

# The Lens of Polycentricity: Identifying polycentric governance systems illustrated through examples from the field of water governance

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## Abstract

This paper discusses definitions that have been developed and used in the study of polycentric governance, and offers some refinements of those definitions for purposes of operationalization and application to an empirical setting - in other words, for viewing governance arrangements through the lens of Polycentricity. The paper then presents a pair of cases from Berlin and Hamburg concerning implementation of the EU Water Framework Directive, characterizing the two cases in terms of their Polycentricity and comparing how they have functioned so far. Using the lens of Polycentricity helps to illuminate important features and distinctions of those two cases, and the effort to apply Polycentricity also yields insights about further work that needs to be done in defining and operationalizing the concept.

*Keywords: Polycentricity, governance, coordination, EU Water Framework Directive, Berlin, Hamburg, river restoration*

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# 1 Introduction

The concept of polycentric governance is used increasingly. Often it is used in a normative manner associated with values like 'better performance'. Governance systems are analyzed with the intention of proving that polycentric governance systems perform better. However, based on existing definitions, this paper shows that the concept of polycentric governance remains unclear and that a clearer operationalization is still needed to distinguish polycentric structures in governance systems from other kind of structures to analyze any differences in performance among polycentric governance systems.

The first part of this paper moves forward from contrasting definitions to propose several steps to elaborate the concept further and to analyze potential polycentric governance systems more systematically in order to facilitate comparisons. In this first part, I rely on the assumption that polycentric governance systems are characterized minimally by a multiplicity of decision-making centers governing a certain good or problem within defined system boundaries. The proposed steps are, first, to clearly specify the good or problem in focus, in order to categorize decision-making centers according to their tasks, aims and functional interlinkages; second, to explicitly identify and define the system boundaries and the level of analysis – steps one and two are interlocked in an iterative process of analysis; and, third, to analyze the overlap among centers according to two categories: territorial and functional. Especially examples from the area of water governance show that the focus of analysis significantly alters the outcome of the analysis. This raises the question how a governance system or parts of it can be called polycentric or not, or more or less polycentric respectively.

In the second part, this way of analysis is applied to a case comparison of water governance in Germany for the implementation of the EU Water Framework Directive in the federal states Berlin and Hamburg. It shows also that based on a minimum definition of polycentric governance no statement can be made whether a more polycentric governance system performs better than a less polycentric one. Further characteristics need to be defined in order for general statements on the functioning of these polycentric systems to be made. In these two cases the interaction, especially coordination, between the decision-making centers is highly relevant for the outcomes. In these cases beside the multiplicity of centers the differing distribution of functions/ responsibilities and power among the decision-making centers as well as the distances between them appears to influence coordination patterns. The kind of overlapping creates different sorts of redundancy on the one hand as well as conflicts on the other hand. A combination of formal and informal institutions specifies authorities and responsibilities of the centers as well as their discretion to act independently. They may also set a frame for basic interactions between these centers – for conflict resolution mechanisms and coordination mechanisms. Institutional interplay can create conflicts between centers - additionally to the conflicts emerging from functional interlinkages.

Based on these observations further research questions are proposed to characterize the functioning of polycentric governance systems further.

## 2 Steps to reduce fuzziness in using the Polycentricity lens

There are more definitions and understandings of Polycentricity or polycentric governance on the scientific market than authors or even papers [just to name a few of the widely cited works: Ostrom, Tiebout, and Warren (1961, as reprinted in McGinnis 1999); V. Ostrom, 1972 (essay published in McGinnis, 1999: 55 and 73); E. Ostrom, 2001: 2; Skelcher, 2005: 89; Huitema et al. 2009; E. Ostrom, 2005: 283; Andersson and E. Ostrom, 2008: 79; Pahl-Wostl, 2009: 357; McGinnis and E. Ostrom, 2011: 15; McGinnis, 2011: 171; Oakerson and Parks,

2011: 153; Aligica and Tarko, 2012: 251; Galaz et al., 2012: 22; Pahl-Wostl and Knieper (2014: 140); Gruby and Basurto, 2014: 50; etc.]. What they share is referring to multiple actors (units, decision-making centers and so on). There is a variation in what Polycentricity is covering: structures and/ or processes as well as “a nonhierarchical, institutional, and cultural framework” [Aligica and Tarko, 2012: 251]. They vary in the way how autonomous or independent actors need to be, to be decision-making centers (formally independent, de-facto independent, relatively..., semi, substantive etc.). Some definitions require diverse types of organizations and differing scales, or the location at different levels. Some are including overlapping or redundancy. But boundaries are rarely mentioned, in which boundaries should we look for multiple centers – no matter how they are designed? Some definitions are referring to systems, so it seems to be logical that system boundaries could be used as reference point to examine the existence of multiple centers. However, in some definitions the term system is only used if polycentric governance is performing in a certain way (well-performing or “in a coherent manner” [Ostrom, Tiebout and Warren, 1961]), but then it remains unclear within which boundaries centers need to be considered and their joint performance need to be evaluated. And complementary, how independent need an actor to be, to be considered a decision-making center? I am following here the argumentation of Marshall [2015] that the decision-making centers need to have considerable de facto autonomy (instead of de jure autonomy) and the condition for decision centers of Aligica [2014: 61] “active exercise of diverse opinions and preferences”. Considered decision-making centers in hereafter described cases may at least be able to actively exercise their diverse opinions and preferences in some issues which are relevant for governing the good or problem in focus. This does not need to be the case for the full range of their decisions-making capabilities.

