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Assessing participatory process-system linkages in polycentric water governance: Insights from WFD implementation in Germany

Nadine Jenny Shirin Schröder[1,2] | **Nigel Watson**[3]

[1]Department for Environmentally Sound Urban and Infrastructure Planning, HafenCity University Hamburg, Hamburg, Germany

[2]IRI THESys Graduate Program (Integrative Research Institute on Transformations of Human-Environment Systems), Humboldt-Universität zu Berlin, Berlin, Germany

[3]Faculty of Science and Technology, Lancaster Environment Centre (LEC), Lancaster University, Lancaster, UK

Correspondence
Nadine Jenny Shirin Schröder, Department for Environmentally Sound Urban and Infrastructure Planning, HafenCity University Hamburg, Henning-Voscherau-Platz 1, 20457 Hamburg, Germany.
Email: nadine.schroeder@hcu-hamburg.de; nadinejennyshirin.schroeder@alumni.hu-berlin.de

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Abstract

An important, although insufficiently answered, environmental governance research question concerns how exactly participation improves policy implementation at different scales. Numerous studies have highlighted important variables influencing the effectiveness of participatory processes. However, studies of participation tend to be strongly process-oriented rather than system-oriented and often overlook the reality that participatory processes are part of increasingly complex and broader decision-making systems. By analyzing particular process-system linkages, this paper contributes new knowledge regarding how participatory processes can influence decision-making in polycentric governance systems. This study focuses on the implementation of the EU Water Framework Directive, which aims for good ecological and chemical status in all European waters, in six German states with varied polycentric decision-making structures. No direct decision-making power was found to be associated with any of the participatory processes themselves. Rather, the power remained embedded within the other established institutional structures. Nevertheless, the participatory processes did still intend to influence decision-making within those established structures through the aggregation

and multiplication of information. The findings show that only a few representatives or a small proportion of the total number of decision-makers are involved in participatory processes. Therefore, those processes may either affect decisions directly due to the binding nature of the decisions taken within participatory processes or alternatively have effects through more complex and nuanced multiplication routes following the conclusion of each participatory process. Moreover, all of the participatory processes examined in this study were reliant to some extent on such multiplication mechanisms to amplify the effects on decisions throughout the overall polycentric governance system.

KEYWORDS

EU water framework directive, Germany, participation, polycentricity, water governance

INTRODUCTION

A common, but so far insufficiently answered, research question concerns how participatory approaches for governance improve policy implementation. "(P)articipation can have a twofold impact on effective policy delivery. The first is that it influences the decision itself (otherwise it would not be participation). (...) The second is that participation can lead to a more complete implementation of decisions" (Fritsch & Newig, 2007, p. 4). This definition reflects a common, but narrow, understanding of participation. One criticism of the literature is that accounts of public participation are predominantly normative and virtue-laden instead of assessing the actual mechanics of participation as they are practised (Heijden & Heuvelhof, 2012). Such mechanics are, in part, related to the governance systems in which participatory processes are embedded in. While participation is expected to fit well with the philosophy of polycentricity, its actual implementation is assumed to be easier in monocentric systems because a single actor could interact with and provide feedback to the public (Huitema et al., 2009).

However, at present, little is known about the interactions among implementation structures, the governance system, and different instrument types (Steinebach, 2022) both generally and specifically with regards to participatory processes. Over time, governance systems tend to become increasingly complex because a multiplicity of diverse actors pursue an increasing number of aims (Adam et al., 2019) as a consequence of changes to environmental regulations and economic development. All of this complexity and change results in various place- and context-specific decision-making structures in terms of the actor types and decisions to be taken. Significant system-related research gaps persist concerning participation and scale dependency (Stringer et al., 2006), scale and level of collaboration (Margerum & Robinson, 2016), multi-level governance (Newig & Fritsch, 2009; Niles & Lubell, 2012), decision-making context (Speer, 2012), the nature of linkages among processes in polycentric governance systems (Pattberg et al., 2018), the role of network variables (Niles & Lubell, 2012), and the nesting of collaborative efforts at

different scales (Margerum & Robinson, 2016). Acknowledging this, this paper offers some fresh insights and knowledge by assessing the embeddedness of participation and responding to the question of: What mechanisms provide linkage and enable influence between participatory processes and wider governance systems? This paper examines this question using the example of WFD implementation in Germany where the federal states' decision-making arrangements include polycentric governance structures.

The European Union (EU) Water Framework Directive (WFD) has led to a tremendous increase in participatory processes in various decision-making settings, pursuing, in general, similar ecological outcomes—the protection of all EU waters. The WFD (Article 14) prescribes the encouragement of public participation with the expectation that this would improve the overall achievement of its key goals (Preamble 14). The CIS guidance document No. 8 (European Communities, 2003, p. iv) defines public participation generally "as allowing people to influence the outcome of plans and working processes" and as "a means of improving decision-making, to create awareness of environmental issues and to help increase acceptance and commitment towards intended plans. Public participation for the implementation of the Directive is recommended at any stage in the planning process". However, apart from public consultations for river basin management plans (RBMPs) and associated programs of measures (PoMs), the WFD leaves open the matter of how exactly participation should be encouraged. This situation has resulted in a huge diversity of participatory processes among and within the member states (e.g., Liefferink et al., 2011)—including Germany with its federal state structure.

By recognizing institutional complexity, the idea of polycentric governance has increasingly attracted attention from researchers (Jordan et al., 2018; Thiel et al., 2019; Van Zeben & Bobić, 2019). The term ""Polycentric" connotes many centers of decision-making which are formally independent of each other. Whether they actually function independently, or instead constitute an interdependent system of relations, is an empirical question in particular cases" (Ostrom et al., 1961, p. 831). Polycentricity as a lens (Blomquist & Schröder, 2019) allows an open analysis of any kind of decision-making structure without restricting the view to federal structures, market structures, or networks or the presence of multiple levels. Thus, this lens helps us shed light on Germany's high degree of diversity. While being characterized by a similar cultural and regulatory (transposition into the National Water Law) background, the federal states vary in their decision-making structures—that is, levels, types, and multiplicity of actors and decision-making power—as well as in their approaches toward public participation. This diversity allows us to compare the processes' and systems' characteristics individually as well as combinations of these characteristics regarding processes and actors.

Premising that participatory processes are embedded in polycentric governance systems, we could expect a multiplicity of varying participatory processes to develop (Angst et al., 2022). While participation is only loosely regulated, the multiplicity and independence of decision-making centers in polycentric systems allow actors to actively exercise their autonomy in designing processes according to their own visions. Nevertheless, following a narrow understanding of participation, we expected organizers of participatory processes to at least allow participants to participate in their decision-making and for those processes also to potentially lead to joint decision-making. However, the analysis of the collected data showed that this was often not the case, despite the organizers being convinced they were doing something good. Therefore, we posed the following research questions:

- How is decision-making regarding WFD implementation structured?
- How are participation and its outputs understood and what is participation designed or intended for by organizers?

- How are linking mechanisms influenced by dimensions of participation and polycentricity? Do expectations on participation need to be adjusted to its abilities?

Contrasting intended process purposes and characteristics of the decision-making systems with theoretical considerations on polycentricity allowed us to identify mechanisms linking participatory processes and governance systems. In doing so, we applied an explorative approach which looked for commonalities and differences in data. Data were collected through semi-structured interviews with a cross-level selection of actors for each governance system, combined with participatory observation of processes and document analysis.

PARTICIPATORY GOVERNANCE IN POLYCENTRIC SYSTEMS

The performance of polycentric governance systems is widely debated (Aligică & Tarko, 2012; Huitema et al., 2009; McGinnis, 1999; Morrison et al., 2023; Pahl-Wostl et al., 2012; Schlüter et al., 2010). Questions regarding performance relate to the debate whether resources are better governed by a central government or decentralized and self-organized by rather local actors (Andersson & Ostrom, 2008). Compared to monocentric governance systems, polycentric systems are expected to better adapt to problems of different scales and local needs but also to miss scale-effects and to face difficulties in achieving and sustaining agreements (Huitema et al., 2009; Ostrom & Parks, 1999).

Similarly, it is often asked whether participation is worth the effort? Are there correlations between process design or process outputs and social or environmental outcomes (Ansell & Gash, 2007; Blackstock et al., 2007, 2012; Newig et al., 2018; Özerol & Newig, 2008; Rauschmayer et al., 2009; Rowe & Frewer, 2000, 2004; Ulibarri, 2015)?: Does participation contribute to effectiveness, beyond emancipation and legitimacy (Albrecht, 2016; Newig, 2007), or to a substantive or instrumental effect beyond normative or legalistic rationales (Blackstock et al., 2007; Wesselink et al., 2011)? Or might participation be even disadvantageous when leading to a non-adoption of environmentally favorable plans (Heijden & Heuvelhof, 2012)? As such, participatory processes require a more systematic analysis of causal mechanisms (Trein et al., 2021), especially on how to leverage benefits and on understanding pathologies associated with power asymmetries (Carlisle & Gruby, 2017).

We take the view here that the phenomena of polycentricity and participation are neither necessarily good nor bad. We seek to assess how polycentricity characteristics affect the functioning of the overall governance system and how some of those characterizing variables, especially the multiplicity and independence of decision-making centers (Schröder, 2018), interact with participatory governance.

