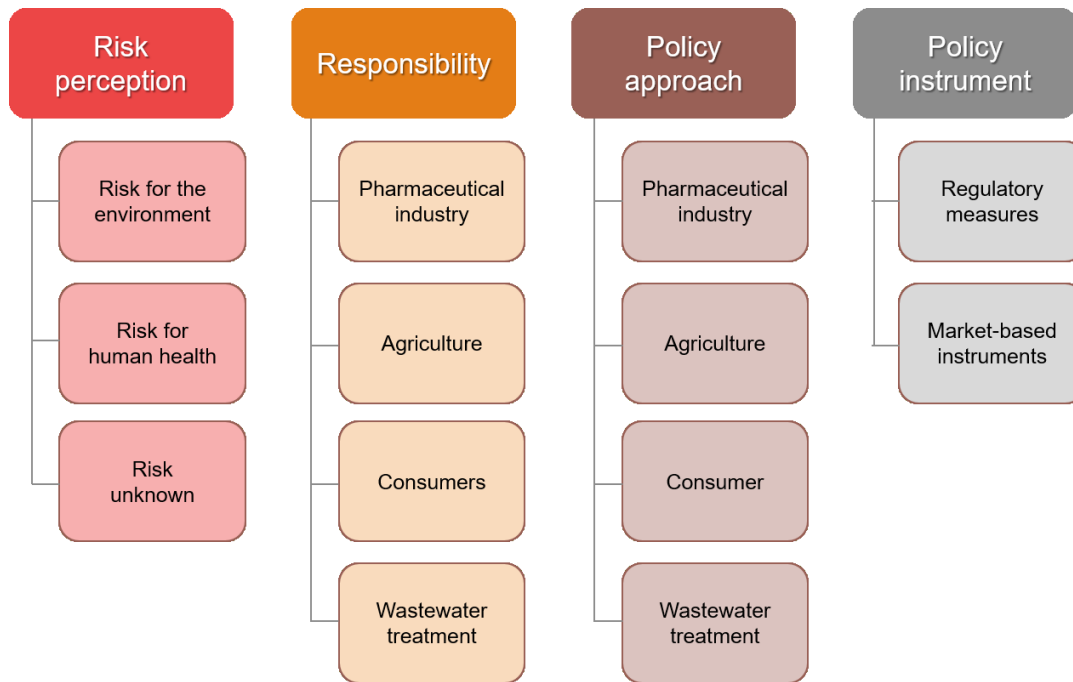


Figure 4.2. Measurement of policy beliefs via four different types of policy aspects

Fourth, we coded actors' preferences towards specific policy instruments. These included different regulatory measures, such as product bans or environmental quality standards, and market-based instruments, such as subsidies or taxes. We derived these four categories deductively based on our theoretical considerations and background knowledge on this policy issue. The codebook was then modified stepwise based on a first round of coding. Modifications mostly corresponded to specific policy instruments, which we then added to the codebook. Differences in policy beliefs as measured by agreement or disagreement with these policy aspects should, in principle, enable us to differentiate between actors who support a current policy status quo from those who mobilize for a policy change.

We then applied different methods to analyze the data: In a first step, we computed descriptive statistics to gain a first insight in what type of actors took part in the public debate and which policy beliefs predominated. For this purpose, we compared the actors' share of statements and the share of policy beliefs.

In a second step, we derived a one-mode actor subtract network, where we linked organizations depending on whether they shared positions on the four different types of policy aspects. The subtract network combined congruence and conflict networks, which means that they included both agreement and disagreement on policy aspects. In congruence networks, organizations are linked with an edge if they both share the same policy belief, i.e. mutual agreement or disagreement with a policy aspect. The more beliefs two actors share, the higher their edge weight. In conflict networks, organizations are linked with an edge if two organizations have conflicting positions on the same policy aspect. The more policy beliefs two actors do not share, the higher their edge weight in the conflict network. The subtract network combines both approaches by subtracting conflict network edge weights from congruence network edge weights. We further normalized the subtract network by applying the Jaccard similarity measure, which

is known for its normalizing function. The measure divides each edge weight by the sum of the two respective actors' independent and joint referrals to the policy aspects (Leifeld et al., 2019; Leydesdorff, 2008). One-mode actor networks should be normalized, if the goal is to identify coalition structures, which otherwise could be masked because of different activity levels in the debate (Leifeld, 2017; Leifeld et al., 2019). The resulting matrix contained organizations in rows and columns, with cell values indicating the degree of shared policy beliefs and ranging from -1 to 1. High values indicated high belief similarity and low values low belief similarity. We then graphically portrayed this actor subtract network by placing organizations as nodes in a two-dimensional space using the Fruchterman–Reingold force-directed placement algorithm. The algorithm is commonly applied in social network analysis and groups nodes, which share more connections to each other, closer together. At the same time, it reduces overlap of nodes and, thereby, improves readability of a graph (Fruchterman & Reingold, 1991; Ognyanova, 2016). In the graph, nodes were only linked by edges, if they shared cell values greater than zero indicating a certain degree of belief similarity (see Nagel (2016) for a similar application). This graphical approach allows to evaluate the structure of networks and to identify actor clusters, since actors with higher degrees of similarity are placed closer to each other (Leifeld et al., 2019). In addition, we conducted a community detection analysis with the help of the Louvain algorithm to complement the graphical analysis of coalition structures (also based on the modified subtract network with values ≥ 0). The method identifies communities within networks based on a modularity measure and a hierarchical approach (Blondel et al., 2008). Modularity measures the strength of community structures compared to a random network with identical sets of nodes and edges (Linhares et al., 2020). Communities are more similar subsets of nodes and may, therefore, represent actor coalitions as their similarity is determined based on their shared policy beliefs. In order to better understand the division between communities and to evaluate whether these can be interpreted as opposing coalitions, we added a qualitative analysis of their shared beliefs.

Finally, we complemented our analysis of actor coalition structures with an analysis of structures in the policy narrative. For this purpose, we derived a one-mode concept congruence network. In these networks, concepts represent the nodes, which are linked by edges if they are co-referenced by an identical actor. Here, we linked any two policy aspects if they were co-referenced by the same organization. More specifically, we subdivided the policy aspects into agreement and disagreement (e.g. agreement with a risk for the environment and disagreement with a risk for the environment). The resulting matrix contained the subdivided policy beliefs in rows and columns, with cell values indicating the number of actors that articulated the same two policy beliefs (e.g. 22 of the organizations that stressed the responsibility of consumers also supported a policy approach that focuses on upgrading wastewater treatment). We also illustrated the concept congruence network by placing the subdivided policy beliefs as nodes in a two-dimensional space using the Fruchterman-Reingold force-directed placement algorithm. This approach enables an analysis of the structure of policy narratives. If two or more clusters

of policy beliefs form in the network, then these can be interpreted as competing storylines in the policy debate (Leifeld, 2016, 2017).

4.4 Results

In this section, we first evaluate the policy response to pharmaceutical contaminants in Germany and analyze whether a major policy change occurred over time. Subsequently, we analyze the public debate in Germany and evaluate its impact on policy formation.

4.4.1 Policy response to pharmaceutical contaminants

Since Germany is a member state of the European Union (EU), EU legislation needs to be translated into domestic legislation. Thus, legislation at the federal and the state level is dependent on regulatory activity at the EU-level. This also applies to water legislation (Herzog, 2020; Metz, 2017).

The EU Water Framework Directive (Directive 2000/60/EC) is one of the EU's central water policies and relevant for the regulation of pharmaceutical contaminants. Its main goal is to achieve a good ecological condition of European water bodies. Among others, the directive aims at reducing the entry of priority hazardous substances into water. These substances are defined to have toxic, persistent or bio-accumulative properties or cause equivalent levels of concern to have adverse effects on human health or aquatic ecosystems (Directive 2000/60/EC). EU member states are obliged to monitor these substances and to adopt measures to mitigate their entry into water. Measures should be based on the precautionary principle, primarily address the source of contamination, and follow the polluter-pays principle (Directive 2000/60/EC). The priority hazardous substances are defined by a priority substances list that is meant to be updated regularly (Directive 2013/39/EU). The list entails 45 priority substances since the last revision in 2013. In addition, the EU assigned an *Environmental Quality Standard (EQS)* to every priority substance on this list. These define concentration limits for the specific substance. In case a limit is exceeded, policy-makers are required to take measures in order to reduce the entry of the respective pollutant (Herzog, 2020; Metz, 2017). Until today, the list did not include any pharmaceutical substances (Directive 2000/60/EC; Directive 2008/105/EC; Directive 2013/39/EU). However, the EU also laid down a watch list of substances that includes potentially hazardous substances for aquatic ecosystems (Commission Implementing Decision (EU) 2015/495; Commission Implementing Decision (EU) 2018/840). These substances are required to be monitored only by EU member states and will be added to the priority substances list upon decision by the European Commission Joint Research Centre if their occurrence in water bodies across Europe has been proven (Hillenbrand et al., 2015; Hillenbrand et al., 2016). Several pharmaceutical substances have been added to the list including sexual hormones (17-alpha-ethinylestradiol, 17-beta-estradiol estrone, and estrone), one painkiller (diclofenac), and various antibiotics (macrolide antibiotics, amoxicillin, and ciprofloxacin). Diclofenac has been removed from the watch list in the latest update in 2018, because its European-wide occurrence in environmentally relevant concentrations could not be proven (Commission Implementing Decision (EU) 2018/840). Nevertheless, Hillenbrand et al. (2016) emphasize that there are analytical difficulties

to detect residues in water and point towards the high amounts of production and consumption of the substances on this list that actually point towards considerable emissions of these substances into water. Finally, the Water Framework Directive required member states to select river basin-specific substances and define EQSs. The EU did not specify the specific substances but left the decision to include the substances to member states (Directive 2000/60/EC; Metz, 2017).

Altogether, EU legislation required Germany to adopt new water legislation that addresses the entry of hazardous substances into water (Herzog, 2020; Metz, 2017). As laid down by the watch list of substances, potential hazardous substances also included pharmaceutical contaminants. These were only required to be monitored. However, the river basin specific substance list gave Germany the opportunity to also take mitigating measures that address pharmaceutical contaminants present in German waters at environmentally relevant concentrations, such as Diclofenac (Lonappan et al., 2016; Stülten et al., 2008). Finally, the directive was clear in its recommendation to primarily adopt a source-directed approach and put pressure on polluters via the polluter-pays principle (Herzog, 2020).

Water policies at the federal level

The German Surface Water Ordinance (OGewV), adopted in 2011, and the Federal Water Act (WHG), adopted in 2009, are the two main water legislations at the federal level in Germany. Both transpose the EU Water Framework Directive into domestic law (Berger, 2017; Herzog, 2020). The OGewV is of main importance for this study because it regulates the entry of hazardous substances in water bodies in Germany. It has been designed in accordance with a control approach (Metz, 2017). As requested by the Water Framework Directive, the ordinance specifies EQSs for a list of river basin-specific substances. The OGewV has two significant limitations with regard to the regulation of pharmaceutical contaminants. First and foremost, the list of 67 substances does still not include a single pharmaceutical contaminant (OGewV). When the ordinance was drafted, opposition by the German states prevented the listing of some new river basin-specific substances, including pharmaceutical chemicals (Metz, 2017). Second, the OGewV only states that further political measures need to be taken to mitigate immissions in case an EQS is exceeded. It does not specify what measures were to be taken and what sanctions polluters would face (Metz, 2017). The approach mainly builds on point pollution where specific polluters can be identified on a case-by-case basis and then be held responsible. However, the entry of pharmaceuticals into water bodies is more complex and the identification of polluters is not unambiguous (Beek et al., 2016). Thus, the behavior of relevant target groups (like the pharmaceutical industry as an indirect polluter) would be difficult to address even if pharmaceuticals were added to the list in the future (Metz, 2017).

Source-directed approaches to address pharmaceutical residues in water are largely absent in Germany. Such an approach could target the producers of pharmaceuticals, for instance (Hillenbrand et al., 2016). However, the authorization of human medicines in Germany does not necessarily depend on a prior environmental risk assessment (Oelkers & Floeter, 2019). The authorization procedure in

Germany is regulated at the EU level under Directive 2001/83/EC and Regulation (EC) No 726/2004 and on the national level under the German Medicinal Products Act (AMG). Although the authorization of new pharmaceuticals requires an environmental risk assessment, the assessment is not decisive for an authorization decision and, in addition, has only been mandatory for newly marketed drugs since 2005. In fact, most frequently consumed pharmaceuticals were authorized before 2005 (Beek et al., 2016). Therefore, there is no significant incentive for the pharmaceutical industry to produce more environmentally friendly pharmaceuticals. With regard to end-of-pipe solutions, there is no legal requirement for wastewater treatment plants to upgrade their wastewater technology in order to be able to filter pharmaceutical contaminants. Improving the treatment technology has remained a voluntary decision by the operators (Metz, 2017).

In 2016, the German Federal Ministry of the Environment initiated a stakeholder consultation to develop a new federal strategy on micropollutants in water, including pharmaceutical contaminants. Invited stakeholders included industry representatives, agricultural associations, environmental groups, consumer protection organizations, representatives of the water treatment sector, scientists and representatives of the German states. The initiative had the potential to induce a change regarding the regulation of pharmaceutical contaminants. However, the results of the stakeholder consultation represented in March 2019 do not suggest that a major change in the approach is likely in the near future (Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit & Umweltbundesamt, 2019). Participating stakeholders were only successful in agreeing on voluntary policy measures such as a new round table and an information campaign that addresses consumers' consumption behavior. Therefore, relevant regulation for pharmaceutical contaminants in Germany at the federal level still mostly follows a control approach with a strong emphasis on *soft* voluntary measures.

Implementation at the state-level

The German states are responsible for the implementation of the rules set out by the OGeV and need to comply with the defined concentration limits at the federal level (Herzog, 2020; Metz, 2017). Since the OGeV does not determine political measures in case EQSs are exceeded, the German states enjoy some freedom in their regulatory response. With the exception that the states are not allowed to develop own regulations that address the emission of substances (Berger, 2017; Herzog, 2020). As there are no concentration limits defined for pharmaceutical contaminants at the federal level, the German states *de jure* do not need to take regulatory measures, except for monitoring (OGeV). Nevertheless, some German states have developed their own strategies on how to address the entry of pharmaceutical contaminants and implemented policy measures. These measures mostly follow an end-of-pipe approach, which aims at upgrading wastewater treatment technology at selected treatment plants, and a source-directed approach that aims at changing the behavior of consumers through information campaigns. States that pursue an end-of-pipe approach include Baden-Württemberg (UM BW, 2012, 2018), Hessen (HMUKLV, 2018), North Rhine-Westphalia (MKULNV, 2012), and to some degree Bavaria (StMUV BY, 2015) and Saarland (MUV SL, 2016). The former have provided financial support

for operators who voluntarily upgrade their treatment technology, whereas the latter only have funded pilot studies or scientific research in the development of new treatment technologies. Information campaigns have been part of the strategies of Hessen (HMUKLV, 2018), and North Rhine-Westphalia (MKULNV, 2012). The remaining states have not taken any measures. Some of them explicitly state that they wait for further regulatory action at the EU-level before taking any measures (Herzog, 2020; Metz, 2017).

Major policy change?

Theoretically, we argued that a major policy change in the regulation of pharmaceutical contaminants would involve a significant change in the overall approach or in the pressure policy instruments put on target groups. As detailed above, Germany has adopted a control approach at the federal level that has been complemented by end-of-pipe solutions by only a few selected German states. Over the course of time, there has not been a significant change to this overall approach. The pressure on target groups has been low. Command-and-control regulation that would force operators to update their treatment technologies have not been adopted. The same applies for market-based instruments that would push producers to develop more environmentally friendly pharmaceuticals or consumers to consume pharmaceuticals more environmentally consciously. Therefore, the emitters of pharmaceutical contaminants are not directly targeted and there is no pressure to change behavior. The only measures taken were voluntary and can be expected to exert only *soft* pressure on relevant target groups (see Metz (2017) for a detailed evaluation). A significant change in the measures adopted could not be observed. To conclude, the policy status quo in Germany has been predominantly a control approach in combination with *soft* policy measures. A major policy change did not occur.

4.4.2 Public debate and its impact on the policy response

In the subsequent section, we first provide some descriptive statistics on actor participation and the policy beliefs expressed in the public debate. We then turn to the main part where we analyze the coalition structure. In addition, we shed some light on the structure of policy narratives in the public debate. We conclude by relating our empirical findings to our theoretical expectations with regard to an impact of the public debate on policy formation.

Overall, persons affiliated with 200 different organizations issued 666 statements on pharmaceutical contaminants in the selected newspaper articles between January 2013 and December 2017. Table 4.1 presents descriptive statistics for different types of organizations, including the number of organizations per type and the frequency of statements (for a full list of organisations and their abbreviations, please refer to Table C.2.1 in Appendix C.2).

The public debate was dominated by political-administrative actors, science, and organizations affiliated with the sectors of wastewater treatment and water provision (together 73.3% of statements). Political-administrative actors from different regulatory levels contributed the second highest share of statements. Among these, actors representing the federal and state levels were most active (9.5 and 9.6%,

respectively), which coincides with the fact, that responsibilities for water protection lie mostly on the federal and the state levels. The German Federal Environmental Protection Agency (UBA) was the most active single organization with 52 statements (7.8%). Universities and other higher education institution accounted for 16.5% of the statements. The largest share of statements stemmed from wastewater treatment and water provision (30.2 and 4.2%). These included water associations such as the BDEW (Federal Association of the Energy and Water Industry) and the DWA (German Association for Water Management, Wastewater and Waste), smaller municipal utilities or private water companies. Not only their share of statements, but also their number was largest compared to the other types of organizations.

Table 4.1. Frequency of organizations and statements per type of organization in the public debate

<i>Type of organization</i>	<i>Organizations</i>	<i>Statements</i>	<i>Share of statements (%)</i>
Agricultural association	3	4	0.6
Fishery association	1	1	0.2
Pharmacy association	7	14	2.1
Medicine association	3	3	0.5
Industry, Retail	2	6	0.9
Water association, municipal utility	68	201	30.2
Water company	11	28	4.2
Environmental organization	6	45	6.7
Consumer protection organization	4	13	1.9
Green party	14	72	10.8
Leftist party	1	1	0.2
Social democratic party	4	9	1.4
Christian Democratic Party	6	7	1.1
Liberal party	3	3	0.4
Federal government	5	63	9.5
State government	18	64	9.6
Regional, local government	14	22	3.3
Science	30	110	16.5
Sum	200	666	100.0

We identified 72 statements by the German Green party (10.8%), 45 statements by environment organizations (6.7%) and 13 statements by consumer protection organizations (1.9%). Only two organizations affiliated with industry or retail appeared in the public debate: the German Pharmaceutical Industry Association (BPI) and the Association of Research-Based Pharmaceutical Companies (VFA). In total, these organizations made six statements equivalent to 0.9% of the sum of statements. The presence of organizations affiliated with agriculture was even lower (0.6%).

Policy positions taken in the debate and degree of dispute

We further give some insights into the policy beliefs actors expressed in the debate. Table 4.2 shows how frequent actors referred to the different policy aspects, either with a supportive or opposing stance. The table reports absolute numbers of statements as well as percentages on the total number of statements.

Table 4.2. Frequency of expressed policy beliefs in the public debate

<i>Policy aspects</i>	<i>Agreement</i>		<i>Disagreement</i>		<i>Total</i>	
	Σ	%	Σ	%	Σ	%
Risk for the environment	87	13.1	0		87	13.1
Risk for human health	24	3.6	43	6.5	67	10.1
Risk unknown	32	4.8	0		32	4.8
Consumers responsible	115	17.3	0		115	17.3
Agriculture responsible	38	5.7	1	0.2	39	5.9
Pharmaceutical industry responsible	13	2.0	0		13	2.0
Wastewater treatment responsible	74	11.1	0		74	11.1
Policy approach: Consumer	54	8.1	0		54	8.1
Policy approach: Agriculture	19	2.9	1	0.2	20	3.0
Policy approach: Pharmaceutical industry	42	6.3	0		42	6.3
Policy approach: Wastewater treatment	72	10.8	16	2.4	88	13.2
Policy instrument: Tax	3	0.5	1	0.2	4	0.6
Policy instrument: Subsidy	1	0.2	0		1	0.2
Policy instrument: Authorization	14	2.1	1	0.2	15	2.3
Policy instrument: Application	4	0.6	0		4	0.6
Policy instrument: Product ban	1	0.2	0		1	0.2
Policy instrument: EQN	10	1.5	0		10	1.5
Sum	603	90.5	63	9.5	666	100.0

Note: EQN – Environmental Quality Norms

Overall, the policy beliefs expressed in the debate indicate a low level of conflict. Most statements indicated a supportive stance towards the various policy aspects (90.5%). Only a small number of statements revealed opposition towards discussed sources of pollution, policy approaches, or policy instruments (9.5%). The majority of statements on policy approaches advocated for addressing consumer behavior (8.1%) or upgrading wastewater treatment (10.8%). Opposition towards these approaches was low. However, the end-of-pipe approach faced some opposition (2.4%)—mainly by actors representing municipal utilities or water associations such as the BDEW (Federal Association of the Energy and Water Industry). Within these statements, organizations mostly did not per se argue against upgrading wastewater treatment, but against prioritizing the end-of-pipe approach while

neglecting source-directed approaches. The share of statements that advocate source-directed approaches in the pharmaceutical industry or agriculture was comparatively smaller (6.3 and 2.9%, respectively).

The pattern was similar with regard to identifying the sources of pollution and attributing responsibility. Most statements saw the responsibility with consumers and wastewater treatment (17.3 and 11.1%, respectively). Organizations held responsible (1) the consumers for pollution mainly because of inappropriate disposal behavior and (2) the wastewater treatment sector for not being able to eliminate contaminants from the sewage water. Responsibility was comparatively less often attributed to the pharmaceutical industry or the agricultural sector (2.0 and 5.7%, respectively).

Statements on particular policy instruments were rare and issued only by a few organizations. EQSs characterize the current water policy in Germany to a large degree, and some organizations advocated for applying new limits for pharmaceutical residues (1.5% of statements). A slightly larger share of statements showed approval for restricting the authorization of pharmaceuticals (2.1%), with only one opposing statement by the BPI (0.2%). Restricting the application of certain pharmaceuticals, another command-and-control measure, was hardly debated (0.6%). Market-based instruments, including taxes and subsidies, were mentioned only five times (0.9%). Overall, the public debate did not pay much attention to tangible policy instruments.

Finally, there was general agreement that pharmaceutical residues pose a risk for the environment (13.1%) or that the risk remains unknown (4.8%). The main exception from this pattern was actors' position on a possible risk for human health. The majority of statements explained that pharmaceutical residues do not pose a risk to human health (6.5% compared to 3.6%). These statements were mostly related to discussions on drinking water quality, which, in fact, can be rated as very good to excellent due to Germany's very high standards for drinking water protection (Tosun, Scherer, et al., 2020).

Actor coalitions in the policy debate

The analysis of coalition structures revealed a unitary network structure without conflicting actor coalitions. Figure 4.3 the actor subtract network with nodes representing organizations and edges their degree of similarity with regard to their policy beliefs. The node colors indicate the organizations' membership to six different communities as determined by the Louvain algorithm.

A first visual inspection of the network graph with regard to the location of nodes and edges reveals a unitary coalition structure. Most actors cluster in the middle of the graph and share many policy beliefs as indicated by the high density of edges linking the nodes. There are only a few smaller groups on the outside, which are characterized by higher belief similarity compared to other actors in the network. The visual interpretation does clearly indicate the absence of an adversarial coalition structure. If present, the graph would show two clearly separated clusters characterized by many edges within coalitions and no, or at least only a few, edges between coalitions.

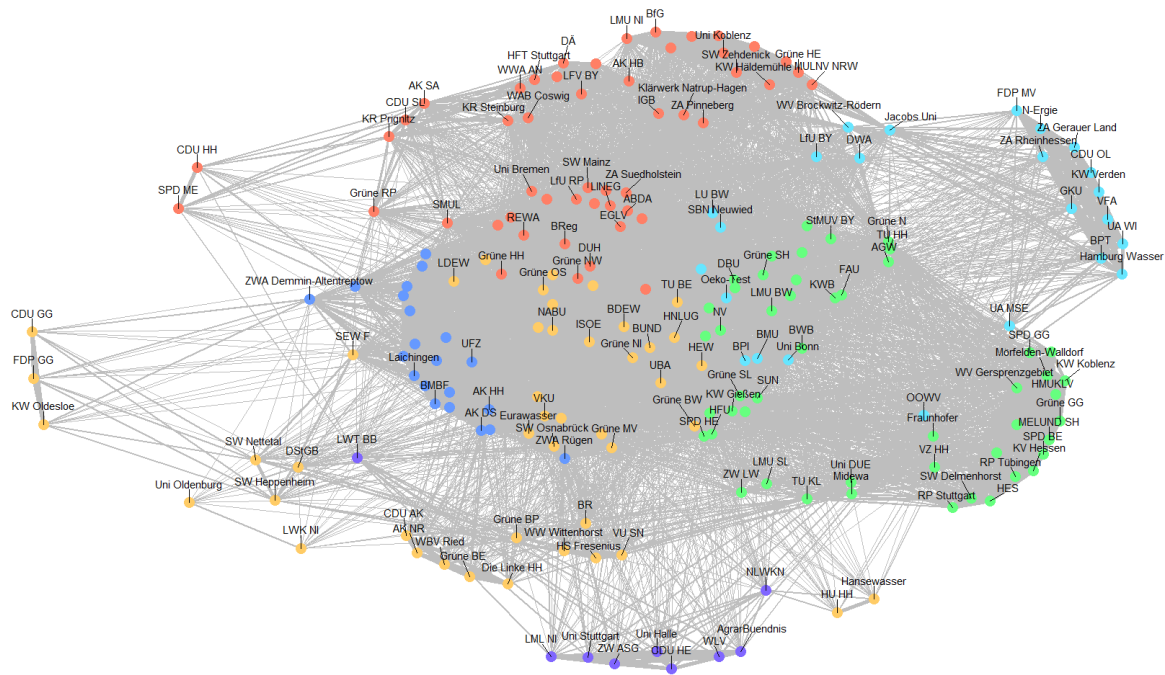


Figure 4.3. Normalized actor subtract network based on actors' policy beliefs

Note: Line widths are dependent on belief similarity between organizations. For explanation of abbreviations, please refer to the full list of actors in Table C.2.1 in Appendix C.

Community detection with the help of the Louvain algorithm suggests that, in fact, six different actor groups were present in the network. These consisted of three large groups with 50, 49 and 45 actors, two medium sized groups with 24 and 21 actors, and one small group consisting of 9 actors. Subsequently, we analyzed these groups and their shared policy beliefs in detail in order to investigate whether they represent adversarial actor coalitions. Visualizations of actors' policy beliefs for each group are reported in section C.4 in Appendix C.

The largest group is colored in red in Figure 4.3. Many actors in this group shared the beliefs that wastewater treatment and consumers were responsible for contamination by pharmaceuticals and that these represented a risk to the environment. However, these actors mostly did not articulate their preferred policy approach or policy instruments to regulate the issue. The second largest group is colored in green in Figure 4.3 and can be termed as the *end-of-pipe-coalition*. Actors in this group all shared the belief that policy measures should address wastewater treatment. Some also favored solutions that address consumption behavior. Although these actors seemed to be united in how they preferred pharmaceutical contaminants to be addressed, they did not take a clear position on what type of policy measures should be implemented. The group of actors colored in orange in Figure 4.3 is more difficult to classify since actors in this group shared many positions but also had divergent policy beliefs. Apparently, some of the actors in this group explicitly rejected the end-of-pipe approach. Most of these actors were water associations. Furthermore, actors in this group mostly pointed towards the responsibility of consumers and suggested to follow a source-directed approach that addresses

consumption behavior. This group could have represented a counterpart to the *end-of-pipe-coalition* described before. The group of actors colored in dark blue in Figure 4.3 appears to be similar to the one colored in orange. Actors in this group all shared the belief that consumers were responsible for contamination. The group consisted mostly of water associations, municipal communities or water companies, and science. However, this group also did not indicate clearly their preferred policy approach or policy instruments. The group of actors colored in light blue in Figure 4.3 was characterized by their shared belief that pharmaceutical contaminants do not represent a threat to human health. Some of these shared the belief that there is a risk for the environment. However, there is no clear pattern with regard to the attribution of responsibility and the preferred policy approach. Finally, there is one small group of actors, colored in purple in Figure 4.3. Actors in this group all shared the belief that the agricultural sector is responsible for water contamination by pharmaceuticals.

Finally, we analyzed the distribution of actor types across the identified actor groups. Normally, one would expect similar actors (such as different environmental organizations) to be more likely to share policy beliefs and to be part of one actor coalition. In fact, the type of actors is not a strong predictor of group membership. All actor groups are characterized by a heterogeneous composition regarding the types of actors. Furthermore, a differentiation between types of organizations did not reveal significant differences in their policy beliefs. In fact, the different types of organizations held surprisingly similar policy beliefs. The majority of organizations agreed that the discharge of pharmaceutical contaminants into aquatic ecosystems was primarily a problem of consumer behavior that should be tackled by addressing consumption and disposal behavior and upgrading wastewater treatment. This mirrors the control approach that is currently in place at the federal level and efforts of some German states to improve wastewater technologies on their territory.

Altogether, the qualitative analysis of the determined communities suggests that these did not represent adversarial actor coalitions. The identified actor groups diverged in their policy beliefs to some degree. However, an actor coalition that clearly mobilizes for a major policy change could not be identified. The computation of a modularity score of 0.312 supports the interpretation that community structures in the network were not very strong. The modularity score ranges between 0 and 1 with higher modularity scores indicating stronger community structures (Linhares et al., 2020). The graphical layout by the Fruchterman–Reingold algorithm also supports this interpretation since many actors of the different communities were placed close to each other and communities partially overlap in the center of the graph.

The supplemental materials provide the results of a robustness test for the graphical analysis where we gradually removed lower edge weights, i.e. edges between organizations with fewer shared policy preferences (section C.3 in Appendix C). These edges tend to mask underlying network structures. The robustness test further substantiates our findings on the coalition structure: even when we remove the edges with lower degree of similarity, organizations still cluster in one main group and then dissolve into many smaller subgroups.

To conclude, the results of the graphical analysis and the community detection point towards a unitary coalition structure as defined in the theoretical section.

Policy narratives in the policy debate

The analysis of policy narratives substantiates our previous findings. Competing storylines in the policy debate on pharmaceutical contaminants in surface waters could not be identified. Figure 4.4 visualizes the concept congruence network where two policy beliefs are linked by edges if they were co-referenced by at least one organization. The more organizations co-referenced two policy beliefs the higher their similarity.

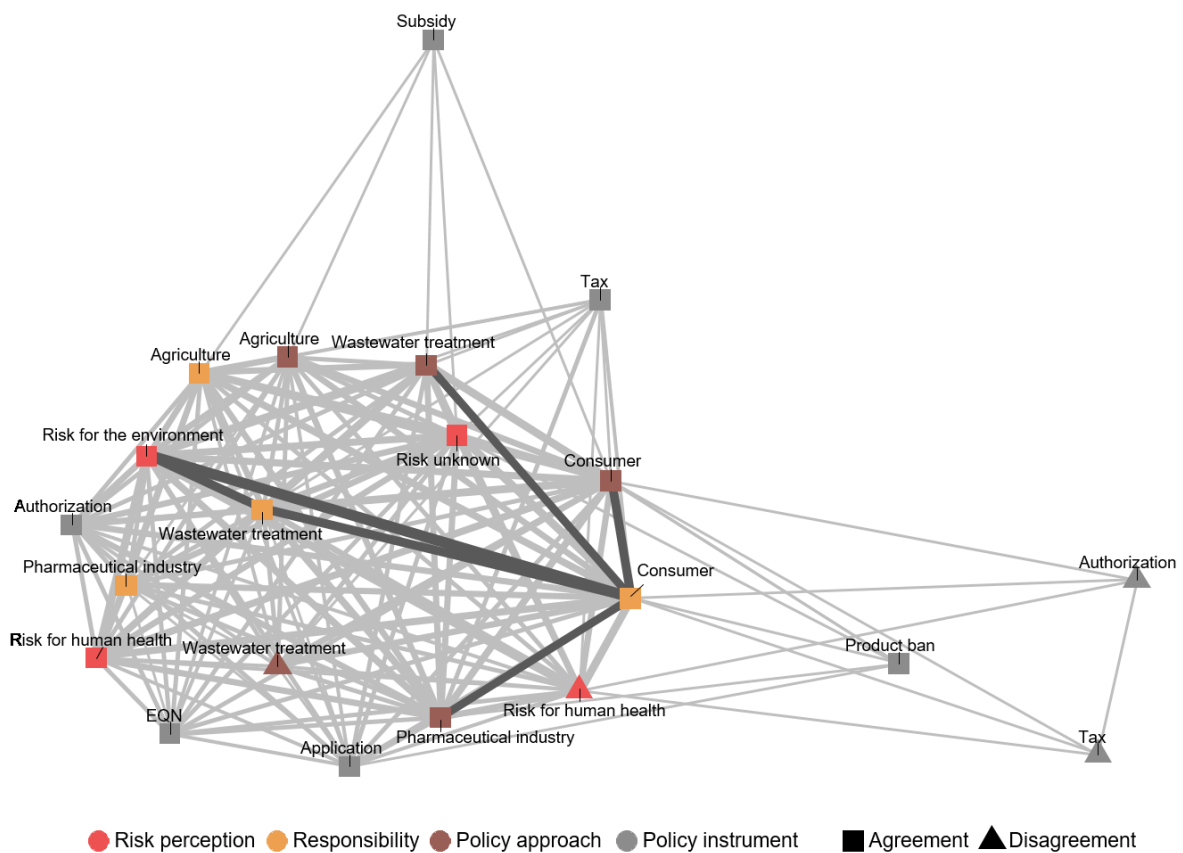


Figure 4.4. Concept congruence network based on actors' policy beliefs.

Note: The nodes in the graph visualize agreement (squares) and disagreement (triangles) with the policy beliefs. Two nodes are linked if at least one organization co-referenced both of them (e.g. 16 organizations point towards responsibility of consumers and deny a risk for human health). The more organizations co-referenced two nodes the thicker the lines connecting them. For color code of symbols, cf. Figure 4.2. Edges with more than 10% of organizations are colored in dark grey. Isolates (policy beliefs without a connection) are not depicted in this graph.

The graph shows a similar unitary network structure we identified previously for the actor subgraph network. There is only one big cluster in the center with many edges connecting the different policy beliefs. We also performed a robustness test for the concept network where we gradually removed edges with lower similarity (i.e. fewer organizations). The unitary structure persisted, even when we

normalized the network (sections C.5 and C.6 in Appendix C). The test also revealed that organizations not only mentioned the responsibility of consumers most frequently but also most often in combination with the following policy beliefs: responsibility of the wastewater treatment sector (15.5% of organizations), policy approaches that address consumer behavior (13.5%), wastewater treatment (11.0%), and the pharmaceutical industry (10.0%) as well as a risk for the environment (17.0%). The edges between these policy beliefs are colored in grey in Figure 4.4.

This combination of policy beliefs can be interpreted as the dominant narrative in the policy debate, which coincides to a large degree with the current water policy approach in place in Germany. The combination of consumer responsibility and a policy approach that targets the pharmaceutical industry is the only exception. Overall, the absence of a second cluster of policy beliefs indicates that the dominant policy narrative was not challenged by a competing storyline that could have advocated for policy change.

Altogether, our empirical findings support our Expectation 1b. The policy status quo in the regulation of pharmaceutical contaminants in Germany has been characterized by a focus on a control approach that has been complemented by support for wastewater treatment upgrades and information campaigns for consumers in selected German states only. Implemented policy measures included mostly voluntary measures with *soft* pressure on target groups. Over the course of time, a major policy change did not take place. The empirical findings on the public debate suggest that the observed coalition structures did not challenge but rather contributed to the persistence of the policy status quo. The debate was characterized by a unitary coalition structure without adversarial actor coalitions. Although identified actor groups showed some level of disagreement on whether the current control approach should be complemented by a stronger focus on end-of-pipe solutions, there was nearly no debate on how to implement the approach, i.e. policy measures, and whether the pressure on target groups should be increased. Thus, it was mainly the absence of an actor coalition publicly mobilizing for major policy change that explains why the policy status quo has not been challenged.

4.5 Discussion

We can compare our findings to two strands of literature. The first includes studies on the relationship between public debates and policy change. The second involves public policy research on the policy subsystem of pharmaceutical contaminants and, on a more general level, on contaminants of emerging concern or micropollutants in water. Research in political science on pharmaceutical contaminants is very limited. However, a few empirical studies have been published on the topic of micropollutants or contaminants of emerging concern.

Several studies have identified polarization of the public debate in a policy subsystem as an enhancing factor for subsequent major policy change. For instance, Leifeld (2013) showed in a study on pension politics in Germany how a prior phase of polarization in the public debate preceded major policy change. Similarly, D. R. Fisher et al. (2013) investigated climate politics in the United States and

showed, based on Congressional hearings, how a phase of polarization and a subsequent phase of dominance of a climate change supporting actor coalition preceded the adoption of the first climate change bill in the 111th Congress. Rinscheid (2015) was able to show for nuclear energy policymaking that, similarly to our case, a unitary coalition structure inhibited major policy change in Japan in the aftermath of the nuclear crisis after the Fukushima accident. On the contrary, a polarized coalition structure enhanced major policy change in Germany. Thus, our findings are in line with literature that investigates the relationship between public debate and (the absence of) policy change.