Beside all further elements appearing in different definitions on interactions, overarching system of rules and so on, the minimum requirement for governance systems to be categorized as polycentric is the existence of many decision-making centers. The system, as understood here, draws boundaries around actors which are functionally interlinked (as one sort of overlapping) with each. This system does not need to perform in a certain way to be called a system. If the centers are not functionally interlinked with each other, they do not belong to the same system and should not be considered for identifying a polycentric structure<sup>1</sup> in that particular system. If there is no overlapping, it could be argued that these decision-making centers would rather form separate systems than one common system. They then will need to be analyzed as separate systems.

These minimum requirements raise two questions: First, which decision-making centers need to be considered in order to determine that there is a multiplicity among them - at least to determine that there is more than one center deciding? Second, what is overlapping for decision-making centers to form one system?

Obviously there are many decision-making centers in one society – in the worst case scenario every individual. If we consider all of them then we can say everything is potentially polycentric. But for comparing systems with each other it would be useless then to analyze them with a Polycentricity lens. We need a reference point to determine the (sub-)system for the analysis. If we differentiate by a general topic, we could already see a potential difference between systems concerning these different topics. For example, it is more likely in existing nation-states that the decision-making authority for national defense is spread over a fewer

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<sup>1</sup> Structure refers here only to the distribution of responsibilities, power, functions among decision-making units, but not to interactions between decision-making units.

number of decision-making centers (it is more centralized) than the authority to govern water issues.

The following considerations show that 1) the arrangements in polycentric governance systems are influenced by the nature of the good or the problem they address and 2) that decision-making units can be considered specifically to their tasks. These considerations are essential for defining the boundaries of a governance system, and this is necessary to categorize them as polycentric or not. Identifying the system boundaries is also a necessary step toward exploring and categorizing how the centers within the system overlap and interact with each other.

### *2.1 Good or Problem Specificity*

Identifying a governance system can begin with the question, “What is being governed?” Where the provision or production of a good or the reduction of a problem is being considered, then, we can ask what is that good or problem.

It is less likely that somebody would compare the governance of national defense with water governance in terms of performance. This would seem like comparing the functional setting for growing apples with the raising of elephants. Rather, it is much more likely that several water governance systems would be compared. And, to stay in the picture, the functional setting for the growing of apples and strawberries is comparable as both are fruits. Yet, apples grow on trees whereas strawberries grow on haulms. This makes a difference, for example, in watering and also with regard to their need for light. The same holds for different goods or problems in water governance systems. To trace performance patterns back to characteristics of Polycentricity the governance systems should be comparable in terms of what they are specifically governing.

For example, if there are in a particular location several producers of drinking water<sup>2</sup> but only one company treating waste water for private users, then the system might be polycentric concerning drinking water production but monocentric if only waste water treatment is considered. If the focus of analysis is slightly changed, the picture might change too. If the focus lies on river water quality in that same location—in other words, if the answer to “what is being governed” is “the quality of the water in the river at this location,” then the waste water treatment company, industrial water treatment facilities (and connected actors), perhaps one or more regulatory authorities with responsibility for water quality, land uses, etc., also need to be considered as decision-making centers in this system. Which decision-making centers should be considered highly depends on the good or problem in focus. And, the number and characteristics of decision-making centers are relevant for the question whether that governance system can be called polycentric or not.

This is especially important for comparative analysis. It is possible to simply say one is comparing “water governance systems,” for instance, but that is likely to not be specific enough in order to define the systems in such a way that one is comparing truly similar cases. One “water governance system” might include drinking water quality, drinking water production and distribution, waste water collection and treatment and disposal, and recreational uses of the water and its shoreline, while another “water governance system” might include only some of those dimensions. Asking the question, “what is being governed”

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<sup>2</sup> E.g. tap water producer, bottled water from another region etc.

and answering that question carefully is a key to identifying what is included in or excluded from the systems one is attempting to compare.