The literature conceptualizes rationales regarding the role played by participatory processes (or their organizers) in wider governance systems, including:

- emancipation, effectiveness (quality of decision/quality of implementation), and legitimacy (Albrecht, 2016; Newig, 2007),
- normative, substantive, and instrumental (Blackstock et al., 2007), complemented by legalistic rationales (Wesselink et al., 2011),
- political and substantive (Beierle, 2000),

- the rationales of improving the governance of service provision, making decision-making more democratic, overcoming structural conditions for underdevelopment, and leading to tailored solutions in public service provision (Speer, 2012),
- one-way communication (information dissemination or consultation) and two-way communication between all participants and process organizers (participation) (Rowe & Frewer, 2000; Vente et al., 2016).

However, only a few case studies have analyzed the rationales for participation and choices regarding process design. The question of 'why' is ignored in most literature (Wesselink et al., 2011).

Numerous studies, in contrast, have nevertheless highlighted important variables influencing the effectiveness of participatory processes and their environmental outcomes, including process design characteristics, the previous experiences of participants and power asymmetries (Ansell & Gash, 2007). To date, research has concentrated on the participatory process itself, meaning that participatory processes were analyzed separately from the systems' decision-making structures. This process orientation manifests itself by focusing on inclusiveness/representativeness, effects on representatives and decisions taken by a process, and how decisions are characterized regarding innovation, cost-effectiveness, environmental standards, etc. (e.g. Beierle, 2000; Holley, 2010; Newig et al., 2018; Vente et al., 2016; Wright & Fritsch, 2011).

However, it is also critical to know what happens outside and after the immediate participatory process (Bull et al., 2008), particularly since the context may determine outcomes (Vente et al., 2016). The context is set, in part, by the distribution of power (Speer, 2012; Vente et al., 2016) and the institutional set-up, the degree of political decentralization, the relation between the executive and the legislative, government resource endowments, and the size of the jurisdiction (Speer, 2012). Thus, expanding the analysis to the level of the governance system and its characteristics allows to identify mechanisms which link processes to their systems. This can help understand the challenges for participation resulting from scaling up (Stringer et al., 2006).

In general, more centralized systems may achieve enhanced adaptive capacity and good institutional fit by creating sub-units, while more decentralized systems may achieve them by coordination (Ostrom et al., 1961). In particular, decision-making centers need linkages which allow for deliberation and learning (Carlisle & Gruby, 2017). Such linkages can be provided by cooperative or participatory processes which allow decision-making centers to consider interdependencies (Morrison et al., 2023) and which may facilitate the processes of convergence and divergence (Pattberg et al., 2018). These linkages may be generated through joint memberships, which bridge participatory processes and different organizations (Pattberg et al., 2018), and joint decision-making.

Joint membership reflects dimensions of polycentricity as well as participation, particularly the importance of a multiplicity of actors (Blomquist & Schröder, 2019) and the breadth of involvement (Newig et al., 2018). Nevertheless, membership can only link processes and wider governance systems if actors are involved. Hence, it is crucial to investigate participation and non-participation jointly (Angst et al., 2022). A link to those not involved may occur due to cascading events which are described in network science as knock-on effects on neighborhood nodes after an initial change in one node leading to large-scale effects (Pattberg et al., 2018). However, the effects of processes on constituencies were rarely studied (e.g., Campbell et al., 2011).

Joint decision-making is a form of power delegation and is another dimension of participation (Newig et al., 2018). Following Lubell and Robbins (2022), joint decision-making through participation might be understood as a form of decision-related centralisation, if the decisions

are binding. If the decisions are binding, the independence of decision-making centers in the respective polycentric system is reduced through participation.

Both joint membership as well as joint decision-making are a matter of process design and often viewed and analyzed as involvement or representation and power delegation in process-oriented studies. However, joint membership and decision-making also deserve attention beyond individual processes because process-focused studies already pointed to the importance of independence in polycentric decision-making in the aftermath of participatory processes: for example, explanations for why public managers encourage collaborative governance (Scott & Thomas, 2017) include the importance of external decision-making for providing resources and taking actions. Furthermore, there are often uncertainties regarding whether environmental outcomes result from a sound management plan or an imperfectly implemented poor management plan (Rauschmayer et al., 2009).

Thus, in this paper, our goal is to contribute to assessing the functional quality of polycentric systems (Morrison et al., 2023) more systematically (Carlisle & Gruby, 2017) and especially regarding the role of cooperative and participatory processes (Lubell & Robbins, 2022; Morrison et al., 2023) by reflecting on the system-theoretical assumptions of polycentricity (Pattberg et al., 2018). The paper empirically analyzes the "why" question in addition to exploring the nature of joint membership and joint-decision-making. The findings and insights shed fresh light on how processes are embedded into wider governance systems.

CASES AND METHODS

The WFD aims to bring about good ecological and chemical status in all European Waters by 2027 at the very latest (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit [BMU], 2010). This includes a requirement to establish monitoring programs and management cycles which include the preparation of river basin management plans (RBMPs) and associated programs of measures (PoMs) which are to be implemented during each 6-year cycle.

Nevertheless, it appears highly unlikely that the Member States will achieve their ambitious aims by 2027 (European Environment Agency, 2018). Only 8.2% of the German surface waters reached the stated ecological goals by 2018 (Bund/Länder-Arbeitsgemeinschaft Wasser [LAWA], 2018). Therefore, a larger in-depth comparative study of WFD implementation in the six German federal states of Saxony, Saxony-Anhalt, Hesse, North Rhine-Westphalia, Thuringia, and Lower Saxony was conducted to investigate the influences on implementation decisions in polycentric governance systems. Among these influences are participatory processes which are the focus of the research presented here. To address the complexity of polycentric governance, the study adopts an exploratory approach and focuses on decision-making related to the achievement of WFD goals regarding hydromorphology and connectivity.

This focus was selected because, additional to measures addressing nutrient pollution from agriculture and toxic substances, measures addressing hydromorphology and connectivity (e.g., re-meandering rivers and diversifying shorelines with river wood and gravel) showed the largest gap between identified but not yet implemented measures (LAWA, 2018).

The German states are characterized by complex decision-making structures of three to four (Bogumil & Jann, 2009) general purpose administrative levels (municipalities, counties, district governments/middle authorities (state-wide responsibility below ministries)/none, and ministries) and in addition various special purpose authorities as well as public and private entities. The study covers a diversity of the structures of the territorial federal states, which were expected

to face cooperation and participation challenges differing from city-states due to the scales which need to be recognized. The selected states, three from the former East and three from the former West of Germany, represent the different general-purpose administrative level structures (macro-organizational structures). They are all further characterized by a multiplicity of independent decision-making centers implementing WFD goals regarding hydromorphology and connectivity, but they vary in the degree of multiplicity, the independence of actors, and actor-types (micro-organizational structures). This allows the identification of cross-cutting patterns among varying polycentric governance systems.

In order to assess the various roles and functions related to WFD implementation, semi-structured interviews were conducted between January 2017 and November 2019 with actors (see Table 1) from the water sector at all levels within the federal states and especially different types of local level actors actively realizing WFD measures (public and private actors, associations). This was complemented by non-state actors, who were in a position to give a detailed overview of the implementation situation in the states, and particularly included nature conservation associations due to their roles as critical observers and environmental advocates.

Interviewees were identified through the analysis of policy documents, participation in WFD-related exchange formats (e.g., organized by nature conservation associations or professional organizations across Germany), the observation of participatory processes, and a snowballing approach which involved asking contacts to recommend further contacts. The listed actor types in Table 1 are not all relevant as WFD decision-makers for all states (compare with Table 2) due to state-specific arrangements, and some types do not exist at all in some states (e.g., the aforementioned level structures or special-law water associations which only exist in North Rhine-Westphalia). In a few cases, no contact could be made with a few actors (especially small actor-types without WFD implementation capacities) or no interview agreement could be achieved: There was however a brief conversation with the staff of the Saxonian Ministry during a participatory observation. In North Rhine-Westphalia, water and soil associations were examined through an interview with the county's water authority, in Lower Saxony through interviews with other actors, which are specified in the interview list. Similarly, municipalities were captured. “Other” actor-types were relevant especially when tasks had been transferred, e.g., to counties, landscape planning associations, umbrella organizations, or any organizational solution which is not covered by the overview in Table 1. The applied explorative approach adopted for the study made it possible to identify such structures.

The 70 interviews each lasted approximately 2 hours and used open-ended questions to explore pertinent issues such as how WFD implementation happens in each state, the roles interviewees played in WFD implementation, their responsibilities, which participation/cooperation processes they utilize and/or participate in, their expectations for the processes, and how they perceive the overall processes and other actors.

To see how German WFD implementers understand participation, we looked for processes which the federal states had themselves named as “participatory” or “collaborative” with regards to complying with the WFD on official websites, in documents, and in statements by steering level authorities. As process names changed over time and interviewees sometimes recalled process names only partially, tracing some participatory processes proved difficult (see the Supplementary Material for a list of all processes found). Overall, the states rarely explicitly distinguished between coordination, collaboration, and participation processes or between participation of the wider or interested public or participation of the water sector and other sectors. Thus, the processes which we found are placed all along the steps of Arnstein's ladder of participation (Arnstein, 1969).

TABLE 1 Types of actors related to WFD implementation which were interviewed in each selected federal state (◊).