The level of belief similarity among political actors was surprisingly high. Normally, there are significant differences in policy beliefs between political actors in areas of environmental policy (Ingold, 2011; Tosun & Lang, 2016; Tosun & Schaub, 2017). One possible explanation revolves around the character of the policy issue. The issue of pharmaceutical contaminants is complex and characterized by a high degree of uncertainty with regard to consequences (Kirschke et al., 2017). The complexity of the issue implies that there is not the one solution able to solve the problem (Kirschke et al., 2019), which might explain why actors with an interest in stronger environmental protection do not mobilize for a certain policy solution or policy approach. In fact, Metz and Leifeld (2018) and Metz et al. (2018) observe a similar pattern in a study on the regulation of micropollutants in Switzerland. They find that environmental organizations, as well as other actors such as water associations, do not prefer specific policy solutions but take a positive stance towards most types of policy intervention that would help to improve water protection. Metz (2017) also investigates political actors' policy beliefs in Germany during the drafting of the OGeV between 2008 and 2011 based on survey data. She also finds comparatively high similarity in actors' policy beliefs on the issue of micropollution, which further supports our observation that the policy subsystem is characterized by an absence of strong conflict lines. Schaub and Metz (2020) more systematically compare coalition structures in the policy subsystem of micropollutants in Germany. The authors compare two different types of data used to measure policy beliefs, survey and media data, and show that the analysis of both data sources lead to the identification of a policy subsystem characterized by a similar unitary coalition structure. Compared to other policy issues, media attention to the issue of pharmaceutical contaminants was lower. For instance, the issue of fracking received about twice as much attention in the FAZ in a similar period (Tosun & Lang, 2016). In general, policy issues compete for attention (Wagner & Meyer, 2014). The complex and often very technical nature of the issue of pharmaceutical contaminants could be a barrier for increased attention, for instance by political parties. This also could be an explanation why the Green party was not more active in the public debate and did not pursue a more coherent mobilization strategy with a stronger focus on stricter and source-directed policy measures. Similarly, environmental organizations are confronted with many environmental issues and might lack the resources to run sophisticated public campaigns on every single issue, especially if these are complex and technical in nature. Related to this point, these actors might prefer other venues, such as stakeholder consultations, in their attempt to influence policy on pharmaceutical contaminants. In principle, the stakeholder consultation initiated by

the German Federal Ministry of the Environment in 2016 provided such a venue. It should also be kept in mind that—at least at the scientific and technological levels—intensive internal technical discussions take place. For instance, a scientific discussion about the best strategy for the enforcement of wastewater treatment plants has been initiated quite a while ago and is ongoing at a world-wide scale (Beijer et al., 2017; Brillas, 2020; Guillosoy et al., 2020; Henneberg & Triebkorn, 2015; López-Velázquez et al., 2020; Maier et al., 2016; Monteoliva-García et al., 2020; Yang et al., 2017). However, it remains questionable whether stakeholder consultations and non-public scientific discussions will lead to a change in the policy response to pharmaceutical contaminants. Unfortunately, the results of the federal stakeholder dialogue published in 2019 cement a continuation of the current policy approach. The disillusioning outcome suggests that future regulations on pharmaceutical contaminants in Germany are likely to remain *soft* despite claims from the scientific community that the current control approach should be complemented by an end-of-pipe and a source directed approach (Hillenbrand et al., 2016) and that a mix of policy instruments would be favorable for achieving environmental goals (Bressers & O'Toole Jr, 2005; Pakizer et al., 2020).

The low level of politisation of the public debate might also coincide with the strong presence of political administrative actors. Their high activity in the public debate suggests that agenda-setting took place top-down to a large degree. Federal and state ministries and agencies, such as the Federal Ministry of the Environment or the German Environment Agency, apparently concluded that this particular issue needed to be addressed and, therefore, initiated a policymaking process. The federal stakeholder consultation may serve as an example for such a top-down agenda-setting process. Similar top-down activities could be observed in some German states, including Baden-Württemberg (UM BW, 2012, 2018), Hessen (HMUKLV, 2018), and North Rhine-Westphalia (MKULNV, 2012). In contrast, politicized public debates often coincide with bottom-up agenda-setting. In this case, political actors, e.g. environmental organizations or citizen initiatives, try to create attention for an issue in order to place the issue on the political agenda (Baumgartner & Jones, 2009; Jones & Baumgartner, 2007; Tosun & Triebkorn, 2020). The comparatively low presence of organizations with an interest in environmental protection, e.g. environmental organizations or the Green party (e.g. compared to Nagel (2016) or Tosun and Schaub (2017)), in the public debate suggests that bottom-up agenda-setting was weak in comparison. However, it is bottom-up agenda-setting that mostly leads to major policy change whereas top-down agenda-setting is rather associated with only small incremental changes (Baumgartner & Jones, 2009). These findings also resonate with Metz (2017) who finds that the Federal Ministry of the Environment, the German Environment Agency and representatives of the German states played central roles in the formulation of the OGeV, which in turn was largely motivated by policymaking at the EU-level (Metz, 2017).

4.6 Conclusions

Despite clear-cut scientific evidence that pharmaceutical contaminants cause adverse effects in aquatic life and pose a risk for drinking water resources, the regulatory response in Germany has been weak.

This study investigated the impact of the public debate on the policy response to pharmaceutical contaminants in surface waters in Germany. Thus, the study contributes to public policy research in environmental policy. More specifically, it contributes to literature on pharmaceutical contaminants in water by analyzing current regulation and policymaking processes in this policy subsystem with a political science research design, coupled with insights from the environmental sciences. The main aim was to investigate whether the public debate on pharmaceutical contaminants had an impact on the observed policy response to pharmaceutical contaminants in Germany. Overall, the empirical findings suggest that the observed actor coalition structures revealed in the public debate contributed to the persistence of the regulatory response. Strong bottom-up mobilization by an adversarial coalition could not be observed. Reasons could be the complex and technical nature of the policy issue, which makes it more difficult to conduct sophisticated public campaigns. Related to this, political actors with an interest in policy change might resort to other venues, such as lobbying or stakeholder consultations, to influence policymaking on the regulation of pharmaceutical contaminants. Our findings suggest that policy formation was largely influenced by top-down agenda-setting by political-administrative actors, instead. Based on our findings and the insights of previous research, we expect only small incremental changes to the current regulatory response likely to occur in the near future. Nevertheless, empirical research in political science has repeatedly shown that the public debate can have an impact on policy formation and trigger major policy change. Thus, political actors with an interest in stricter regulatory measures and a prioritization of source-directed approaches might want to reconsider their strategies.

Despite the insights offered, the current study bears some limitations: First, the findings of this case study do not allow causal conclusions, since the study has exclusively been focused on Germany and, therefore, lacks comparison with other cases. Future studies might build on the results of this pre-test and compare different cases, which would allow to systematically varying the independent variable and control for other influences. A comparison with Switzerland appears fruitful where the adoption of the new Water Protection Act in 2016 meant a change to an end-of-pipe approach combined with strong regulatory measures. Selected operators have been forced to upgrade their purification technologies to the so-called *fourth treatment stage* over the next 20 years (Metz, 2017). Second, the study focuses on the role of the public debate and neglects other venues political actors might use to influence policymaking. Other venues may include lobbying activities behind closed doors, stakeholder consultations or legal confrontations. Further studies could investigate the strategic behavior of specific political actors based on interviews, for instance. Third, we had to leave other potentially influential factors aside. These factors include the role of the EU or the influence of the German states in Germany's federal political system. Future studies might, e.g. investigate long-term and long-range EU policymaking processes and their impact on national responses to pharmaceutical contaminants.

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5 Comparing discourse and policy network approaches: evidence from water policy on micropollutants

*Research article written with Florence Metz**

Abstract. To understand how actors make collective policy decisions, scholars use policy and discourse network approaches to analyze interdependencies among actors. While policy networks often build on survey data, discourse networks typically use media data to capture the beliefs or policy preferences shared by actors. One of the reasons for the variety of data sources is that discourse data can be more accessible to researchers than survey data (or vice versa). In order to make an informed decision on valid data sources, researchers need to understand how differences in data sources may affect results. As this remains largely unexplored, we analyze the differences and similarities between policy and discourse networks. We systematically compare policy networks with discourse networks in respect of the types of actors participating in them, the policy proposals actors advocate and their coalition structures. For the policy field of micropollutants in surface waters in Germany, we observe only small differences between the results obtained using the policy and discourse network approaches. We find that the discourse network approach particularly emphasizes certain actor types, i.e., expanders who seek to change the policy status quo. The policy network approach particularly reflects electoral interests, since preferences for policies targeting voters are less visible. Finally, different observation periods reveal some smaller differences in the coalition structures within the discourse network. Beyond these small differences, both approaches come to largely congruent results with regards to actor types, policy preferences and coalition structures. In our case, the use of discourse and policy network approaches lead to similar conclusions regarding the study of policy processes.

5.1 Introduction

The network lens is an analytical approach to policymaking, which emphasizes that policies are adopted in a bargaining process between multiple actors. These actors participate in advocating and formulating policies and include political parties, interest groups or administrative units. As no single actor has sufficient decision-making power, scholars adopt the network lens to uncover the complex interdependencies among actors in policymaking processes. Scholars of policy process have employed the network approach as an analytical tool either: a) to describe the variety of actors, their policy positions and their relationships to one another; or b) to determine analytically how actors' interactions shape the outcomes of policymaking processes (Howlett, 2002).

As popularity for the network lens has increased, so too have the number of different network approaches (Adam & Kriesi, 2007; Börzel, 1998). One important strand of the literature draws attention to *policy networks*. Policy networks are defined as entities composed of organizations involved in the

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formulation or implementation of public policies (Fischer, 2017). The concept has its roots in the literature on the organizational state (Laumann & Knoke, 1987) and collective action (Laumann, Pappi, & Rossi, 1976). According to this literature a multitude of actors participates in policymaking. The actors depend on each other to make collective decisions. These interdependencies are conceptualized in networks by *nodes* and *ties*. Examples of nodes in policy networks are interest groups, political parties, administrative units, experts, and other actors involved in policy processes. These can be linked by ties of cooperation, information exchange or conflict. In this article, we adopt a narrow definition of policy networks by focusing on actors solely involved in policy formulation, i.e., the production of policy outputs. The policy network approach serves to systematically test theoretical mechanisms guiding the production of policy outputs.

Another body of literature focuses on *discourse networks* (Leifeld, 2017). While the literature on discourses is broad, its various strands converge on the claim that discourses matter in politics. Verbal interventions constitute important elements of political mobilization, conflict and decision-making (Leifeld & Haunss, 2012). Classic works on critical discourse analysis (Foucault, 1991) and deliberative democracy (Habermas, 1981) paved the way for more empirical analytical approaches, such as the discourse network approach. Discourse networks are defined as verbal interactions between political actors which make public statements conditional on each other about a given policy (Janning, Leifeld, Malang, & Schneider, 2009; Leifeld, 2016, 2017). Accordingly, actors constitute the nodes in discourse networks, while shared policy preferences expressed via public statements represent the ties. The discourse network approach is an analytical tool used to systematically test the theoretical mechanisms guiding the development of policy debates.

Both discourse and policy network approaches have been used to elucidate the policymaking process, but it remains unclear whether both approaches yield similar results regarding policy change. For example, Leifeld (2013) and Bulkeley (2000) analyze policy change by studying the formation of coalitions based on the discourse network approach, while Ingold (2011) and Fischer (2014) employ the policy network approach for the same purpose. It remains unclear whether such studies would have come to the same results if they had used the respective other approach. To close this research gap, we ask: Which aspects of policy change do the different analytical frameworks emphasize?

This article compares similarities and differences between the two types of network approaches in four steps: First, we analyze differences in the participation of actors. Some scholars conceptualize discourses and policy processes as two different arenas of political participation (Binderkrantz, Christiansen, & Pedersen, 2015; Wolfe, Jones, & Baumgartner, 2013). Organizations may opt to participate in the discourse if they do not have access to formal decision-making. We therefore compare how accessible both types of networks are to different actors.

Secondly, we compare policy preferences of actors. Studies on discourse networks have relied on the content analysis of texts, e.g., media articles or parliamentary debates, in order to gather data on actors participating in the discourse and their policy preferences (Fisher, Leifeld, & Iwaki, 2013; Leifeld,

2013). By contrast, numerous studies on policy networks have relied on surveys (e.g., Henry, 2011; Ingold & Fischer, 2014). Here, we compare actors' policy preferences in discourse and policy networks in order to understand whether results differ systematically.

Thirdly, we scrutinize the formation of coalitions. Coalitions refer to subgroups of actors with shared policy preferences (Fischer, 2017). Actors form coalitions as a strategy to pool resources among likeminded others and influence policymaking in line with their preferences. In policy processes, it is typical for several competing coalitions to exist, such as a pro-change and a pro-status quo coalition. Here, we analyze whether discourse and policy networks fall into the same coalition structures. With structures, we mean the overall existence, number and strength of competing coalitions rather than the composition of coalitions. Consequently, the same coalition structures (e.g., two opposing coalitions) can be in place, even if coalitions themselves are not composed of the same actors.

Fourthly, we investigate the degree to which different observation periods influence results. The policy cycle model conceptualizes policymaking as a series of consecutive stages (Easton, 1965). Networks that reflect the agenda-setting phase of the policy process may look different to those that capture the decision-making phase. Time-stamped data are available for discourse networks, which rely on coded media data, but are difficult to gather for policy networks, which rely on survey data. We compare differences between discourse networks analyzed over time and policy networks for one point in time.

We rely on a case from German water protection policy. An emerging issue in water protection concerns micropollutants, i.e., chemical substances that end up in water bodies in small concentrations but, nevertheless, raise concern due to their potential adverse health effects on humans and the environment (Metz, 2017). Actors involved in policy discourse and policy formulation have debated on how to address the issue. Potential policy solutions address consumers, agriculture or industry in order to reduce the use of potential pollutants at the source. An alternative policy approach addresses the problem from the *end-of-the-pipe* by treating polluted wastewater in sewage plants (Triebkorn et al., 2019).

The goal of this study is to uncover differences and similarities between discourse and policy networks in order to comprehend whether both types of analyses produce similar results regarding policy change in democratic states. This article provides researchers with insights into three key aspects of policy change: a) the accessibility of policy venues (discourse/policy formulation) to actors; b) policy proposals actors advocate; and c) coalition structures. These insights should improve researchers' understanding of what they can infer about policy processes from the data they have gathered. Providing clarity is relevant in order to understand whether both network approaches can be used to answer similar research questions and empirically test the same theories.

5.2 Expectations of differences and similarities between the network approaches

5.2.1 Actor participation

The literature on agenda-setting and policy narratives suggests that we can expect differences between discourse and policy networks (Baumgartner, Berry, Hojnacki, Leech, & Kimball, 2009; Jones, McBeth, & Shanahan, 2014). We argue that these differences can be attributed to the differences in actor participation between the two networks.

The idea underlying why actors participate in policy discourse is that they try to influence public opinion in order to affect the dynamics of political competition (Tosun & Schaub, 2017). The literature of comparative politics has shown that public opinion influences policy decisions (Mühlböck & Tosun, 2018; Wlezien, 2004). Based on the work of Schattschneider (1960) and Baumgartner et al. (2009), one can infer that not every actor in a policy field is interested in participating in the discourse and drawing attention to a policy issue. Politics is conceptualized as a conflict in which competing actor coalitions strive to influence policymaking (Weible, Sabatier, & McQueen, 2009). Depending on whether these actor coalitions aim for policy change or to preserve the status quo, they tend to use different strategies and use different venues (Baumgartner et al., 2009; Jones et al., 2014). Actors can be categorized as *containers* and *expanders* (Cobb & Coughlin, 1998; Jones et al., 2014). *Containers* are actors with an interest in preserving the policy status quo. They typically aim to minimize the level of public attention on an issue and, therefore, avoid participation in a public discourse. Regarding environmental policy, industrial associations are less likely to participate in the discourse because they try to avoid public attention that could result in stricter regulation. Instead, these actors prefer to establish direct links to decision makers and exert influence in policy networks through participation in polycentric institutional arrangements (Fischer, Angst, & Maag, 2017; Leifeld & Schneider, 2012). This especially holds true in corporatist political systems (Christiansen, Mach, & Varone, 2018). On the contrary, *expanders* are actors with an interest in changing the policy status quo, though they often have limited access to decision makers and policy networks or find themselves in a weak bargaining position. In their need to adapt and use different strategies, these actors resort to public discourse. In environmental policy, these actors are usually environmental or consumer protection organizations with an interest in stricter regulation (Tosun & Schaub, 2017). For such new or marginalized actors, public discourse is a venue comparatively easy to access. Their goal is to steer public opinion by dominating the discourse and attracting media attention, since this exerts pressure on decision makers (Baumgartner et al., 2009; Jones et al., 2014; McCombs & Shaw, 1972). Based on these considerations, we assume that both network approaches reveal some differences with regard to the actors participating in policymaking:

Expectation 1a: The policy network approach should emphasize the participation of containers in the policymaking process;

Expectation 1b: The discourse network approach should emphasize the participation of expanders in the policymaking process.

In addition, we expect both approaches to reveal similarities concerning the participation of political-administrative actors, which are usually central to both policy and discourse networks. Policy networks represent the venue in which these actors typically play an important coordination role. Additionally, political-administrative actors tend to participate in public discourse, often in an effort to sensitize the population. Therefore, we categorize these actors as a third group and expect both approaches to reveal their presence:

Expectation 1c: Discourse and policy network approaches should equally emphasize the participation of political-administrative actors in the policymaking process.

To summarize, we expect any study employing either the discourse or the policy network approach to reveal differences in the types of actors participating in policymaking. Participation depends on whether actors want to preserve or change the policy status quo. Only political-administrative actors are expected to be present in equal degrees.

5.2.2 Actors' policy preferences

Discourses in democratic countries ideally resemble deliberative arenas, while policy processes have to follow stricter institutional rules. In the ideal model of a deliberative democracy (Habermas, 1996), actors can freely participate in discourses. In a policy debate, state and non-state actors can participate and express their preferences based on their causal beliefs. The discourse network approach should, therefore, represent a broad spectrum of actors and policy proposals.

By contrast, policy processes are governed by formal and informal rules of participation that restrict access to decision-making and, thereby, the spectrum of discussed policy proposals. Formal rules attribute decision-making power and responsibility for the design and content of policies to elected state actors (Moe, 1990; Trebilcock & Hartle, 1982). Informal rules provide a few non-state actors, which have a stake in or knowledge on a particular policy issue, with access to policy processes. In the formal policymaking process, actors are less likely to propose unpopular policies that target their respective constituency, because it can be costly for target groups to implement such a policy (Metz & Ingold, 2017). Since elected state actors are dependent on votes, they are unlikely to express policy preferences that target their electorate and would impose costs on their voters. In fact, German citizens disapprove of policy measures such as taxes or fees that would entail personal costs (Tosun, Schaub, & Fleig, 2020). Likewise, non-state actors are likely to block policies that would impose the burden of implementation on the economic or civil society groups whose interests they represent. We expect the network approach to reflect the vested interests of those actors which have access to policy formulation. Policy proposals that do not meet the interests of respective electoral, corporate or civil society interests are likely to be neglected or rejected.

Expectation 2: The policy network approach should more strongly reveal policy preferences that reflect respective electoral, corporate or civil society interests than the discourse network approach.

5.2.3 Coalitions

The concept of *coalitions* is central to theories of policy process, e.g., the *Advocacy Coalition Framework* (Sabatier & Jenkins-Smith, 1999), and argumentative discourse analysis (Hajer, 1993). Actors express their policy preferences in discourses and during policy formulation, and they form coalitions based on shared preferences (Leifeld, 2013; Sabatier, 1987). Opposing coalitions compete for influence on policy outputs. The coalition that dominates the discourse or policy formulation respectively has the greatest potential to shape policy outputs.

We distinguish between three ideal types of coalition structures in Figure 5.1 (Ingold & Gschwend, 2014): Adversarial structures with opposing coalitions and little coordination; collaborative structures with opposing but coordinated coalitions; and unitary structures consisting of one dominant coalition.

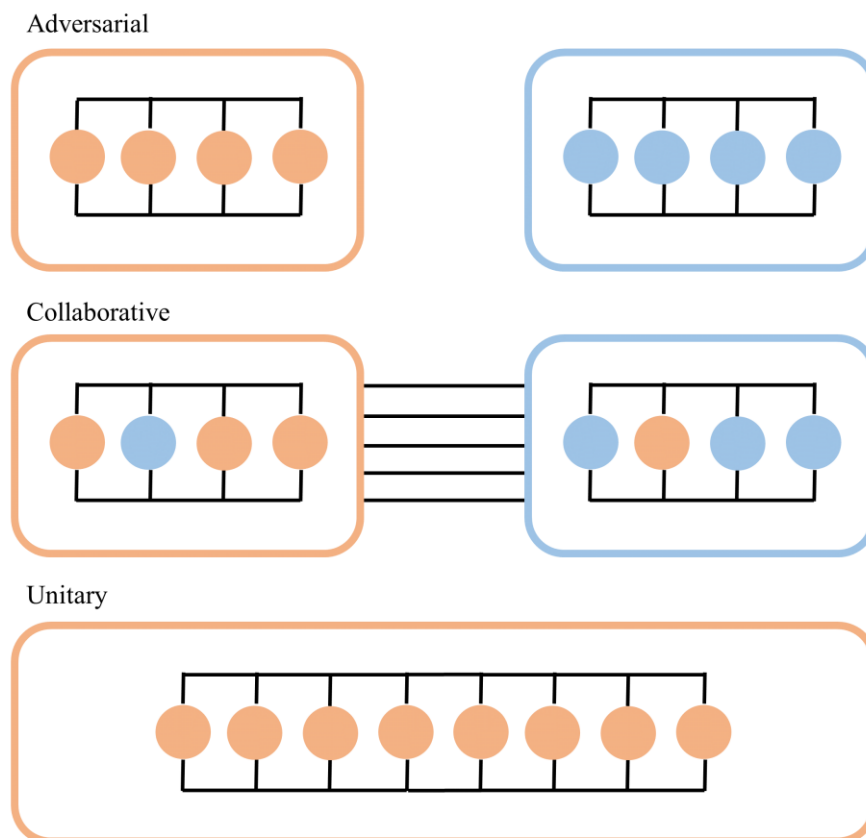


Figure 5.1. Three coalition structures. Based on Metz (2017).

Similar coalition structures should, in principle, be observable across discourse and policy networks. In Expectations 1a and 1b, we explained that discourse and policy network approaches are likely to reveal different actor types in policymaking. Despite such differences in participation, it is possible that both network approaches lead to the identification of similar coalition structures (adversarial, collaborative or dominant coalitions), because they each reveal the same underlying lines of conflict that shape the formation of coalitions. For example, both approaches could reveal a dominant pro-change coalition if the majority of actors in the policy discourse and in policy formulation expresses a clear preference for

policy change. In both analyses, a majority of actors would cluster around pro-change preferences. We therefore expect the following similarities:

Expectation 3: Discourse and policy network approaches should reveal similar coalition structures.

5.2.4 Differences in time

In his analysis of a discourse network, Leifeld (2013) observes the evolution of the policy process from one unitary coalition towards a bipolarized discourse, and then back to a new, dominant, advocacy coalition. These observations suggest that the discourse network approach highlights the evolution of political conflict between coalitions over time.

Observing the evolution of policy processes over time is possible with time-stamped discourse data (Leifeld, 2017), but rarely feasible with policy network data. To date, the most widely applied method for gathering data on policy networks is through surveys. One would need to survey actors repeatedly in order to capture the evolution of the policy process over time, but such repeated surveys are rarely possible due to resource constraints and the objections of respondents to repeated participation (exceptions include Ingold & Fischer, 2014). To overcome this difficulty, survey data tend to capture the aggregate of actors' policy preferences and interactions during the entire policy process or during the phases that precede the survey. Due to cognitive constraints and recall difficulties, it is plausible that data on policy networks capture the phase of the policy process in which the survey took place. If the survey took place during polarization, the coalition structure of the policy networks will capture this particular point of the policy process. Our data-related expectation is as follows:

Expectation 4: Different results between policy and discourse network approaches are due to different measurement, time and data collection methods.

To summarize, we formulate four expectations regarding the similarities and differences in actor participation, policy preferences and coalition formation. Whereas the first two expectations are derived from theory, the latter two stem from methodological considerations.

5.3 Case, data, and methods

5.3.1 Case

In this study, we compare policy and discourse networks in the new emerging policy field of micropollutants in surface waters in Germany. These networks are built on actors' preferences towards four different policy solutions for mitigating micropollution. We observe actors' preferences through a survey in order to construct the policy network, and through the coding of newspaper articles in order to construct the discourse network.

5.3.2 Data

Discourse Network

To analyze the discourse on micropollutants, we selected newspaper articles published in the nationwide newspaper *Frankfurter Allgemeine Zeitung* and in at least one principal regional newspaper from each of the German states (23 newspapers in total). Relevant articles were identified by using a keyword search within the respective newspaper archives. Overall, we identified 1069 relevant articles on micropollutants between January 2013 and March 2017. The number of articles per newspaper ranges between 17 and 124. Most of the articles stem from the regional newspapers, and the geographic distribution is fairly even (see figures and tables provided in Appendix D.1). Due to duplicate articles that reproduced information provided by the German news agency *dpa* (*Deutsche Presse-Agentur*), we reduced our final sample to 770 articles. Within these articles, we coded statements that actors made on micropollutants in surface waters. More specifically, we coded whether actors agreed or disagreed with the same four policy solutions that were also put forward in the discourse: a) addressing consumers; b) taking measures in the agricultural sector; c) adapting industrial production; and d) improving filtering in sewage treatment plants (end-of-pipe). Statements were coded using the software Discourse Network Analyzer (Leifeld, Gruber, & Bossner, 2019). One of the authors and two research assistants coded the statements to ensure reliability. After coding, 63 of originally 173 actors were selected as relevant. Relevant actors are defined as organizations that are politically active across Germany or which issued at least two statements at different points in time during the observation period (see also Leifeld, 2017, on applying thresholds for participation in discourse). Selected actors issued 303 statements in total.

Policy Network

In 2014, we surveyed all the state and non-state actors which had participated in the legal revision of the German Surface Water Ordinance since 2008 (see Metz (2017) for a description of the policy process and the actor identification method). With a response rate of 68.4%, we obtained policy preference data for 27 actors. In the survey, we asked respondents to indicate their level of agreement with the following statements on a four-point Likert scale: a) Reducing pharmaceutical micropollution is a consumer responsibility; b) micropollution is a responsibility of agricultural policy, c) micropollution is a responsibility of chemical policy (in order to adapt industrial production); d) measures should be end-of-pipe. Usually, the policy network approach links actors by ties of cooperation or information exchange. In this study, the policy network is built on shared policy preferences to enhance comparability with the discourse network approach. The data were not originally collected for this comparative study; however, the comparison is possible as both the survey questions and the statements coded in the discourse measure the same concepts, i.e., actors' preferences regarding the same four policy solutions.

5.3.3 Methods

We apply network methodology as well as descriptive statistics to test the plausibility of our theoretical and data-related expectations. Given its' small-N research design, our study constitutes a plausibility probe, i.e., a pre-test for future theory development (Levy, 2008). In order to probe Expectations 1 and 2, we compare actor types and their policy preferences across policy and in discourse networks. We classify all actors representing the chemical and pharmaceutical industry as well as the agricultural sector as containers since we expect these to have an interest in preserving the policy status quo. Conversely, environmental and consumer protection organizations, green political parties and actors from the wastewater treatment sector were categorized as expanders since these can be expected to have an interest in changing the policy status quo. Political-administrative actors include different governmental institutions and agencies. Third-party actors include all organizations for which no clear preference towards changing or preserving the policy status quo can be expected (see Table D.2.1 and Table D.2.2 in Appendix D.2 for an overview of the actors and their membership).

For Expectations 3 and 4, we compare the structure of both networks. First, we compare the policy and the discourse networks based on the full observation period (Expectation 3). In a further step, we divide the discourse network into two observation periods ranging from 2013 to 2014 and 2015 to 2017 and then compare both discourse networks with the policy network captured in the period before 2014 (Expectation 4). Precisely, we compare one-mode networks in which actors are linked depending on whether they share preferences with regard to the four policy solutions. We compute these separately for the policy network and discourse network data. The resulting matrices contain actors in rows and columns, with cell values indicating the degree of shared policy preferences. High values indicate high similarity and low values low similarity. More specifically, we analyze *subtract* networks; these are created by combining *congruence* and *conflict* networks, which means that they include both agreement and disagreement on policy solutions. In congruence networks, actors are linked if they co-support or co-reject a policy proposal. In conflict networks, actors are linked if one actor supports while the other opposes a policy. The subtract network then combines both approaches by subtracting conflict network ties from congruence network ties (Leifeld, 2017). To improve the comparability of discourse and policy networks, we normalized both networks via the *jaccard similarity measure* (see Leifeld (2017) and Leifeld et al. (2019) for discourse network normalization). We graph the networks by placing actors as nodes in a two-dimensional space based on their connectedness. Nodes are linked by edges if they share policy preferences. Negative edges indicating conflicting policy preferences had been removed beforehand (see Nagel, 2016, for a similar application). This approach allows researchers to evaluate the structure of networks and to identify actor clusters, since actors with higher degrees of similarity are placed closer to each other (Leifeld et al., 2019). Finally, we compare differences in subgroup structures within the networks by conducting a cluster analysis (Leifeld et al., 2019). More specifically, we apply hierarchical cluster analysis using Ward's optimization method in order to probe Expectation 3 (Jain &

Dubes, 1988). To compare the two observation periods of discourse networks, we detect communities by using the *spinglass* algorithm (Reichardt & Bornholdt, 2006).

5.4 Results and discussion

5.4.1 Actor participation

We expected the policy network approach to emphasize the participation of containing actors more strongly than the discourse network approach (Expectation 1a). Conversely, we expected the discourse network approach to emphasize expanding actors (Expectation 1b). Figure 5.2 portrays the share of containers, expanders, political-administrative and third-party actors. The results support Expectations 1a and 1b. The policy network reveals a larger share of containing actors (ca. 25%) compared to the discourse network (ca. 10%). The discourse network emphasizes expanding actors more strongly (ca. 45%) than the policy network (ca. 25%). However, Figure 5.2 also shows that the share of containers and expanders in the policy network is about equal. This might be a result of the efforts of political-administrative actors to include every relevant stakeholder in the policy formulation process. Thus, differences in emphasis can mostly be traced back to the discourse network, which aligns well with our theoretical argument.

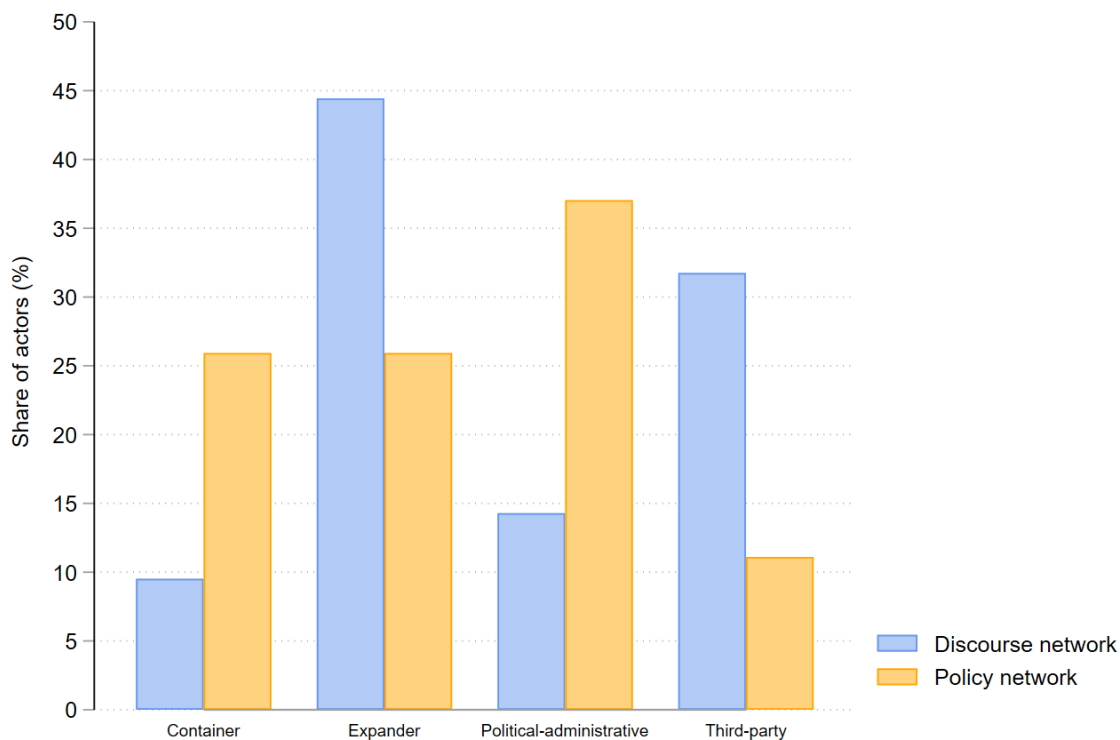


Figure 5.2. Emphasis of different actor types.

Both networks reveal the presence of political-administrative actors, which is in line with our theoretical expectation. However, they are more pronounced in the policy network. The discourse network is

characterized by a larger share of third-party actors. This is mainly due to the larger number of scientific institutions present in the discourse.

Figure 5.3 gives further details on actors' affiliations and their relative frequency within both networks. The policy network is characterized by a larger share of organizations that are affiliated with the agricultural and industrial sectors, which mostly explains the differences in containers between both approaches. The share of political-administrative actors from federal, state and regional levels is also larger, which can be explained by their coordination role in the policy network. The discourse network emphasizes political parties more strongly, mainly the German Green Party (Alliance 90/The Greens). Political parties are not represented in the policy network, because the legal proposal was exclusively discussed in the parliamentary chamber that represents the German states (German Bundesrat). Rather surprisingly, the share of environmental organizations is equal. However, this observation fits the presumption that political-administrative actors strived to include every relevant stakeholder in the legal revision.

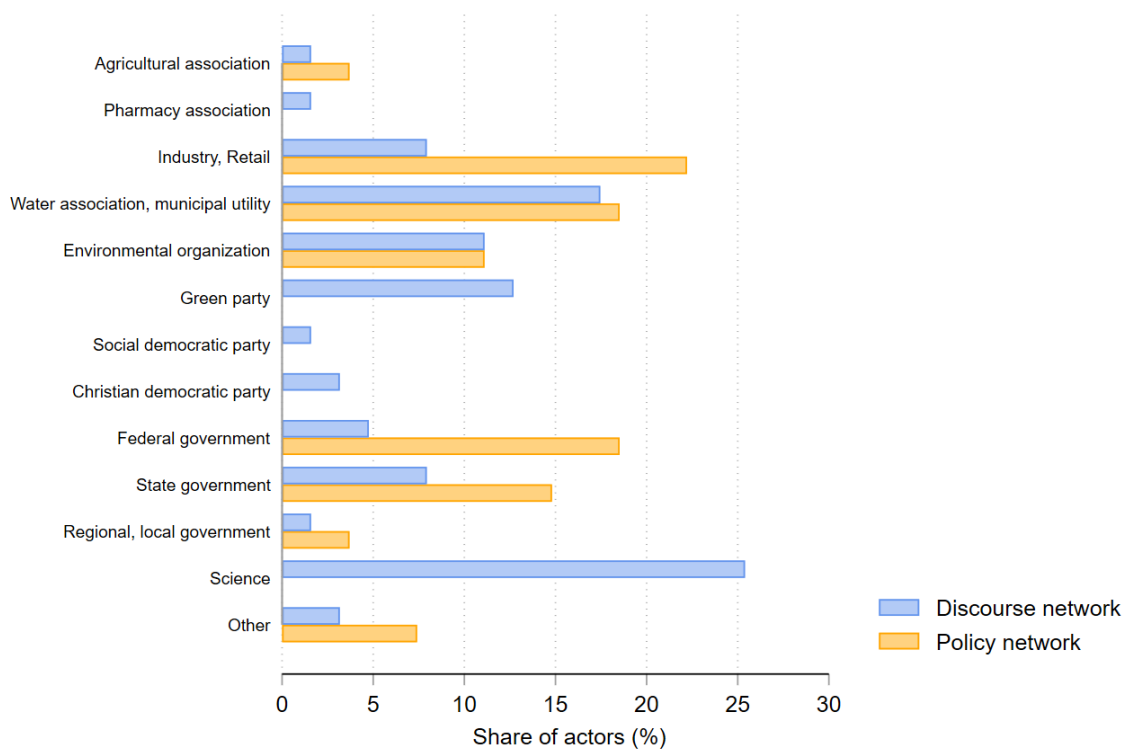


Figure 5.3. Presence of different actors.

To summarize, the policy and the discourse networks differ in their emphasis on containing and expanding actors. These differences are mostly due to the unequal distribution in the discourse network (blue bars in Figure 5.2). As expected, political-administrative actors are present in both networks.