Clearly defining the good or problem in focus helps us identify which decision-making centers need to be considered as relevant to a system before we state that the system is polycentric or not - or more or less so - and whether it performs differently due to that particular characteristic.

## *2.2 Task Specificity*

We defined the good or problem in focus – the special purpose the main actors are making decisions for or against. However, we still have several possibilities which actors (organizations and individuals) to consider as decision-making centers to show a difference in the configuration of systems in terms of (poly)centricity.

It seems to be obvious that a system with two centers is less polycentric than a system with seven centers. But then, what characterizes these centers? Do they need to decide about the same issues to be considered? The issue could be constructing dams in rivers which is executed by flood protection authorities or other actors. Or do the centers only need to pursue (partially) the same aims? Such an aim could be flood protection in the case of constructing dams by a flood protection authority as well as in the case of renaturation of rivers upstream for fewer floods downstream by nature protection authorities or planners for the implementation of the EU Water Framework Directive. Or is it enough that the decision-making centers are functionally interlinked to be considered as decision-making centers in a system concerning one good or problem? City planners for example prefer space close to rivers to build houses with nice views and this space is lost as a natural retention area in case of temporal floodings.

A thought experiment with the example above, one system with two centers compared to one system with seven centers, can illustrate that: Let us imagine the good ‘being protected from floods’ in two given regions. The two centers in system A could be two flood protection authorities. They act in two administrative jurisdictions within one river basin<sup>3</sup>. They work on the same issues and are functionally interlinked as flood protection measures upstream can affect the flood protection downstream. The seven decision-making centers in system B could refer to one flood protection authority<sup>4</sup> and three planning actors<sup>5</sup> for the EU Water Framework Directive. The latter ones want to reach a good ecological status in the river but have to consider flood protection too (synergies are possible). Additionally there could be one NGO working on nature conservation, one spatial planning authority and one mining company<sup>6</sup> considered as relevant decision-making units. The picture is not as clear and obvious anymore as thought on the first glance.

It shows the following configurations. If we just compare decision-making centers with the same issue, we count two decision-making centers compared to one. If we include decision-making centers with the same aims, we end up with two compared to four centers (or more). If we include also functionally interlinked centers we can end up with long lists of centers and then the comparison of the two systems becomes difficult. One difficulty, for example, would

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<sup>3</sup> e.g. two municipalities

<sup>4</sup> one administrative jurisdiction

<sup>5</sup> e.g. three sub-basins cross-cutting the one administrative jurisdiction if Water Boards are responsible

<sup>6</sup> e.g. pumped groundwater needs to be transported away by the river

be how strongly centers need to be functionally interlinked to be considered that systems are kept comparable.

To conclude, actors considered as decision-making centers can be at least categorized in these three different ways when using the lens of Polycentricity to analyze what implications it can have. Can a specific system in the same way be called polycentric if there is one center engaged in the issue and eight functionally interlinked centers as if it comprises three decision-making centers engaged in the same issue and five functionally interlinked centers? This is not a trivial question and this needs to be included in the analysis when making any statement on whether a system is polycentric or not or more or less so.

### *2.3 System Boundaries and Level for Analysis and Comparisons*

Even if we decided which kind of decision-making centers to consider, we need to clearly define within which system boundaries we consider the centers. The system boundaries should reflect the good/ problem in focus of the analysis as well as the level of analysis. This relates to the specific research question too.

To give another example, the good in focus is the possibility of shipping in a defined river. In this case it seems to be useful to draw the system boundaries of analysis along a sub-basin. There could be one Water Board counted as a decision-making center which is responsible for the maintenance (task) of the defined river. This system configuration for this specific good would then be called monocentric. However, if the important good is the possibility of shipping in a larger river network then it maybe useful to draw the system boundaries along the basin or a nation state. Then several Water Boards and other actors need to be considered as decision-making centers. For this specific good the system under analysis is potentially polycentric (if e.g. not fragmented).

If we change the focus a little bit, it alters the picture. We can analyze the same small river as in the beginning, but the focus moves to the good of the living environment for fishes in terms of good water quality and adequate hydromorphology. In this sense, it may be sufficient to draw the system boundaries of analysis along the sub-basin. Though, perhaps the system boundaries need to cover a larger area. The water quality for example could be influenced by open mining at the edge of the sub-basin and the decisions made there are strongly influenced by other actors who concern processes and actors rather in the influence area of the open mining than in the sub-basin. The system boundaries of analysis should cover these causal chains so that actors within these system boundaries need to be considered as functionally interlinked decision-making centers.

The system boundaries can be defined territorially, according to e.g. natural borders such as basins, artificial borders such as the area covered by infrastructure or administrative jurisdictions, or non-territorially (also dependent on the level in focus) according to possibilities of access<sup>7</sup> or membership<sup>8</sup>.