Actor type	Saxony	Saxony-Anhalt	Hesse	North Rhine-Westphalia	Thuringia	Lower Saxony
Ministry		◊	◊	◊	◊	◊
Middle authority		◊			◊	
Supporting technical authority	◊		◊			
District governments	◊		◊	◊		
State agency	◊	◊			◊	◊
Counties (water authorities)	◊	◊	◊	◊	◊	◊
Counties (nature conservation authorities)		◊				◊
County-free cities	◊		◊	◊	◊	◊
Municipalities			◊		◊	
Maintenance associations		◊				◊
Water and soil associations						
Special–law water associations				◊		
Special purpose associations			◊		◊	◊
Nature conservation associations		◊	◊	◊	◊	◊
Landscape planning associations	◊				◊	
Others	◊	◊	◊	◊	◊	◊
Number of interviews	10	11	12	11	13	13

TABLE 2 Actor types which fulfill steering tasks and those which are expected to or actually do realize WFD measures on hydromorphology and connectivity in the German federal states.

Actor type	Saxony	Saxony-Anhalt	Hesse	North Rhine-Westphalia	Thuringia	Lower Saxony
Ministry						
Middle authority						
Supporting technical authority						
District governments						
State agency						
Counties (water authorities)						
Counties (nature conservation authorities)						
County-free cities						
Municipalities						
Maintenance associations						
Water and soil associations						
Special-law water associations						
Special purpose associations						
Nature conservation associations						
Landscape planning associations						

Note: Light orange: actor with steering tasks; Dark blue: the state level expects this actor type to realize WFD measures; Light blue: actor type generally not expected to realize WFD measures but single actors found taking measures.

The inclusion of processes from the long list in the subsequent analysis was determined by data availability. Re-occurring processes were often better documented and could be more easily recalled by interviewees than single events that occurred some time ago. We therefore mostly included repetitive processes in addition to single events happening throughout the data collection period. We excluded from the analysis:

- Early single-event processes lacking data.
- Despite the diversity of participatory processes, participatory processes which accompany specific WFD measures have only been mentioned by one state (Saxony-Anhalt) as a building block for complying with WFD prescriptions, resulting in little documentation and limited chances for observation.
- Official hearings for RBMPs and PoMs, despite these being considered to be participation by practitioners, due to their different nature, involving written statements analyzed by the authorities.

Regarding process observation, potential dates were identified through public announcements and by approaching interviewees. Whenever possible, the first author here sought permission to participate and, when granted, joined the meeting. Some process organizers were reluctant in disclosing dates and allowing research observation, while others were very open to the idea, even though participation was only formally possible by invitation. Thus, 12 processes were observed (between April 2017 and November 2019) out of 21 processes which were included in this analysis.

Additionally, we analyzed policy documents, such as interim reports, decrees, state-level contributions to RBMPs, programs for water protection and working papers, as well as recorded information from participatory processes (see the Supplementary Material for lists of documents providing information on each process). This data source reflects the overall diversity of the states: Some processes have their statutes, while others are only briefly described in WFD-related administrative documents. For some processes, meeting minutes were recorded and published on a dedicated website, while others made them only internally available to participants or not at all. For some, but not all, processes, intended or actual participants' lists could be found. Their level of detail varied for individual events associated with the same process. For example, names for representatives of particular organizations appeared in some but not all documentation, or only changes of representatives were documented. Due to the variation in data quality of the open data collection process, the study is partially constrained by a lack of data comparability. Nevertheless, this approach allows some general and interesting insights.

Data were coded in MAXQDA 2022 (VERBI Software, 2021) to identify cross-cutting patterns among the selected states, processes, settings, and rationales. First, statements or information on tasks and responsibilities, structures, and the actual decision-making behavior and in- and interdependencies were identified, as well as on process purposes, participants, non-participants, and organizers. Afterward, the data were coded in greater detail, e.g., intended vs. actual participants, and clustered: process purposes regarding their kind and participation in relation to the overall number of decision-makers. Details on the process of clustering are provided linked to the results in the respective results' sections.

In the remainder of the paper, we use the interview number '[Ix]' and the process observation number '[Ox]' to refer to interview statements or, respectively, particular aspects that were observed in participatory processes (see the references for a complete and numbered list of interviewed actors and observed processes).

DISENTANGLING THE SCENE: PROCESSES AND ACTORS

This part of the analysis disentangles process elements from system elements, allowing cross-case comparisons regarding the following questions: Who takes decisions in WFD implementation systems? Who organizes participatory processes and how many of systems' decision-makers are involved in the processes? How do the processes themselves and their organizers seek to influence WFD implementation?

Actual decision-making structures

Pressman and Wildavsky (1984) illustrated the length and importance of decision-making chains for the implementation success of policies as well as the discretion at each point of decision-making along these chains. In the German federal states, parallel decision-making structures determined the WFD implementation success. In this and subsequent sections, we characterize the different decision-makers regarding operational levels, WFD-related tasks, and original tasks as well as their multiplicity and independence in their decision-making.

Regarding measures on hydromorphology and connectivity, we distinguish two levels of decision-making (see Schröder et al. (2020) for further details): (A) the steering level and (B) the level of measure realization (see Table 2).

A Decisions at the steering level involve drafting new laws, compiling RBMPs and PoMs, and developing lower-level policies and actions. Furthermore, at this level, decision makers develop funding schemes (partially final decision-making by other entities), produce guidelines and strategies, conduct pilot projects, designate roles, allocate funds to supporting entities, investigate or assign researchers to particular topics, and have coordination roles. Although some of the pilot projects include the realization of ecological measures, overall, the steering level only has indirect effects on environmental outcomes through supporting and regulating local actions. The 'steering level' refers here particularly to state ministries as well as middle authorities or district governments of the respective states. Thus, this level involves just a small number of organizations per state.

B Actors at the local level (similarly found by Koontz and Newig (2014)) decide whether and what WFD measures to realize, how to fund those measures, and who they should coordinate with. This huge discretion and independence in measure realization is related to the 'voluntariness principle' (*Freiwilligkeitsprinzip*) which the states decided to apply for measures regarding hydromorphology and connectivity. According to this approach, actions at this level shall be incentivized (the implementation deficit, though, proved the incentive-setting to be insufficient) because the steering level has no basis to command and enforce WFD measure realization. Steering instruments such as funding schemes address actors to realize voluntarily measures, primarily local-level actors with water maintenance tasks. Therefore, we refer to these actors here as 'WFD addressees'.

The water maintenance actors maintain waters to allow the drainage of fields, flood protection, and shipping. Addressing them instead of other existing actors or instead of establishing new actors suggested itself to the steering level: Water maintenance actors already work on water issues and through that they are an established part of the water governance systems in all of the states. However, water maintenance is organized very differently across

and within the states. Water maintenance actors vary in terms of task-combinations in their responsibilities, in their staff number, in the size of their area of control or jurisdiction or sphere of influence (their share of waters), in their funding, in their institutionalization (public, private, company, association, authority, etc.), and their organizational structure (voluntary or full-time officers, members' influence, etc.). Therefore, their capacities for realizing measures vary strongly.

Furthermore, states vary tremendously in terms of the multiplicity of water maintenance actors, which ranges from 28 (Saxony-Anhalt) to more than 500 (North Rhine-Westphalia with five district governments, 396 municipalities/county-free cities, 11 special-law water associations, and more than 100 water and soil associations). Additionally, some actors (e.g., county authorities, special purpose associations, landscape planning associations, and nature conservation associations) have been found to be developing and implementing WFD measures despite not being addressed by the steering level, demonstrating a particularly strong degree of voluntary behavior.

Further roles complement the decision-making structures related to implementation: water authorities and nature conservation authorities prevent the further deterioration of waters through approving various requested water usages with obligations; funding bodies (state banks or authorities) administer and prioritize funded measures; supporting technical authorities fulfill scientific tasks especially for the ministries. Some of the actors use their discretion to act beyond their primary areas of responsibility and thus fulfill multiple roles in the governance system. These actors can be engaged individuals or organizations which historically have developed special organizational solutions (e.g., through task transfers). They take up tasks of realizing measures, supporting funding, and coordinating or motivating WFD addressees. The expansion of roles and the use of discretion further enlarge the plurality and multiplicity of actors to be influenced in their decision-making.

The number and diversity of these actors make polycentricity an exceptionally prevalent phenomenon in Germany's WFD implementation – especially at the local level in measure realization. Measure realization needs to be understood here as independent decision-making by a multiplicity of actors because the steering level has no enforcement power. Hence, WFD addressees are not only stakeholders for steering level decisions, but all actors within and across these polycentric systems are decision-makers and stakeholders in each other's decisions: In line with Lubell and Robbins (2022), the steering level's (regional actors) interest is to achieve WFD goals, while local level actors are interested in optimizing implementation arrangements and conditions. Further, local level actors may be affected as up-stream or down-stream neighbors of other actor's measures in their living conditions (e.g., flood protection) but also in the success of their WFD measures as WFD addressees: With their separate choices of measures (or decisions not to act), they contribute incrementally to the overall environmental decision-making and related outcomes. Thus, in principle, participation in each of these multiple decisions might improve WFD implementation overall.

Involvement in participatory processes

In this section, the analyzed processes are characterized generally regarding their format, geographical scope, and content, before analyzing the organizers of participatory processes and the share of direct involvement of the systems' decision-makers.

The participatory processes found in the six federal states are very diverse. They vary in terms of organizers and participants, rules of involvement, and also in terms of their geographical

scope, topics, and stated purposes. Process frequency can vary from one or two times per year, when processes occur in the RBMP/PoM cycles or can be project-related.