5.4.2 Actors' policy preferences

Discourse and policy networks are expected not only to differ in the composition of actor types but also regarding actors' policy preferences. Specifically, we expect the discourse network to be more open to discussions on policies that are aimed at target groups, such as consumers or voters. Figure 5.4 depicts the share of actors that agree or disagree with each of the four discussed policy solutions in both networks.

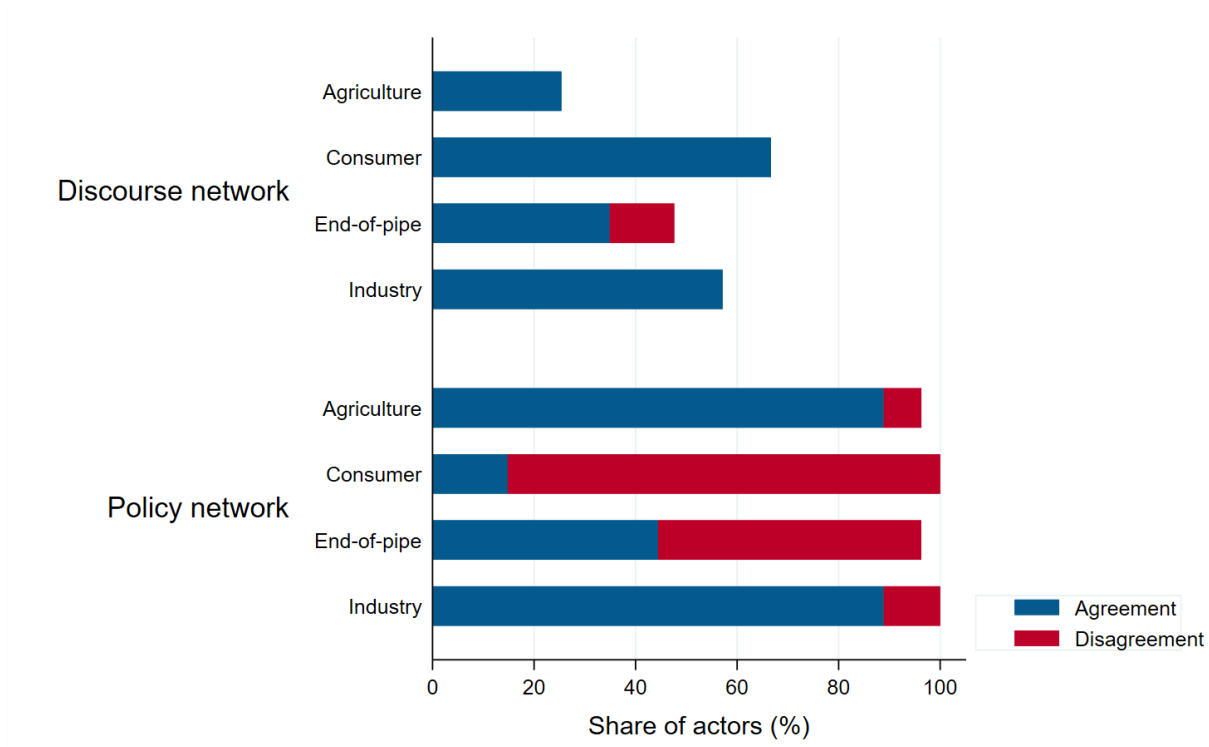


Figure 5.4. Agreement and disagreement on policy preferences.

First, we report differences in the data underlying policy and discourse network analysis. Whereas in policy networks most of the surveyed actors took a position on all four policy solutions, the discourse network is characterized by a large share of *missing* information. Many actors present in the discourse only positioned themselves on one or two of the discussed policy solutions. The differences can be traced back to the different types of data collection. Whereas surveys ask actors to indicate their preferences (agreement or rejection) from a predefined list, the discourse network approach only captures the spectrum of preferences that actors formulate. Second, and contrary to the policy network, the discourse network reveals mostly *positive* statements in which actors indicate agreement with policy solutions.

Regarding our theoretical considerations, the policy preferences revealed by both network approaches are surprisingly similar. Agreement with measures addressing the agricultural and industrial sector is high in both networks (at least among those actors that made a statement on these measures within the discourse). Disagreement with end-of-pipe solutions is stronger in the policy network. Here, actors are divided on the question of whether end-of-pipe measures are best for mitigating the entry of

micropollutants, with around 44% agreeing and 52% disagreeing. We can mainly observe differences between the approaches in the measures that address consumers. Here, opposition is stronger in policy networks; this might be due to electoral concerns as actors wish to avoid increasing costs for voters.

To summarize, we can observe differences in the positions taken in both networks. As predicted in Expectation 2, policies targeting consumers, i.e., voters, are less prominent in the policy than in the discourse network, which may be due to electoral concerns. Apart from this difference, similarities among the policy proposals put forward in both networks are surprisingly high. In contrast to Expectation 2, results do not particularly emphasize the policy preferences of corporate interests in the policy network. In the latter, only few actors reject policies targeting agriculture or industry.

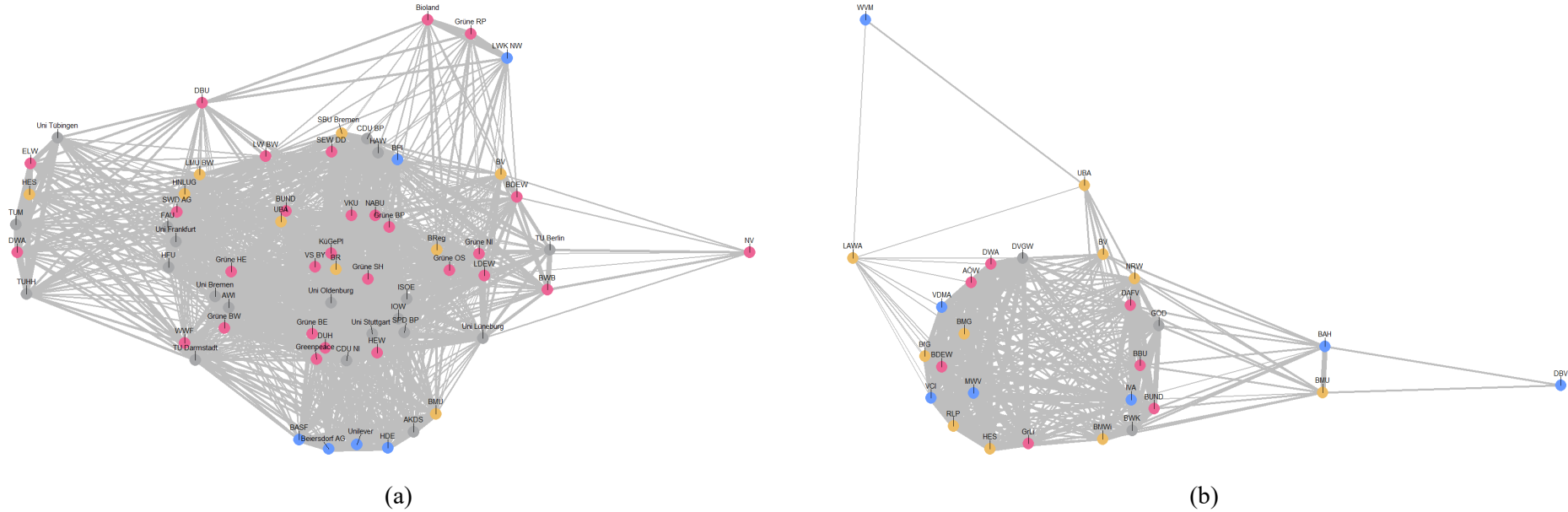
5.4.3 *Coalitions*

We expected discourse and policy networks to reveal similar network structures regarding the formation of coalitions. Figure 5.5 gives a first visual impression of the structure and the composition of subgroups within both networks.

Polarization in the discourse network is rather low. In fact, most actors cluster in the middle as they share policy preferences with many other actors within the network. There are only a few actors which form small opposing clusters that surround one big cluster in the middle. The gradual removal of links between actors with lower weights, i.e., fewer shared policy preferences, substantiates this impression (see the network graphs in Appendix D.3.1). However, we can observe that four of the six containers form a separate cluster, indicating some divergence between containing and expanding actors. Nevertheless, the network indicates a higher degree of consent than conflict. Therefore, we conclude that the discourse network is characterized by a unitary or strongly collaborative structure.

The structure of the policy network is similar. The network consists of one large group of actors in the center of the graph. Within this center, two subgroups exist. Within these subgroups, edge weights are higher, indicating a slightly higher degree of preference similarity (see the network graphs in Appendix D.3.2). Much like the discourse network, there are many links between the subgroups, indicating that polarization is not very strong. Regarding actor types, expanding and containing actors do not cluster in separate groups, which further indicates an absence of conflict. Overall, we can conclude that the policy network also reveals a unitary or strongly collaborative structure.

The results of the hierarchical cluster analysis substantiate the conclusions drawn from our first analysis of the network structures. Figure 5.6 depicts the results as a dendrogram in which similar actors are grouped together as clusters. The height of the branches displays the similarity or dissimilarity of actor groups. The lower the branches connecting two clusters, the more similar they are. The heat map located underneath the dendrogram illustrates each actor's positioning on the policy solutions discussed.

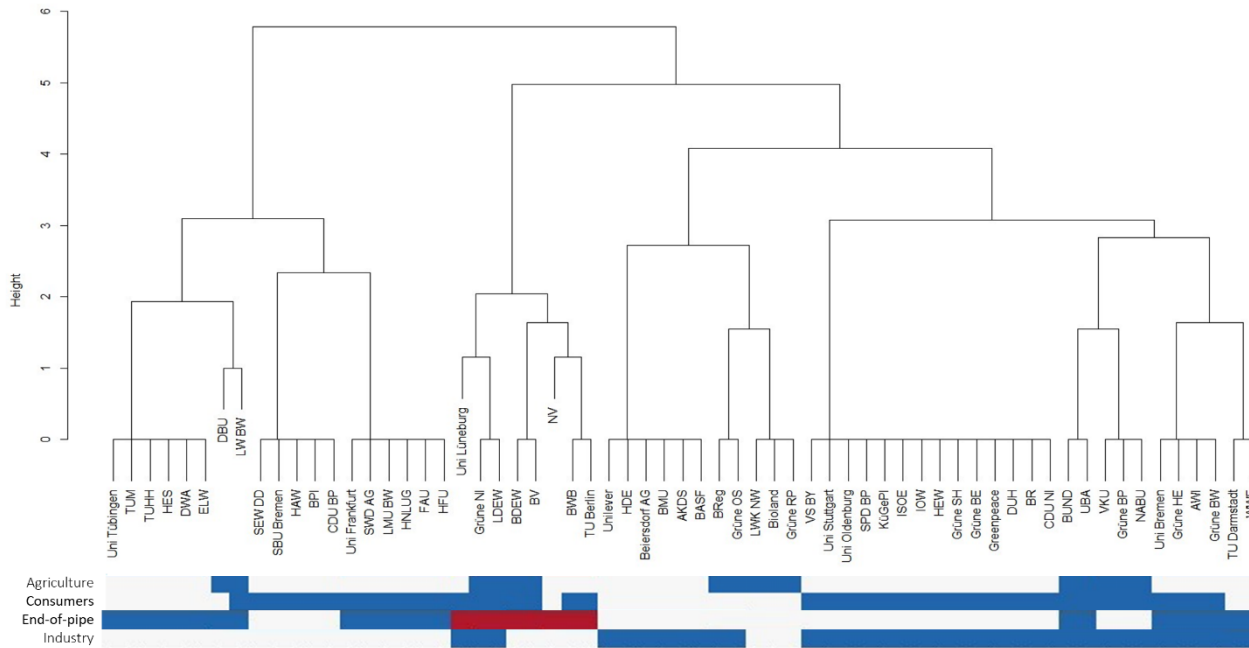


Container
 Expander
 Political-administrative
 Third-party

Figure 5.5. Subtract networks: (a) Discourse network, (b) Policy network.

Notes: Line widths are dependent on edge weight (the more shared policy preferences, the thicker the line between two actors). Actors have been positioned using the Fruchterman-Reingold algorithm.

Discourse network



Policy network

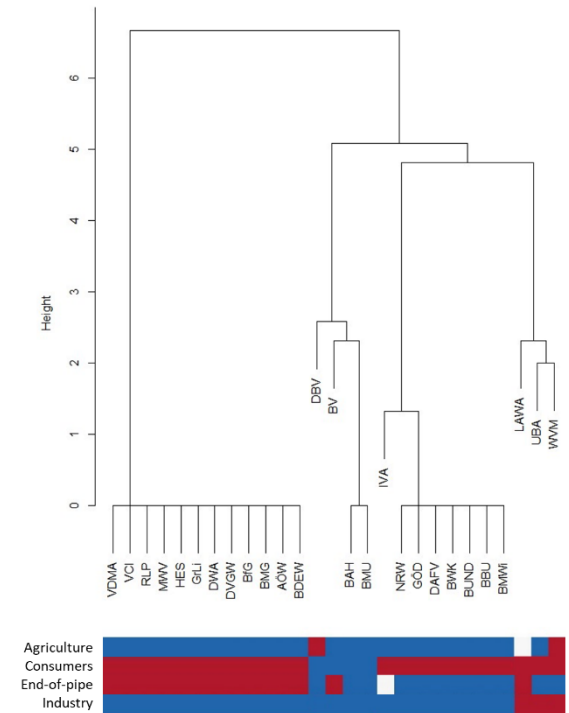


Figure 5.6. Cluster analysis.

Notes: Blue = agreement; red = disagreement; white = no statement. The colors illustrate actor's positioning on the policy solutions equivalent to Figure 5.4.

The discourse network is characterized by a larger number of smaller cliques with unique policy preferences, rather than adversarial coalitions. This impression prevails upon closer inspection of the actor groups' shared policy preferences in the heat map. One group of actors on the left mostly agrees on solutions that either address consumers or apply an end-of-pipe approach. In the middle, one group opposes an end-of-pipe approach and another one only favors solutions targeting the industrial or the agricultural sector. There is one larger group on the right which supports solutions addressing consumers and the industrial sector. Finally, there are a few smaller groups with actors which support solutions targeting the industry but differ in their preference towards other solutions.

The policy network consists of two groups of actors, though actors in both of these groups have very similar policy preferences. Most actors support measures in the agricultural and industrial sector and oppose policies that address consumers. The two groups only emerge as distinct from one another due to their divergent positions on the question of whether end-of-pipe measures should be prioritized. While the group on the left opposes the prioritization of end-of-pipe measures, the group on the right remains mostly supportive. Overall, the results of the cluster analysis also indicate a unitary structure.

To summarize, policy and discourse networks reveal similar coalition structures. Both are characterized by a unitary or strongly collaborative structure. Observed differences between networks are rather small.

5.4.4 *Differences in time*

Turning to Expectation 4, we split the discourse network into two periods and analyze whether significant differences in network structures can be observed.

Figure 5.7 depicts the subtract networks for both periods and the results of community detection (node colors). When looking at clusters, the network in Period 2 (January 2015–March 2017) is less polarized than in Period 1 (January 2013–December 2014). The results of community detection also suggest differences in the network structures. The analysis reveals three larger and one very small group in the first period. In the second period, we identify four groups. However, the positions of these groups overlap to a large degree. The higher number of policy preferences shared by members of different groups in the second period indicates that similarity between groups (between-group density) increased compared to in the first period. This further points towards an evolution of network structure over time.

The results of hierarchical cluster analyses and closer inspection of the specific policy preferences substantiate these observations (see the dendrograms and heat maps in Figure D.5.1 and Figure D.5.2 in Appendix D.5) since congruence between the actors increases over time. Actors are less divided concerning measures in the agricultural or industrial sectors in Period 2. Instead, the question of whether end-of-pipe measures should be prioritized is now more prominent in Period 2 and divides some of the actors. In this regard, Period 2 of the discourse network resembles the policy network more closely as divisions on this policy solution coincide with the main line of conflict in the policy network.

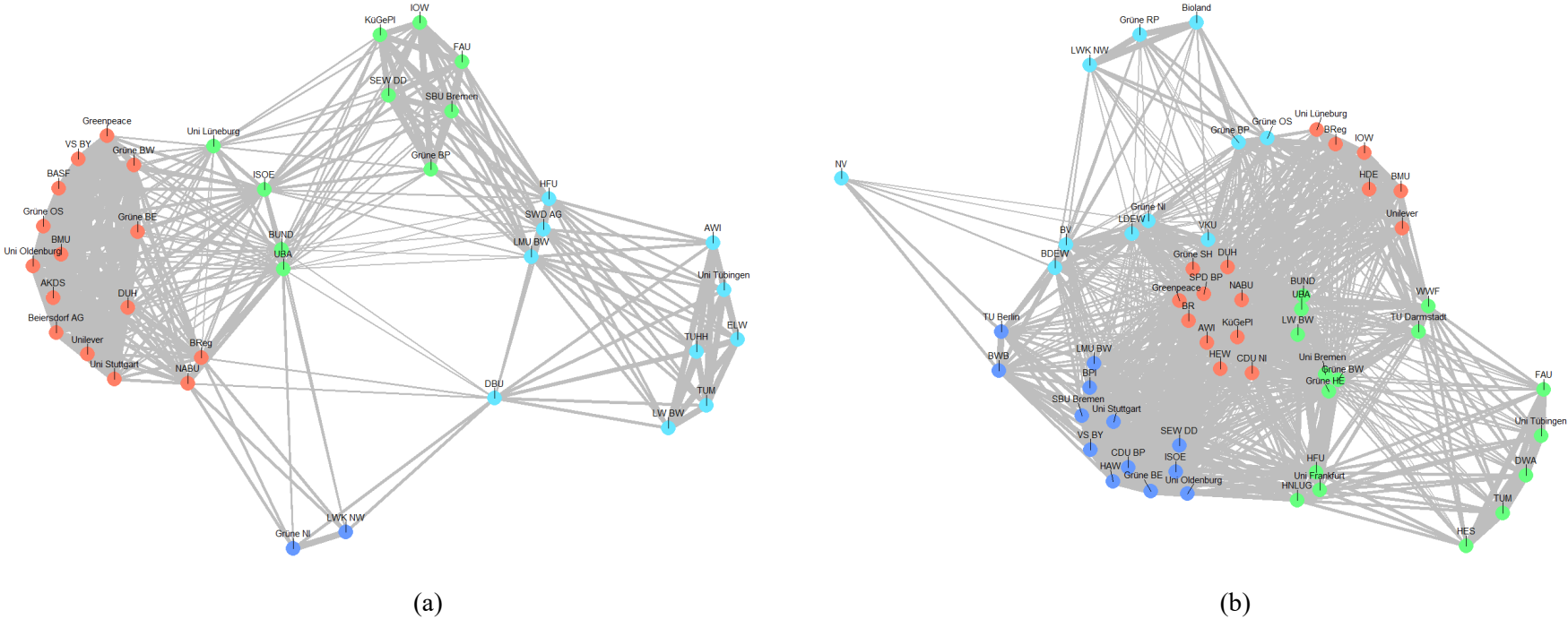


Figure 5.7. Comparing discourse networks over time: (a) January 2013–December 2014, (b) January 2015–March 2017.

Notes: Node colors refer to different community membership; line width is dependent on edge weight (the more shared policy preferences, the thicker the line between two actors); actors have been positioned using the Fruchterman-Reingold algorithm.

To summarize, we can observe some small differences between both observation periods. In fact, the structure of the discourse network in the second period resembles the policy network more closely. Although the differences are not very strong, it is noteworthy that different time periods may lead to different results. These findings suggest that data collection for policy networks at different points in time could most likely also increase the accuracy of results. This especially holds true when analyzing policymaking processes that stretch over a longer period of time.

5.5 Conclusions

Both policy and discourse network approaches are used to analyze policymaking processes, but there is a lack of empirical studies comparing the similarities and differences in results that these approaches reveal regarding policy change. While policy networks often build on survey data, discourse networks typically employ media data to capture actors' shared policy preferences. In order to make an informed decision on valid data sources, researchers need to understand how differences in data sources may affect results. As this remains largely unexplored, we systematically compared policy and discourse networks by taking the case of water policy in Germany.

In a first set of theoretical expectations, we explored *differences* based on the idea that discourses may represent a more deliberative process, open to marginalized actors and various policy proposals, compared to policy networks. In a second set of expectations, we investigated *similarities*, i.e., whether similar coalition structures of actors with shared policy preferences emerged in both types of networks.

For our case, we find that the different analytical approaches lead to largely similar results, though some differences become manifest as well. First, results from policy and discourse network approaches differ in their emphasis on actor types. Whereas the share of actors with an interest in expanding or containing an issue is equal in the policy network, expanders dominate the discourse network. Results can be interpreted as a specificity of Germany, or corporatist states more generally, where organized interests (e.g., industry) have institutionalized access to policy formulation. Their lack of access to policy formulation may drive expanders to be particularly active in the policy discourse. Results could also be interpreted as specificities of methodological approaches. Studies that employ the discourse network approach could systematically emphasize expanders more than the policy network approach does. Future research is needed that compares expanders' and containers' access to policy venues (discourse/policy formulation) across corporatist and pluralist countries.

Secondly, both network approaches capture a high number of similarities among policy proposals, though some differences become manifest, as expected, when policies target consumers, i.e., voters. Such preferences are less visible in the policy than in the discourse network approach. Results may forewarn future research that policies targeting voters, e.g., demand-sided policies, are sensitive topics and therefore show up more prominently in discourse than in policy network approaches. Such dissimilarities also have implications for the analysis of coalitions. Coalitions are identified based on the shared preferences of actors. However, if actors strategically mask (or emphasize) their preferences

depending on the venue (discourse/policy formulation), scholars should carefully evaluate how to integrate preference data into coalition analysis in order to produce results that are congruent across approaches.

Thirdly, the structures of policy and discourse networks are similar. Both networks are characterized by low polarization and a unitary structure. Although the differences in coalition structure are rather small, results indicate that discourse and policy network approaches highlight different games that actors play in discourses and policy formulation. The low share of disagreement statements in the discourse network suggests that actors focus on promoting their preferred policy proposals. In policy formulation, by contrast, actors seem additionally concerned with blocking unpopular proposals. The manner in which data are gathered emphasizes such differences because surveys explicitly ask respondents to indicate which policy proposals they support and reject, while media tends to report on policies that actors support.

Lastly, the structure of the discourse network differs between observation periods. Although the differences are not very strong, it is noteworthy that different time periods affect results. Collecting data for policy networks at different points in time would increase the accuracy of results. As it remains challenging to survey political actors repeatedly, future research is needed which explores innovative data-collection methods that overcome the constraints of survey research (e.g., low participation) but still provide insider information about the policymaking process.

A key insight of our study is that some, albeit small, differences exist between policy and discourse network analyses. The discourse network approach emphasizes expanders, while the policy network approach masks actors' preferences for policies targeting voters. As differences are surprisingly low, our results suggest that both discourse and policy network data can be used to study the policy process and that results should not differ systematically. The conclusions apply to our case, but the generalizability is limited due to several reasons. First, the small-N research design of this study possibly accentuates idiosyncrasies, i.e., characteristics that might be case-specific. For instance, the low level of polarization that the discourse network approach revealed might also stem from the fact that micropollution is a rather technical issue that actors have not yet politicized in the German media. Second, our discourse network analysis includes four concepts, whereas most of the published studies on discourse networks consider a larger number of concepts. The use of a limited number of concepts in our case could be one reason for the low level of polarization that we find within the discourse network. With more concepts, however, the analysis of coalition structures should be more fine-grained. In fact, most published studies on discourse networks find strongly polarized coalitions (Fisher, Waggle, & Leifeld, 2013; Leifeld, 2013; Tosun & Lang, 2016). In order to enhance external validity, future research comparing discourse and policy networks should use a more extensive number of concepts and apply a large-N and comparative research design.

To generate further theory-relevant insights, future research should identify the origin of differences between analytical approaches. Are differences a consequence of data-gathering techniques or an

indication that different theoretical mechanisms guide the development of policy debates or policy formulation? To date, only a few comparative network studies exist (exceptions include Metz, 2017; Ylä-Anttila et al., 2018) to which we could compare our results in order to address this question. Ingold et al. (2020) follow a slightly different goal in their comparison of data on policy preferences that were gathered using surveys and coded consultations. They report differences in data on actors' policy preferences across data sources, in particular for policy losers, i.e., actors whose positions were not considered in the final policy decision. They can only speculate where changes come from, e.g., as losers may want to mask their political loss. Their study encounters the same difficulty as we do in identifying the origin of these differences. One possible conclusion is that both survey and media data can only approximate what happens during policy processes. However, future developments, e.g., e-democracy, could increase the transparency of this and thereby draw a sharper picture of policy change.

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Supplementary materials

Appendix A to *Investigating narrative strategies by using discourse network analysis. Insights from the public debate on agricultural nitrate pollution in Germany*

A.1 Actor coalitions

Table A.1.1. Full list of actors

<i>Actor code</i>	<i>Full actor name in German</i>	<i>Full actor name in English</i>	<i>Type</i>
AfD BP	Alternative für Deutschland (Bundespartei)	Alternative for Germany (federal party)	Right-wing party
BB BB	Bauernbund Brandenburg	Farmer Federation Brandenburg	Agricultural association
BDEW	Bundesverband der Energie- und Wasserwirtschaft	Federal Association of Energy and Water Industry	Water association
BMEL	Bundesministerium für Ernährung und Landwirtschaft	Federal Ministry of Food and Agriculture	Federal government
BMU	Bundesministerium für Umwelt, Naturschutz und nukleare Sicherheit	Federal Ministry of the Environment, Nature Conservation and Nuclear Safety	Federal government
BÖLW	Bundesverband Ökologische Lebensmittelwirtschaft	German Federation of the Organic Food Industry	Organic agriculture
BR	Bundesrat	German Federal Council	State government
BReg	Bundesregierung	German Federal Government	Federal government
BUND	Bund für Umwelt und Naturschutz Deutschland	Friends of the Earth Germany	Environmental organization
CDU BP	Christlich Demokratische Union (Bundespartei)	Christian Democratic Union (federal party)	Christian democratic party
CSU BP	Christlich-Soziale Union (Bundestagsfraktion)	Christian Social Union in Bavaria (federal parliamentary group)	Christian democratic party
DBV	Deutscher Bauernverband	German Farmers' Association	Agricultural association
Die Linke BP	Die Linke (Bundespartei)	The Left Federal Party	Left-wing party
DNR	Deutscher Naturschutzring	German League for Nature and Environment	Environmental organization
DUH	Deutsche Umwelthilfe	Environmental Action Germany	Environmental organization
DVGW	Deutscher Verein des Gas- und Wasserfaches	German Association for Gas and Water	Water association

<i>Actor code</i>	<i>Full actor name in German</i>	<i>Full actor name in English</i>	<i>Type</i>
DWA	Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall	German Association for Water, Wastewater and Waste	Water association
EC	Europäische Kommission	European Commission	European Union
FDP BP	Freie Demokratische Partei (Bundespartei)	Liberal Democratic Party (federal party)	Liberal party
Greenpeace	Greenpeace	Greenpeace	Environmental organization
Grüne BP	Bündnis 90/Die Grünen (Bundespartei)	Alliance 90/The Greens (federal party)	Green party
Grüne Liga	Grüne Liga	Green League	Environmental organization
HBV	Bauernverband Hessen	Farmers' Association Hessen	Agricultural association
HMUKLV	Umwelt- und Agrarministerium Hessen	Ministry of Agriculture and the Environment Hessen	State government
IVA	Industrieverband Agrar	German Crop Protection, Pest Control and Fertilizer Association	Agricultural association
LSV	Land schafft Verbindung	-	Agricultural association
MELUND SH	Landesumweltministerium Schleswig-Holstein	Ministry of the Environment Schleswig-Holstein	State government
MLUK BB	Ministerium für Landwirtschaft, Umwelt und Klimaschutz Brandenburg	Ministry of Agriculture, Environment and Climate Protection Brandenburg	State government
MULNV NRW	Ministerium für Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen	Ministry of Environment, Agriculture, Nature and Consumer Protection North Rhine-Westphalia	State government
NABU	Naturschutzbund	Nature And Biodiversity Conservation Union	Environmental organization
NMELV	Ministerium für Ernährung, Landwirtschaft und Verbraucherschutz Niedersachsen	Ministry of Food, Agriculture and Consumer Protection Lower Saxony	State government
SPD BP	Sozialdemokratische Partei Deutschlands (Bundespartei)	Social Democratic Party of Germany (federal party)	Social democratic party
SRU	Sachverständigenrat für Umweltfragen	German Advisory Council on the Environment	Science
UBA	Umweltbundesamt	German Environmental Agency	Federal government

<i>Actor code</i>	<i>Full actor name in German</i>	<i>Full actor name in English</i>	<i>Type</i>
VKU	Verband Kommunaler Unternehmen e. V.	Association of Municipal Companies	Water association
VZBZ	Verbraucherzentrale (Bundesverband)	Federation of German Consumer Organisations	Consumer protection organization
WBAE	Wissenschaftlicher Beirat Agrarpolitik beim Bundesministerium für Ernährung und Landwirtschaft	Agricultural Policy Advisory Council of the Federal Ministry of Food and Agriculture	Science
WLV	Westfälisch-Lippischer Landwirtschaftsverband	Agriculture Association Westphalia-Lippe	Agricultural association
WWF	World Wide Fund for Nature	World Wide Fund for Nature	Environmental organization

Table A.1.2. Actor coalitions' beliefs indicated by agreement or disagreement for period 1 & 2

		<i>Period 1</i>				<i>Period 2</i>			
		<i>Pro-coalition</i>		<i>Contra-coalition</i>		<i>Pro-coalition</i>		<i>Contra-coalition</i>	
		<i>Agree</i>	<i>Disagree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Agree</i>	<i>Disagree</i>
<i>Problem perception</i>	Conventional farming threatens drinking water quality	4			1	16			3
<i>Problem perception</i>	Conventional farming threatens surface water quality	13			2	18			4
<i>Policy position</i>	Environmental protection needs organic agriculture	5			1	6			
<i>Policy position</i>	Tighten Federal Water Act (WHG)								
<i>Policy position</i>	Tighten Fertilizer Act (DüG)	6			1	13			3
<i>Policy position</i>	Tighten Fertilizer Ordinance (DüV)	10			2	18			4
<i>Policy position</i>	Tighten Fertilizer Regulation (DüMV)	2							
<i>Policy position</i>	Tighten regulation on area designation (AVV GeA)								
<i>Policy position</i>	Tighten regulation on farm gate balance (StoffB)								
<i>Policy instrument</i>	Limit livestock production to pasture	2				4			
<i>Policy instrument</i>	Mandatory field-based nutrient accounting					1			
<i>Policy instrument</i>	Prohibit fertilizer use on ecological compensation areas	2							
<i>Policy instrument</i>	Stricter blocking periods for fertilizer application	1				8			3
<i>Policy instrument</i>	Riparian buffer strips					3			
<i>Policy instrument</i>	General upper limit on fertilizer application	1			2	8	1*		2
<i>Policy instrument</i>	Farm gate balance					15			1
<i>Policy instrument</i>	Dung exchange („Gülle-Börse“)					1			
<i>Policy instrument</i>	Environmental tax on nitrate surplus					4			1
<i>Policy instrument</i>	Internal differentiation								

Note: Numbers reported indicate absolute numbers of actors; * BÖLW deviates from other coalition members.

Table A.1.3. Actor coalitions' beliefs indicated by agreement or disagreement for period 3 & 4

		<i>Period 3</i>				<i>Period 4</i>			
		<i>Pro-coalition</i>		<i>Contra-coalition</i>		<i>Pro-coalition</i>		<i>Contra-coalition</i>	
		<i>Agree</i>	<i>Disagree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Agree</i>	<i>Disagree</i>	<i>Agree</i>	<i>Disagree</i>
<i>Problem perception</i>	Conventional farming threatens drinking water quality	13	1*		5	14			2
<i>Problem perception</i>	Conventional farming threatens surface water quality	16		1•	4	16		1†	6
<i>Policy position</i>	Environmental protection needs organic agriculture	7				8			2
<i>Policy position</i>	Tighten Federal Water Act (WHG)					2			2
<i>Policy position</i>	Tighten Fertilizer Act (DüG)	10			1	2			
<i>Policy position</i>	Tighten Fertilizer Ordinance (DüV)	16	1*		9	17			8
<i>Policy position</i>	Tighten Fertilizer Regulation (DüMV)								
<i>Policy position</i>	Tighten regulation on area designation (AVV GeA)					5			5
<i>Policy position</i>	Tighten regulation on farm gate balance (StoffB)	10			2	8			1
<i>Policy instrument</i>	Limit livestock production to pasture	9		1♦		11			
<i>Policy instrument</i>	Mandatory field-based nutrient accounting	8			5	3			2
<i>Policy instrument</i>	Prohibit fertilizer use on ecological compensation areas								
<i>Policy instrument</i>	Stricter blocking periods for fertilizer application	10			4	4			5
<i>Policy instrument</i>	Riparian buffer strips	9			1	8			2
<i>Policy instrument</i>	General upper limit on fertilizer application	11			7	7			8
<i>Policy instrument</i>	Farm gate balance	11			1	7			
<i>Policy instrument</i>	Dung exchange („Gülle-Börse“)								
<i>Policy instrument</i>	Environmental tax on nitrate surplus	1				1			
<i>Policy instrument</i>	Internal differentiation					1+	6	8	

Note: Numbers reported indicate absolute numbers of actors; *BMEL both agrees and disagrees; †BMEL deviates from other coalition members; †CDU BP deviates from other coalition members; • NMELV deviates from other coalition members; ♦NMELV deviates from expected coalition position.

A.2 Codebook: Narrative strategies

Table A.2.1. Cost-benefit frames

	<i>Definition</i>	<i>Theory</i>
<i>Concentrate benefits of stricter regulation</i>	Statement of an actor that implies that a small group benefits from stricter regulation	Actor is against stricter regulation and losing
<i>Diffuse costs of stricter regulation</i>	Statement of an actor that implies that a large group is harmed by stricter regulation	Actor is against stricter regulation and losing
<i>Diffuse benefits of liberalization</i>	Statement of an actor that implies that a large group benefits from liberalization	Actor is in favor of liberalization and winning
<i>Concentrate costs of liberalization</i>	Statement of an actor that implies that a small group is harmed by liberalization	Actor is in favor of liberalization and winning
<i>Concentrate benefits of liberalization</i>	Statement of an actor that implies that a small group benefits from liberalization	Actor is against liberalization and losing
<i>Diffuse costs of liberalization</i>	Statement of an actor that implies that a large group is harmed by liberalization	Actor is against liberalization and losing
<i>Diffuse benefits of stricter regulation</i>	Statement of an actor that implies that a large group benefits from stricter regulation	Actor is in favor of stricter regulation and winning
<i>Concentrate costs of stricter regulation</i>	Statement of an actor that implies that a small group is harmed by stricter regulation	Actor is in favor of stricter regulation and winning

Note: Based on Shanahan et al. (2013) and Shanahan et al. (2018).

Table A.2.2. Characters

	<i>Definition</i>	<i>Theory</i>
<i>Hero</i>	The entity designated as fixing or being able to fix the specified problem. Those who take action with purpose to achieve or oppose a policy solution	Actor is winning
<i>Villain</i>	Those who create a harm, or inflicts damage or pain upon a victim or, in other cases as one who opposes the aims of the hero.	Actor is losing
<i>Victim</i>	Those who are harmed by a particular action or inaction.	Actor is losing
<i>Beneficiary</i>	Those who profit from a particular action or inaction.	Actor is winning

Note: Based on Shanahan et al. (2013), Shanahan et al. (2018) and Weible et al. (2016).

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A.3 Cost-benefit-frames

Table A.3.1. Mann-Kendall Trend Tests for mean frame ratio per month

		<i>Period 1 & 2</i>	<i>Period 3 & 4</i>
<i>Contra stricter regulation</i>	<i>Observations (months)</i>	87	45
	<i>Kendall's tau</i>	0.049	-0.436
	<i>Score</i>	102	-370
	<i>p-value</i>	0.572	0.000 ***
<i>Pro stricter regulation</i>	<i>Observations (months)</i>	87	45
	<i>Kendall's tau</i>	-0.354	0.201
	<i>Score</i>	-921	190
	<i>p-value</i>	0.000 ***	0.062 *

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.3.2. Parametric and non-parametric tests for coalition differences in mean contain-expand ratio

		<i>Period 1</i>	<i>Period 2</i>	<i>Period 3</i>	<i>Period 4</i>
<i>Contra stricter regulation</i>	<i>observations</i>	5	20	40	98
	<i>mean</i>	0.600	0.050	-0.184	-0.452
<i>Pro stricter regulation</i>	<i>observations</i>	14	88	150	92
	<i>mean</i>	-0.643	-0.568	-0.567	-0.337
	<i>difference in means</i>	1.243 ***	0.618 ***	0.383 ***	-0.115
	<i>test</i>	t-test	Welch t-test	t-test	t-test
	<i>t-value</i>	4.682	3.207	3.652	-1.386
	<i>p-value</i>	0.000	0.004	0.000	0.167
	<i>test</i>	Wilcoxon rank sum	Wilcoxon rank sum	Wilcoxon rank sum	Wilcoxon rank sum
	<i>W</i>	65	1248.5	3432.5	4154
	<i>p-value</i>	0.003	0.001	0.003	0.235

Note: stars indicate level of statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$; Welch t-tests have been computed instead of t-tests in cases where the assumption of variance homogeneity was violated.