The level of analysis (e.g. local, regional, national, supra-national, global) alters the drawing of the system boundaries as well. Let us think about the governance of the provision of drinking water. At the local level the decisions on where to build water wells may be in the focus of analysis. At the regional level it could be the cooperation to establish ground water protection zones. At the national level finding common standards on drinking water quality and how to hold and monitor them could be the relevant tasks of decision-making centers.

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<sup>7</sup> e.g. access to knowledge or access to drinking water if the latter one for example is more determined by purchasing power instead of connection to water pipe infrastructure

<sup>8</sup> e.g. the members of labour unions, associations and certified companies

Agreements on plans to improve drinking water supply in developing countries can be located at the supra-national level. The good is the provision of drinking water but the research question defines the level in focus and related to this the system boundaries as well. And again, the level alters the relevant tasks in focus. This draws significantly different pictures of which decision-making centers should be considered for the sub-system. At the local level a drinking water company could be considered. Whereas, at the national level to determine drinking water quality standards different public authorities and lobbying associations are taken into account. As shown above a system can be called polycentric at one level whereas it is more monocentric at another level.

## 2.4 *Overlapping*

The considered decision-making centers need to form a system. In some definitions ‘overlapping’ is a precondition for a system to be called polycentric. Here it is assumed that overlapping between decision-making centers let them form a system. However, how could overlapping be captured? Decision-making centers could overlap in areas or individuals affected by their decisions and in the membership of individuals forming decision-making centers. For forming one functional system respective to governing a good or problem we focus here only on the overlapping caused by decisions. Nevertheless, it can be important, for e.g. information exchange and learning processes, to analyze overlaps in social relations such as membership additionally. This might alter the choice of system boundaries.

We refer in the following to overlapping in areas affected by decisions, but similar distinctions seem to be reasonable for groups of individuals<sup>9</sup> affected by decisions.

We can differentiate between a territorial overlapping and functional overlapping. Territorial overlapping refers to an overlapping of areas where decision-making centers are active/responsible or have their target areas, for public authorities this is the jurisdiction. Whereas, functional overlapping occurs where decision-making centers overlap in their areas of influence. Centers affect the area of overlapping through given functional interlinkages (often without intention). Functional overlapping in this sense refers to externalities and spill-overs or to the sphere of influence of decision-making centers instead of the area of responsibility. Especially in water governance the area of functional overlapping can be larger than territorial overlapping. For instance, two actors in flood protection with identical tasks form one sub-system of analysis. They do not overlap territorially as the jurisdictional borders where they have authority to decide are clearly defined and not overlapping. Nevertheless, they overlap functionally as upstream and downstream decisions can influence each other. In this sense, they form one system by functional overlapping.

Further we can differentiate between vertical overlapping and horizontal overlapping. In horizontal overlapping considered decision-making centers are at the same level whereas actors in the case of vertical overlapping make their decisions on different levels. In vertical overlapping decision-making centers may contain hierarchical structures<sup>10</sup> or they overlap without hierarchical relations between the actors of different levels. Jurisdictions are vertically territorially neatly nested in basically federal systems. But attention has to be given to whether there is a vertical or horizontal functional overlapping too.

In complex systems it is very likely that decision-making centers are overlapping with other centers in several ways territorially and functionally at the same time. If centers with the same task overlap territorially there is a stronger redundancy than in territorial overlapping between

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<sup>9</sup>

<sup>10</sup> Nevertheless, the question of independence between decision-making centers in hierarchical relations need to be considered. In general a higher authority could give orders to a lower authority but the lower authority could still decide relatively autonomous concerning the good or problem in focus.

centers with the same aim. In the latter case they often have only one aim in common amongst several other differing aims.

To conclude, to form one system it is a necessary condition that decision-making centers related to the good or problem in focus need at least functional overlapping if they do not overlap in territorial boundaries. This is especially necessary for systems with non-territorial boundaries. The different kinds of overlapping significantly influence the relations between centers and redundancy between them. This therefore affects how the good or problem is governed.

### 3 The EU Water Framework Directive in Germany

Based on the foregoing conceptual part the following questions shall be answered for two cases of implementation processes of the EU Water Framework Directive in Germany:

- What is the good or problem in focus of the analysis? Which goods or problems are affecting or are affected by the governance of this good or problem?
- What are the system boundaries?
- Which actors are fulfilling key tasks? Which actors share aims with key actors and which actors are just functionally interlinked?
- Are task and goals of the different decision-making centers aligning or conflicting?
- At what levels are considered decision-making units located?
- What is the scale of the considered decision-making centers and how do they overlap?
- How are the considered decision-making centers institutionally in- and interdependent?