Often the large-scale processes, such as advisory councils, consist of consecutive meetings of a defined group of participants or a group whose composition varies over time, including arrangements with open registration for each meeting. In contrast, the process formats at lower levels tend to consist of parallel participatory processes for groups of actors from different regions, basins, or catchments with sequences of meetings for each group: for example, area cooperations in Saxony-Anhalt and regional working groups in Saxony. Thus, the process names (in plural) refer to multiple parallel processes which may vary regarding the type of organizer, involvement, and design, although being initiated on the same basis, e.g., with support by a higher-level actor.

The geographical scope of processes often follows hybrid boundary systems, neither being clearly administrative nor clearly hydrological. Hybridity results from merging multiple sub-basins (named as 'basin region' in the following tables) or catchments ('catchment region') and limiting the scope to state or district boundaries. Enlarging the scope, some organizers invited actors beyond state borders [O1, O12], but not necessarily successfully [O12, O3]. Some processes followed administrative boundaries (e.g. advisory councils for whole states), while only a few processes came very close to matching hydrological boundaries (water body level: e.g., area cooperations in Lower Saxony and workshops in Thuringia). Also, parallel processes of the, initially, same type varied ('catchment/district') in scope because different districts exercised their autonomy to varied degrees. Over time, some fora were actually divided into several events or merged into a single event.

Most of the processes address multiple topics related to water and combine WFD and flood protection issues. A few states separated sub-topics by conducting different processes, e.g., point-sources and hydromorphology from diffuse agricultural pollution (e.g., Hesse platforms/workshops), or hydromorphological changes from pollution [O1]. Some processes changed the main topic from event to event or over a few events. Some of them discussed and deliberated laws or regulations or specific plans and concepts, such as RBMPs/PoMs or lower-level concepts.

Actors organizing and hosting the selected participatory processes (see Table 3) were mainly steering level actors and more seldom WFD addressees (gray shaded in the table). This shows that processes undertaken by WFD addressees, although they do exist, have not been widely considered by the states for creating the public image of public participation.

Due to their different geographical scope, participatory processes include different numbers of WFD addressees (and other decision-makers) within their scope from which they, as the literature suggests, might expect compliance with decisions taken in the process and the implementation of measures (Newig et al., 2018). Direct involvement would enable processes to affect decision-makers immediately. We estimated what proportion of WFD addressees within the scope of a process was directly involved in that process. This estimation is based on the mix of available data (see the supplementary material for a list of data sources for each process and the legend of Table 4 for details on data coding and clustering), especially participant lists and interview statements.

We found that the share was low in most of the analyzed processes (see Table 4): Eight processes had a low share, mainly because these large-scale processes rely on representatives. For a further six processes, we categorized the processes as having a low to medium share. Often a larger process scope was associated with open registration. Only seven process formats had a higher share of directly involved WFD addressees. These had either a smaller scope, lower multiplicity of actors within their scope (water fora in Saxony-Anhalt), or did not invite actors other than WFD addressees (information events).

TABLE 3 Process organizers.

Process(es) (intended scope/scale of the process)	Ministry	Middle authority	Technical authority	District governments	State agency	Counties	County-free cities	Municipalities	Maintenance associations
Saxony									
Advisory council WFD (state)	x								
Water forum (state)			x						
Regional working groups (basin region)				x					
Saxony-Anhalt									
Water advisory council (state)	x								
2 Water fora (basin region)		x							
Project accompanying working groups (catchment region)					x				
Lower Saxony									
Enlarged professional groups on surface/subsurface waters (state)	x								
Area fora (basin region)	x								
Area cooperations (catchment)					x	(x)			
Hesse									
Advisory council (state)	x								
Water forum (state)	x								
Participation platforms [2008] (catchment)	x			x					
North Rhine-Westphalia									
WFD-Symposium (state)	x								
Area fora/conferences (catchment/district)				x					
Information events on measure overviews [2018] (district)				x					

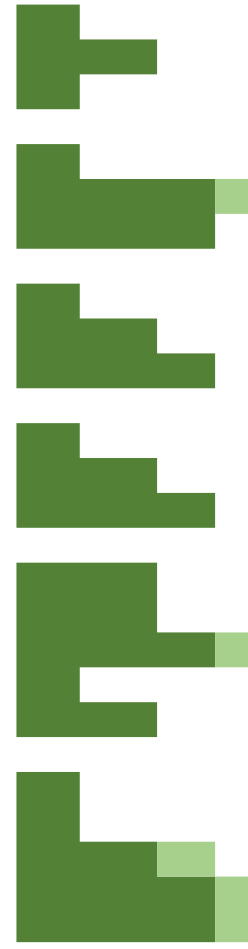
TABLE 3 (Continued)

Process(es) (intended scope/scale of the process)	Ministry	Middle authority	Technical authority	District governments	State agency	Counties	County-free cities	Municipalities	Maintenance associations
Core working groups (catchment)				x					
Round Tables (regional)				x					(x)
Thuringia									
Water advisory council (state)	x								
3 Water fora (basin region)		x							
Water workshops (catchment)		x							
Information events on establishing water maintenance associations [2019] (catchment)	x						x		

Note: **Processes and actors:** x process organizers, (x) in a few cases alternative organizer in case of multiple parallel events, gray-shaded: WFD addressees, unshaded: steering level actors, [year] for non-repetitive events.

TABLE 4 Estimated share of involved WFD addressees in relation to the overall number of WFD addressees within the scope of a process.

Process(es) (intended scope/scale of the process)	Share of involvement
Saxony	
Advisory council WFD (state)	
Water forum (state)	
Regional working groups (basin region)	
Saxony-Anhalt	
Water advisory council (state)	
2 Water fora (basin region)	
Project accompanying working groups (catchment region)	
Lower Saxony	
Enlarged professional groups on surface/subsurface waters (state)	
Area fora (basin region)	
Area cooperations (catchment)	
Hesse	
Advisory council (state)	
Water forum (state)	
Participation platforms [2008] (catchment)	
North Rhine-Westphalia	
WFD-Symposium (state)	
Area fora/conferences (catchment/district)	
Information events on measure overviews [2018] (district)	
Core working groups (catchment)	
Round Tables (regional)	
Thuringia	
Water advisory council (state)	
3 Water fora (basin region)	
Water workshops (catchment)	
Information events on establishing water maintenance associations [2019] (catchment)	
Number of process formats with the respective share of involvement	**8 6 4 3**



Share of Involvement: Green-shaded: share of involved WFD addressees related to the overall number of WFD addressees in the scope of a process (light green: varying statements due to differing perceptions and variances among events of the same process format at different places).

One green bar represents a low share; this includes formats which mainly involve representatives (e.g., from umbrella organizations) and cover larger scales such as advisory councils. *Two green bars* signal a low-to-medium share; especially formats with open invitation (everybody is free to participate upon registration, but many are not showing up or participation varies from event to event), but large scales in target areas can be found here. A medium to high share of involved WFD addressees, *three green bars*, are achieved by some representative and open formats which target smaller scales—the lower number of not directly involved actors is there a result of the lower overall number of decision-makers at smaller areas. Despite an overall higher share of directly involved actors, data draw a heterogenous picture on involvement and non-participation. *Four green bars* represent a high share of involvement; we expect here non-participation being only a result of unavoidable reasons (e.g., illness). A homogenous picture of statements such as 'it participated much more actors than planned/invited/expected' or 'all of them' have been instances for categorizing processes with four green bars.

Apart from the process format determining the rule of involvement, the actual participant lists, participatory observation, and the interviews revealed sectoral, temporal, and spatial variation in (non-)participation for various reasons (find details in the Supplementary Material). Some WFD addressees frequently participated, others only sporadically or not at all. In some of the processes, WFD addressees were represented by employees of umbrella organizations or interest associations, while in others, addressees were represented by one or several individual decision-makers or in some cases not at all.

While in a few processes more actors (of particular groups) were engaged than originally intended ('overparticipation'), the analysis showed that *only a small-to-medium proportion of the total number of WFD addressees* falling within the scope of processes *were actually directly involved* in the processes. This is similar to the findings of Angst et al., which showed that a majority of actors in the Swiss water governance system did not participate in any kind of forum (Angst et al., 2022). One implication is that if processes aim to affect wider governance systems, links or relationships beyond the process itself need to be established.

Process intentions and decisiveness

All of the observed process meetings focussed on a top–down provision of information. We found that those processes shared a *common absence of decision-making power*. Crucially, the decision-making power remained with actors—and equally important also remained outside of the process—instead of being brought into or transferred to the processes as the deciding fora or nodes. Therefore, we focus here on how process organizers understand participation, what they expect from participatory processes, or what the processes are intended to achieve. We explain how we clustered process intentions while differentiating underlying communication directions. This provides the basis for analyzing the multi-functionality of processes and the incidence of intentions.