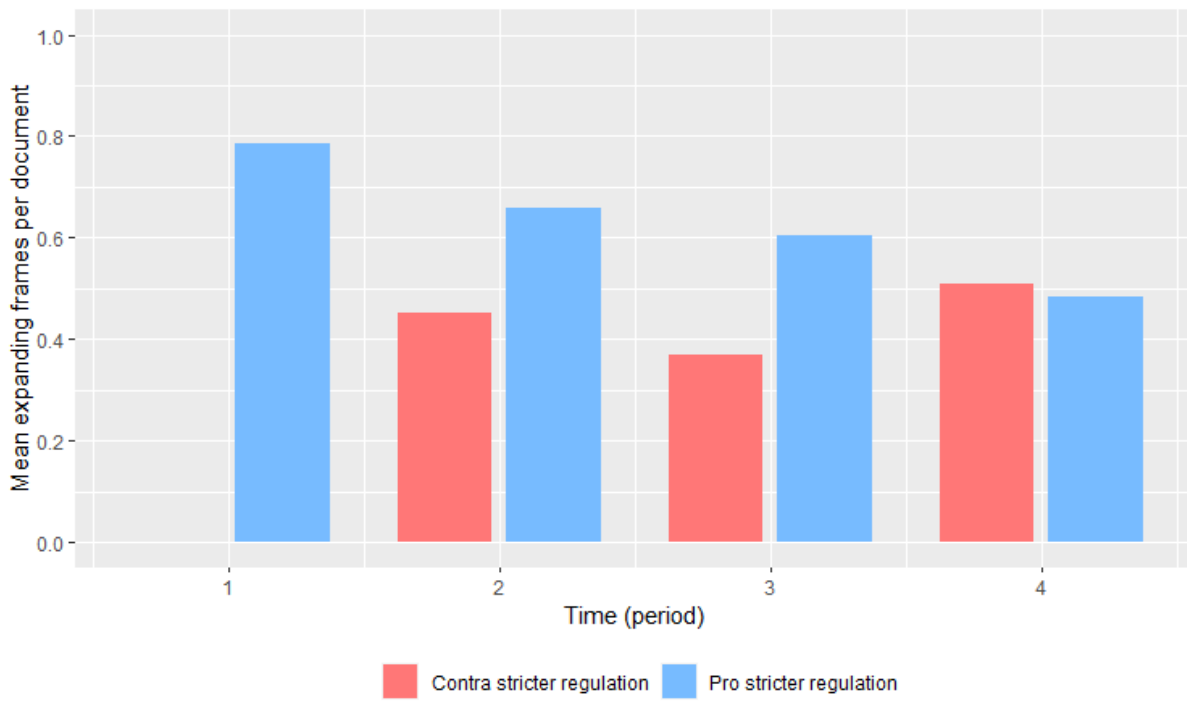


Figure A.3.1. Mean number of expanding frames within documents per period

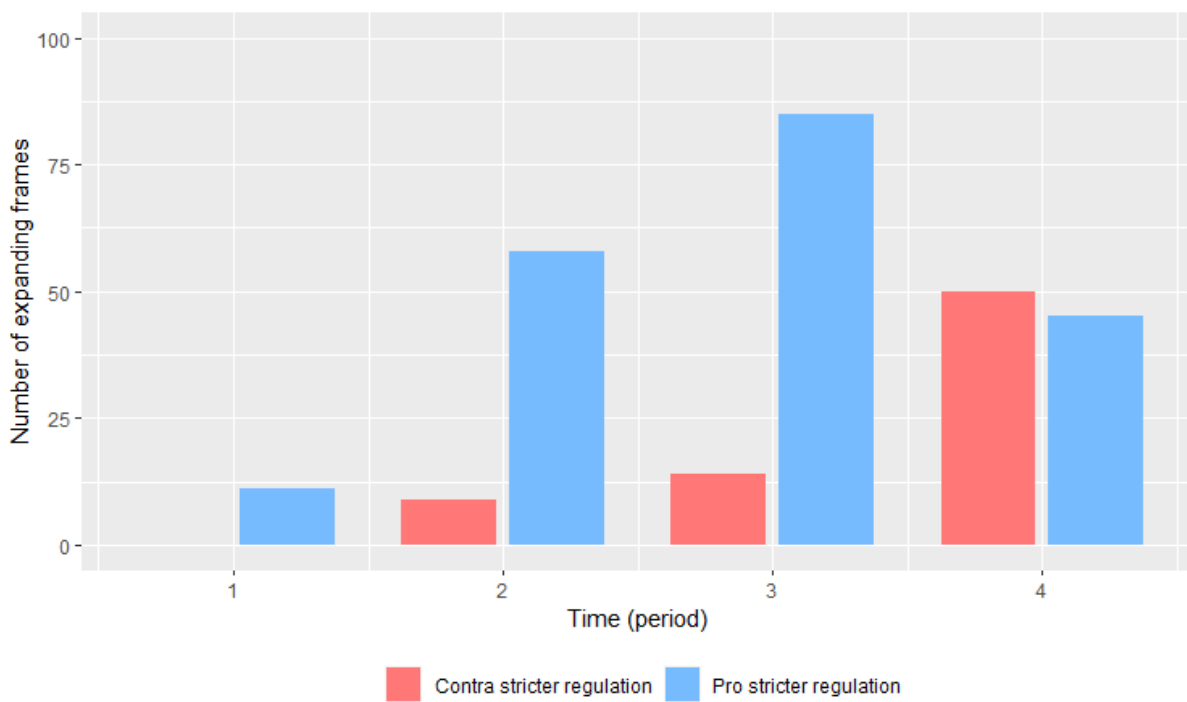


Figure A.3.2. Absolute number of expanding frames per period

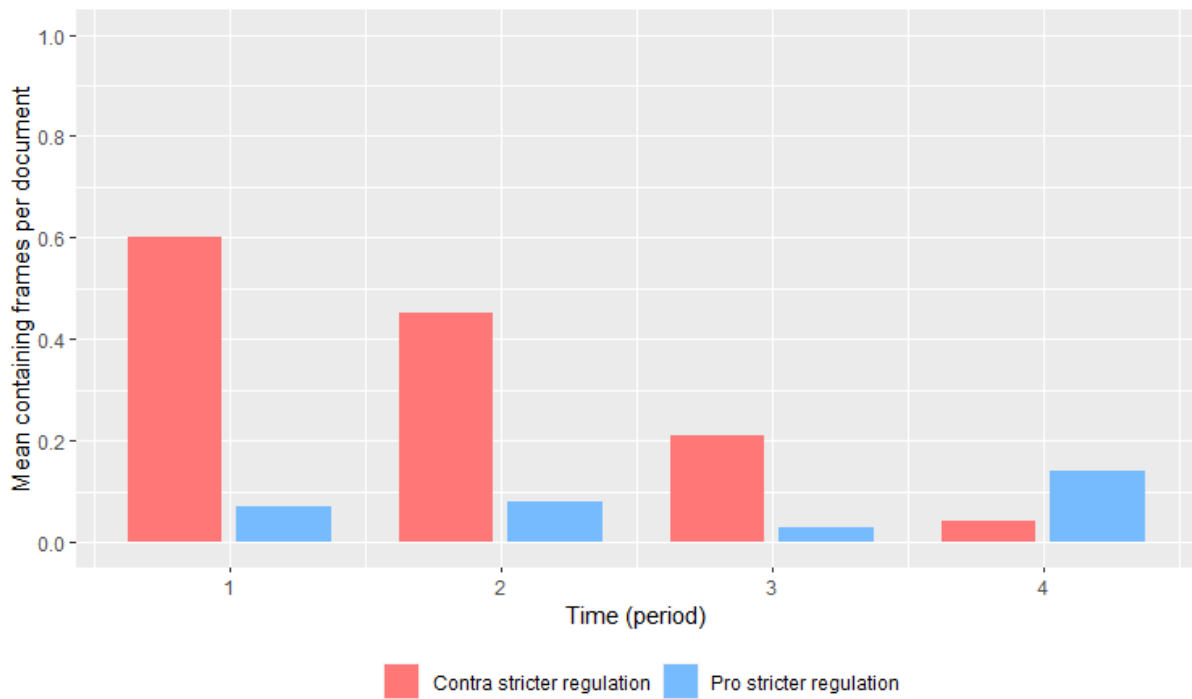


Figure A.3.3. Mean number of containing frames within documents per period

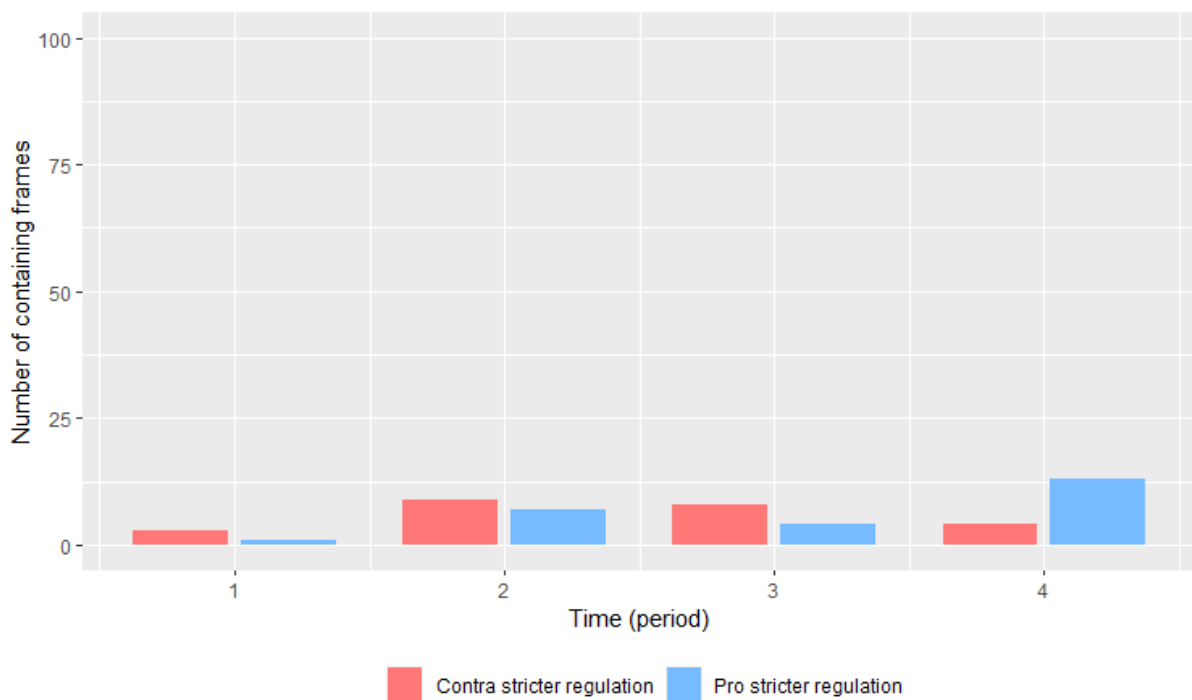


Figure A.3.4. Absolute number of containing frames per period

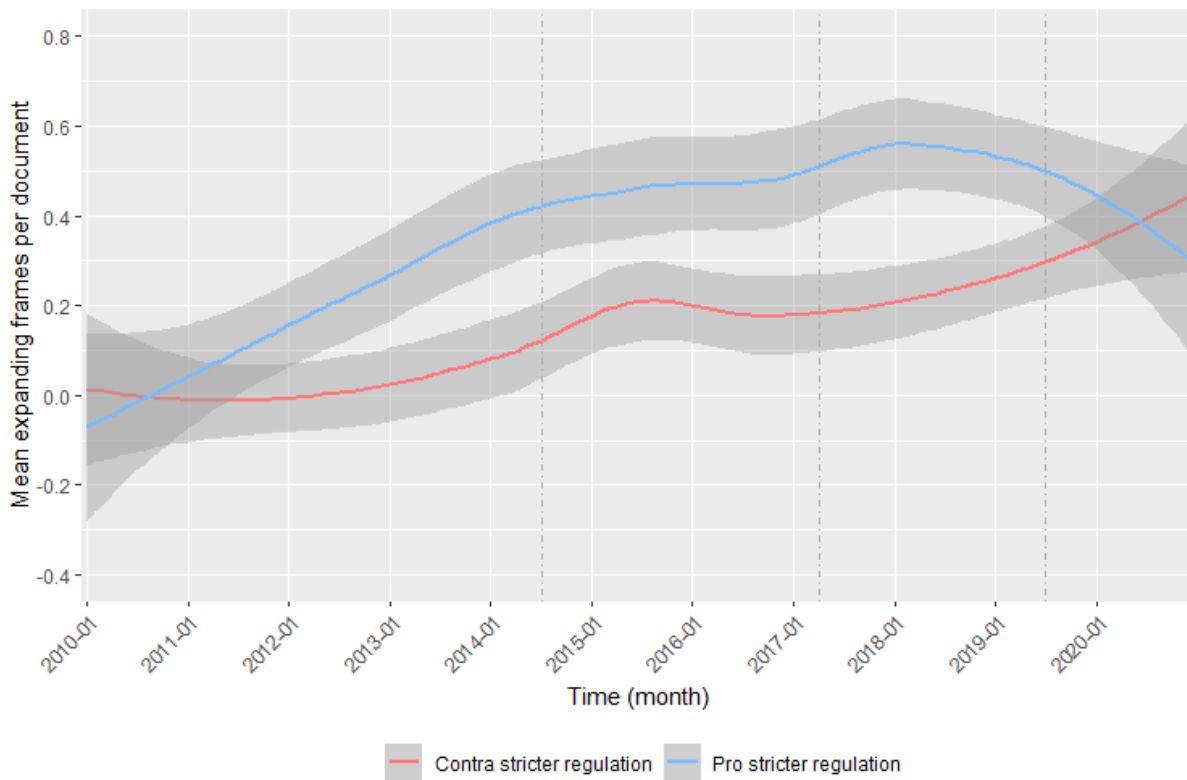


Figure A.3.5. Changes in coalition's use of expanding frames over time.

Note: The graph reports smoothing lines estimated by using the non-parametric LOESS (locally estimated scatterplot smoothing) method based on mean number of expanding frames within documents per month. The grey shaded areas around the lines represent 90% confidence intervals.

A.4 Devil Shift-Angel Shift

Table A.4.1. Parametric and non-parametric tests for coalition differences in mean villains per document

		<i>Period 1</i>	<i>Period 2</i>	<i>Period 3</i>	<i>Period 4</i>
<i>Contra stricter regulation</i>	<i>observations</i>	5	20	40	98
	<i>mean</i>	-0.667	-0.183	-0.165	-0.495
	<i>difference in means</i>	-0.321	0.449 ***	0.501 ***	-0.038
<i>Pro stricter regulation</i>	<i>observations</i>	14	88	150	92
	<i>mean</i>	-0.345	-0.633	-0.666	-0.457
	<i>difference in means</i>	-0.321	0.449 ***	0.501 ***	-0.038
<i>test</i>	t-test	t-test	Welch t-test	t-test	
<i>t-value</i>	-0.924	3.007	3.983	-0.480	
<i>p-value</i>	0.369	0.003	0.000	0.632	
<i>test</i>	Wilcoxon rank sum	Wilcoxon rank sum	Wilcoxon rank sum	Wilcoxon rank sum	
<i>W</i>	26.5	1182	4166.5	4274	
<i>p-value</i>	0.429	0.006	0.000	0.483	

Note: stars indicate level of statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Welch t-tests have been computed instead of t-tests in cases where the assumption of variance homogeneity was violated.

Table A.4.2. Mann-Kendall Trend Tests for mean hero-villain ratio per month

		<i>Period 1 & 2</i>	<i>Period 3 & 4</i>
<i>Contra stricter regulation</i>	<i>Observations (months)</i>	87	45
	<i>Kendall's tau</i>	-0.196 **	-0.423 ***
	<i>Score</i>	-405	-363
	<i>p-value</i>	0.024	0.000
<i>Pro stricter regulation</i>	<i>Observations (months)</i>	87	45
	<i>Kendall's tau</i>	-0.358 ***	0.405 ***
	<i>Score</i>	-983	385
	<i>p-value</i>	0.000	0.000

Note: stars indicate level of statistical significance: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table A.4.3. Actor coalitions' cohesiveness in their use of villains and victims

		<i>Period 1</i>	<i>Period 2</i>	<i>Period 3</i>	<i>Period 4</i>
<i>Contra</i>	<i>observations</i>	3	5	8	9
<i>stricter</i>	<i>density</i>	0.333	1	0.714	0.778
<i>regulation</i>	<i>modularity</i>	0	0	0	0.009
<i>Pro</i>	<i>observations</i>	9	12	13	10
<i>stricter</i>	<i>density</i>	0.444	0.833	0.833	0.644
<i>regulation</i>	<i>modularity</i>	0	0.034	0.013	0

Note: One-mode congruence networks with statements filtered at document level, normalized by average activity.

Table A.4.4. Actor coalitions' cohesiveness in their use of all characters

		<i>Period 1</i>	<i>Period 2</i>	<i>Period 3</i>	<i>Period 4</i>
<i>Contra</i>	<i>observations</i>	3	5	8	9
<i>stricter</i>	<i>density</i>	0.333	1	0.5	0.75
<i>regulation</i>	<i>modularity</i>	0	0	0	0.006
<i>Pro</i>	<i>observations</i>	9	12	13	10
<i>stricter</i>	<i>density</i>	0.278	0.742	0.769	0.400
<i>regulation</i>	<i>modularity</i>	0.071	0.024	0.004	0

Note: One-mode congruence networks with statements filtered at document level, normalized by average activity.

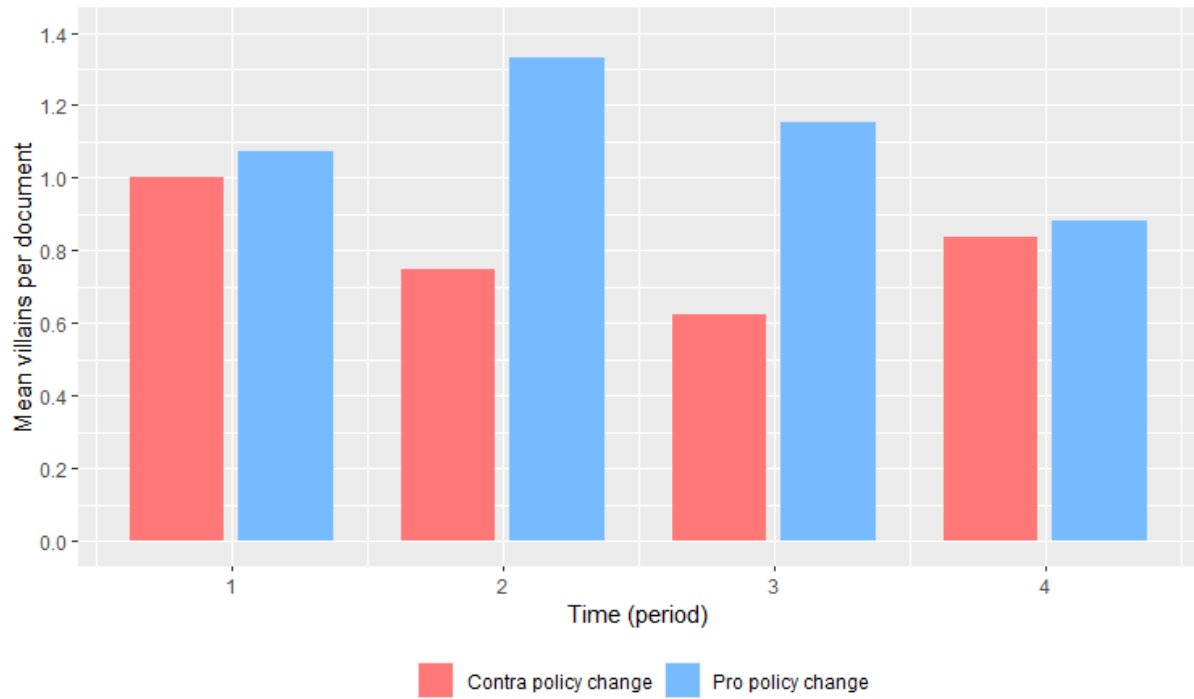


Figure A.4.1. Mean number of villains within documents per period

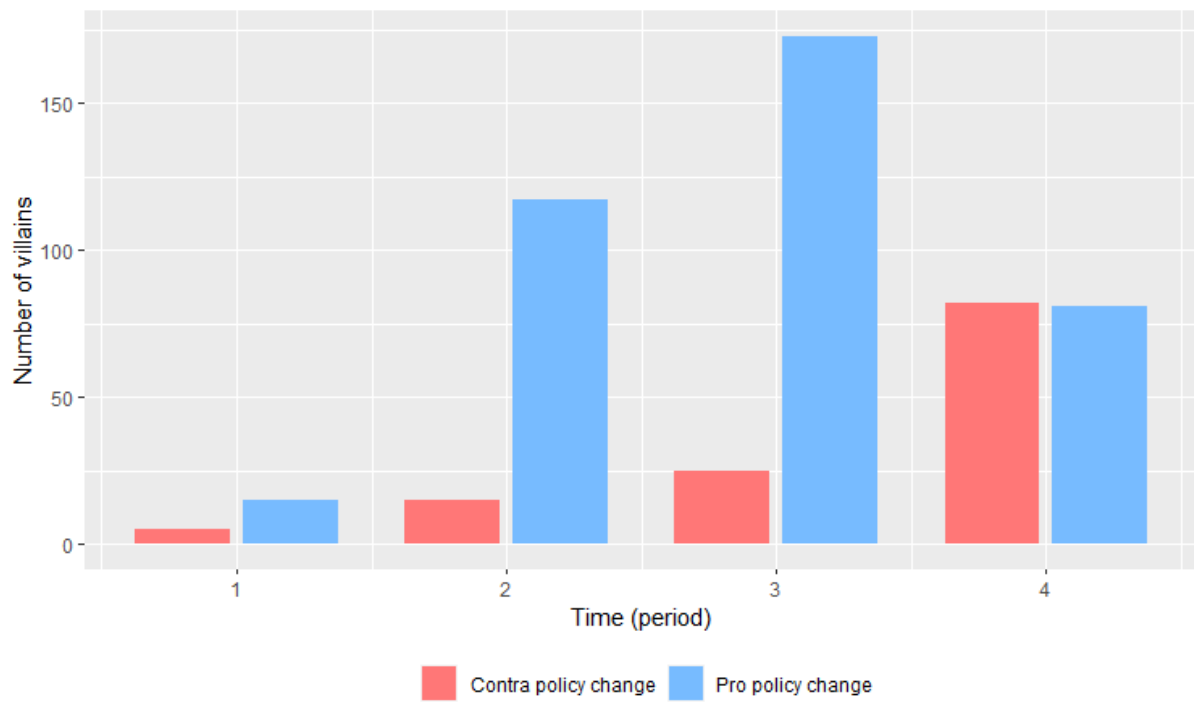


Figure A.4.2. Absolute number of villains per period

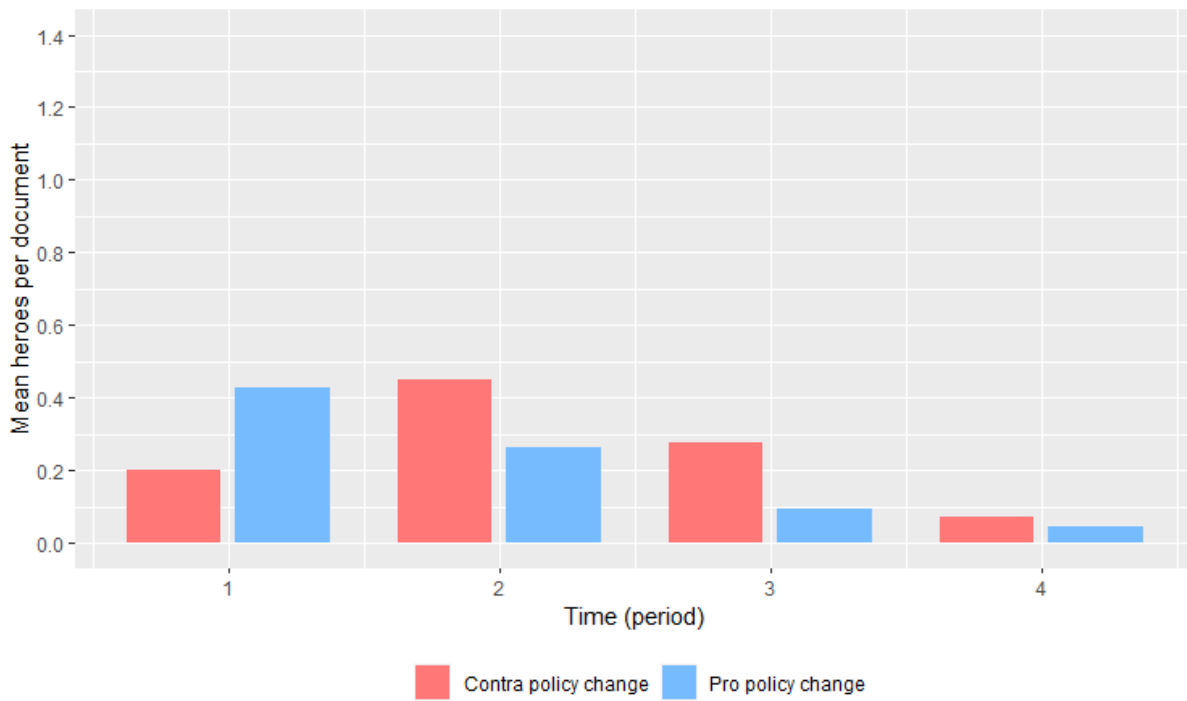


Figure A.4.3. Mean number of heroes within documents per period

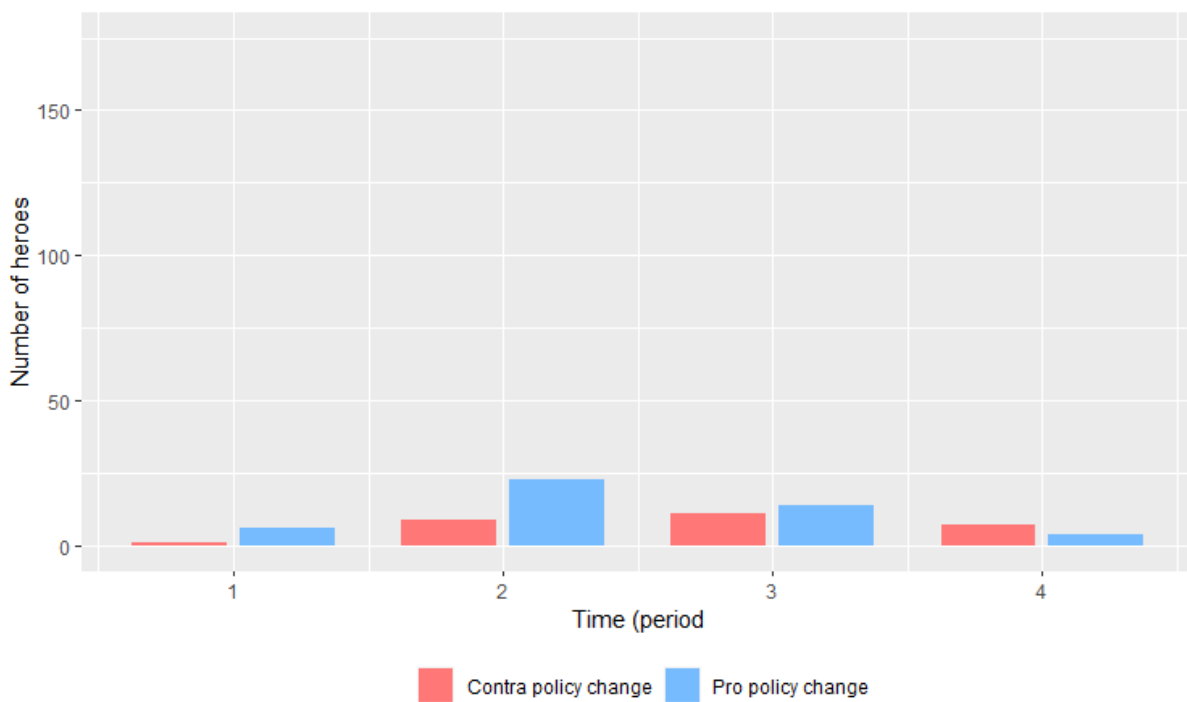


Figure A.4.4. Absolute number of heroes per period

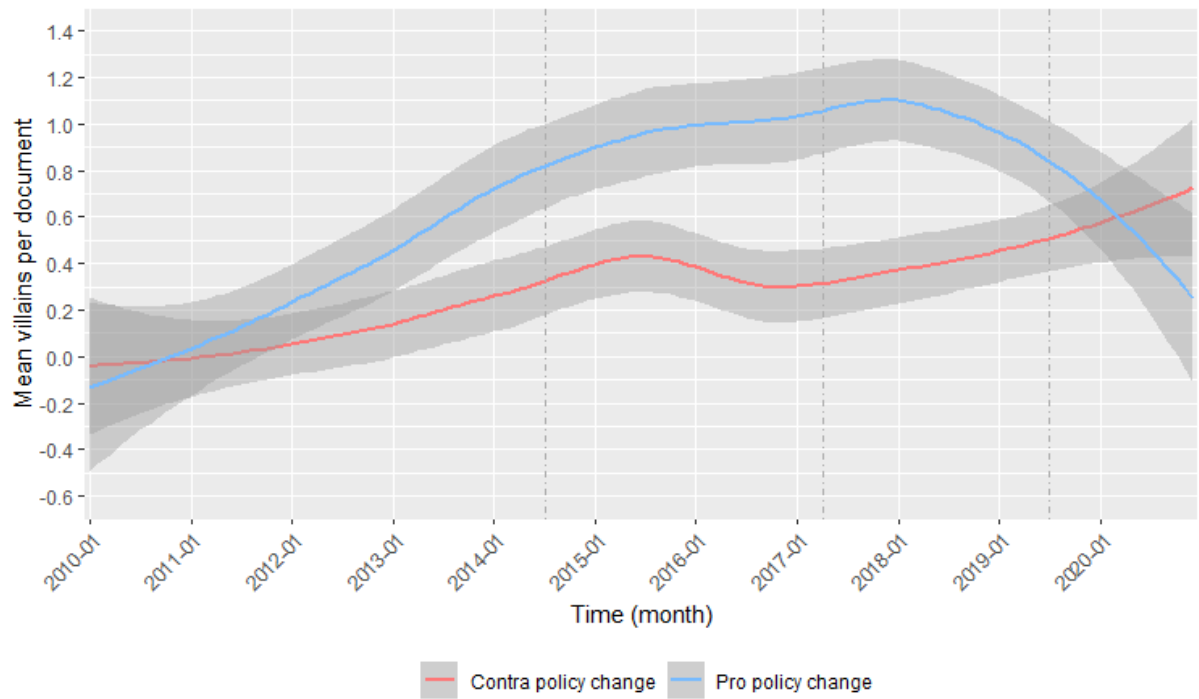


Figure A.4.5. Changes in coalition's use of villains over time.

Note: The graph reports smoothing lines estimated by using the non-parametric LOESS (locally estimated scatterplot smoothing) method based on mean villains within documents per month. The grey shaded areas around the lines represent 90% confidence intervals.

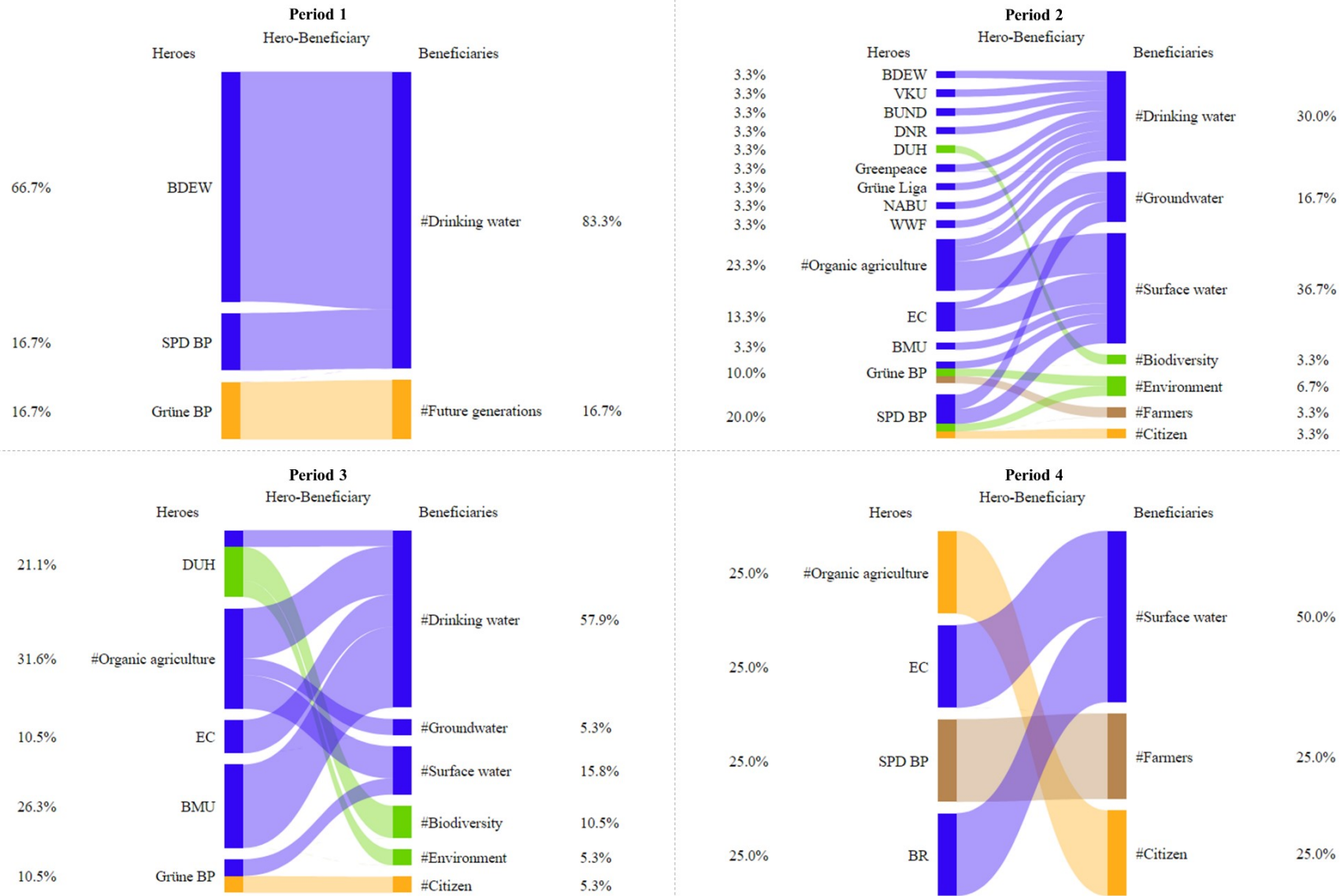


Figure A.4.6. Use of heroes and beneficiaries by pro-coalition



Figure A.4.7. Use of heroes and beneficiaries by contra-coalition

Appendix B to Salient to whom? The positioning of German political parties on agricultural pollutants in water bodies

B.1 Overview on party manifestos mentioning agricultural pollutants in water

Table B.1.1. Party manifestos mentioning agricultural pollutants in water

<i>Party</i>	<i>Federal/ State</i>	<i>Year</i>	<i>Nitrate, nutrients, manure, dung</i>	<i>Pesticide, plant protection</i>
Alliance 90/The Greens	Federal	2005	1	
Alliance 90/The Greens	Federal	2013	1	1
Alliance 90/The Greens	Federal	2017	1	1
The Left	Federal	2013	1	
The Left	Federal	2017	1	1
AfD	BW	2016	1	
AfD	NI	2017	1	
AfD	NW	2017	1	
AfD	SH	2017	1	1
AfD	TH	2014	1	
CDU	BW	2011	1	
CDU	HE	2018	1	
CDU	NI	2013	1	
CDU	NI	2017	1	
CDU	ST	2006	1	
CDU	SH	2012	1	
CDU	SH	2017	1	1
FDP	BY	1998	1	1
FDP	BY	2003	1	1
FDP	HE	2018	1	1
FDP	NI	2017	1	1
FDP	RP	2006	1	
FDP	SH	2000	1	1
FDP	SH	2005	1	1
FDP	SH	2017	1	
Alliance 90/The Greens	BB	2009	1	1
Alliance 90/The Greens	BB	2014	1	1
Alliance 90/The Greens	BE	2016		1
Alliance 90/The Greens	BW	2011	1	
Alliance 90/The Greens	BW	2016	1	1
Alliance 90/The Greens	BY	2008	1	1