Additionally, to show the relevance of interactions for performance analysis, important coordination processes between centers of these two systems are outlined in their relevance and in their nature to solve conflicts. The case data for illustration are extracted from an in-depth case study comparison on the EU Water Framework Directive implementation processes in Berlin and Hamburg, Germany [Schröder, 2014].

#### *3.1 The good in focus: the good ecological status of rivers*

The analysis here focusses on the implementation of the EU Water Framework Directive in the cities Berlin and Hamburg. They are at the same time federal states in Germany. The main WFD-task in these cities is to reach the good ecological status<sup>11</sup> in water bodies within (or overlapping with) the jurisdictional area of these cities by 2015<sup>12</sup>. The good ecological status is derived from the status of a natural water bodies without anthropogenic influence (defined as a very good ecological status)<sup>13</sup>. The focus of analysis lies here on how the aims are reached in the river system as these and their basins are connecting different jurisdictions and especially the rivers are under pressure of conflicting usages. There are four main problems in Germany to be solved to reach a good status in the river systems, which are basically constant variables in the cases of Berlin and Hamburg:

- the chemical water quality (nitrates/ phosphates from agriculture, pharmaceuticals)
- appropriate water quantity in time and space
- the connectivity for fishes and smaller organisms (e.g. dams, weirs,...)

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<sup>11</sup> The good ecological status shall be reached in water bodies which are classified as natural whereas the good ecological potential shall be reached in water bodies classified as heavily modified.

<sup>12</sup> Exemptions are possible until 2027.

<sup>13</sup> As there are nearly no water bodies without anthropogenic influence anymore around Europe. How to define the good ecological status/ potential is a difficult task in itself. See the numerous grey and research literature on this around the WFD for further details.



- hydromorphological changes in the shape of rivers (box profile, concreted banks, straightened river shape instead of meandering, no floodplains)

Next to the ecological aims the WFD intends to improve the coordination/ cooperation across borders and sectors and public participation in planning measures, but without elaborated formal provisions (except for official public hearings). It seems to be unlikely that the aims of the WFD can be fully reached without coordination/ cooperation and public participation. This is due to the fact that the WFD-tasks are interacting with many tasks/ goals of other actors in watersheds which are to be fulfilled to make use of many water-related goods in a society. This leads to a large number of functionally interlinked actors with a wide range of heterogeneity in interests which have to take each other into account to reach their own aims (in differing degrees depending on physical properties and power relations). If they do not coordinate/ cooperate with each other zero-sum games are more likely or no actor can reach its aims. Tab. 1 shows a list of water-related goods which are interacting with the implementation processes of the EU Water framework Directive (it is not intended to be a complete list). It shows tasks resulting from governing these goods and the related tasks of the WFD. Additionally it is summed up whether conflict or cooperation with these kinds of actors seem to be more likely based on their assumed aims. It shows that most of the possible actors may cause conflicts during the implementation process. The institutional setting shows whether these actors need to be considered as independent decision-making units influencing the performance of governing ‘the good ecological status of rivers’ (see chapter 3.6).

tasks ←	Water related goods	WFD problems	→ tasks
Analyzed function: good ecological status of waters as a public good (interacting with a broad range of goods)			
- ensure water supply reliability (quantity and quality in different degrees)	Water extraction for - <b>drinking water</b> - <b>irrigation water</b> - <b>cooling water</b> (e.g. factories) - <b>process water</b>	- Water quantity  - Water temperature if returned to river - Water quality if returned to waters	- Adequate water quantity for preferred ecosystems - adequate water quality for preferred ecosystems
Downstream users could support ecological tasks in the upstream course as their interest align with task to reduce ecological problems in terms of water quantity and quality to allow their own use of the CPR for their preferred goods			
- keep storage facilities in operation - prevent pollution of emergency reserves	<b>Draught prevention/ water storage</b> - dams - groundwater protection/ recovery (- extra storage facilities)	- missing connectivity for fishes and other aquatic species - changed habitats in the impounded area - missing sediments downstream	- dismantling of barriers in the water course - recreation of connectivity (e.g. remove barriers or build fish passes and ramps)
Conflicts in case of facilities which impound rivers. Synergies in aims to retain water in the landscape (more slowly water transport through a near natural river compared to a straightened concreted river).			
- keep resource recreation stable or increase it	<b>Fishing</b> - income generation - sports	- “wrong” species - over-fishing - water pollution through aquatic ponds - missing habitat conditions for fishes and other water related species - missing connectivity for fishes in river streams	- habitat improvement for preferred species - reduction of pollution from aquatic ponds - recreation of connectivity (e.g. remove barriers or build fish passes and ramps)
The fishery support WFD tasks if the abundance of preferred species is expected to be improved. The fishery may do not support WFD tasks if the abundance of preferred species is expected to be reduced (if they are aware of this fact) The sport fishery may be indifferent			
- keep or improve flood protection	<b>Flood Protection</b> - dams, embankments - weirs	- missing connectivity for fishes and other aquatic species - missing connections to former floodplains	- recreation of connectivity (e.g. remove barriers or build fish passes and ramps) - renaturation
Actors of flood protection are more likely to contradict WFD tasks in Germany although in theory flood protection and renaturation can have synergies (problems evolve from the dense settlement very close to rivers especially in cities and fixed			