For identifying intentions associated with processes, we analyzed process descriptions on official websites and statements by interviewees (organizers, participants and other steering level actors), analyzed process statutes/policies, and observed participatory processes (also capturing statements of participants and organizers). Not all process purposes were named consistently in the sources of information, making it necessary to group them. In a first step, purposes with similar terms were grouped in one category, e.g., 'informing', 'information giving', and 'information provision', or 'finding', 'collecting' and 'prioritizing ideas', in addition to 'conflict solving', 'exploring' and 'solving conflicts', and 'carving out goal conflicts'. In a second step, we integrated similar purposes into broader categories under the name which was used most often: for example, the category advice also contains 'recommendations', 'influence on strategic decisions', 'bringing suggestions in', 'feeding knowledge into plannings' and 'supplementing suggestions'; the category information exchange also 'discussions' and 'dialogue related statements'; and the category information giving also 'enlarging knowledge', 'explaining plannings', 'enlarging transparency', 'taking participants along', 'presenting results', 'experts introduce', 'presentation event' and 'one-way meeting'; and checking also 'demanding information' and 'controlling'; and so forth.

We considered, from the organizers' point of view, the communication directions among organizers, process participants and the system, which underlie the different purposes. Therefore, the categories overlap to a degree and are not entirely mutually exclusive in content. For example, information exchange contains information giving as well as receiving, and therefore it is multidirectional. This process characterization was kept separate from 'information giving,' which

implies only a one-way communication flow. Similarly, both, 'advice' and 'checking' imply a flow from actors to organizers (or their organization), but are each distinctive. Furthermore, multiplication implies flows beyond participants, while the categories of conflict solving, coordination, and acceptance generation leave open the matter of whether flows beyond participants are intended. Interestingly, not only the terms, but the purpose statements taken as a whole are rarely linked to particular actors. Such statements often do not differentiate, for example, between participants and non-participants or which actors are expected to multiply process outputs and to whom outputs should be passed to and multiplied through.

Table 5 summarizes the process purposes which we identified. Official purposes, as from process descriptions on websites and process statutes, and unofficial purposes, as from interview statements from organizers, may differ. Furthermore, multiple statements regarding intentions often exist in one or more documents and in interview statements, and therefore we adopted multiple categories for each process. This helps showi the intended multi-functionality of processes but also points to unconsciousness or a lack of clarity in formulating process aims or even contradictions regarding what a participatory process is intended for.

As Table 5 shows, most often processes should facilitate 'information giving', 'information exchange' and should generate 'advice', but the latter is not dominating, although no power was transferred for joint decision-making within the processes. Purposes such as 'acceptance generation', 'conflict solving', 'multiplication', 'coordination', 'idea development', and 'checking' were named much less often.

LINKING PARTICIPATORY PROCESSES TO WIDER DECISION-MAKING SYSTEMS

This section links the analyzed processes to their wider decision-making systems by further elaborating and generalizing the process intentions. We conceptualize different influencing situations by distinguishing between whether power was transferred or not and whether decision-makers are directly involved or not.

The intention analysis showed that each process has multiple intended purposes. We can generalize process intentions further by disregarding the actual 'content'. Content means here any kind of information including any knowledge about or perception of data, perceptions, attitudes, and habits which contributes to achieve coordination, acceptance, advice, and so on. Thus, we can distinguish mechanisms of influencing decision-making through influencing information flows based on the direction of the linkage which is created among decision-makers and thus between processes and systems: (A) aggregation, (B) multiplication, and (C) multiplication and aggregation combined (see Figure 1). These mechanisms may occur within processes. However, if not all of the actors are directly involved in participatory processes, but only represented, the mechanisms are also needed among non-participants outside the processes. The general interpretations of influencing effects in relation to aggregation and multiplication are as follows:

A Through aggregation, one decision is influenced by several actors. One actor seeks to receive, e.g., information of several other actors for its own decision-making, or several actors seek to influence another actor's decision-making, such as in seeking advice and idea development. Thus, the mechanism of aggregation corresponds with the literal understanding of participation, meaning that some participate in someone else's decision.

TABLE 5 Processes' intentions derived from process descriptions on websites, statutes, interviews, and observation.

Process purposes (intended scope/scale of the process)	Advice	Information exchange	Information giving	Conflict solving	Coordination of WFD activities	Multiplication	Acceptance	Idea development	Checking
Saxony									
Advisory council WFD (state)	x							x	
Water forum (state)		x ◊	◊				x		
Regional working groups (basin region)		◊	x ◊	O	x O	x ◊	◊		x O
Saxony-Anhalt									
Water advisory council (state)	x ◊	x	x ◊ O			x O		O	◊
2 Water fora (basin region)	x	x							
Project accompanying working groups (catchment region)		◊	◊ O				x		
Lower Saxony									
Enlarged professional groups on surface/subsurface waters (state)			◊						
Area fora (basin region)	x	◊	x ◊	x			x		
Area cooperations (catchment)	x ◊	x ◊	x ◊	x	◊	x	x ◊	◊	
Hesse									
Advisory council (state)	◊	◊	x O						
Water forum (state)	x	◊	x ◊ O		◊			O	

(Continues)

TABLE 5 (Continued)

Process purposes (intended scope/scale of the process)	Advice	Information exchange	Information giving	Conflict solving	Coordination of WFD activities	Multiplication	Acceptance	Idea development	Checking
Participation platforms [2008] (catchment)	x		x				x		
North Rhine-Westphalia									
WFD-Symposium (state)		◊	x						
Area fora/conferences (catchment/district)		◊	x						
Information events on measure overviews [2018] (district)			O						
Core working groups (catchment)		◊	x ◊		◊	◊			
Round Tables (regional)	x		◊					◊	
Thuringia									
Water advisory council (state)	x ◊		x ◊	x	x	◊			
3 Water fora (basin region)		◊	x ◊	x ◊	x	x ◊	◊		
Water workshops (catchment)	x ◊		x ◊			◊	x	x ◊	
Information events on establishing water maintenance associations [2019] (catchment)			x ◊						

Note: x statement on/in process-related website/document, ◊ interview statement (black: organizer, gray: participant or another steering-level actor than the organizer), O statement during/observation in the process, [year] for non-repetitive events.

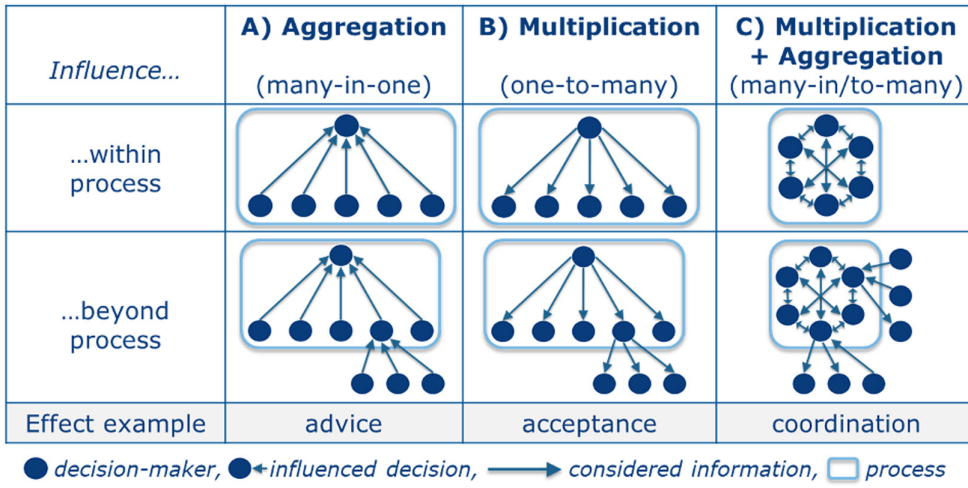


FIGURE 1 Three mechanisms of influencing decision-making through influencing information flows among organizers, participants, and non-participants within a governance system.

B In contrast, through multiplication, one actor seeks to influence decisions of several other actors, e.g., by spreading information to many others who ideally consider this information in the way intended by that one actor. For example, a ministry elaborates how important measures on hydromorphology and connectivity are for the reproduction of fishes and stakeholders accept or support the realization of such measures. The multiplication mechanism particularly dominates in our cases through the intention of 'information giving'. Further, actual intention statements sometimes named the effects to be achieved (e.g. acceptance) and sometimes the activities (e.g. information giving) which contribute to achieve effects. For some intentions, as in conflict solving and multiplication, the distinction between activity and effect remained unclear. Nevertheless, it is important to distinguish between effect (multiple decision-makers affected) and mechanism (multiplying from one to many)—especially when linking participatory processes to polycentric governance systems. Other mechanisms can also lead to a situation where multiple decision-makers are affected, such as cascading (Pattberg et al., 2018) and replication, but different actors need to be active to achieve the effect. While multiplication requires efforts by a participant (being a multiplication factor) toward non-participants, 'replication' requires one or multiple decision-maker(s) to copy, e.g., activities from another decision-maker (e.g., the participant) to their contexts. In 'cascading', decision-makers affect each other in a sequence in which the participant might be the starting point. Overall, multiplication is much more closely related to process characteristics and participants, while replication and cascading rely more on governance system characteristics (e.g., network connections) and may also occur when not intended by the participant or organizer.

C Some intentions combine both multiplication and aggregation mechanisms; exchange is required so that many decision-makers consider each other's information and provide others with information. Coordination and conflict solving would be examples from the studied processes. Below, we only refer to A and B since situation C is essentially a combination of A and B.

We also considered how power transfer and involvement determine the effect of aggregation and multiplication on decision-making.