<i>Party</i>	<i>Federal/ State</i>	<i>Year</i>	<i>Nitrate, nutrients, manure, dung</i>	<i>Pesticide, plant protection</i>
Alliance 90/The Greens	BY	2013	1	1
Alliance 90/The Greens	BY	2018	1	1
Alliance 90/The Greens	HB	1999		1
Alliance 90/The Greens	HE	2003	1	1
Alliance 90/The Greens	HE	2013	1	1
Alliance 90/The Greens	HE	2018	1	1
Alliance 90/The Greens	MV	2002	1	1
Alliance 90/The Greens	MV	2011	1	1
Alliance 90/The Greens	MV	2016	1	1
Alliance 90/The Greens	NI	2003	1	
Alliance 90/The Greens	NI	2013	1	1
Alliance 90/The Greens	NI	2017	1	1
Alliance 90/The Greens	NW	2000	1	1
Alliance 90/The Greens	NW	2005	1	1
Alliance 90/The Greens	NW	2010		1
Alliance 90/The Greens	NW	2012	1	1
Alliance 90/The Greens	RP	2016	1	1
Alliance 90/The Greens	SH	2000	1	1
Alliance 90/The Greens	SH	2005	1	1
Alliance 90/The Greens	SH	2009	1	1
Alliance 90/The Greens	SH	2012	1	1
Alliance 90/The Greens	SH	2017	1	1
Alliance 90/The Greens	SL	2009		1
Alliance 90/The Greens	SL	2012		1
Alliance 90/The Greens	SN	2004	1	1
Alliance 90/The Greens	SN	2014	1	1
Alliance 90/The Greens	ST	1998	1	1
Alliance 90/The Greens	ST	2006	1	1
Alliance 90/The Greens	ST	2016	1	1
Alliance 90/The Greens	TH	1999	1	1
Alliance 90/The Greens	TH	2009	1	1
The Left	BW	2011	1	
The Left	BW	2016	1	
The Left	BY	2018	1	
The Left	HE	2018	1	1
The Left	MV	2016	1	

<i>Party</i>	<i>Federal/ State</i>	<i>Year</i>	<i>Nitrate, nutrients, manure, dung</i>	<i>Pesticide, plant protection</i>
The Left	NI	2013	1	1
The Left	NI	2017	1	1
The Left	NW	2012	1	
The Left	NW	2017	1	1
The Left	SH	2017	1	1
The Left	SL	2017	1	1
SPD	BY	2013	1	1
SPD	BY	2018	1	1
SPD	HE	1999	1	1
SPD	HE	2018	1	1
SPD	NI	2003	1	
SPD	NI	2013	1	
SPD	NI	2013	1	
SPD	NW	2017	1	
SPD	SH	2017	1	1
SPD	SL	2009	1	
<i>Sum</i>			78	57

Appendix C to Transition towards sustainable pharmacy? The influence of public debates on policy responses to pharmaceutical contaminants in water

C.1 Details on the data collection

Table C.1.1. List of newspapers used for the analysis

<i>Geographical scope</i>	<i>Newspaper</i>
Germany	Frankfurter Allgemeine Zeitung
Baden-Württemberg	Stuttgarter Zeitung Südwest Presse
Bavaria	Nürnberger Nachrichten Passauer Neue Presse
Berlin	Berliner Zeitung
Brandenburg	Märkische Allgemeine
Bremen	Weser Kurier
Hamburg	Hamburger Abendblatt
Hessen	Rhein Main Digital GmbH
Lower Saxony	Hannoversche Allgemeine Zeitung Neue Osnabrücker Zeitung Nordwest-Zeitung
Mecklenburg-Vorpommern	Nordkurier Ostsee-Zeitung
North Rhine-Westphalia	Rheinische Post Gesamt
Rhineland-Palatinate	Rhein-Zeitung Wormser Zeitung
Saarland	Saarbrücker Zeitung
Saxony	Sächsische Zeitung
Saxony-Anhalt	Mitteldeutsche Zeitung
Schleswig-Holstein	Schleswig-Holsteiner Zeitungsverlag
Thuringia	Thüringer Allgemeine



Figure C.1.1. Geographical distribution of newspapers used for the analysis

Note: Full list provided in Table C.1.1

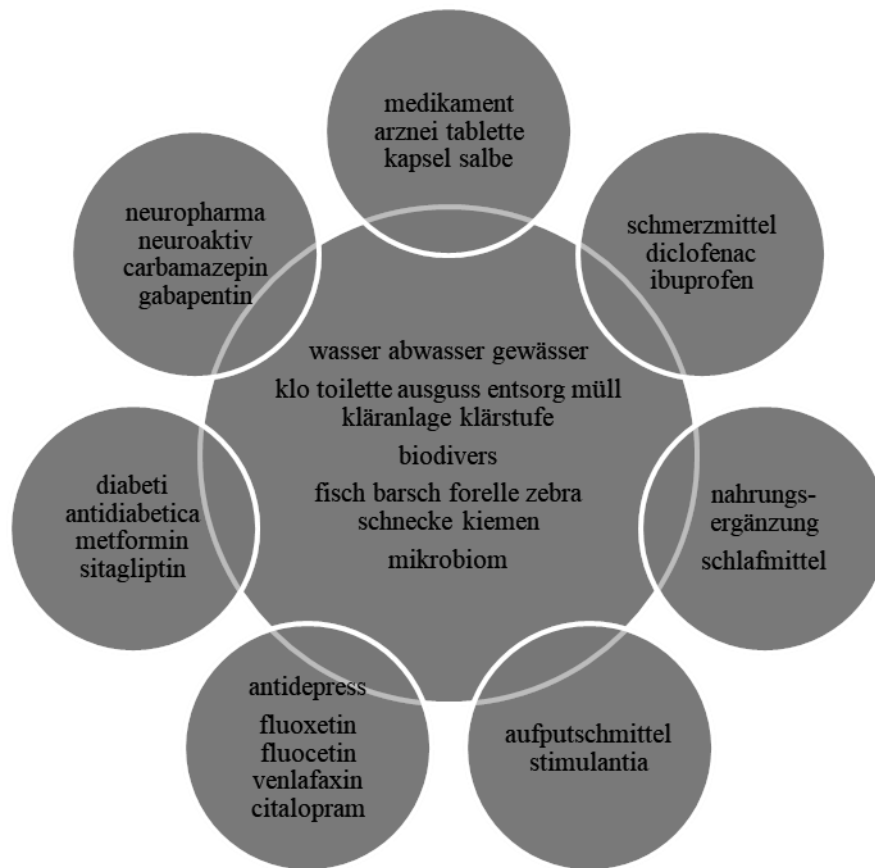


Figure C.1.2. Combination of key words used to retrieve relevant newspaper articles

Note: Key words located within circles are combined using the operator “OR” and circles are combined by using the operator “AND”. Example from the graph at the top: “Give me every article that contains any of the key words ‘medikament’, ‘arznei’, ‘tablette’, ‘kapsel’, or ‘salbe’ in combination with any of the key words ‘wasser’, ‘abwasser’, ‘gewässer’, ‘klo’, ‘toilette’, ‘ausguss’, ‘entsorg’, ‘müll’, ‘kläranlage’, ‘klärstufe’, ‘biodivers’, ‘fisch’, ‘barsch’, ‘forelle’, ‘zebra’, ‘schnecke’, ‘kiemen’, or ‘mikrobiom’”.

C.2 Full list of organizations

Table C.2.1. Full list of organizations identified in the public debate

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Type</i>
ABDA	Federal Union of German Associations of Pharmacists	Bundesvereinigung Deutscher Apothekerverbände	Pharmacy association
AgrarBuendnis	AgrarBündnis	AgrarBündnis e.V.	Environmental organisation
AGW	Committee of Water Associations in North Rhine-Westphalia	Arbeitsgemeinschaft der Wasserwirtschaftsverbände in Nordrhein-Westfalen	Water association, municipal utility
AK DS	Chamber of Pharmacy Saarland	Apothekerkammer Saarland	Pharmacy association
AK HB	Chamber of Pharmacy Bremen	Apothekerkammer Bremen	Pharmacy association
AK HH	Chamber of Pharmacy Hamburg	Apothekerkammer Hamburg	Pharmacy association
AK NR	Chamber of Pharmacy Nordrhein	Apothekerkammer Nordrhein	Pharmacy association
AK SA	Chamber of Pharmacy Sachsen-Anhalt	Apothekerkammer Sachsen-Anhalt	Pharmacy association
ANTL	Committee for nature conservation Tecklenburger Land	Arbeitsgemeinschaft für Naturschutz Tecklenburger Land	Environmental organisation
AvDuU	Pharmacy-Club Düsseldorf	Apotheken-Verein von Düsseldorf und Umgebung	Pharmacy association
BDEW	Federal Association of Energy and Water Industry	Bundesverband der Energie- und Wasserwirtschaft	Water association, municipal utility
BfG	German Federal Institute for Hydrology	Bundesanstalt für Gewässerkunde	Federal government
BMBF	German Federal Ministry of Education and Research	Bundesministerium für Bildung und Forschung	Federal government
BMU	Federal Ministry for the Environment	Bundesumweltministerium	Federal government
BPI	German Pharmaceutical Industry Association	Bundesverband der Pharmazeutischen Industrie	Industry, Retail
BPT	German Association of Practising Veterinary Surgeons	Bundesverband praktizierender Tierärzte	Medicine association
BR	German Federal Council	Bundesrat	State government
BReg	Federal Government Germany	Bundesregierung	Federal government
BTU	Brandenburg University of Technology	Brandenburgisch-Technische Universität	Science

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Type</i>
BUND	Friends of the Earth Germany	BUND	Environmental organisation
BV MV	Agriculture Association Mecklenburg-Vorpommern	Bauernverband Mecklenburg-Vorpommern	Agricultural association
BWB	Water Company Berlin	Berliner Wasserbetriebe	Water association, municipal utility
CDU AK	Christian Democratic Union Altenkirchen	CDU Altenkirchen	Christian Democratic Party
CDU GG	Christian Democratic Union Gernsheim	CDU Gernsheim	Christian Democratic Party
CDU HE	Christian Democratic Union Hesse	CDU Hessen	Christian Democratic Party
CDU HH	Christian Democratic Union Hamburg	CDU Hamburg	Christian Democratic Party
CDU OL	Christian Democratic Union Oldenburger-Land	CDU Kreis Oldenburg-Land	Christian Democratic Party
CDU SL	Christian Democratic Union Saarland	CDU Saarland	Christian Democratic Party
DÄ	Deutsches Ärzteblatt	Deutsches Ärzteblatt	Medicine association
DBU	German Federal Environmental Foundation	Deutsche Bundesstiftung Umwelt	Environmental organisation
Die Linke HH	The Left Hamburg	Die Linke Hamburg	Leftist party
Dresden	Dresden	Stadt Dresden	Regional, local government
DStGB	German Association of Towns and Municipalities	Deutscher Städte- und Gemeindebund	Regional, local government
DUH	Environmental Action Germany	Deutsche Umwelthilfe	Environmental organisation
DWA	German Association for Water, Wastewater and Waste	Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall	Water association, municipal utility
EGLV	Lippeverband	Lippeverband	Water association, municipal utility
ELW	Municipal utility Wiesbaden	Entsorgungsbetriebe Wiesbaden	Water association, municipal utility
Eurawasser	Eurawasser	Eurawasser-Unternehmensgruppe	Water company
EVS	Waste Disposal Association Saar	Entsorgungsverband Saar	Water association, municipal utility
FAU	University Erlangen-Nürnberg	Universität Erlangen-Nürnberg	Science

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Type</i>
FDP GG	Free Democratic Party Gernsheim	FDP Gernsheim	Liberal party
FDP MV	Free Democratic Party Mecklenburg-Vorpommern	FDP Meckelburg-Vorpommern	Liberal party
FFS	Fishery Research Institute Langenargen	Fischereiforschungsstelle Langenargen	Science
Fraunhofer	Fraunhofer Society	Fraunhofer Institut	Science
FW Bavaria	Free Voters of Bavaria	Die Freien Wähler Bayern	Liberal party
GKU	Association of Environmental Servies Ostmecklenburg - Vorpommern	Gesellschaft für Kommunale Umweltdienste Ostmecklenburg - Vorpommern	Water company
Grüne BE	Alliance 90/The Greens Berlin	Die Grünen Berlin	Green party
Grüne BP	Alliance 90/The Greens Federal Party	Die Grünen Bundespartei	Green party
Grüne BW	Alliance 90/The Greens Baden-Württemberg	Die Grünen Baden-Württemberg	Green party
Grüne GG	Alliance 90/The Greens Gernsheim	Die Grünen Gernsheim	Green party
Grüne HE	Alliance 90/The Greens Hesse	Die Grünen Hessen	Green party
Grüne HH	Alliance 90/The Greens Hamburg	Die Grünen Hamburg	Green party
Grüne MV	Alliance 90/The Greens Mecklenburg-Vorpommern	Die Grünen Mecklenburg-Vorpommern	Green party
Grüne N	Alliance 90/The Greens Nuremberg	Die Grünen Nürnberg	Green party
Grüne NI	Alliance 90/The Greens Lower Saxony	Die Grünen Niedersachsen	Green party
Grüne NW	Alliance 90/The Greens North Rhine-Westphalia	Die Grünen Nordrhein-Westfalen	Green party
Grüne OS	Alliance 90/The Greens Osnabrücker Land	Die Grünen Osnabrücker Land	Green party
Grüne RP	Alliance 90/The Greens Rhineland-Palatinate	Die Grünen Rheinland-Pfalz	Green party
Grüne SH	Alliance 90/The Greens Schleswig-Holstein	Die Grünen Schleswig-Holstein	Green party
Grüne SL	Alliance 90/The Greens Saarland	Die Grünen Saarland	Green party
Hamburg Wasser	Hamburg Wasser	Hamburg Wasser	Water company

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Type</i>
Hansewasser	Hansewasser	Hansewasser	Water company
HES	State of Hesse	Landesregierung Hessen	State government
HEW	Hessenwasser	Hessenwasser	Water company
HFT Stuttgart	Stuttgart Technology University of Applied Sciences	Hochschule für Technik Stuttgart	Science
HFU	Furtwangen University of Applied Sciences	Hochschule Furtwangen	Science
HMUKLV	Ministry of the Environment Hesse	Landesumweltministerium Hessen	State government
HNLUG	Hessian Agency for Nature Conservation, Environment and Geology	Hessisches Landesamt für Naturschutz, Umwelt und Geologie	State government
Hohenstein	Hohenstein	Gemeinde Hohenstein	Regional, local government
HS Fresenius	Fresenius University of Applied Sciences	Fresenius Hochschule	Science
HU HH	Hamburg Institute for Hygiene and the Environment	Hamburger Institut für Hygiene und Umwelt	Science
IGB	Leibniz Institute for Baltic Sea Research	Leibniz-Institut für Gewässerökologie und Binnenfischerei	Science
ISOE	Institute for Social-Ecological Research	Institut für sozial-ökologische Forschung	Science
Jacobs Uni	Jacobs University Bremen	Jacobs University Bremen	Science
Kirchheim	Kirchheim	Gemeinde Kirchheim	Regional, local government
KR Bad Kreuznach	District Bad Kreuznach	Kreisverwaltung Bad Kreuznach	Regional, local government
KR Borken	District Borken	Kreis Borken	Regional, local government
KR Cochem-Zell	District Cochem-Zell	Kreisverwaltung Cochem-Zell	Regional, local government
KR Prignitz	District Prignitz	Kreisverwaltung Prignitz	Regional, local government
KR Steinburg	District Steinburg	Kreis Steinburg	Regional, local government
KV Hessen	Association of Statutory Health Insurance Physicians	Kassenärztliche Vereinigung Hessen	Medicine association
KW Achim	Wastewater treatment plant Achim	Klärwerk Achim	Water association, municipal utility

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Type</i>
KW Bad Homburg	Wastewater treatment plant Bad Homburg	Klärwerk Bad Homburg	Water association, municipal utility
KW Freyung	Wastewater treatment plant Freyung	Klärwerk Freyung	Water association, municipal utility
KW Gießen	Wastewater treatment plant Gießen	Klärwerk Gießen	Water association, municipal utility
KW Häldemühle	Wastewater treatment plant Häldenmühle	Gruppenklärwerk Häldenmühle	Water association, municipal utility
KW Koblenz	Wastewater treatment plant Koblenz	Klärwerk Koblenz	Water association, municipal utility
KW Laichingen	Wastewater treatment plant Laichingen	Klärwerk Laichingen	Water association, municipal utility
KW Natrup-Hagen	Wastewater treatment plant Natrup-Hagen	Klärwerk Natrup-Hagen	Water association, municipal utility
KW Oldesloe	Wastewater treatment plant Oldesloe	Klärwerk Oldesloe	Water association, municipal utility
KW Verden	Wastewater treatment plant Verden	Klärwerk Verden	Water association, municipal utility
KWB	Berlin Centre of Competence for Water	Kompetenzzentrum Wasser Berlin	Water association, municipal utility
Laichingen	Laichingen	Stadt Laichingen	Regional, local government
LDEW	Energy- and Water Association Hesse/Rhineland-Palatinate	Landesverband der Energie- und Wasserwirtschaft Hessen/Rheinland-Pfalz	Water association, municipal utility
LfU BY	State Office for Environment Bavaria	Landesamt für Umwelt Bayern	State government
LfU RP	State Office for Environment Rhineland Palatinate	Landesamt für Umwelt, Wasserwirtschaft und Gewerbeaufsicht Rheinland-Pfalz	State government
LFV BY	Fishery Association Bavaria	Fischereiverband Bayern	Fishery association
LINEG	Linksniederrheinische Entwässerungs-Genossenschaft	Linksniederrheinische Entwässerungs-Genossenschaft	Water association, municipal utility
LML NI	Ministry of Agriculture Lower-Saxony	Landwirtschaftsministerium Niedersachsen	State government
LMU BW	Ministry of the Environment Baden-Württemberg	Landesumweltministerium Baden-Württemberg	State government
LMU NI	Ministry of the Environment Lower Saxony	Landesumweltministerium Niedersachsen	State government

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Type</i>
LMU SL	Ministry of the Environment Saarland	Landesumweltministerium Saarland	State government
LU BW	State Institute for the Environment Baden-Württemberg	Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg	State government
LWK NI	Chamber of Agriculture Lower Saxony	Landwirtschaftskammer Niedersachsen	Agricultural association
LWT BB	Water Association Brandenburg	Landeswasserverband Brandenburg	Water association, municipal utility
MELUND SH	Ministry of the Environment Schleswig-Holstein	Landesumweltministerium Schleswig-Holstein	State government
Midewa	Midewa	Midewa	Water company
Mörfelden-Walldorf	Mörfelden	Stadt Mörfelden-Walldorf	Regional, local government
MULNV NRW	Ministry of the Environment North Rhine-Westphalia	Landesumweltministerium Nordrhein-Westfalen	State government
NABU	Nature And Biodiversity Conservation Union	NABU	Environmental organisation
N-Ergie	N-Ergie	N-Ergie	Water company
NLWKN	Lower Saxony Department for Water, Coastal and Nature Conservation	Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz	State government
NV	Niersverband	Niersverband	Water association, municipal utility
Oeko-Test	Öko-Test	Öko-Test	Consumer protection organisation
OOWV	Water Association Oldenburg-Ostfriesland	Oldenburgisch-Ostfriesischer Wasserverband	Water association, municipal utility
Postmünster	Postmünster	Gemeinde Postmünster	Regional, local government
REWA	Water and Wastewater Association Stralsund	Regionale Wasser- und Abwassergesellschaft Stralsund	Water company
RP Stuttgart	Governing Council Stuttgart	Regierungspräsidium Stuttgart	State government
RP Tübingen	Governing Council Tübingen	Regierungspräsidium Tübingen	State government
SBN Neuwied	Service company Neuwied	Servicebetriebe Neuwied	Water association, municipal utility
SBU HB	Environmental Agency Bremen	Umweltbehörde Bremen	Water association, municipal utility

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Type</i>
SEW DD	Municipal utility Dresden	Stadtentwässerung Dresden	Water association, municipal utility
SEW DÜ	Municipal utility Düsseldorf	Stadtentwässerungsbetrieb Düsseldorf	Water association, municipal utility
SEW F	Municipal utility Frankfurt	Stadtentwässerung Frankfurt	Water association, municipal utility
SMUL	Ministry of Environment and Agriculture Saxony	Umwelt- und Landwirtschaftsministerium Sachsen	State government
SPD BE	Social Democratic Party of Germany Berlin	SPD Berlin	Social democratic party
SPD GG	Social Democratic Party of Germany Gernsheim	SPD Gernsheim	Social democratic party
SPD HE	Social Democratic Party of Germany Hesse	SPD Hessen	Social democratic party
SPD ME	Social Democratic Party of Germany Monheim	SPD Monheim	Social democratic party
SRH	City Cleaning Hamburg	Stadtreinigung Hamburg	Water association, municipal utility
StMUV BY	Ministry of the Environment Bavaria	Landesumweltministerium Bayern	State government
SUN	Municipal utility Nuremberg	Stadtentwässerung und Umweltanalytik Nürnberg	Water association, municipal utility
SW Delmenhorst	Municipal utility Delmenhorst	Stadtwerke Delmenhorst	Water association, municipal utility
SW Erfurt	Municipal utility Erfurt	Stadtwirtschaft Erfurt	Water association, municipal utility
SW Heppenheim	Municipal utility Heppenheim	Stadtwerke Heppenheim	Water association, municipal utility
SW Hilden	Municipal utility Hilden	Stadtwerke Hilden	Water association, municipal utility
SW Hochheim	Municipal utility Hochheim	Stadtwerke Hochheim	Water association, municipal utility
SW Husum	Municipal utility Husum	Stadtwerke Husum	Water association, municipal utility
SW LE	Municipal utility Leinfelden-Echterdingen	Stadtwerke Leinfelden-Echterdingen	Water association, municipal utility
SW Mainz	Municipal utility Mainz	Stadtwerke Mainz	Water association, municipal utility
SW Nettetal	Municipal utility Nettetal	Stadtwerke Nettetal	Water association, municipal utility
SW Osnabrück	Municipal utility Osnabrück	Stadtwerke Osnabrück	Water association, municipal utility

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Type</i>
SW Zehdenick	Municipal utility Zehdenick	Stadtwerke Zehdenick	Water association, municipal utility
SWD Düsseldorf	Waterworks Düsseldorf	Wasserwerke Düsseldorf	Water association, municipal utility
THM	Mittelhessen University of Applied Sciences	Technische Hochschule Mittelhessen	Science
TU BE	Technical University of Berlin	Technische Universität Berlin	Science
TU DA	Technical University of Darmstadt	Technische Universität Darmstadt	Science
TU HH	Hamburg University of Technology	Technische Universität Hamburg-Harburg	Science
TU KL	Technical University of Kaiserslautern	Technische Universität Kaiserslautern	Science
TW Verden	Drinking Water Association Verden	Trinkwasserverband Verden	Water association, municipal utility
UA MSE	Environmental Agency Mecklenburgische Seenplatte	Umweltamt Landkreis Mecklenburgische Seenplatte	Water association, municipal utility
UA VG	Environmental Agency Vorpommern-Greifswald	Umweltamt Landkreis Vorpommern-Greifswald	Water association, municipal utility
UA WI	Environmental Agency Wiesbaden	Umweltamt Wiesbaden	Water association, municipal utility
UBA	German Environmental Agency	Umweltbundesamt	Federal government
UFZ	Helmholtz Centre for Environmental Research	Helmholtz-Zentrum für Umweltforschung	Science
Uni Bonn	Bonn University	Universität Bonn	Science
Uni Bremen	Bremen University	Universität Bremen	Science
Uni DUE	Duisburg-Essen University	Universität Duisburg-Essen	Science
Uni Frankfurt	Frankfurt University	Universität Frankfurt	Science
Uni Freiburg	Freiburg University	Universität Freiburg	Science
Uni Halle	Halle University	Universität Halle	Science
Uni Kiel	Kiel University	Universität Kiel	Science
Uni Koblenz	Koblenz-landau University	Universität Koblenz-Landau	Science
Uni Lüneburg	Lüneburg University	Universität Lüneburg	Science
Uni Oldenburg	Oldenburg University	Universität Oldenburg	Science
Uni Stuttgart	Stuttgart University	Universität Stuttgart	Science
Uni Tübingen	Tübingen University	Universität Tübingen	Science
Uni Umea	Umea University	Universität Umea	Science

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Type</i>
VFA	Association of Research-Based Pharmaceutical Companies	Verband Forschender Arzneimittelhersteller	Industry, Retail
VG Stromberg	Municipal utility Stromberg	Stromberger Verbandsgemeindewerke	Water association, municipal utility
VG Wörrstadt	Water Supply Wörrstadt	Versorgungsgesellschaft Wörrstadt	Water association, municipal utility
VKU	Association of Municipal Companies	Verband Kommunaler Unternehmen	Water association, municipal utility
VU SN	Consumer Organisation Saxony	Verbraucherzentrale Sachsen	Consumer protection organisation
VZ HH	Consumer Organisation Hamburg	Hamburger Verbraucherzentrale	Consumer protection organisation
VZ NW	Consumer Organisation North Rhein-Westphalia	Verbraucherzentrale Nordrhein-Westfalen	Consumer protection organisation
WA Boddenland	Water Company Boddenland Ribnitz-Damgarten	Wasser- und Abwasser GmbH Boddenland Ribnitz-Damgarten	Water company
WAB Coswig	Water Company Coswig	Wasser Abwasser Betriebsgesellschaft Coswig	Water company
WBV Ried	Water Association Riedgruppe ost	Wasserbeschaffungsverband Riedgruppe Ost	Water association, municipal utility
Wiesbaden	Office for urban planning Wiesbaden	Stadtplanungsamt Wiesbaden	Regional, local government
WLV	Agriculture Association Westphalia-Lippe	Westfälisch-Lippischer Landwirtschaftsverband	Agricultural association
WV Brockwitz-Rödern	Water Supply Brockwitz-Rödern	Wasserversorgung Brockwitz-Rödern	Water association, municipal utility
WV Gersprenzgebiet	Water Association Gersprenzgebiet	Wasserverband Gersprenzgebiet	Water association, municipal utility
WV Riesa-Großenhain	Water Supply Riesa-Großenhain	Wasserversorgung Riesa-Großenhain	Water association, municipal utility
WW Wittenhorst	Waterworks Wittenhorst	Wasserwerke Wittenhorst	Water association, municipal utility
WWA AN	Water Authority Ansbach	Wasserwirtschaftsamt Ansbach	Regional, local government
ZA Gerauer Land	Municipal Union Gerauer Land	Zweckverband Gerauer Land	Water association, municipal utility
ZA LEE	Municipal Union Langen/Engesbach/Erzhäusen	Zweckverband Langen/Engesbach/Erzhäusen	Water association, municipal utility
ZA Pinneberg	Municipal Union Pinneberg	Zweckverband Pinneberg	Water association, municipal utility

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Type</i>
ZA Rhein Hessen	Municipal Union Rhein Hessen	Zweckverband Abwasserentsorgung Rhein Hessen	Water association, municipal utility
ZA Suedholstein	Municipal Union Suedholstein	Zweckverband Südholstein	Water association, municipal utility
ZKE SB	Waste Disposal Saarbrücken	Zentraler Kommunalen Entsorgungsbetrieb Saarbrücken	Water association, municipal utility
ZW ASG	Municipal Union AmmertalSchönbuchgruppe	Zweckverband Ammertal- Schönbuchgruppe	Water association, municipal utility
ZW LW	State Water Supply Baden- Württemberg	Zweckverband Landeswasserversorgung Baden-Württemberg	Water association, municipal utility
ZWA Bad Dürrenberg	Municipal Union Bad Dürrenberg	Zweckverband Wasserversorgung und Abwasserbeseitigung Bad Dürrenberg	Water association, municipal utility
ZWA Demmin- Altentreptow	Municipal Union Demmin/Altentreptow	Zweckverband Wasser und Abwasser Demmin/Altentreptow	Water association, municipal utility
ZWA Donau- Wald	Municipal Union Donau- Wald	Zweckverband Abfallwirtschaft Donau-Wald	Water company
ZWA Grimmen	Municipal Union Grimmen	Zweckverband Wasserversorgung und Abwasserbeseitigung Grimmen	Water association, municipal utility
ZWA Ilmenau	Municipal Union Ilmenau	Zweckverband Ilmenau	Water association, municipal utility
ZWA Ostharz	Municipal Union Ostharz	Zweckverband Wasserversorgung und Abwasserentsorgung Ostharz	Water association, municipal utility
ZWA Rügen	Municipal Union Rügen	Zweckverband Wasserversorgung und Abwasserbehandlung Rügen	Water association, municipal utility

C.3 Robustness checks for actor subtract network analysis

In this section, we report a robustness check for the identified coalition structure in the actor subtract network as proposed by Leifeld (2013). The test involves a stepwise increase in threshold values for the edge weights and thus a gradual removal of lower edge weights. Through this procedure, the structure of the discourse network is gradually revealed. We report six network diagrams (Figure C.3.1 – Figure C.3.6) each with a different threshold value. The test substantiates the reported unitary structure with one hegemonic coalition that is accompanied by several smaller groups.

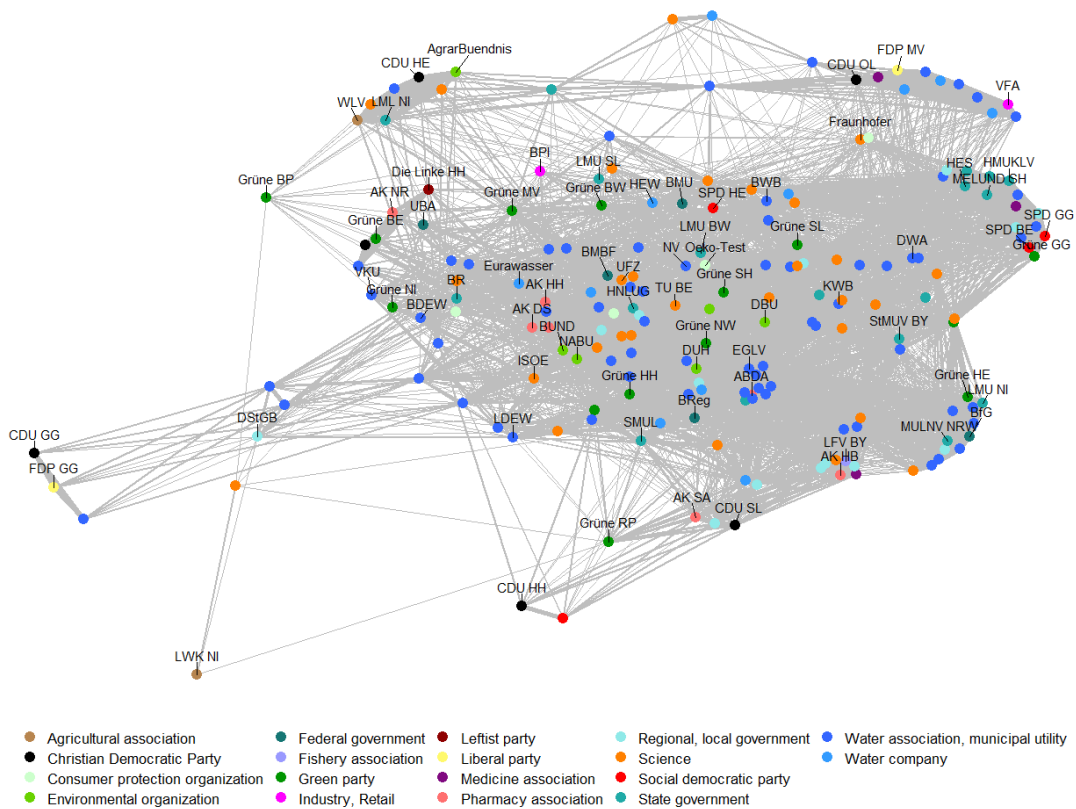


Figure C.3.1. Actor subtract network (Jaccard normalization algorithm applied) with threshold $w \geq 0.25$. Edges between actors with a similarity measure below the threshold were removed.

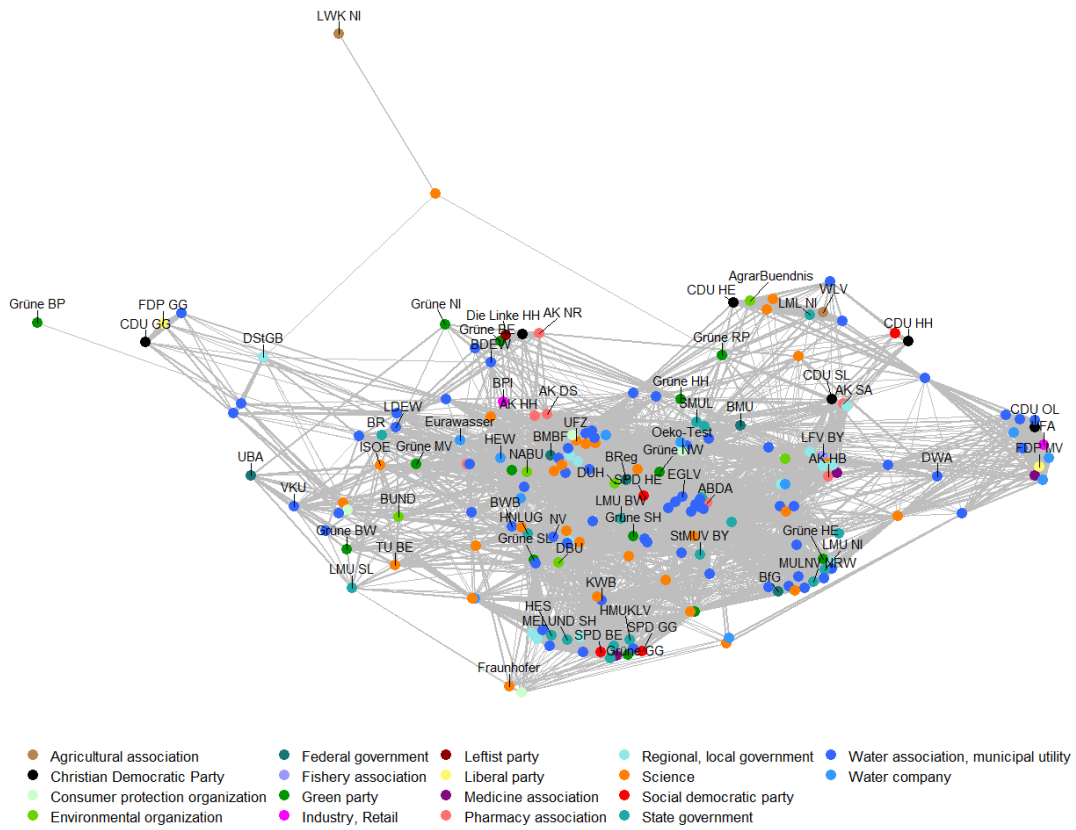


Figure C.3.2. Actor subtract network (Jaccard normalization algorithm applied) with threshold $w \geq 0.33$. Edges between actors with a similarity measure below the threshold were removed.

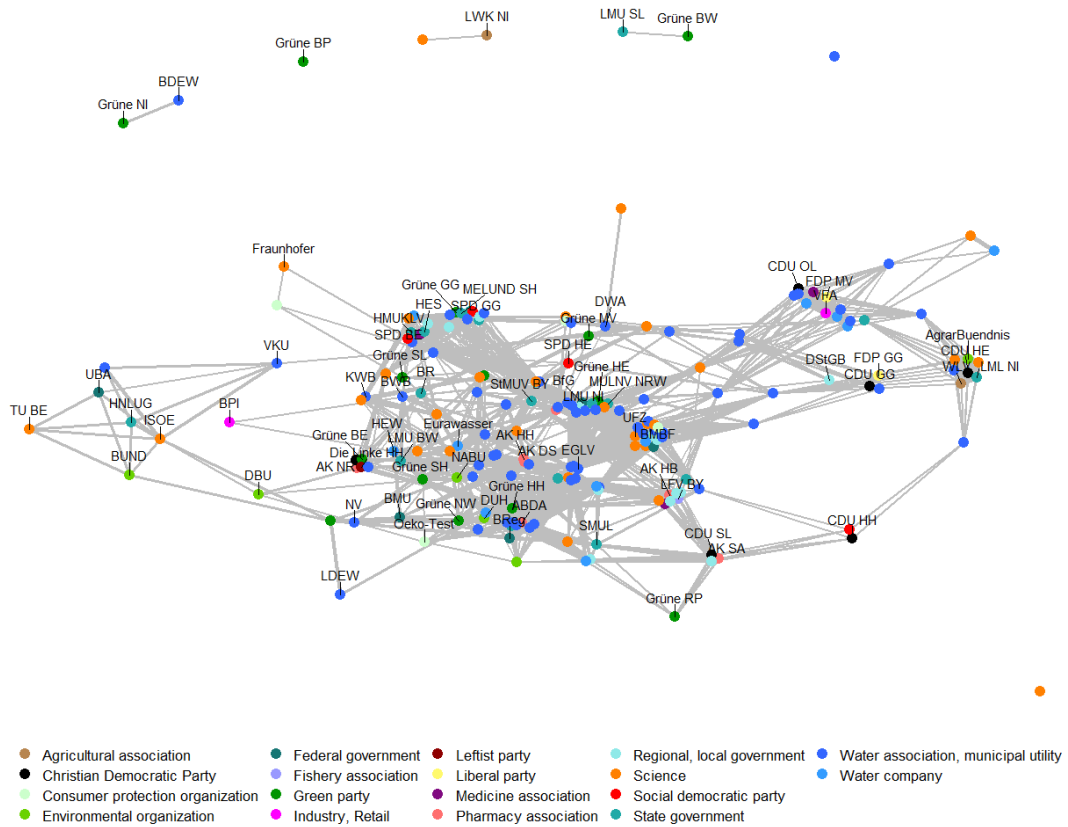


Figure C.3.3. Actor subtract network (Jaccard normalization algorithm applied) with threshold $w \geq 0.50$. Edges between actors with a similarity measure below the threshold were removed.