mental models about technical solutions).			
- sufficient water quantity respectively sufficient deep and wide river profile - for water sport perhaps additionally conservation of pleasant surrounding/ nature experience	<b>Transport way and water sports</b> - concreted river banks - straightening of rivers - pleasant surrounding	- pounding of waves - pollution - disturbance/ damage of sensitive species (e.g. through motor noise) - deterioration of interstitial habitat through repeated dredging out - erosion in the river course through changed flowing conditions	- defining allowed and not-allowed itineraries - defining allowed and not-allowed vehicles - restrictions on the construction of pontoons - renaturation
Actors using rivers as transport way are expected to oppose tasks of the WFD as in most cases the implementation of the WFD brings disadvantages or in the best case no advantages Actors in water sports are expected to be more heterogeneous: E.g. motorized sports would face more restrictions than non-motorized ones and the latter would perhaps enjoy the good of recreation to a greater extent in case of renaturation and reduced traffic.			
- keep sufficient water quality (for human being) and quantity	<b>Swimming</b>	- pollution through swimmers - damages on nature along access ways to rivers/ lakes	- restrictions on access if indicated - reduction of pollution - renaturation
If swimming is not restricted but water quality is improved to make swimming possible, support is expected.			
- conservation - keeping existing water conditions (e.g. groundwater table, flooded areas) - keeping access to heritage for the public	<b>Cultural Heritage</b> - e.g. old water mills - earth heritage	- missing connectivity for fishes and other aquatic species - missing space in former floodplains	- dismantling of barriers in the water course - recreation of connectivity (e.g. remove barriers or build fish passes and ramps) - flooding of former floodplains
Depending on the local conditions there can be several options to align conflicting aims.			
- in case of population growth: keeping space or enlarge usable space for settlements or production	<b>Space</b> - on the water: house boats - settlements - gardens - parks - agriculture	- Missing space for natural water course development - pollution from the catchment area	- deconstruction - renaturation on available space - changes of usages in the catchment area
This constellation can bear conflicts as well as synergies depending on other local factors and interests in spatial planning.			
- keep space naturally/ without buildings	<b>Space</b> - nature conservation - flood protection	- optionally missing space	- renaturation on available space - changes of usages in the catchment area
Actors from nature conservation may be willing to cooperate, however, the opposite is not unlikely too especially in case of different interests in the abundance of preferred species (e.g. in Germany locally institutional interplay between WFD and Nature Conservation Act – differences in time reference points which result in different lists of preferred species for defined ecosystems). To convince nature conservationists is expected to be easier than other actors with conflicting aims because due to the fact that they are environmentalists. Yet, this does not mean that aims are easier to reach especially if the institutions allow no scope for flexible actions (to negotiate common aims in a cooperation process). If a river has more “free” flood plains along its course, settled areas are less prone to floods. Conflicts can arise if created flood plains contain structures which bear other risks in case of floods (e.g. removable material which is able to block tight parts downstream and cause floods there therefore).			
- conserve or improve conditions which are attractive for users	<b>Recreation/ Tourism</b> - good environmental quality (e.g. air, water) - beautiful landscape	- traffic disturbs species - pollution	- restriction on access - reduction of pollution - renaturation
Renaturation can create landscapes that attract tourism to support WFD implementation but expected restrictions could also cause the opposite.			
- conserving or increasing biodiversity as nobody knows whether humans can need it later on	<b>Biodiversity</b>	- “wrong” (not water-related) habitats on space where the river was located in former times	- reconstruction of the former river course
Aims in increasing biodiversity should align with WFD aims as water-related ecosystems are the most biodiverse ecosystems. Conflicts may arise through institutional interplay with nature conservation (see above). In Germany there is no aim of maximizing biodiversity. Instead, rare species to be protected are defined on lists (which could in an extreme example grow on a place polluted with mineral oil). This raises the question of which specific habitat to protect or to restore.			
- retain impounded water	<b>Energy production</b> - dams	- missing connectivity for fishes and other aquatic	- dismantling of barriers in the water course

quantity - retain operation conditions (against clogging with sediments etc.)		species - changed habitats in the impounded area - missing sediments downstream	- recreation of connectivity (e.g. remove barriers or build fish passes and ramps)
There are strong conflicting interests also in case of less disturbing measures, like fish passes due to the fact that these are very expensive. (The conflict potential depends e.g. on who has to pay for costly measures.)			