Influence within processes means that decision-makers are directly involved (Figure 2). If binding decisions are taken within a process, the *decision-making rule* (e.g., majority voting) defines how information is aggregated into a decision, while *commitment and compulsion mechanisms* define how effects are multiplied. Through collectively binding outputs, follow-up decisions along the chain from the output of the process to the (environmental) outcome become less independent, and the system less polycentric. This effect depends on the effectiveness of commitment or compulsion mechanisms (e.g., enforcement mechanisms). In contrast, if processes take no decisions or non-binding decisions (decision-makers stay as independent as without the participatory process), the process becomes one out of many factors influencing their decision-making. In such cases, it does not matter whether decisions are taken by organizers or participants.

Influence beyond a process refers to situations in which decision-makers are not directly involved (Figure 3). Decision-makers can be represented or not considered at all. This adds *additional decision-making points* (consecutive and requiring clearance or processing to be passed) to the linkages between processes and governance systems. For aggregation, this is a representative's aggregation rule (e.g., how an interest association collects and relays its members' interests). For multiplication, the representative as well as the ultimate decision-maker decides how to consider processes' information for their decision-making. Binding decisions, though, may allow compulsion or sanctioning in cases of non-compliance.

Overall, due to the independence of decision-makers, we expect aggregation as well as multiplication to become increasingly difficult and challenging the more decision-makers are involved in a system—in other words, the more polycentric a system is. From our findings, we expect these

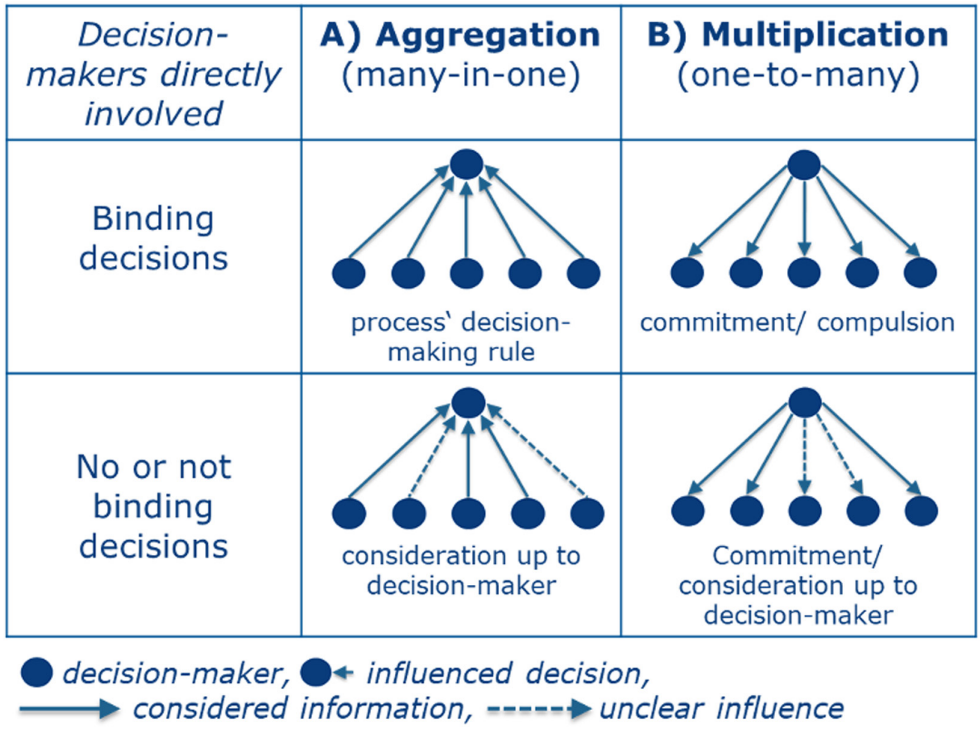


FIGURE 2 Aggregation and multiplication mechanisms within processes (decision-makers are directly involved).

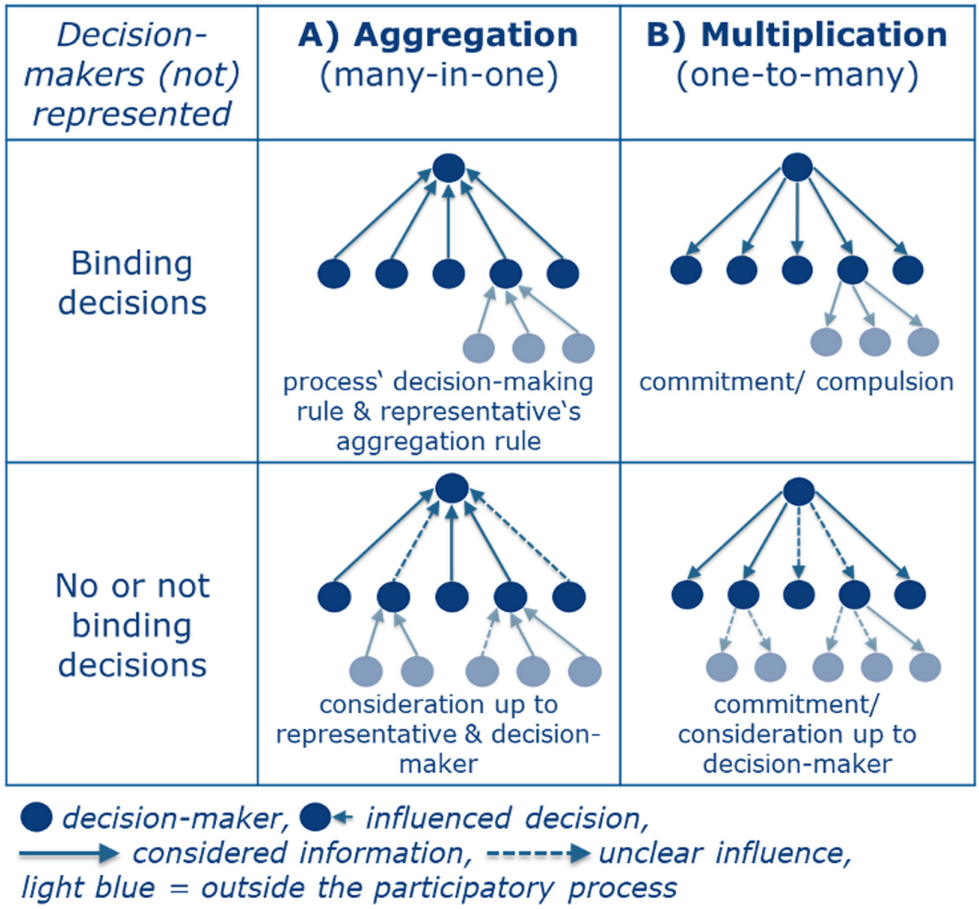


FIGURE 3 Aggregation and multiplication mechanisms beyond processes (decision-makers are (not) represented).

mechanisms also to show more imperfections (dotted lines in Figure 2 and Figure 3) in contrast to ideal conditions, as depicted in Figure 1: Some information is not aggregated into a decision, and not all information is multiplied to all decision-makers.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Considering the observed embeddedness of participatory processes in polycentric governance systems, these findings imply that our current understanding of decision-making and what we may or may not expect from participation need to change.

Researching participation in polycentric governance systems

How do the findings relate to existing research on participation? Newig et al. (2018) provided an overview of researched mechanisms linking participation to its outcomes, and thus to the wider governance system. They summarize three types of effects: the environmental standard

of the output, acceptance of the output by stakeholders, and the implementation of and compliance with the output. Every effect is positively or negatively related to various process design characteristics.

We may relate the mechanism of aggregation conceptually to the standard of the output. The related design characteristics, e.g., the involvement of knowledge holders and the openness of the dialogue, influence how aggregation is supported. Aggregation through participation and related imperfections resulting from real-life conditions are relatively well-researched: For example, difficulties and hybridity of representation may result in imperfect aggregation (Blackstock et al., 2014), which is expected to lead to less integrated decisions or a lower environmental standard of the output (Newig et al., 2018). In contrast, acceptance, implementation, compliance, and the respective influencing design characteristics may be related to the mechanism of multiplication. This process–system link needs more attention.

Newig et al. (2018) compiled variables conditioning the acceptance of the output which are 'stakeholder involvement', 'procedural fairness', and 'awareness raising and involvement in DMP'. Acceptance is related to the implementation of and compliance with the output, which in turn is also affected by 'involvement of (potential) addressees', 'collaborative DMP', and the incorporation of 'environmental and implementation-relevant knowledge' and the achievement of 'mutual gains' through 'communication and bargaining'. We subsume the influence of these conditioning variables in the following as 'supporting mechanisms'.

Noticeable is that these mechanisms are obviously capable of directly affecting directly involved decision-makers. However, it remains unclear how the variables affect non-participants: for example, what needs to be done in order for non-participants to perceive procedural fairness, that conflicts are solved, or, that they learn and network similarly to participants for acceptance and better implementation?

A matrix can help shed light on the research gap that exists regarding process–system linkages which this paper has addressed. Considering the aforementioned two dimensions (involvement and process decisiveness) as dichotomous variables characterizing participatory processes, we may distinguish among four distinct types of situations (matrix see Table 6): a process may take binding decisions and involves decision-makers directly (situation A), a process is not taking binding decisions and does not involve decision-makers directly (situation D), or a process is either characterized by direct involvement or binding decision-making (B, C). If decision-makers are directly part of the process, a participatory process may influence decision-makers through the supporting mechanisms. This is the case in the situations (A) and (C). In cases where binding decisions are taken within participatory processes, an effect of the process arises due to commitment and compulsion mechanisms. Those affected in their decision-making include actors who are directly involved and decision-makers of the wider governance system. This is the case in the

TABLE 6 Typology of mechanisms influencing wider governance systems based on process decisiveness and involvement.