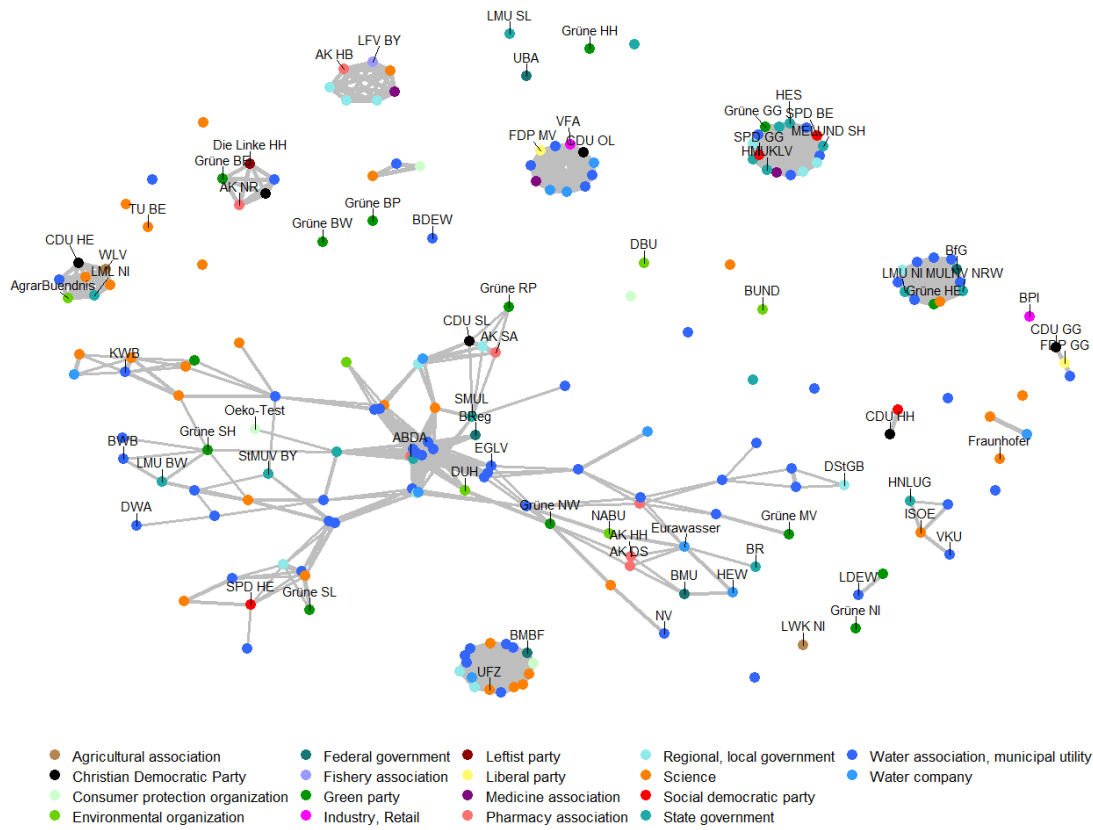


Figure C.3.4. Actor subtract network (Jaccard normalization algorithm applied) with threshold $w \geq 0.66$. Edges between actors with a similarity measure below the threshold were removed.

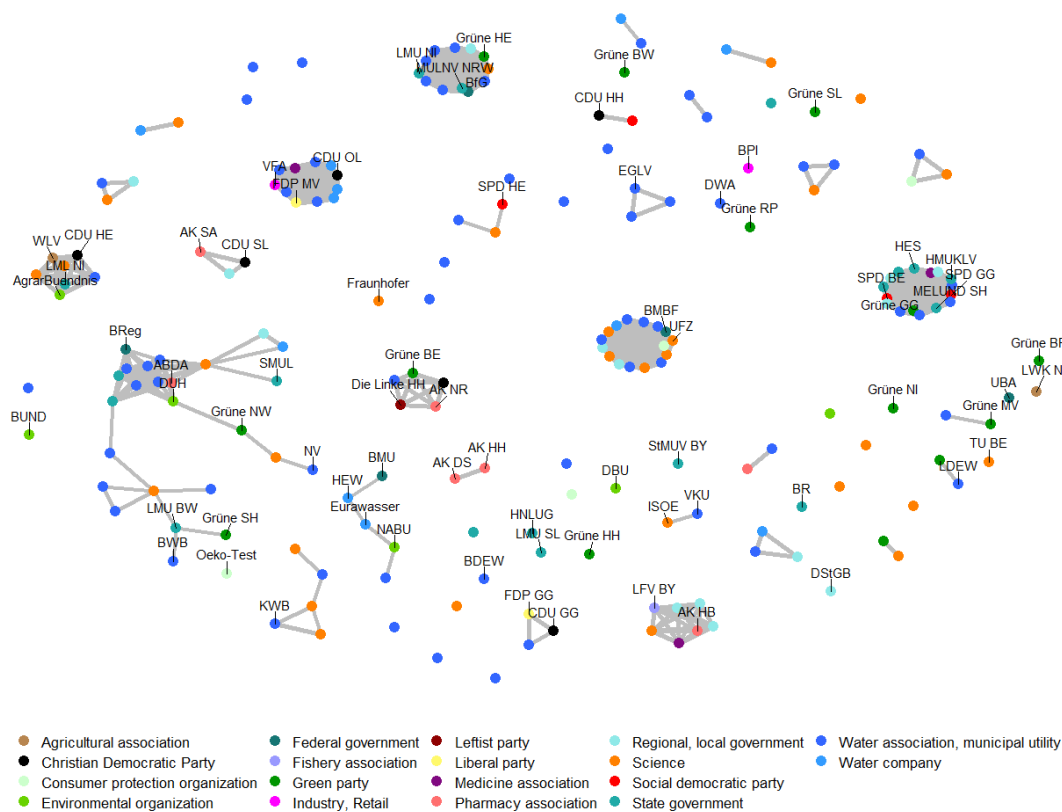


Figure C.3.5. Actor subtract network (Jaccard normalization algorithm applied) with threshold $w \geq 0.75$. Edges between actors with a similarity measure below the threshold were removed.

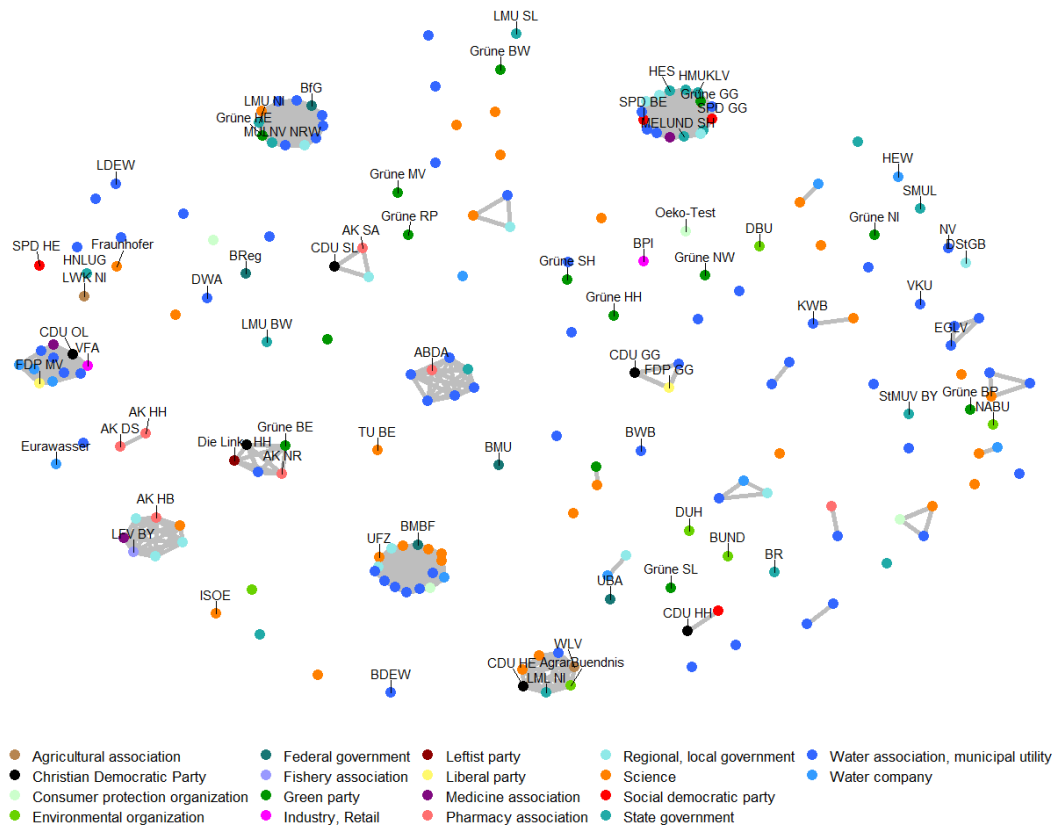


Figure C.3.6. Actor subtract network (Jaccard normalization algorithm applied) with threshold $w = 1$. Edges between actors with a similarity measure below the threshold were removed.

C.4 Detected communities and their shared policy beliefs

Table C.4.1. Group 1: Responsibility by consumers and wastewater treatment

	Consumer responsible	Agriculture responsible	Pharmaceutical industry responsible	Wastewater treatment responsible	Policy approach: Consumer	Policy approach: Agriculture	Policy approach: Pharmaceutical industry	Policy approach: Wastewater treatment	Risk for human health	Risk for the environment	Risk unknown	Policy instrument: Tax	Policy instrument: Subsidy	Policy instrument: Authorization	Policy instrument: Application	Policy instrument: EQN	Policy instrument: Product ban
Uni Bremen	■			■					■	■							
DUH	■			■			■			■							
BReg	■			■		■				■							
ABDA	■			■						■							
LfU RP	■			■						■							
LINEG	■			■						■							
SW Mainz	■			■						■							
ZA LEE	■			■						■							
ZA Suedholstein	■			■						■							
ZKE SB	■			■						■							
Grüne NW	■			■			■			■							
EGLV	■			■						■							
VG Wörrstadt	■			■						■							
ZWA Grimmen	■			■						■							
KR Steinburg				■					■	■							
WAB Coswig				■					■	■							
ANTL		■		■						■							
IGB				■						■							
KW Natrup-Hagen				■						■							
ZA Pinneberg				■						■							
BfG				■						■							
Grüne HE				■						■							
Hohenstein				■						■							
Uni Koblenz				■						■							
LMU NI				■						■							
MULNV NRW				■						■							
KW Bad Homburg				■						■							
KW Freyung				■						■							

	Consumer responsible	Agriculture responsible	Pharmaceutical industry responsible	Wastewater treatment responsible	Policy approach: Consumer	Policy approach: Agriculture	Policy approach: Pharmaceutical industry	Policy approach: Wastewater treatment	Risk for human health	Risk for the environment	Risk unknown	Policy instrument: Tax	Policy instrument: Subsidy	Policy instrument: Authorization	Policy instrument: Application	Policy instrument: EQN	Policy instrument: Product ban
KW Häldeühle																	
SW Hochheim																	
SW Zehdenick																	
ZWA Ilmenau																	
SMUL																	
KR Bad Kreuznach																	
KW Laichingen																	
REWA																	
Grüne RP																	
CDU SL																	
AK SA																	
KR Prignitz																	
Grüne HH																	
LFV BY																	
DÄ																	
AK HB																	
KR Cochem-Zell																	
Postmünster																	
WWA AN																	
HFT Stuttgart																	
CDU HH																	
SPD ME																	

Note: Agreement is labeled in blue, disagreement in red, and ambivalent beliefs (both agreement and disagreement) in grey.

Table C.4.2. Group 2: Policy approach: wastewater treatment

	Consumer responsible	Agriculture responsible	Pharmaceutical industry responsible	Wastewater treatment responsible	Policy approach: Consumer	Policy approach: Agriculture	Policy approach: Pharmaceutical industry	Policy approach: Wastewater treatment	Risk for human health	Risk for the environment	Risk unknown	Policy instrument: Tax	Policy instrument: Subsidy	Policy instrument: Authorization	Policy instrument: Application	Policy instrument: EQN	Policy instrument: Product ban
Grüne SH	Blue			Blue	Blue			Blue	Red	Blue							
Uni Frankfurt				Blue	Blue			Blue		Blue							
FAU				Blue	Blue			Blue									
KWB				Blue	Blue			Blue									
TU DA	Blue							Blue				Blue					
NV	Blue							Blue				Blue					
SWD Düsseldorf	Blue			Blue				Blue	Red								
DBU				Blue				Blue	Grey	Blue	Blue						
Uni Umea				Blue				Blue		Blue	Blue						
EVS				Blue				Blue		Blue							
Grüne N				Blue				Blue									
TU HH				Blue				Blue									
LMU BW	Blue				Blue			Blue	Red	Blue							
BWB	Blue				Blue			Blue	Red								
ZW LW		Blue			Blue	Blue		Blue			Blue		Blue				
LMU SL								Blue			Blue			Blue			
Uni DUE					Blue			Blue									
Midewa					Blue			Blue									
HFU	Blue	Blue						Blue			Blue						
SPD HE	Blue	Blue						Blue									
THM	Blue							Blue	Red	Blue							
KW Achim	Blue							Blue		Blue							
SEW DÜ	Blue							Blue		Blue							
Grüne SL	Blue							Blue								Blue	
Kirchheim	Blue							Blue									
Uni Tübingen	Blue							Blue									
KW Gießen	Blue							Blue									
SUN	Blue							Blue			Blue						
TU KL							Blue	Blue									
AGW								Blue	Red	Blue							
StMUV BY								Blue		Blue							
VZ HH								Blue			Blue						Blue

	Consumer responsible	Agriculture responsible	Pharmaceutical industry responsible	Wastewater treatment responsible	Policy approach: Consumer	Policy approach: Agriculture	Policy approach: Pharmaceutical industry	Policy approach: Wastewater treatment	Risk for human health	Risk for the environment	Risk unknown	Policy instrument: Tax	Policy instrument: Subsidy	Policy instrument: Authorization	Policy instrument: Application	Policy instrument: EQN	Policy instrument: Product ban
Grüne GG								Agreement									
KV Hessen								Agreement									
Dresden								Agreement									
Mörfelden-Walldorf								Agreement									
Wiesbaden								Agreement									
Fraunhofer		Agreement									Agreement						
SPD BE								Agreement									
SPD GG								Agreement									
HES								Agreement									
HMU KL V								Agreement									
MELUND SH								Agreement									
RP Stuttgart								Agreement									
RP Tübingen								Agreement									
ELW								Agreement									
KW Koblenz								Agreement									
SW Delmenhorst								Agreement									
WV Gersprenzgebiet								Agreement									

Note: Agreement is labeled in blue, disagreement in red, and ambivalent beliefs (both agreement and disagreement) in grey.

	Consumer responsible	Agriculture responsible	Pharmaceutical industry responsible	Wastewater treatment responsible	Policy approach: Consumer	Policy approach: Agriculture	Policy approach: Pharmaceutical industry	Policy approach: Wastewater treatment	Risk for human health	Risk for the environment	Risk unknown	Policy instrument: Tax	Policy instrument: Subsidy	Policy instrument: Authorization	Policy instrument: Application	Policy instrument: EQN	Policy instrument: Product ban
VU SN					Agreement												
HS Fresenius					Agreement												
BR					Agreement		Disagreement										
WW Wittenhorst					Agreement												
Grüne BP	Agreement					Agreement	Agreement					Agreement					
LWK NI						Agreement								Agreement			
CDU AK							Agreement										
Grüne BE							Agreement										
Die Linke HH							Agreement										
AK NR							Agreement										
HU HH											Agreement						
Uni Oldenburg						Agreement											
WBV Ried							Agreement										
Hansegwasser											Agreement						

Note: Agreement is labeled in blue, disagreement in red, and ambivalent beliefs (both agreement and disagreement) in grey.

Table C.4.4. Group 4: *Responsibility of consumers*

	Consumer responsible	Agriculture responsible	Pharmaceutical industry responsible	Wastewater treatment responsible	Policy approach: Consumer	Policy approach: Agriculture	Policy approach: Pharmaceutical industry	Policy approach: Wastewater treatment	Risk for human health	Risk for the environment	Risk unknown	Policy instrument: Tax	Policy instrument: Subsidy	Policy instrument: Authorization	Policy instrument: Application	Policy instrument: EQN	Policy instrument: Product ban
ZWA Rügen	Agreement	Agreement															
AK DS	Agreement						Agreement										
AK HH	Agreement																
ZWA Demmin-Altentreptow	Agreement							Disagreement									
SW Erfurt	Agreement								Agreement								
VZ NW	Agreement																
BMBF	Agreement																
KR Borken	Agreement																
Laichingen	Agreement																
BTU	Agreement																
FFS	Agreement																
UFZ	Agreement																
Uni Freiburg	Agreement																
Uni Kiel	Agreement																
SRH	Agreement																
SW Husum	Agreement																
SW LE	Agreement																
TW Verden	Agreement																
VG Stromberg	Agreement																
ZWA Ostharz	Agreement																
ZWA Donau-Wald	Agreement																

Note: Agreement is labeled in blue, disagreement in red, and ambivalent beliefs (both agreement and disagreement) in grey.

Table C.4.5. Group 5: *No risk for human health*

	Consumer responsible	Agriculture responsible	Pharmaceutical industry responsible	Wastewater treatment responsible	Policy approach: Consumer	Policy approach: Agriculture	Policy approach: Pharmaceutical industry	Policy approach: Wastewater treatment	Risk for human health	Risk for the environment	Risk unknown	Policy instrument: Tax	Policy instrument: Subsidy	Policy instrument: Authorization	Policy instrument: Application	Policy instrument: EQN	Policy instrument: Product ban
Oeko-Test	Agreement	Agreement		Agreement					Disagreement	Agreement	Agreement						
LU BW	Agreement			Agreement					Disagreement	Agreement							
SBN Neuwied	Agreement								Disagreement	Agreement							
LfU BY			Agreement	Agreement					Disagreement	Agreement							
Uni Bonn		Agreement					Agreement		Disagreement	Agreement						Agreement	
DWA									Disagreement	Agreement						Agreement	
WV Brockwitz-Rödern									Disagreement	Agreement							
ZWA Bad Dürrenberg	Agreement		Agreement	Agreement			Agreement		Disagreement	Agreement							
BMU	Agreement						Agreement		Disagreement	Agreement							
BPI	Agreement				Agreement				Disagreement	Agreement		Disagreement	Disagreement				
Jacobs Uni			Agreement						Disagreement	Agreement							
OOWV		Agreement							Disagreement	Agreement							
UA MSE									Disagreement	Agreement	Agreement						
CDU OL									Disagreement	Agreement							
VFA									Disagreement	Agreement							
FDP MV									Disagreement	Agreement							
BPT									Disagreement	Agreement							
KW Verden									Disagreement	Agreement							
UA WI									Disagreement	Agreement							
ZA Rheinhessen									Disagreement	Agreement							
ZA Gerauer Land									Disagreement	Agreement							
GKU									Disagreement	Agreement							
Hamburg Wasser									Disagreement	Agreement							
N-Ergie									Disagreement	Agreement							

Note: Agreement is labeled in blue, disagreement in red, and ambivalent beliefs (both agreement and disagreement) in grey.

Table C.4.6. Group 6: *Agriculture is responsible*

	Consumer responsible	Agriculture responsible	Pharmaceutical industry responsible	Wastewater treatment responsible	Policy approach: Consumer	Policy approach: Agriculture	Policy approach: Pharmaceutical industry	Policy approach: Wastewater treatment	Risk for human health	Risk for the environment	Risk unknown	Policy instrument: Tax	Policy instrument: Subsidy	Policy instrument: Authorization	Policy instrument: Application	Policy instrument: EQN	Policy instrument: Product ban
LWT BB		Agreement							Agreement								
NLWKN											Agreement						
WLV																	
CDU HE																	
AgrarBuendnis																	
Uni Halle																	
Uni Stuttgart																	
LML NI																	
ZW ASG																	

Note: Agreement is labeled in blue, disagreement in red, and ambivalent beliefs (both agreement and disagreement) in grey.

C.5 Robustness checks for concept congruence network analysis (without normalization)

In this section, we report a robustness check for the identified narrative structure in the concept congruence network as proposed by Leifeld (2013). The test involves a stepwise increase in threshold values for the edge weights and thus a gradual removal of lower edge weights. Through this procedure, the structure of the discourse network is gradually revealed. We report five network diagrams (Figure C.5.1 – Figure C.5.5) each with a different threshold value. The test substantiates the reported unitary structure with one dominant storyline.

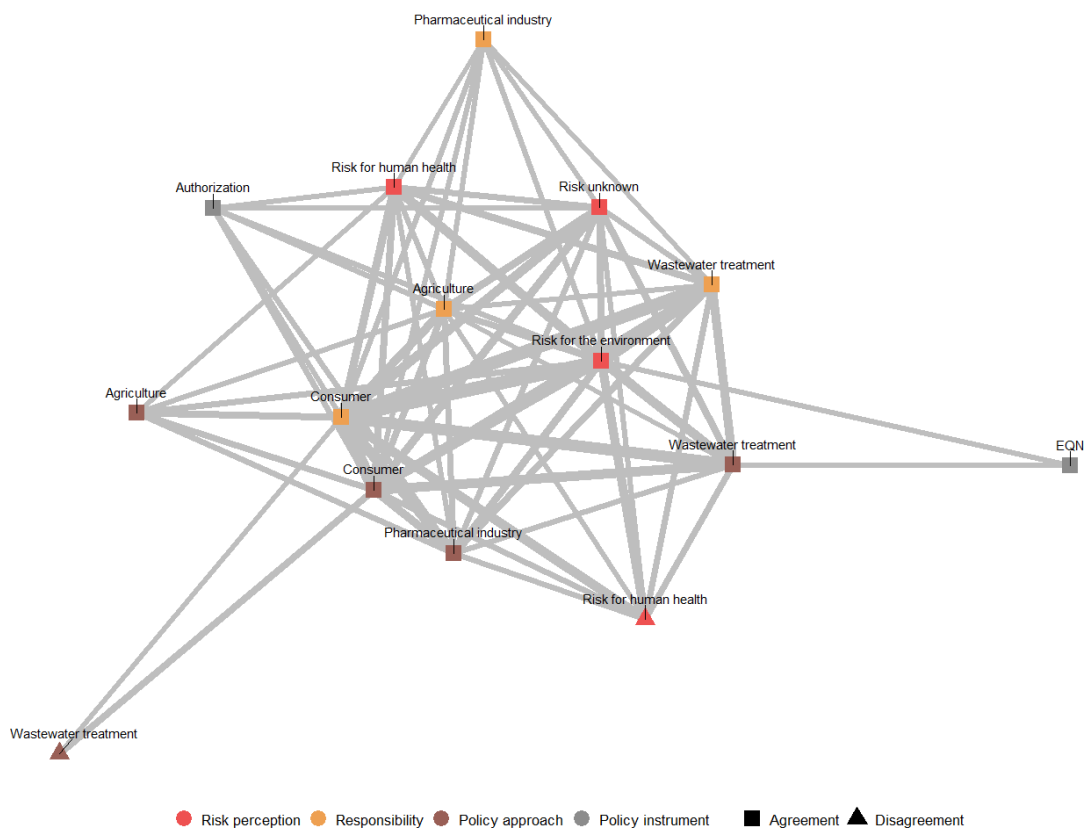


Figure C.5.1. Concept congruence network with threshold $w \geq 5$. Edges between policy beliefs with a similarity measure below the threshold were removed.

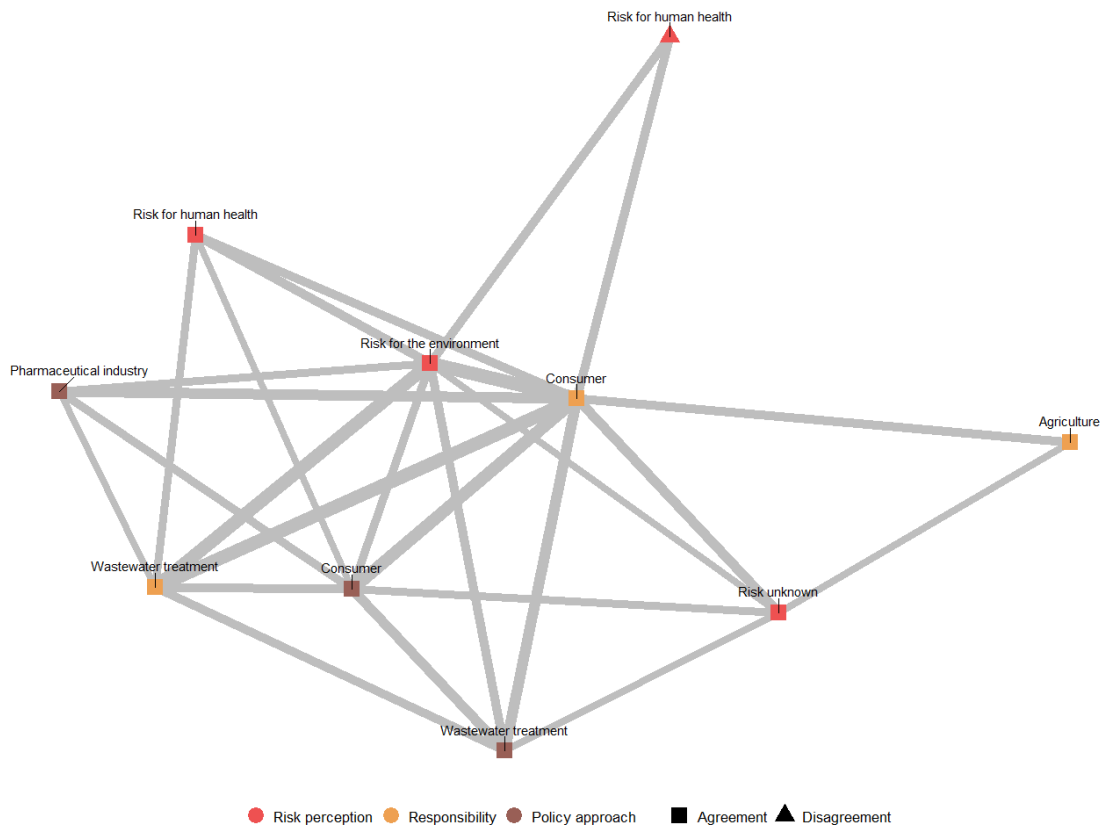


Figure C.5.2. Concept congruence network with threshold $w \geq 10$. Edges between policy beliefs with a similarity measure below the threshold were removed.

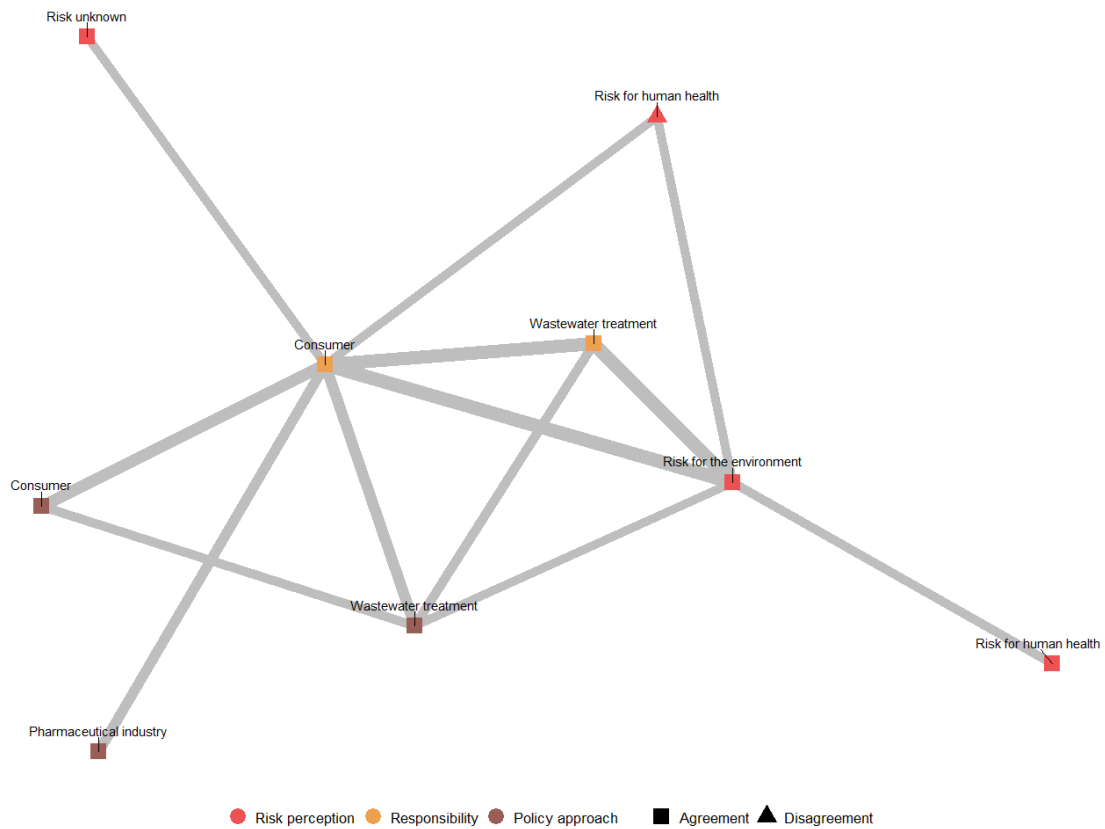


Figure C.5.3. Concept congruence network with threshold $w \geq 15$. Edges between policy beliefs with a similarity measure below the threshold were removed.

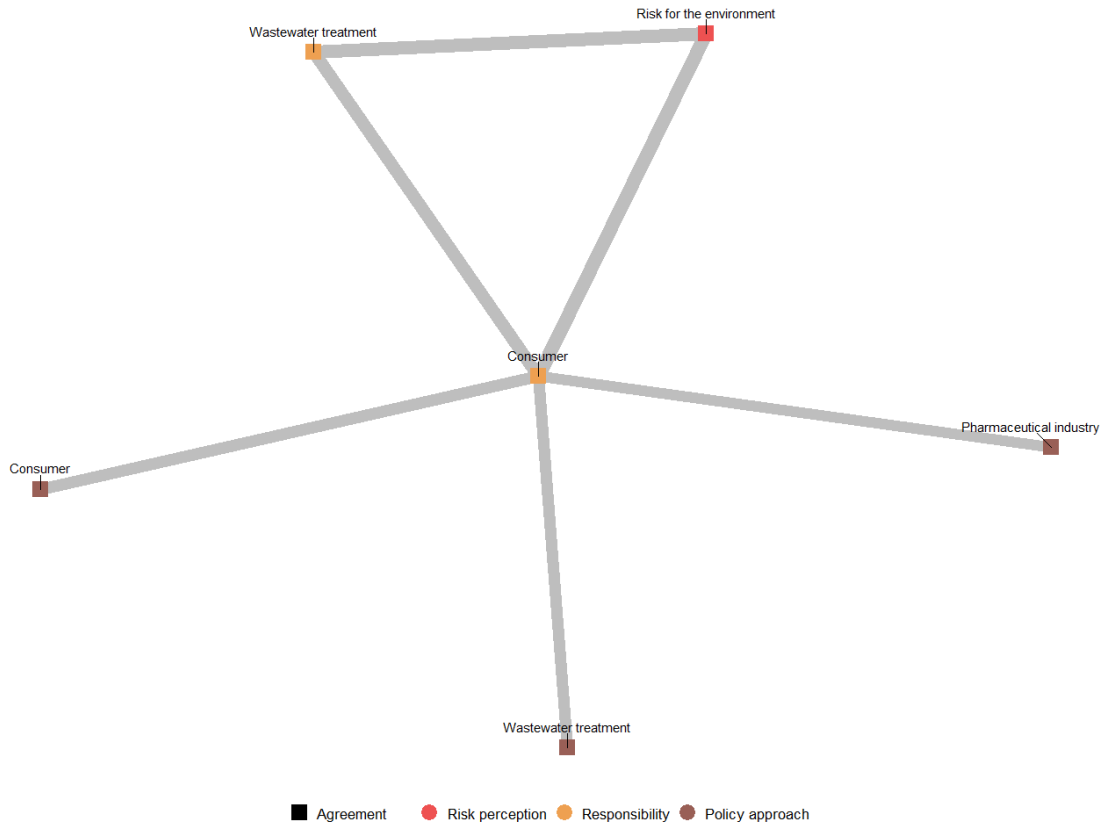


Figure C.5.4. Concept congruence network with threshold $w \geq 20$. Edges between policy beliefs with a similarity measure below the threshold were removed.

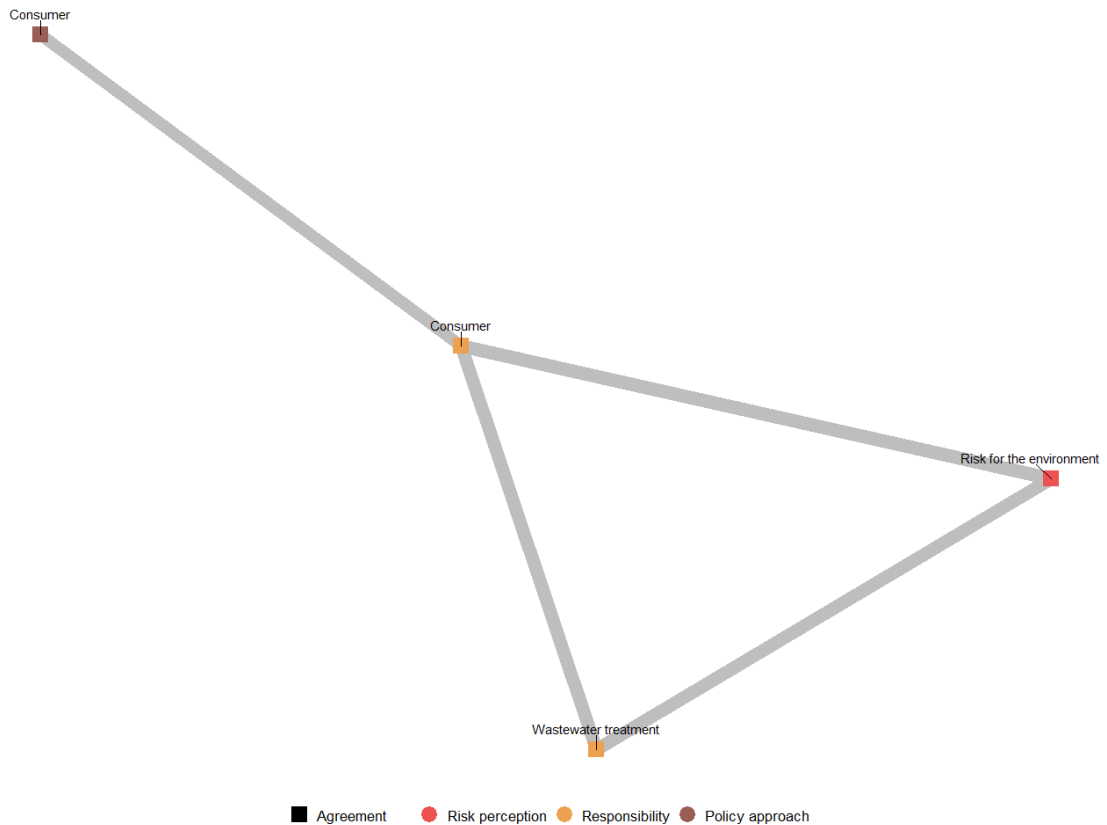


Figure C.5.5. Concept congruence network with threshold $w \geq 25$. Edges between policy beliefs with a similarity measure below the threshold were removed.

C.6 Robustness checks for concept congruence network analysis (Jaccard normalization)

In this section, we report a robustness check for the identified narrative structure in the normalized concept congruence network as proposed by Leifeld (2013). The test involves a stepwise increase in threshold values for the edge weights and thus a gradual removal of lower edge weights. Through this procedure, the structure of the discourse network is gradually revealed. We report five network diagrams each with a different threshold value (w). This second test based on a normalized congruence network also substantiates the reported unitary structure with one dominant storyline.