**Tab. 1 Water-related goods interacting with the implementation processes of the EU WFD**

### *3.2 System Boundaries of Analysis: two cities embedded in sub-basins*

The implementation of the EU WFD in Germany stayed in the responsibilities of the federal states although River Basin Communities (RBC) along the 10 major basins were established. However, no planning competency was transferred to the RBCs.

The cases of Berlin and Hamburg are very interesting for studying polycentric governance. They are located within the same RBC to keep influences of this level constant among the cases. They are special cases in being cities and at the same time federal states. Many different types of water usages and users are assembled within city boundaries and both cities are sharing their river basins with the surrounding federal states. This includes agricultural actors in the system. The basins are crossing several and different kinds of jurisdictional borders in both cases (see Chapter 3.5). As both cities are functionally interlinked with their surroundings by basins and the good ecological status of water bodies within the city is influenced by the activities within the basins no matter whether a part of the basins is located within the city borders or not the system boundaries for analysis are drawn along all basins of rivers flowing at least partially through the jurisdiction of these cities.

### *3.3 Task specificity of involved actors*

Responsibilities and tasks in Berlin and Hamburg are distributed in quite different ways (see Tab. 2 and Tab. 3), also non-state actors are active to different extents. In Berlin there is one authority at the Senate level<sup>14</sup> responsible for the planning of measures to implement the Water Framework Directive on the entire area of Berlin. In contrast to that, in Hamburg the seven districts are responsible for the WDF-planning. However, the kind of planning phase is not completely comparable. Whereas the large planning concepts of Berlin still need to be transformed to a precise planning per Meter, basically by the authorities of construction planning and water course maintenance, in Hamburg the district planning is more close to a detailed construction planning. Next to the districts in Hamburg there is a water management authority at the Senate level which is responsible for pre-planning and has financially a steering function. The pre-planning at Hamburg's Senate level is rather rough and less integrative than plans of the water management authority in Berlin.

In both cities similar actor groups with similar goals can be found, but they play different roles. Many actors which are invited by the water management authority in Berlin to develop integrative plans for the restoration of Berlin's rivers are not reported as relevantly active in Hamburg. This might be due to the fact that the WFD authorities in Hamburg are less ambitious in involving other actors in their planning. On the one hand they avoid some conflicts about contradicting goals in implementing their measures, but on the other hand it seems to be likely that not all conflicts arising from conflicting goals can be avoided forever when not considering actors with contradicting goals. Some of these kind of conflicts were

<sup>14</sup> The authorities of Berlin as a federal state are called Senate, which comprises different houses with different departments. The Senate level is comparable to the Ministry Level within other federal States of Germany. Below the Senate is the district level in Berlin.

already reported there during the conducted interviews, e.g. that the water management authority get plans of the nature conservation authority which are affecting their measures too late to know. Conflicts are breaking out in the very end of planning phases when it is already too late to easily adjust them.

A significant difference between Berlin and Hamburg is the role of Nature Conservation Associations as non-state actors. In Berlin these associations<sup>15</sup> are not actively involved in the WFD implementation processes. In Hamburg some of these associations<sup>16</sup> state WFD goals as some of their own goals instead of referring more to nature conservation (traditionally strongly related to species protection) what would align more with goals of nature conservation authorities. They are initiating several small and larger projects in the realm of the WFD. One of their largest projects they initiated to show the state authorities how public participation in WFD planning should be conducted.

Generally the summarizations of actors and their tasks and goals in Berlin and Hamburg that it can be really measure specific whether the water management authorities may expect support or conflict from their co-players in the system. And also the general abundance of actor groups might be the same among different systems, they do not necessarily need to share the same constellation of matching and contradicting goals.

The comparison of tasks and goals shows where potential conflicts may arise and it seems reasonable that these kind of conflicts need to be addressed by some sort of mechanism (e.g. coordination) to ensure a good performance of the respective governance system (increase effectiveness). Realms of potential synergies could be used to make governance systems more efficient. For further research on the performance of polycentric governance systems this raises the questions what role the distribution of responsibilities/ tasks and goals (with its patterns of potential conflicts and synergies) play for the performance of a system and whether this can be positively influenced without changing the distribution of responsibilities<sup>17</sup>.

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<sup>15</sup> By their own declaration they have enough to do with other projects and are satisfied with how public participation is conducted by WFD planners in Berlin.

<sup>16</sup> To categorize Hamburg's nature conservation associations here as actors with only similar goals is debatable, but their origin is in nature conservation and not in water management and their main purpose is still nature conservation in general and not solely water management, although they are adopting tasks from the water management authorities in Hamburg.