		Involvement of decision-makers	
Decision-makers affected by ...		**Decisions-makers directly involved**	**Decision-makers (not) represented**
Process decisiveness	Binding decisions	(A) ... supporting mechanisms and commitment/compulsion	(B) ... commitment/compulsion
	No or not binding decisions	(C) ... supporting mechanisms	(D) ... multiplication

situations (A) and (B). Influence on decision-making implies a linkage between a participatory process and the governance system. While in situation (A) two sets of mechanisms, and in the situations (B) and (C) one set of mechanism each may link a process and the system, the mechanisms identified in the literature do not fully account for the links of influence for the situation (D). Processes and systems can be linked here through multiplication mechanisms beyond a process. Situation (D) and the associated multiplication effects have until now remained underexplored in the participation literature.

The linkages identified above which arise through supporting mechanisms, commitment and compulsion, or multiplication are formed under ideal conditions. In practice, process design determines the effects of supporting mechanisms. Furthermore, commitment and compulsion mechanisms also rely on the existence and effectiveness of control and sanctioning instruments. Little is known about the ideal and actual conditions to achieve indirect effects on non-participants through the multiplication activities of participants.

An ideal process design allows aggregation and multiplication within processes. Further, under ideal conditions, representatives or other gate-keepers fulfill functions of multiplication and aggregation between representatives and constituencies. Under ideal conditions, the main concern is that all stakeholders are represented. However, it is known that interest organizations do not exist for all kind of actors, and not all representatives are able to fulfill both functions equally or even be aware that they should fulfill these functions. Therefore, process-system linkages need intensified attention.

The aggregation mechanism may be effective (high standard of the decision), while the multiplication mechanism is ineffective within a process (Newig et al., 2018, p. 285). That needs to be considered also beyond processes. While imperfect aggregation links processes to polycentric governance systems at least weakly, an imperfect multiplication mechanism may cause that even no weak link is created between a participatory process and the wider governance system.

Finally, to provide further clarity, the developed typology (Table 6) is decision-centered rather than process-centered, meaning that not whole participatory processes may be categorized in situations A–D, but the decision-making for a specific issue by a particular actor-type. The same process may take binding decisions on some issues, while other decisions, which shall be nevertheless influenced by the process, are taken outside of the process. Furthermore, some kind of decision-makers might be directly involved, while others are only represented or not involved at all.

Practicing participation in polycentric systems

Many German WFD practitioners considered public participation to be generally useful for WFD implementation. However, many of the same practitioners also had very mixed views about participation being successfully implemented in their states (Schröder, 2022). This might (partially) result from a mismatch between what is expected and what participatory processes can accomplish in polycentric governance systems: What is expected stayed fuzzy despite our intention analysis considering that the addressees of the processes' intentions were rarely made explicit. However, our findings combined with the polycentricity lens can shed light on the limits and what participatory processes may accomplish in polycentric governance systems.

In polycentric systems, we are not only faced with multiple actors with multiple preferences leading to multiple goals (Rauschmayer et al., 2009) but also with multiple decision-making capacities. Decision-making happens everywhere, albeit varying in kind and scope as well as

importance for the overall governance system. Mirroring the spreading of decision-making power, most participatory processes here need to be categorized as type (D) regarding WFD measures improving the hydromorphology and connectivity of rivers. Narrow definitions of participation, as of Fritsch and Newig (2007) (see the introduction), however, assume Type A processes. This implies a very monocentric point of view, whereas the polycentricity lens revealed that this assumption is too simple to reproduce the complexity of decision-making.

According to narrow definitions, we might consider the large-scale processes which we analyzed here to be pseudo-participation (despite the perceived positive intent of organizers) because they do not center around one decision. Alternatively, we might reinterpret the definition that at least one of multiple decisions needs to be influenced in polycentric systems to call it participation: Who is participating in whose decision(s)?

In situation (A) participatory processes showed to have the greatest chances to affect the wider system's decision-making because commitment/ compulsion as well as supporting mechanisms apply. Considering that representatives may be no decision-makers themselves but employees of interest associations, as here often the case, we need to acknowledge that the influence solely relies on multiplication external to the process. Hence, our proposed typology suggests that type D processes should be changed into type A processes in order for a system's decision-making to be best affected by participation. However, doing so is limited by the polycentric nature of governance systems.

The multiplicity in decision-making, on the one hand, hampers *involving* (all) *implementers*/ managers as suggested by Vente et al. to improve implementation (2016). For larger-scale processes, the likelihood raises that the number of actors exceeds the number of participants, allowing effective communication. This makes selecting representatives necessary and complex (e.g., avoiding the usual suspects [Erkelens, 2013]). Thus, the transformation of B/D-processes to A/C-processes can only be achieved if the scope of a process would be limited, which allows to involve all decision-makers directly. Measure accompanying processes at the local level, which we could not include in our analysis, can be categorized in (A) or (C).[1] In contrast, downscaling processes related to large-scale decisions, e.g., revising a state water law, would require to conduct multiple participatory processes in parallel what then hampers the aggregation back into that one law.

On the other hand, polycentricity limits, especially due to the multiplicity and independence of actors in decision-making, the *delegation of power* to participatory processes as well as the *commitment to their decisions*. There is a reluctance to give up power (Thompson et al., 2005) and a misfit between public participation and routines of policymaking and planning (Wesselink et al., 2011). Nonetheless, we need to acknowledge that actors who only hold a share of the overall decision-making power cannot transfer the whole power to one process or may face tied hands when trying to commit to processes' decisions. Barriers to participation are imposed by, e.g., laws and regulations, internal contradictions, and the need for coordination and integration of policy areas (Wesselink et al., 2011). Also, if these barriers will be lowered, the problem of transferring power will persist as long as decision-making power is shared. Furthermore, transferring power to participatory processes without fully restricting actors' independence (retaining polycentricity), would indeed increase the number of clearance points (Newig et al., 2012) or veto players because participation adds up to existing decision-making.

Avoiding down-scaling of processes' scope and power transfer, the processes seemed to be rather used as instruments. This aligns with Neef's observation that participation has been depoliticized and increasingly approached as a technical or management solution (Neef, 2009) with the intention not only to aggregate information for their own decision-making but to influence the decision-making of other actors. Abbott calls this orchestration (Abbott, 2018). Because of

conflicting with the normative rationale, this instrumental or legalistic rationale of practitioners toward participation had been found neglected in scholarship (Wesselink et al., 2011).

The reality that no one actor has ultimate authority limits the effectiveness of traditional policy instruments and makes the mobilization of actors by the state necessary for successful implementation (Borowski-Maaser et al., 2010) but also difficult in any desired direction (Setzer & Nachmany, 2018). Therefore, "governors of all types typically orchestrate when they lack certain capabilities needed for stronger forms of governance" like "direct or mandatory action" (Abbott, 2018). They may lack resources and competences, power (Borowski-Maaser et al., 2010), or strong hierarchical authority (Abbott, 2018), of which the latter is generally not a characteristic of polycentric systems. Orchestration relies on effective multiplication to non-participants. It is thinkable that multiplication at least can be supported by the process design. However, unless knowing more about establishing effective multiplication, using participation as an instrument to influence wider governance systems seems to be at least debateable.

Nevertheless, any exchange process may lead to influences on decision-making in multiple directions, but this multi-directionality limits the *clarity of how a process influences decisions*. A lack of clarity hampers trust development (Petts, 2008) and affects the decision to participate (Fritsch & Newig, 2007). Hence, the complexity may lead to processes having a worth because of influencing decisions positively without a power transfer to the process. This worth, though, cannot be made clear and perceived by all actors. Moreover, participatory processes may be unsuccessful regarding their official purposes, but still have positive, although very random effects on other decisions. Focusing on own decisions and making use of processes' aggregation function instead of expecting effects from processes' multiplication function would allow organizers to increase clarity of how a process, or its participants, influence decisions. This clarity might improve the satisfaction with participatory processes.

CONCLUSIONS

By analyzing the implementation of the EU Water Framework Directive (WFD), this paper provides some fresh insights regarding the role of participatory processes in polycentric governance systems.

The decision-making power regarding measure implementation showed, even within the chosen sub-set of WFD implementers, to be widely spread across multiple actors. These multiple actors themselves had no ultimate planning power in their area of responsibility. The study revealed multiple small-scale, rather local-level, decisions regarding implementing measures, which contrasted with a few large-scale participatory processes organized by higher level authorities.

Although the processes reflected different strategies for coping with the multiplicity of decision-makers, such as plural parallel processes, representation or rather large events reduced to information giving, in most cases a large share of WFD implementers were not directly involved. The analyzed processes varied in both scope and the types of issues addressed, as well as process purposes. However, in none of the processes, decision-making power was transferred from actors to the process.

Nevertheless, the organizers of participatory processes intended to positively influence the wider governance system through influencing participating decision-makers, but also the represented constituencies. The intention analysis showed that the participatory processes and governance systems are linked through mechanisms with two directions: Through the mechanism of aggregation, the

information of many actors and decision-makers is aggregated into one decision, e.g., when advice is intended. Through the mechanisms of multiplication, many decision-makers shall be influenced by one or few other decision-makers, e.g., through the provision of information.