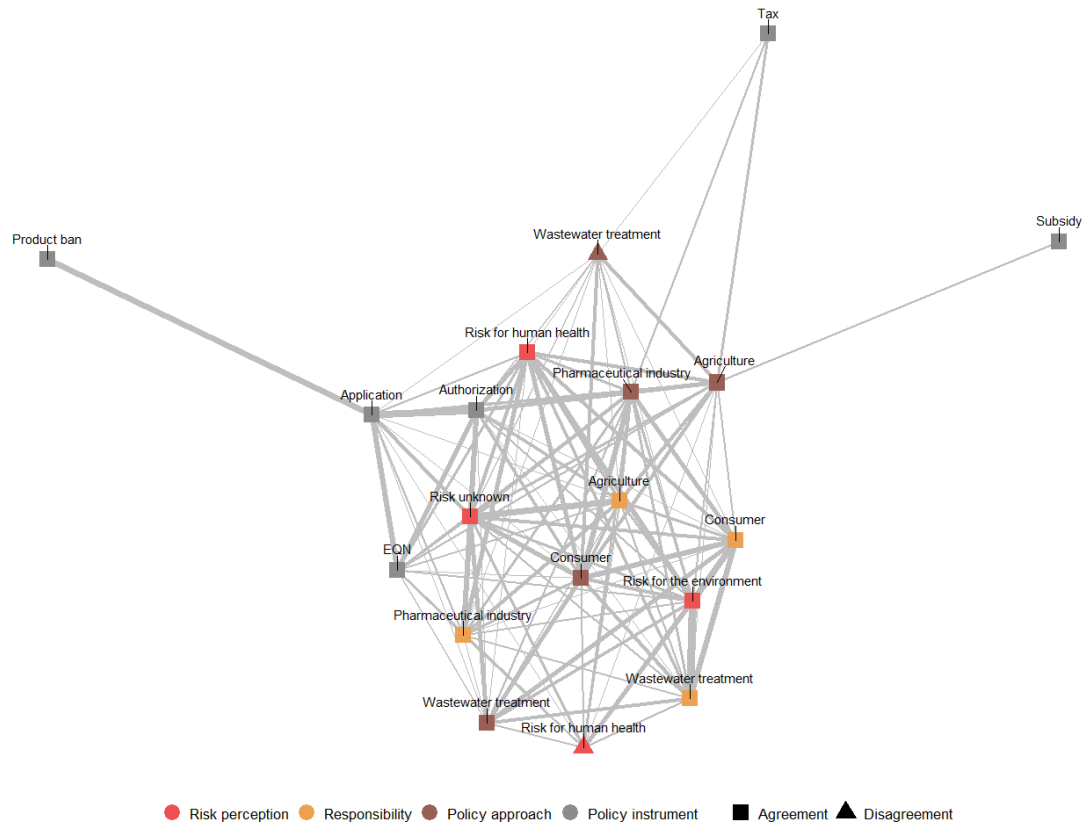


Figure C.6.1. Concept congruence network (Jaccard normalization) with threshold $w \geq 0.05$. Edges between policy beliefs with a similarity measure below the threshold were removed.

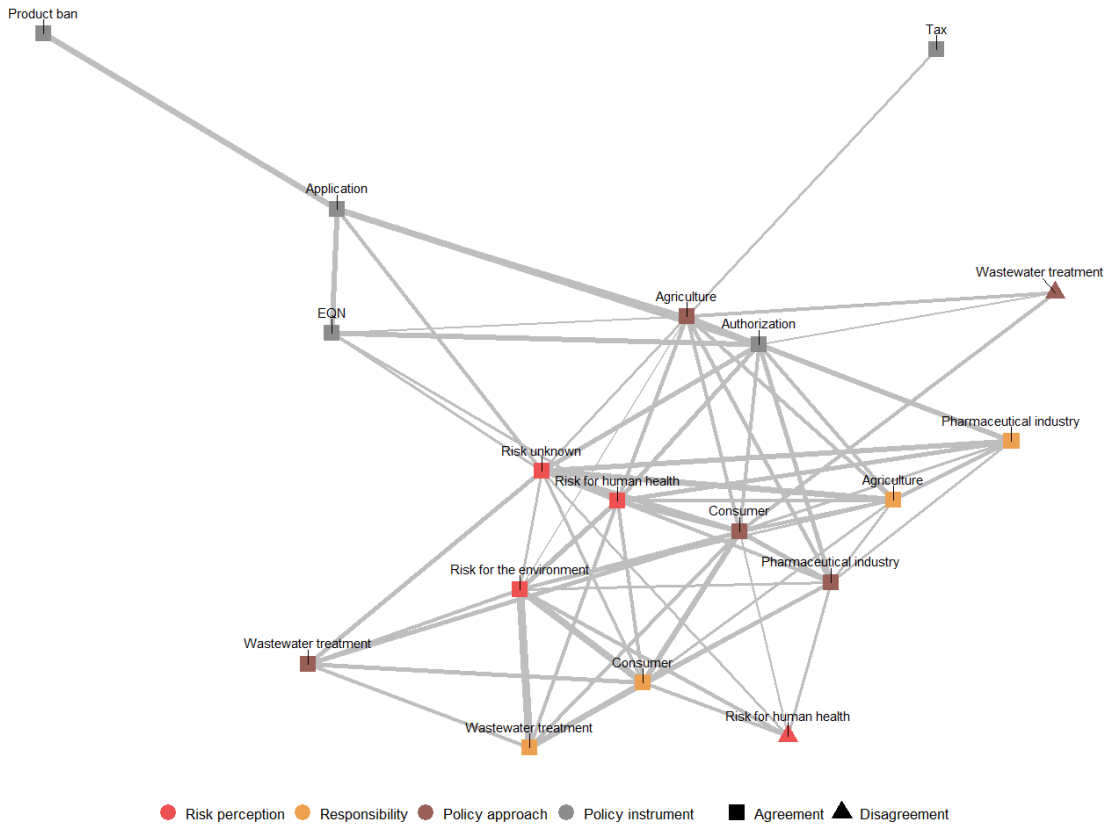


Figure C.6.2. Concept congruence network (Jaccard normalization) with threshold $w \geq 0.1$. Edges between policy beliefs with a similarity measure below the threshold were removed.

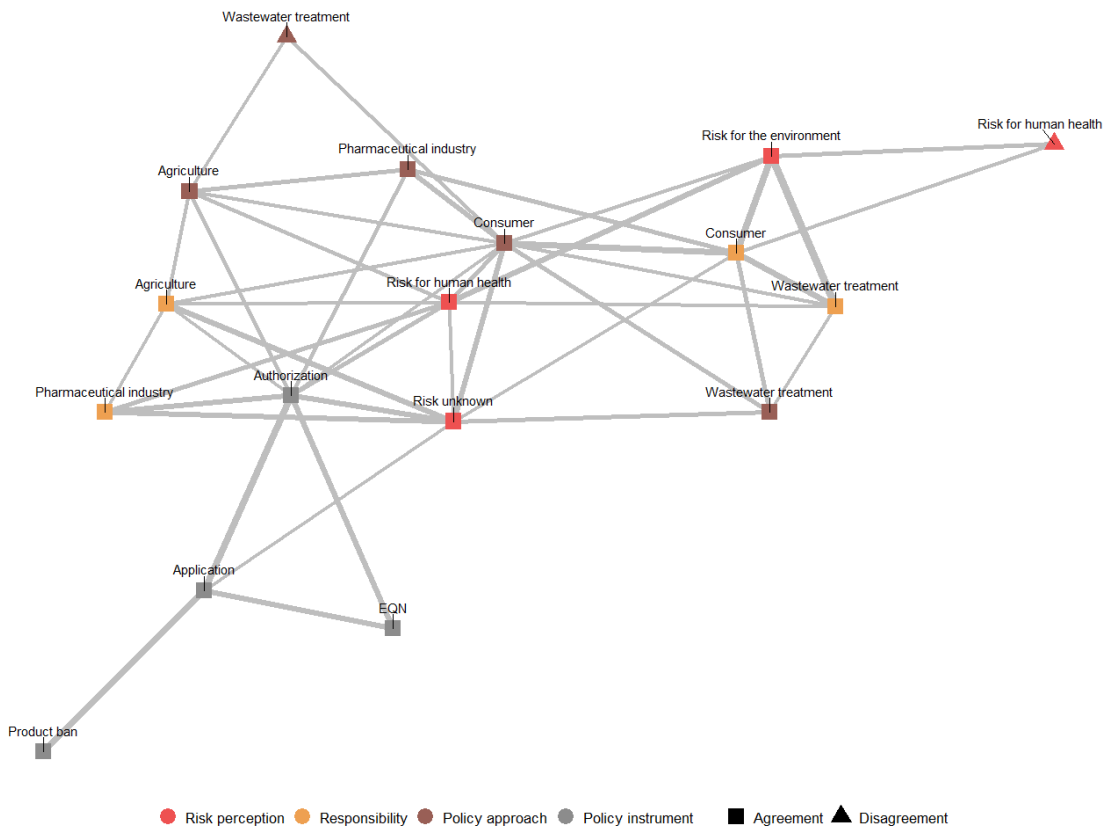


Figure C.6.3. Concept congruence network (Jaccard normalization) with threshold $w \geq 0.15$. Edges between policy beliefs with a similarity measure below the threshold were removed.

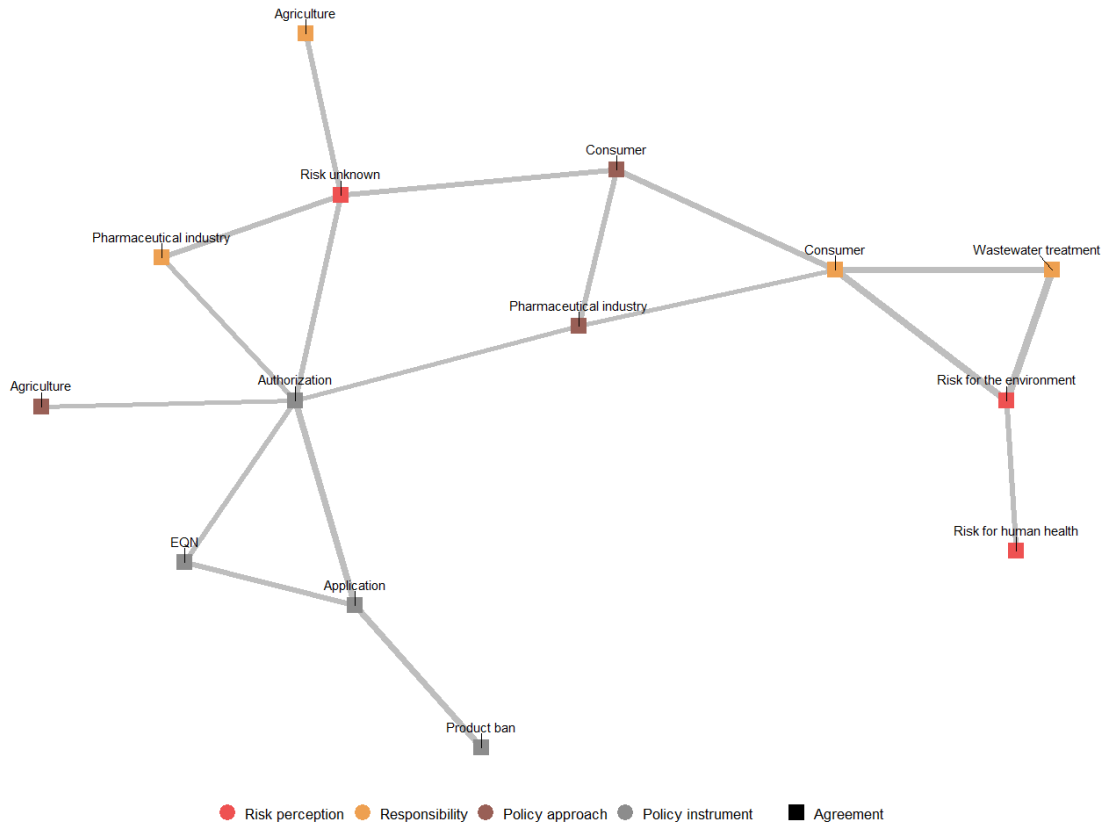


Figure C.6.4. Concept congruence network (Jaccard normalization) with threshold $w \geq 0.2$. Edges between policy beliefs with a similarity measure below the threshold were removed.

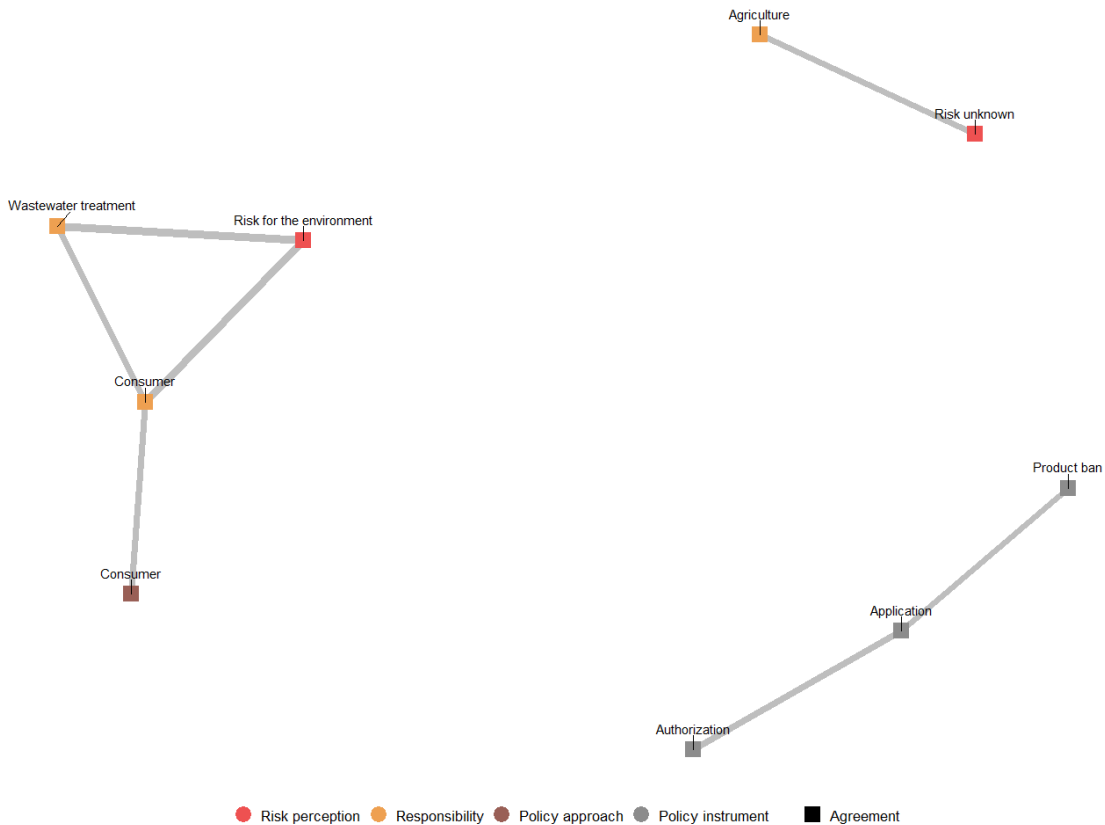


Figure C.6.5. Concept congruence network (Jaccard normalization) with threshold $w \geq 0.25$. Edges between policy beliefs with a similarity measure below the threshold were removed.

Appendix D to Comparing discourse and policy network approaches: evidence from water policy on micropollutants

D.1 Details on data collection

Table D.1.1. List of newspapers used for the analysis

<i>Geographical scope</i>	<i>Newspaper</i>	<i>Articles on micropollutants</i>
Germany	Frankfurter Allgemeine Zeitung	67
Baden-Württemberg	Stuttgarter Zeitung	111
	Südwest Presse	62
Bavaria	Nürnberger Nachrichten	67
	Passauer Neue Presse	44
Berlin	Berliner Zeitung	31
Brandenburg	Märkische Allgemeine	40
Bremen	Weser Kurier	70
Hamburg	Hamburger Abendblatt	59
Hessen	Rhein Main Digital GmbH	124
Lower Saxony	Hannoversche Allgemeine Zeitung	17
	Neue Osnabrücker Zeitung	46
	Nordwest-Zeitung	39
Mecklenburg-Vorpommern	Nordkurier	16
	Ostsee-Zeitung	41
North Rhine-Westphalia	Rheinische Post Gesamt	47
Rhineland-Palatinate	Rhein-Zeitung	41
	Wormser Zeitung	21
Saarland	Saarbrücker Zeitung	34
Saxony	Sächsische Zeitung	38
Saxony-Anhalt	Mitteldeutsche Zeitung	19
Schleswig-Holstein	Schleswig-Holsteiner Zeitungsverlag	18
Thuringia	Thüringer Allgemeine	17
<i>Sum</i>	<i>23</i>	<i>1069</i>



Figure D.1.1. Geographical distribution of newspapers

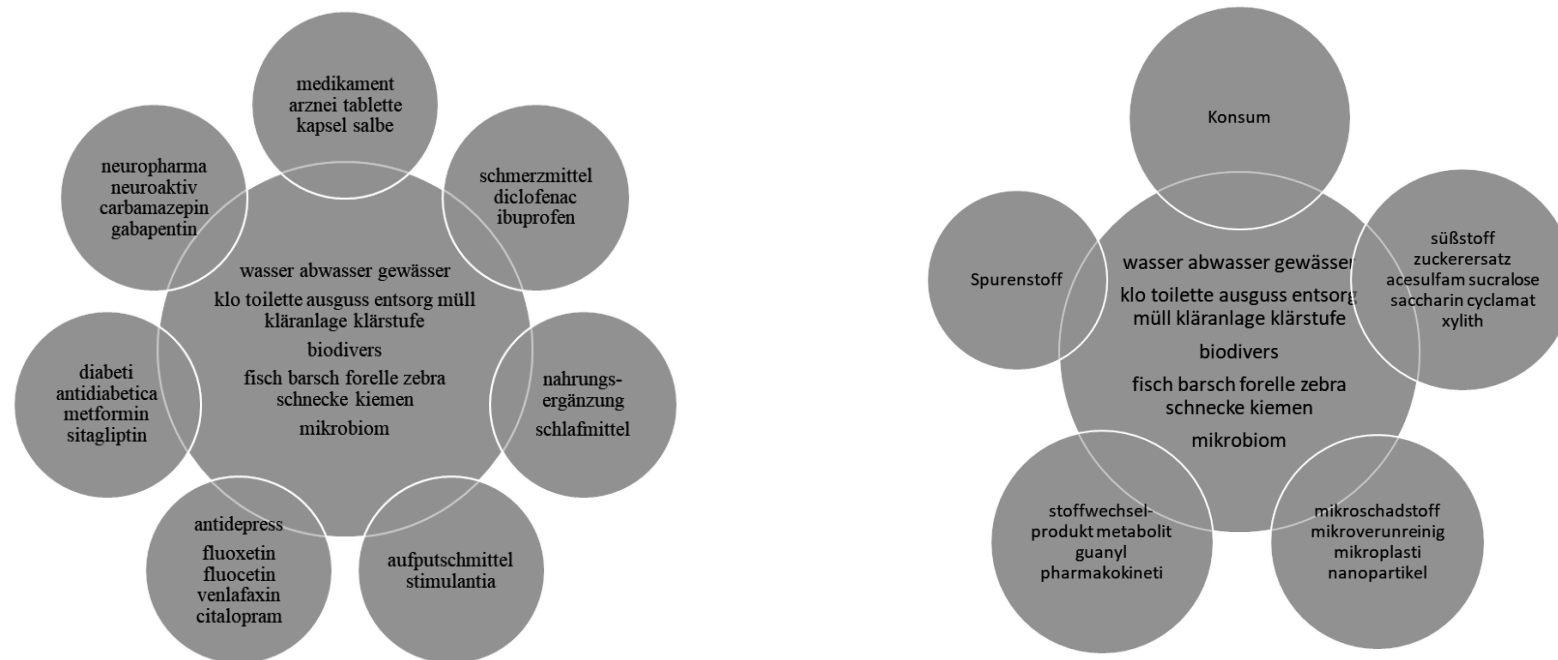


Figure D.1.2. Combination of key words used for the analysis of articles on micropollutants in aquatic ecosystems in Germany from January 2013 to December 2017. Key words located within circles are combined using the operator “OR” and circles are combined by using the operator “AND”. Example from the graph on the left: “Give me every article that contains any of the key words ‘medikament’, ‘arznei’, ‘tablette’, ‘kapsel’, or ‘salbe’ in combination with any of the key words ‘wasser’, ‘abwasser’, ‘gewässer’, ‘klo’, ‘toilette’, ‘ausguss’, ‘entsorg’, ‘müll’, ‘kläranlage’, ‘klärstufe’, ‘biodivers’, ‘fisch’, ‘barsch’, ‘forelle’, ‘zebra’, ‘schnecke’, ‘kiemen’, or ‘mikrobiom’”.

D.2 Full list of organizations

Table D.2.1. Actors in the discourse network

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Affiliation</i>	<i>Type</i>
BASF	BASF	BASF	Industry, Retail	Container
Beiersdorf AG	Beiersdorf AG	Beiersdorf AG	Industry, Retail	Container
BPI	German Pharmaceutical Industry Association	Bundesverband der Pharmazeutischen Industrie	Industry, Retail	Container
HDE	German Trade Association	Handelsverband Deutschland	Industry, Retail	Container
LWK NW	Chamber of Agriculture North Rhine-Westphalia	Landwirtschaftskammer Nordrhein-Westfalen	Agricultural association	Container
Unilever	Unilever	Unilever	Industry, Retail	Container
BDEW	Federal Association of Energy and Water Industry	Bundesverband der Energie- und Wasserwirtschaft	Water association, municipal utility	Expander
Bioland	Bioland	Bioland	Other	Expander
BUND	Friends of the Earth Germany	Bund für Umwelt und Naturschutz	Environment organization	Expander
BWB	Water Company Berlin	Berliner Wasserbetriebe	Water association, municipal utility	Expander
DBU	German Federal Environmental Foundation	Deutsche Bundesstiftung Umwelt	Environment organization	Expander
DUH	Environmental Action Germany	Deutsche Umwelthilfe	Environment organization	Expander
DWA	German Association for Water, Wastewater and Waste	Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall	Water association, municipal utility	Expander
ELW	Municipal utility Wiesbaden	Entsorgungsbetriebe Wiesbaden	Water association, municipal utility	Expander

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Affiliation</i>	<i>Type</i>
Greenpeace	Greenpeace Germany	Greenpeace Deutschland	Environment organization	Expander
Grüne BE	Alliance 90/The Greens (Berlin)	Bündnis 90/Die Grünen (Berlin)	Green party	Expander
Grüne BP	Alliance 90/The Greens (Federal Party)	Bündnis 90/Die Grünen (Bundespartei)	Green party	Expander
Grüne BW	Alliance 90/The Greens (Baden-Württemberg)	Bündnis 90/Die Grünen (Baden-Württemberg)	Green party	Expander
Grüne HE	Alliance 90/The Greens (Hesse)	Bündnis 90/Die Grünen (Hessen)	Green party	Expander
Grüne NI	Alliance 90/The Greens (Lower Saxony)	Bündnis 90/Die Grünen (Niedersachsen)	Green party	Expander
Grüne OS	Alliance 90/The Greens (Osnabrück)	Bündnis 90/Die Grünen (Osnabrück)	Green party	Expander
Grüne RP	Alliance 90/The Greens (Rhineland-Palatinate)	Bündnis 90/Die Grünen (Rheinland-Pfalz)	Green party	Expander
Grüne SH	Alliance 90/The Greens (Schleswig-Holstein)	Bündnis 90/Die Grünen (Schleswig-Holstein)	Green party	Expander
HEW	Hessenwasser	Hessenwasser	Water association, municipal utility	Expander
KüGePl	Küste gegen Plastik	Küste gegen Plastik	Environment organization	Expander
LDEW	Energy- and Water Association Hesse/Rhineland-Palatinate	Landesverband der Energie- und Wasserwirtschaft Hessen/Rheinland-Pfalz	Water association, municipal utility	Expander
LW BW	Water Supplier Baden-Württemberg	Landeswasserversorgung Baden-Württemberg	Water association, municipal utility	Expander
NABU	Nature And Biodiversity Conservation Union	Naturschutzbund	Environment organization	Expander
NV	Niersverband	Niersverband	Water association, municipal utility	Expander

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Affiliation</i>	<i>Type</i>
SEW DD	Municipal utility Dresden	Stadtentwässerung Dresden	Water association, municipal utility	Expander
SWD AG	Municipal utility Düsseldorf	Wasserwerke Düsseldorf	Water association, municipal utility	Expander
VKU	Association of Municipal Companies	Verband Kommunaler Unternehmen	Water association, municipal utility	Expander
VS BY	Customer Service Bavaria	Verbraucher-Service Bayern	Other	Expander
WWF	World Wildlife Fund	World Wildlife Fund	Environment organization	Expander
BMU	Federal Ministry for the Environment	Bundesumweltministerium	Federal government	Political-administrative
BR	German Federal Council	Bundesrat	State government	Political-administrative
BReg	Federal Government Germany	Bundesregierung	Federal government	Political-administrative
BV	Association of German Cities	Bundesverband der kommunalen Spitzenverbände	Regional, local government	Political-administrative
HES	State of Hesse	Landesregierung Hessen	State government	Political-administrative
HNLUG	Hessian Agency for Nature Conservation, Environment and Geology	Hessisches Landesamt für Naturschutz, Umwelt und Geologie	State government	Political-administrative
LMU BW	Ministry of the Environment Baden-Württemberg	Landesumweltministerium Baden-Württemberg	State government	Political-administrative
SBU Bremen	Environmental Agency Bremen	Umweltbehörde Bremen	State government	Political-administrative
UBA	German Environmental Agency	Umweltbundesamt	Federal government	Political-administrative

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Affiliation</i>	<i>Type</i>
AKDS	Chamber of Pharmacy (Saarland)	Apothekerkammer Saarland	Pharmacy association	Third-party
AWI	Alfred Wegener Institute	Alfred-Wegener-Institut	Science	Third-party
CDU BP	Christian Democratic Union (Federal Party)	Christlich Demokratische Union (Bundespartei)	Christian democratic party	Third-party
CDU NI	Christian Democratic Union (Lower Saxony)	Christlich Demokratische Union (Niedersachsen)	Christian democratic party	Third-party
FAU	University Erlangen-Nürnberg	Universität Erlangen-Nürnberg	Science	Third-party
HAW	Hamburg University of Applied Sciences	Hochschule für Angewandte Wissenschaften Hamburg	Science	Third-party
HFU	Furtwangen University of Applied Sciences	Hochschule Furtwangen	Science	Third-party
IOW	Leibniz Institute for Baltic Sea Research	Leibniz-Institut für Ostseeforschung	Science	Third-party
ISOE	Institute for Social-Ecological Research	Institut für sozial-ökologische Forschung	Science	Third-party
SPD BP	Social Democratic Party of Germany (Federal Party)	Sozialdemokratische Partei Deutschlands (Bundespartei)	Social democratic party	Third-party
TU Berlin	Technical University of Berlin	Technische Universität Berlin	Science	Third-party
TU Darmstadt	Technical University of Darmstadt	Technische Universität Darmstadt	Science	Third-party
TUHH	Hamburg University of Technology	Technische Universität Hamburg-Harburg	Science	Third-party
TUM	Mittelhessen University	Technische Hochschule Mittelhessen	Science	Third-party
Uni Bremen	Bremen University	Universität Bremen	Science	Third-party
Uni Frankfurt	Frankfurt University	Universität Frankfurt	Science	Third-party
Uni Lüneburg	Lüneburg University	Universität Lüneburg	Science	Third-party
Uni Oldenburg	Oldenburg University	Universität Oldenburg	Science	Third-party
Uni Stuttgart	Stuttgart University	Universität Stuttgart	Science	Third-party

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Affiliation</i>	<i>Type</i>
Uni Tübingen	Tübingen University	Universität Tübingen	Science	Third-party

Table D.2.2. Actors in the discourse network

<i>Actor code</i>	<i>Full actor name in English</i>	<i>Full actor name in German</i>	<i>Affiliation</i>	<i>Type</i>
BAH	Federal Association of Medicine Manufacturers	Bundesverband der Arzneimittel-Hersteller	Industry, Retail	Container
DBV	German Farmers Association	Deutscher Bauernverband	Agricultural association	Container
IVA	Agrochemical Association	Industrieverband Agrar	Industry, Retail	Container
MWV	Association of German Petroleum Industry	Mineralölwirtschaftsverband	Industry, Retail	Container
VCI	German Chemical Industry Association	Verband der Chemischen Industrie	Industry, Retail	Container
VDMA	German Engineering Federation	Verband Deutscher Maschinen- und Anlagenbau	Industry, Retail	Container
WVM	German Metal Industry Association	Wirtschaftsvereinigung Metalle	Industry, Retail	Container
AÖW	Alliance of Public Water Management	Allianz der öffentlichen Wasserwirtschaft	Water association, municipal utility	Expander
BBU	Federal Association of Citizens' Initiative on Environmental Protection	Bundesverband Bürgerinitiativen Umweltschutz	Environment organization	Expander
BDEW	Federal Association of Energy and Water Industry	Bundesverband der Energie- und Wasserwirtschaft	Water association, municipal utility	Expander
BUND	Friends of the Earth Germany	BUND für Umwelt und Naturschutz	Environment organization	Expander
DAFV	German Fishing Association	Deutscher Angelfischer-Verband/ Mitglied Deutscher Fischerei-Verband	Other	Expander

DWA	German Association for Water, Wastewater and Waste	Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall	Water association, municipal utility	Expander
GrLi	Green League	Grüne Liga	Environment organization	Expander
BfG	German Federal Institute of Hydrology	Bundesanstalt für Gewässerkunde, Referat Gewässerkunde	Federal government	Political-administrative
BMG	Federal Ministry of Health	Bundesministerium für Gesundheit, Referat Gesundheit und Umwelt (TrinkW)	Federal government	Political-administrative
BMU	Federal Ministry for the Environment	Bundesministerium für Umwelt	Federal government	Political-administrative
BMWi	Federal Ministry of Economics	Bundeswirtschaftsministerium	Federal government	Political-administrative
BV	Federation of Municipal Organizations	Bundesvereinigung der kommunalen Spitzenverbände	Regional, local government	Political-administrative
HES	State of Hesse	Hessen	State government	Political-administrative
LAWA/BLAK	Common Working Group on Water of the Federal Government and States Governments	Bund/Länder-Arbeitsgemeinschaft Wasser/Bund/Länder-Arbeitskreis Wasser	State government	Political-administrative
NRW	State of North Rhine-Westphalia	Nordrhein-Westfalen	State government	Political-administrative
RLP	State of Rhineland-Palatinate	Rheinland-Pfalz	State government	Political-administrative
UBA	Federal Environmental Agency	Umweltbundesamt	Federal government	Political-administrative
BWK	Association of Engineers for Water Management, Waste Management and Environmental Construction	Bund der Ingenieure für Wasserwirtschaft, Abfallwirtschaft und Kulturbau	Water association, municipal utility	Third-party

DVGW	German Technical and Scientific Association for Gas and Water	Deutscher Verein des Gas- und Wasserfaches	Water association, municipal utility	Third-party
GÖD	Union of Public Services	Gewerkschaft öffentlicher Dienst und Dienstleistungen	Other	Third-party

D.3 Robustness checks for actor network structure (full observation period)

D.3.1 Discourse network with different threshold values and different normalization algorithms

In this section, we report a robustness check for the identified coalition structure in the discourse network as proposed by Leifeld (2013). The test involves a stepwise increase in threshold values for the edge weights and thus a gradual removal of lower edge weights. Through this procedure, the structure of the discourse network is gradually revealed. We report networks graphs based on networks normalized by *jaccard* (left-hand side of each page) and *average-activity* (right-hand side of each page) and gradually increased threshold values w . Threshold values are chosen based on empirical frequencies (see tables below).

Jaccard		Average-activity	
Edge weights	Sum of edges	Edge weights	Sum of edges
0	1379	0	1379
0.200	32	0.286	32
0.250	346	0.333	12
0.333	696	0.400	334
0.400	8	0.500	704
0.500	798	0.667	798
0.667	326	0.800	326
0.75	56	0.857	56
1	328	1	328