The nature of these links makes involvement and process decisiveness (power transfer) important variables for the effectiveness of these mechanisms. Based on this distinction, participatory processes may either affect the overall governance system through the binding character of decisions (commitment and compulsion), or, without power transfer, they solely rely on process design variables to affect directly involved decision-makers and on multiplication to affect the wider governance system.

The multiplicity and independence of the decision-makers in polycentric systems hamper the achievement of ideal aggregation and multiplication through participatory processes. The larger the scope of a process, the more polycentric a system can be within that scope, and the more difficulties can be caused by the multiplicity of actors. These difficulties are, for example, transferring power to processes, and, involving all actors within the scope of a process. The resulting imperfections in aggregation and multiplication may let effects of participatory processes on the wider governance system appear rather random.

Looking to the future, even if process effects become rather random in polycentric governance systems, the added value of participation should also be analyzed in the light of alternatives to its basic functions, aggregation and multiplication, for communication among multiple actors: Participation offers alternatives to multiple single processes and efforts with many actors individually. Thus, participation might tie communication. We should further ask how participatory processes change the system's communication patterns in the long run in polycentric systems. Processes might have fewer effects on ultimate decisions implemented in the environment. However, they certainly affect planning through selecting plans or ideas out when recognizing insurmountable obstacles for implementation. Hence, we may ask whether and under what conditions participation affects policy implementation (accelerates implementation processes or hampers pathways) through identifying the difficult or non-options and those ideas which get a chance (anticipated chance for success), especially if processes cannot be proofed to improve particular decisions.

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ORCID

Nadine Jenny Shirin Schröder https://orcid.org/0000-0003-1636-9497

ENDNOTE

[1] The first author participated in her non-academic professional life in two measure accompanying participatory processes (not completed yet) in Lower Saxony, which can be classified as (C) situations because no power was transferred to the processes.

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AUTHOR BIOGRAPHIES

Nadine Schröder works as a landscape planner in an engineering company in the state Lower Saxony, Germany. She is a PhD candidate at the Chair for Environmentally sound Urban and Infrastructure Planning at HafenCity University Hamburg and takes part in the IRI THESys Graduate Program at Humboldt-Universität zu Berlin. Her research focusses on the role of polycentricity, especially organizational structures, for policy implementation processes in water governance systems.

Nigel Watson is Professor of Geography and Environmental Management at Lancaster University, UK. His research is focused on institutional arrangements, water governance and integrated environmental management.

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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INTERVIEWS AND OBSERVATIONS

The following tables show the actors interviewed and processes observed for the analysis of each German federal state. They are numbered for referencing in the text. The time frame for interviews is indicated.

Interviews:

Saxony-Anhalt: January 2017, March–June/August 2018.

No.	Organization
I1	Landesverwaltungsamt: water
I2	City Magdeburg, lower water authority
I3	Unterhaltungsverband Ehle-Ihle a
I4	Unterhaltungsverband Ehle-Ihle b
I5	Landesbetrieb für Hochwasserschutz und Wasserwirtschaft (LHW): hydrology and ecology a
I6	Landesbetrieb für Hochwasserschutz und Wasserwirtschaft (LHW): hydrology and ecology b
I7	Landesbetrieb für Hochwasserschutz und Wasserwirtschaft (LHW): hydrology and ecology c
I8	Wasserstraßen- und Schifffahrtsamt Magdeburg—Burg
I9	BUND Saxony-Anhalt (friends of the earth Germany)
I10	Ministry for Environment, Agriculture and Energy of the state Saxony-Anhalt: waste water treatment, facilities for handling water-polluting substances, water provision, water protection, water framework directive
I11	NABU Saxony-Anhalt (Nature and Biodiversity Conservation Union) + County Börde lower nature conservation authority

Saxony: January/April/May 2017, December 2018, January 2019.

No.	Organization
I12	City Dresden: environment
I13	Landesdirektion Sachsen—Dresden a
I14	Landesdirektion Sachsen—Dresden b
I15	Wasser- und Schifffahrtsverwaltung des Bundes, WSA Dresden
I16	City Dresden, lower water authority
I17	Community Dresden: water and soil maintenance

No.	Organization
I18	Landestalsperrenverwaltung: EU directives, nature conservation
I19	Sächsisches Landesamt für Umwelt, Landwirtschaft und Geologie (technical authority): surface waters, water framework directive
I20	Landschaftspflegeverband Sächsische Schweiz-Osterzgebirge e.V.: landscape development, flood protection WFD public relations project
I21	County Meißen, lower water authority

Hesse: September, November 2018.

No.	Organization
I22	Hessisches Landesamt für Naturschutz, Umwelt und Geologie (HLNUG): water ecology
I23	Regierungspräsidium Darmstadt placed in Wiesbaden: surface waters
I24	Hesse Ministry for environment, climate protection, agriculture and consumer protection: surface water protection/water ecology
I25	Hesse Ministry for environment, climate protection, agriculture and consumer protection: questions of principle, state-crossing and international cooperation, coordination of water framework directive, public relations a
I26	Hesse Ministry for environment, climate protection, agriculture and consumer protection: questions of principle, state-crossing and international cooperation, coordination of water framework directive, public relations b
I27	City Wiesbaden: protection and management of waters, water maintenance/lower water authority for non-WFD issues
I28	Rheingau-Taunus-County, lower water authority
I29	Main-Taunus-County, lower water authority
I30	Gemeinnützige Fortbildungsgesellschaft für Wasserwirtschaft und Landschaftsentwicklung GmbH (organizes water neighborhoods for the exchange of experiences)
I31	NABU Hesse (Nature and Biodiversity Conservation Union)
I32	Abwasserverband Main-Taunus: water maintenance
I33	City Taunusstein: city development, technical environmental protection, nature conservation, water protection

North Rhine Westphalia (NRW): October–December 2018, February 2019.

No.	Organization
I34	Water network NRW (by nature conservation associations)
I35	Bezirksregierung Arnsberg: water management including facility related environmental protection, water advisor
I36	County Soest, water maintenance
I37	Kommunalagentur NRW (community agency): water advisor
I38	Lippeverband: river area development, central department EU directives, nature conservation
I39	City Hamm, lower water authority
I40	agw—Arbeitsgemeinschaft der Wasserwirtschaftsverbände in Nordrhein-Westfalen (umbrella organization of special water law associations)

No.	Organization
I41	Ministry for environment, agriculture, nature and consumer protection of the state North Rhine-Westphalia: river area management, water ecology, flood protection
I42	Bezirksregierung Arnsberg: funding approvals, conceptual work
I43	County Coesfeld lower water authority
I44	Bezirksregierung Arnsberg: building authority, water maintenance

Thuringia: January–March 2019.

No.	Organization
I45	City Erfurt, lower water authority: surface waters
I46	Thüringer Landesamt für Umwelt, Bergbau und Naturschutz: river area management
I47	Thüringer Aufbaubank: agricultural advancement, infrastructure, environment, regional water advisor
I48	City Erfurt: garden and graveyard authority, water maintenance
I49	City Blankenhain, building authority
I50	Landschaftspflegeverband "Thüringer Grabfeld" e.V.: landscape development, water maintenance
I51	Thüringer Landgesellschaft: water construction
I52	NATURA2000-Station
I53	City Gera, lower water authority: water maintenance
I54	Flussbüro Erfurt (engineering office), representative of nature conservation associations in the Thuringian water advisory council
I55	Thuringian Ministry for environment, energy and nature conservation: water protection, flood protection
I56	GUV "Harzvorland": water maintenance
I57	Thüringer Gemeinde und Städtebund: department rural area, nature protection, agriculture, forestry and water law

Lower Saxony: January, June, July 2017, September 2019.

No.	Organization
I58	Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz (NLWKN) Verden: river basin management
I59	Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz (NLWKN) Braunschweig: river basin management & biological monitoring
I60	Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz (NLWKN) Lüneburg
I61	River Basin Commission Weser
I62	Lower Saxon Ministry for Environment, Energy, Construction and Climate Protection: surface and coastal waters, marine protection
I63	City Braunschweig, lower water authority
I64	Kommunale Umwelt-Aktion UAN (Municipal Environmental Campaign)
I65	BUND Lower Saxony (friends of the earth Germany)

No.	Organization
I66	City Braunschweig, lower nature conservation authority
I67	Unterhaltungsverband Oker: water maintenance
I68	Aller-Ohre-Verband: water alliance
I69	Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten- und Naturschutz (NLWKN) Hannover: nature conservation
I70	Wasserverband mittlere Oker + Stadtentwässerung Braunschweig: water maintenance

Participatory observation:

No.	Time	Process
Saxony-Anhalt		
O1	June 2018	2nd project accompanying working group for the water development concept of the river Aller
O2	October 2018	Water advisory council
O3	November 2019	Water Forum North (Elbe-Havel-Weser)
Saxony		
O4	April 2017	Regional working group for the river Elbe
O5	May 2019	Water forum
Hesse		
O6	September 2018	Water advisory council
O7	November 2018	Water forum
NRW		
O8	September 2018	WFD symposium
O9	December 2018	Information of WFD addressees with maintenance and construction duties on measure overviews to be compiled
Thuringia		
O10	February 2019	Discussion forum for WFD addressees to establish water maintenance associations in whole Thuringia by 2020
O11	March 2019	Water workshop to determine measures for the water body Middle of Unstrut
Lower Saxony		
O12	June 2017	Area Cooperation for the river Oker