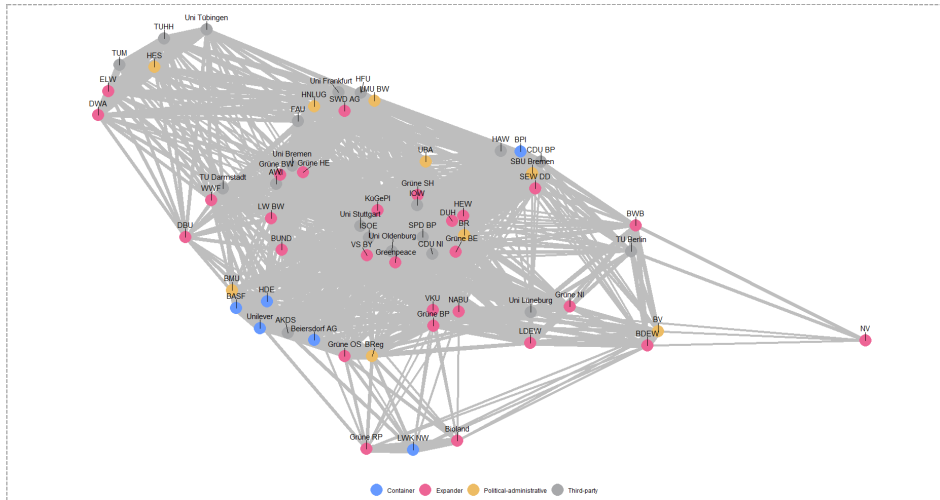


Figure D.3.1. Discourse network (jaccard) with $w \geq 0.33$

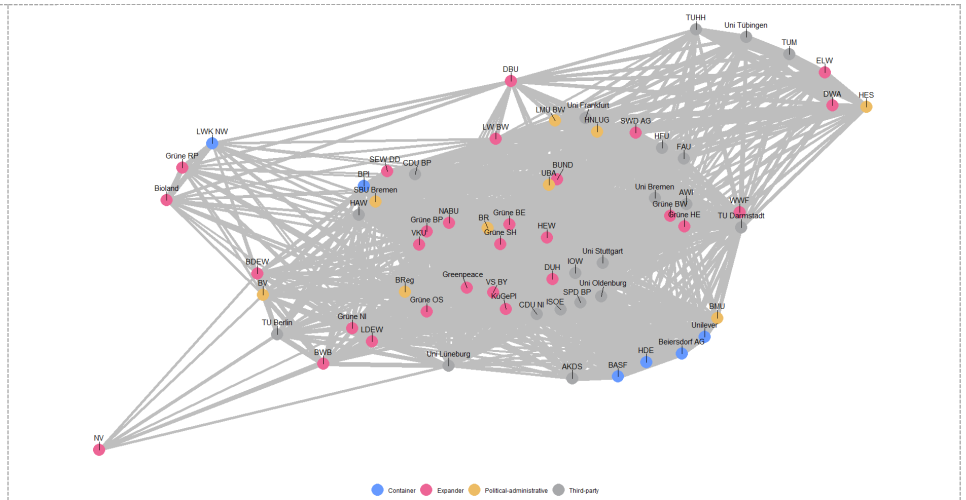


Figure D.3.2. Discourse network (average-activity) with $w \geq 0.33$

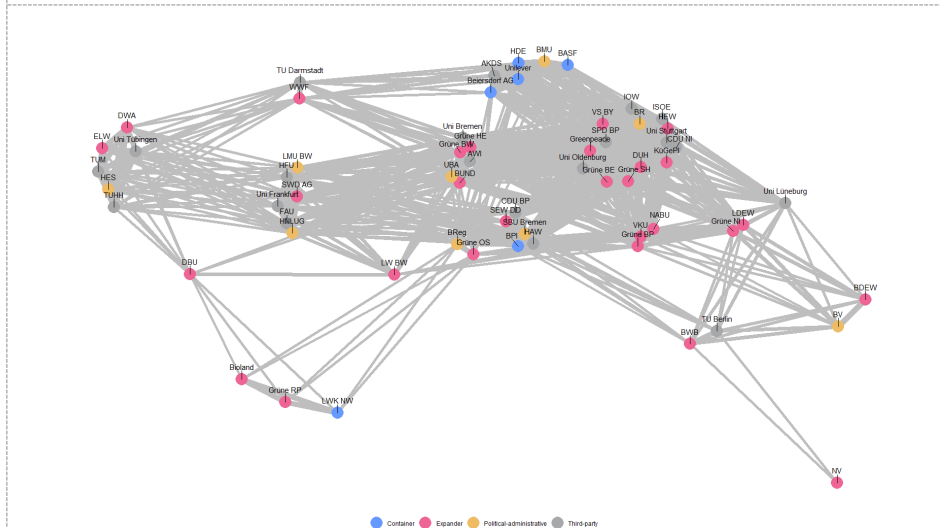


Figure D.3.3. Discourse network (jaccard) with $w \geq 0.5$

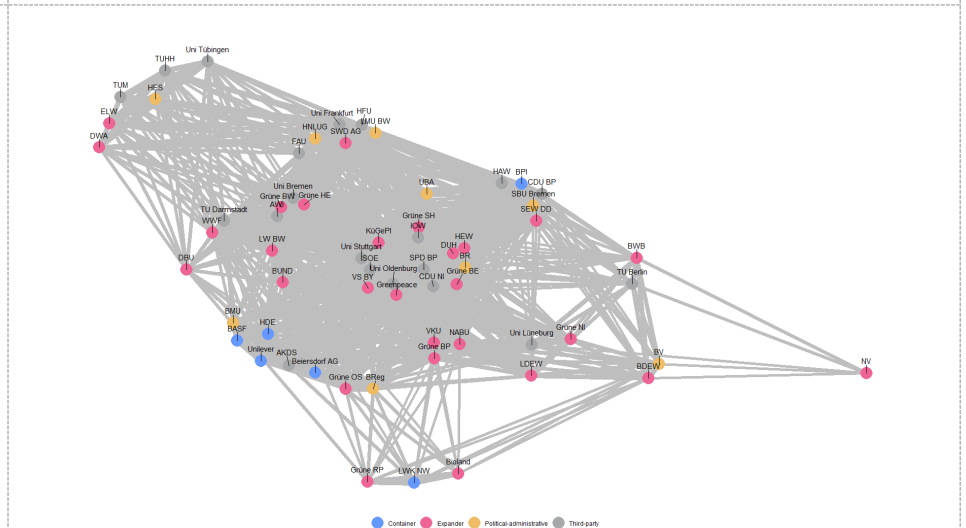


Figure D.3.4. Discourse network (average-activity) with $w \geq 0.5$

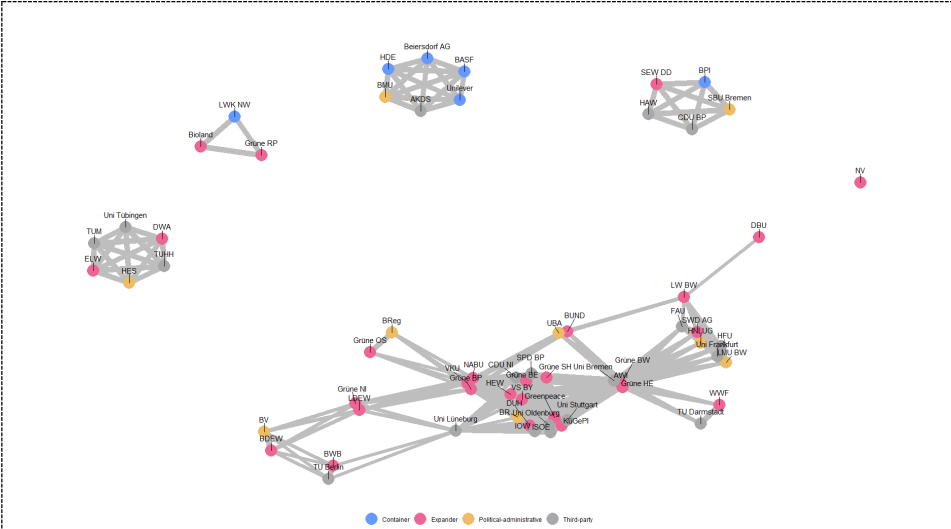


Figure D.3.5. Discourse network (jaccard) with $w \geq 0.66$

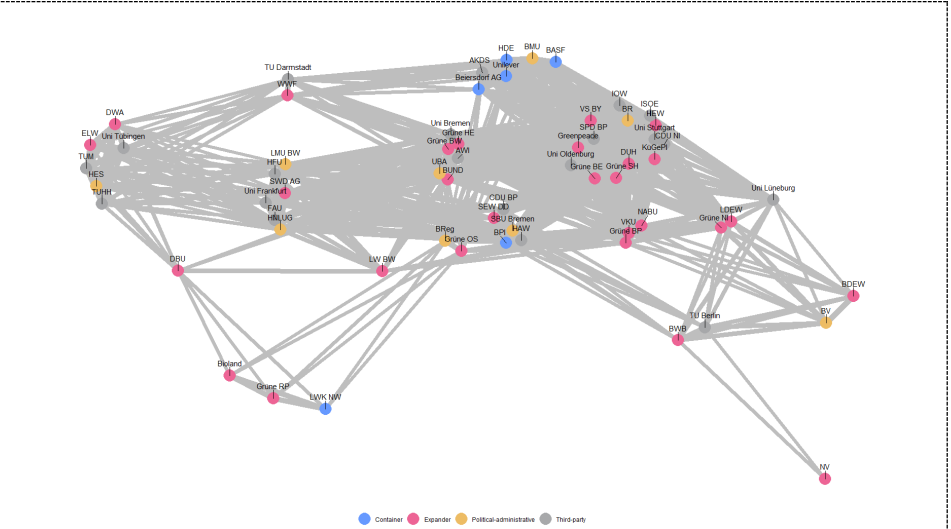


Figure D.3.6. Discourse network (average-activity) with $w \geq 0.66$

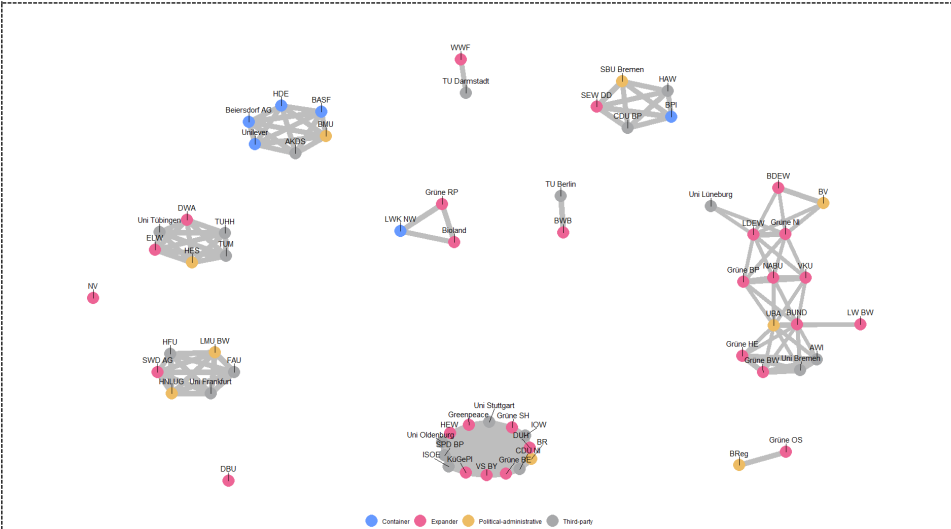


Figure D.3.7. Discourse network (jaccard) with $w \geq 0.75$

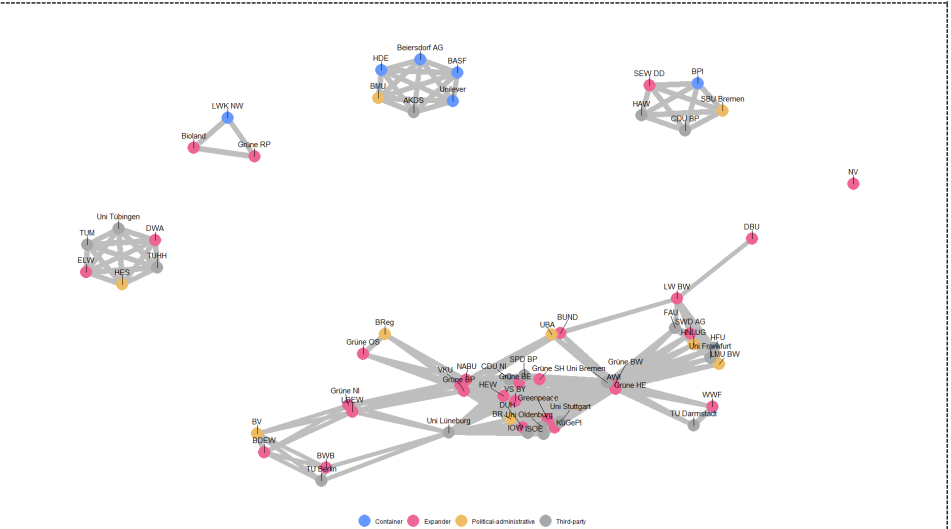
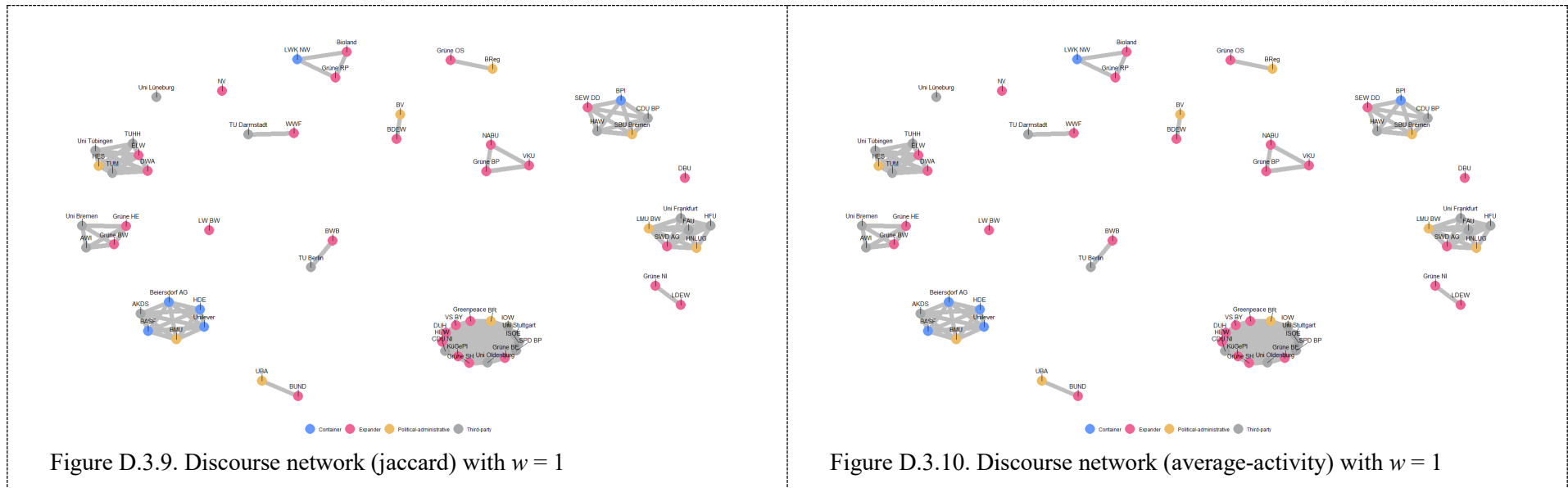


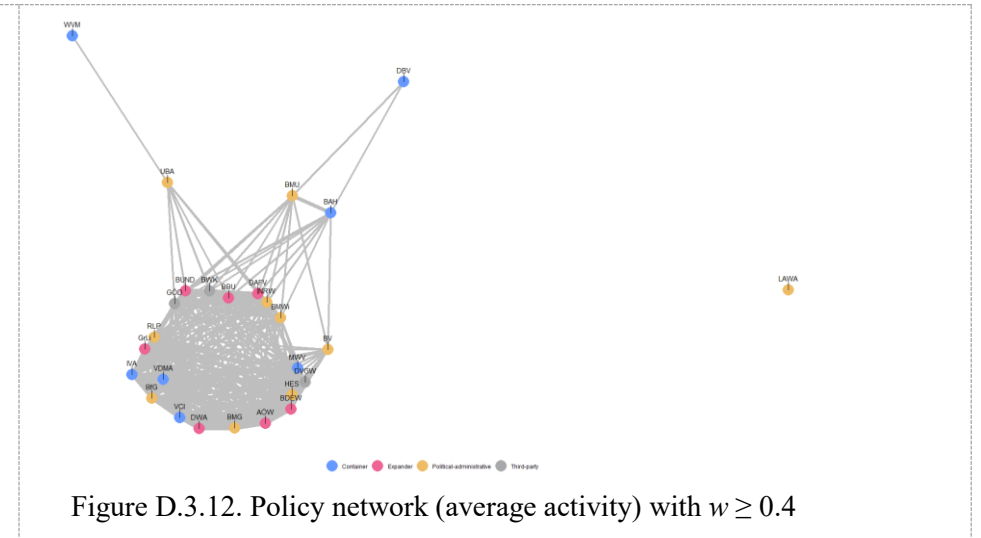
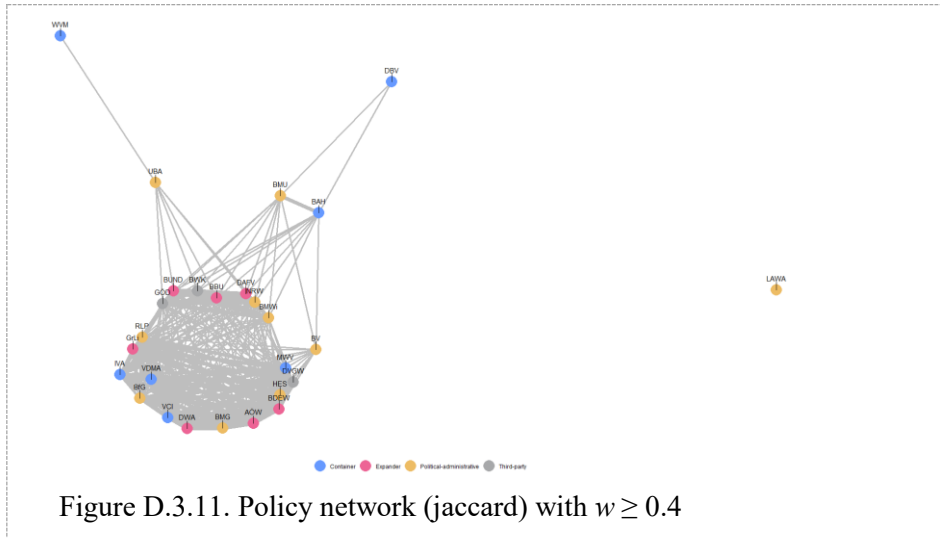
Figure D.3.8. Discourse network (average-activity) with $w \geq 0.75$



D.3.2 Policy network with different threshold values and different normalization algorithms

In this section, we report a robustness check for the identified coalition structure in the policy network as proposed by Leifeld (2013). The test involves a stepwise increase in threshold values for the edge weights and thus a gradual removal of lower edge weights. Through this procedure, the structure of the discourse network is gradually revealed. We report networks graphs based on networks normalized by *jaccard* (left-hand side of each page) and *average-activity* (right-hand side of each page) and gradually increased threshold values w . Threshold values are chosen based on empirical frequencies (see tables below).

Jaccard		Average-activity	
<i>Edge weights</i>	<i>Sum of edges</i>	<i>Edge weights</i>	<i>Sum of edges</i>
<i>0</i>	<i>235</i>	<i>0</i>	<i>235</i>
<i>0.200</i>	<i>36</i>	<i>0.286</i>	<i>36</i>
<i>0.400</i>	<i>244</i>	<i>0.500</i>	<i>244</i>
<i>0.750</i>	<i>38</i>	<i>0.857</i>	<i>38</i>
<i>1</i>	<i>176</i>	<i>1</i>	<i>176</i>



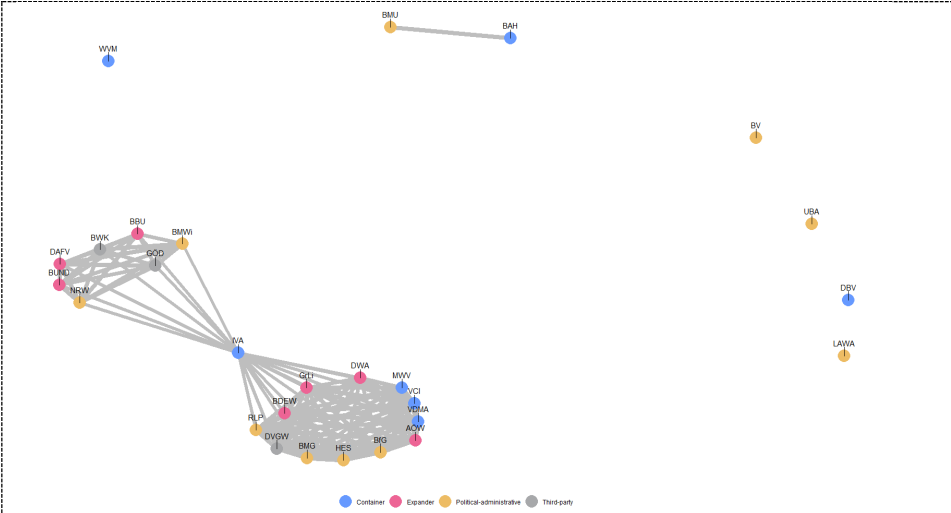


Figure D.3.13. Policy network (jaccard) with $w \geq 0.75$

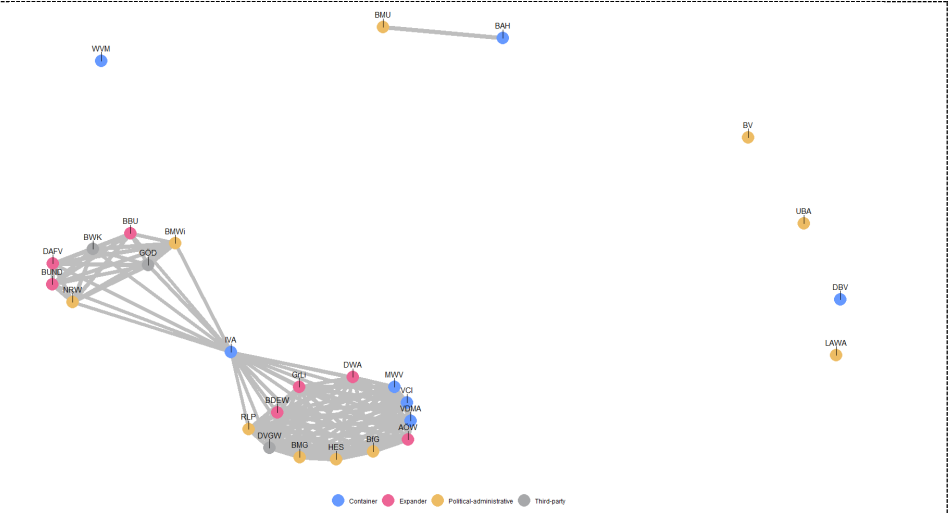


Figure D.3.14. Policy network (average activity) with $w \geq 0.75$

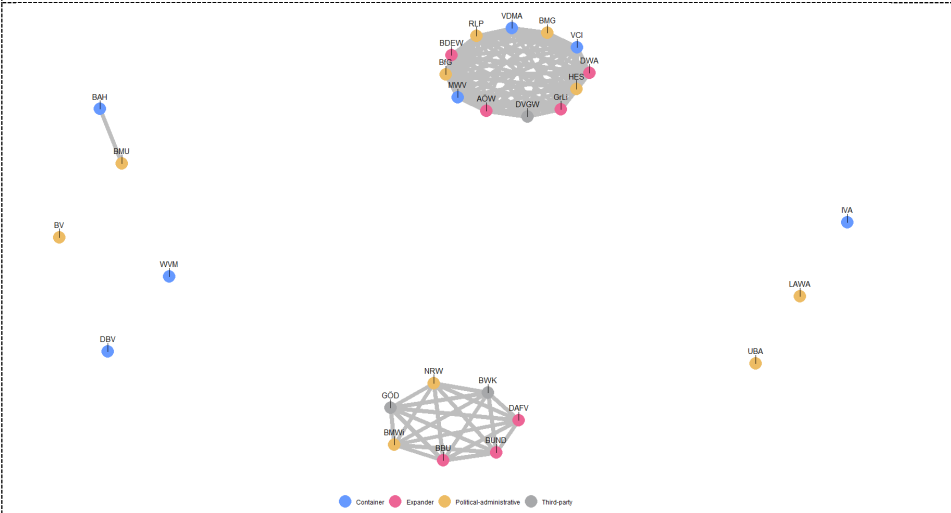


Figure D.3.15. Policy network (jaccard) with $w = 1$

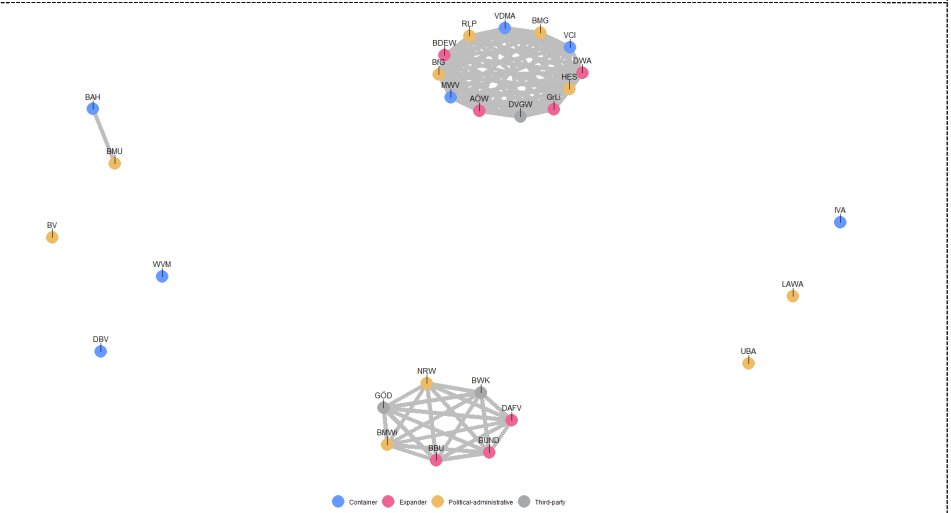


Figure D.3.16. Policy network (average activity) with $w = 1$

D.4 Robustness checks for actor network structure (seperate time periods)

D.4.1 Discourse network with different threshold values and jaccard normalization

In this section, we report a robustness check for the identified coalition structure in the discourse network as proposed by Leifeld (2013). The test involves a stepwise increase in threshold values for the edge weights and thus a gradual removal of lower edge weights. Through this procedure, the structure of the discourse network is gradually revealed. We report networks graphs based on networks normalized by *jaccard* with gradually increased threshold values w for period 1 (left-hand side of each page) and period 2 (right-hand side of each page). Threshold values are chosen based on empirical frequencies (see tables below).

Period 1		Period 2	
<i>Edge weights</i>	<i>Sum of edges</i>	<i>Edge weights</i>	<i>Sum of edges</i>
0	775	0	1198
0.250	20	0.200	24
0.333	142	0.250	290
0.500	190	0.333	470
0.667	14	0.400	8
1	228	0.500	706
		0.667	128
		0.750	32
		1	280

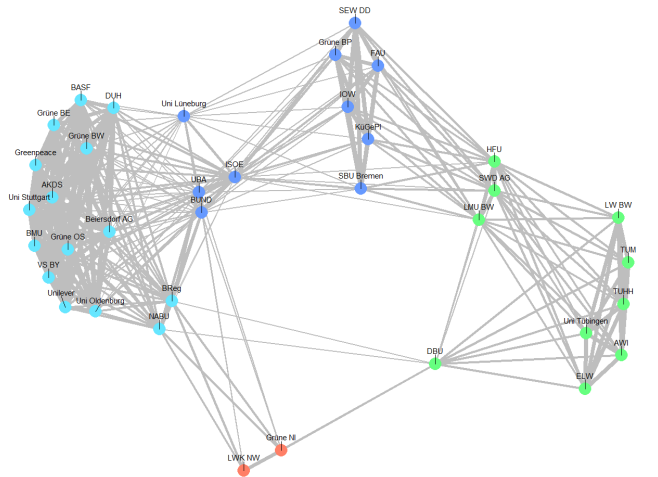


Figure D.4.1. Discourse network (jaccard) in period 1 with $w \geq 0.33$

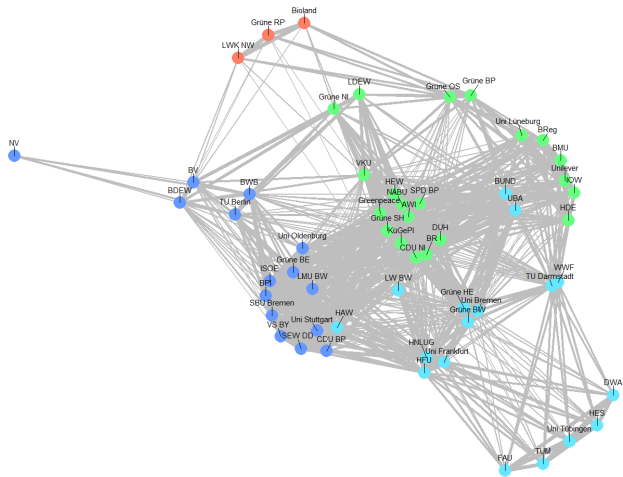


Figure D.4.2. Discourse network (jaccard) in period 2 with $w \geq 0.33$

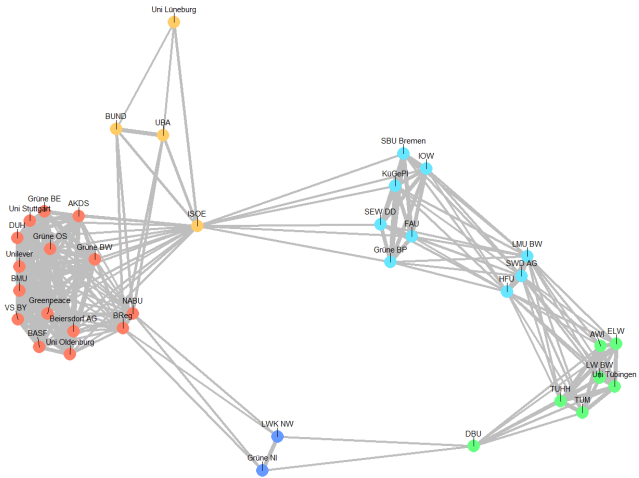


Figure D.4.3. Discourse network (jaccard) in period 1 with $w \geq 0.5$

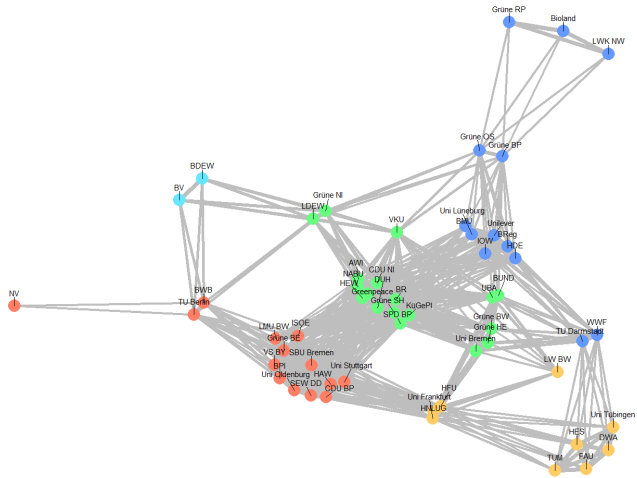


Figure D.4.4. Discourse network (jaccard) in period 2 with $w \geq 0.5$

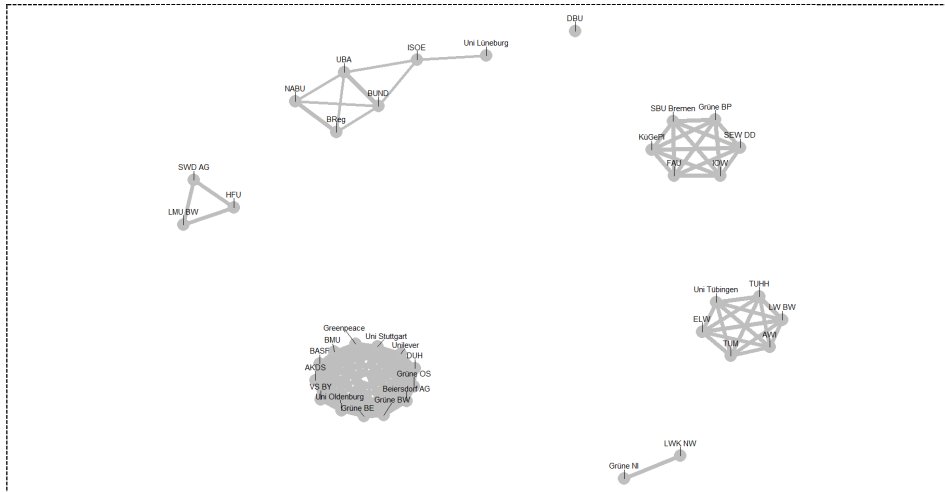


Figure D.4.5. Discourse network (jaccard) in period 1 with $w \geq 0.66$

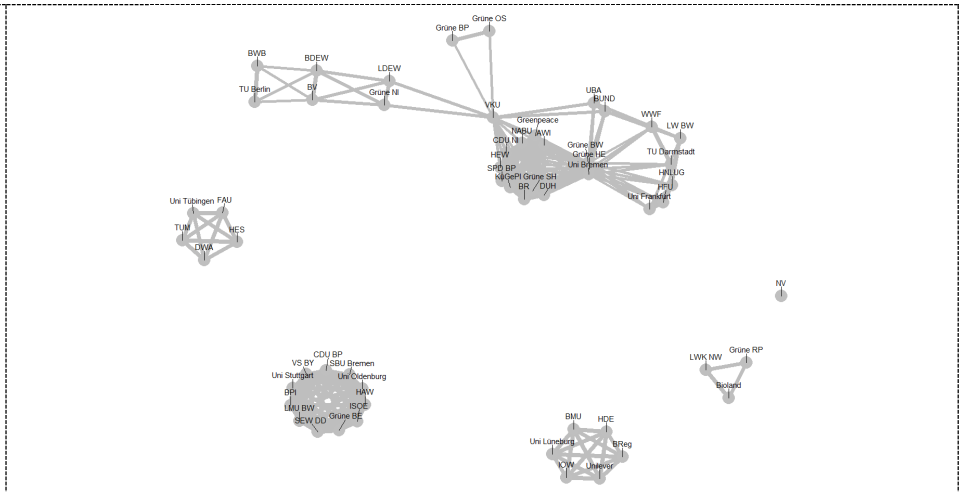


Figure D.4.6. Discourse network (jaccard) in period 2 with $w \geq 0.66$

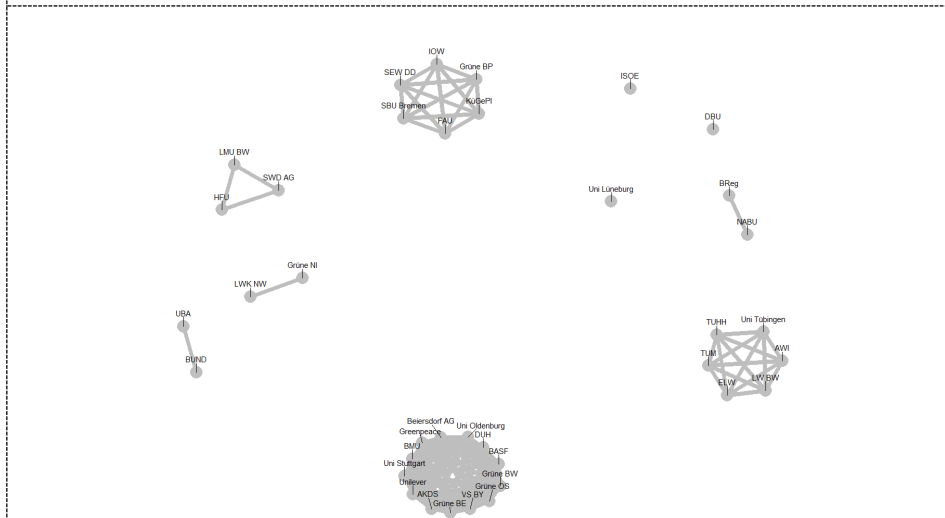


Figure D.4.7. Discourse network (jaccard) in period 1 with $w = 1$

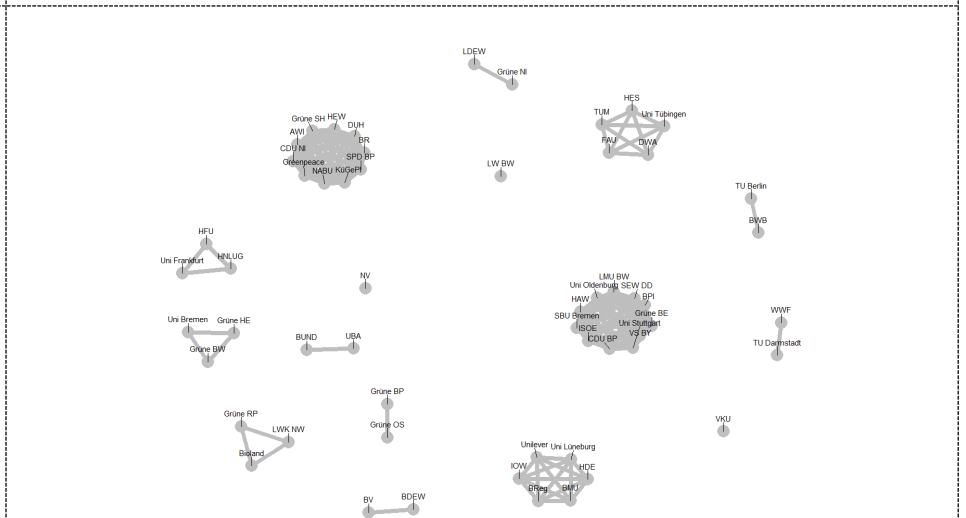


Figure D.4.8. Discourse network (jaccard) in period 2 with $w = 1$

Note: Communities can only be detected in networks with connected subgraphs when using the louvain algorithm.

D.5 Hierarchical cluster analysis of discourse network (separate periods)

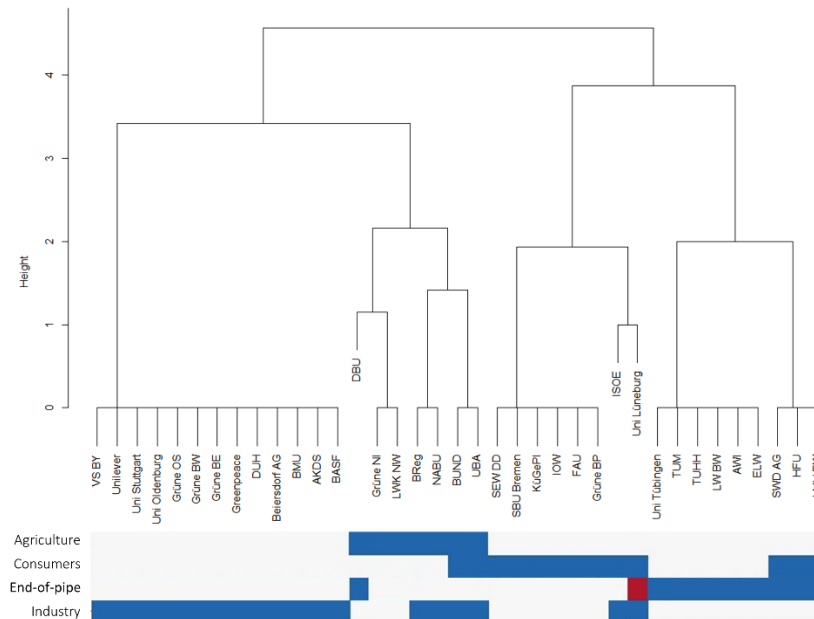


Figure D.5.1. Hierarchical clustering of the discourse network in period 1

Note: blue = agreement; red = disagreement; white = no statement.

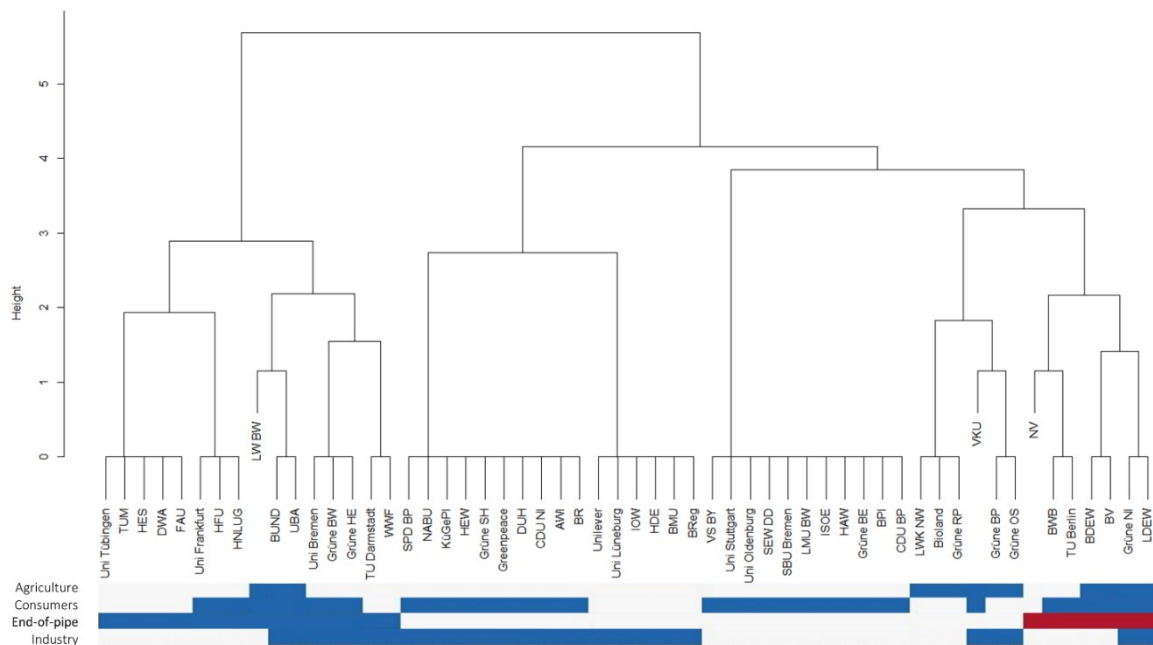


Figure D.5.2. Hierarchical clustering of the discourse network in period 2

Note: Note: blue = agreement; red = disagreement; white = no statement.