<sup>17</sup> In my opinion, every optimization of a system for governing one good/ problem through changes in responsibilities and distribution of competencies causes changes in the performance of governing other goods in the same system. This does not mean that no changes in responsibilities (like centralization or decentralization) should be pursued, but it seems unlikely that the governance of a large number of goods in one system can be optimized at the same time. That it is why it might be worthwhile to optimize the function of a system within the existing distribution of responsibilities and power.

Tasks of Key Actors	Protection and resettlement of species	Improvement of chemical water quality	Removal of/ bypasses for barriers for fishes and smaller organisms	River restoration/ habitat improvement	No degradation of local flood protection	Near natural water quantity	Elimination of invasive species in and near rivers
<b>(1) Actors with the same tasks:</b>							
Water Management Authority	x	x	x	x	x	x	x
Comparable authorities in the Land Brandenburg	+ (but perhaps different priorities)						
<b>(2) Actors with partially similar goals as (1):</b>							
Water Maintenance Authority	0	0	~	~	x	- (d)	0
Nature Conservation Authority	x~ (a)	+	+	~ (b)	0? (b)	0? (b)	x~ (c)
Water Authority	+ Protection of water related systems in case of new 'constructions' and water usage allowance, but weighing up of all objectives of existing usages and new construction plans in plan-approval procedures						
Fishery Bureau	x~ (a)	0	0	0	0	0	~ (a)
Nature Conservation Associations <i>(locally not very focused on the Water Framework Directive)</i>	x~ (a)	0+	0x	0x	0	0	~ (a)
Berliner Wasserbetriebe (drinking water production & waste water treatment company)	0	+~ (e)	0	0	0	0~ (f)	0
<b>(3) Functionally interlinked actors*:</b>							
Urban Planning	0	0	--	~	0	0~	0
Berlin Forestry Agency	0	0	0~	0~	0	~	~
Monument Conservation Authority	0	0	-	~	--	~	0
Construction Planning	0- Plans of the water management need to be developed by the construction planning authority, but they have no background in ecology and are less willing to coordinate with the water management authority						

**Tab. 2 Responsibilities and goals of decision-making centers in Berlin:** \* goals of these actors fit or do not fit to goals of the water management authority, but goals are never the same; Goal of this actor: x; Matching of Water Management Goals with these of the respective actor: +; Contradictions of Water Management Goals with these of the respective actor: -; Partially contradicting goals (context dependence): ~; Neutral (irrelevant for actor): 0; Unknown: ?; Mixed: first is a tendency, second is the range of possibilities; (a) certain species are preferred; (b) Protection of a certain status (e.g. a problem is cutting trees of a certain size for river restoration); (c) differing definition of invasive 'alien' species; (d) priority of fast drainage and navigability for shipment; (e) For drinking water production a better water quality in certain areas is preferred (refers also to inflowing water from Brandenburg) whereas conflicts arise when waste water treatment should be further improved (it is already highly regulated); (f) Berliner Wasserbetriebe are also responsible for rain water management and prefer without incurring costs on the company

Tasks of Key Actors	Protection and resettlement of species	Improvement of chemical water quality	Removal of/bypasses for barriers for fishes and smaller organisms	River restoration/ habitat improvement	No degradation of local flood protection	Near natural water quantity	Elimination of invasive species
<b>(1) Actors with the same tasks:</b>							
7 Water Management Authorities (one in each district): planning	x	x	x	x	x	x	x
Water Management Authority (senate level): Pre-planning	x	x	x	x	x	x	x
<b>(2) (partially) same goals as (1):</b>							
Water Maintenance Authority (same department as water management in districts)	0	0	~	~	x	- (d)	0
Environmental Protection Authority (one in each district) (a variation of goals among different districts is very likely)	x	?	x	x	0	?	?
Nature Conservation Authority	x~ (a)	+	+	~ (b)	0? (b)	0? (b)	x~ (c)
Water Authority (same department as water management in districts: the head of department may decide in favor of the water management or the water maintenance or may find a compromise)	+ Protection of water related systems in case of new 'constructions' and water usage allowance, but weighing up of all objectives of existing usages and new construction plans in plan-approval procedures						
Fishery Bureau	(Not reported as an involved actor in planning)						
Nature Conservation Associations (very active in the implementation process of the Water Framework Directive)	x~ (a)	0+	x	x	0	0	~ (a)
Hamburg Wasser (drinking water production & waste water treatment company)	(Not reported as an involved actor in planning)						
Creek godparents	+ goals are varying from individual to individual and group to group						
<b>(3) Functionally interlinked actors*:</b>							
Urban Planning	(Not reported as an involved actor in planning)						
Monument Conservation Authority	(Not reported as an involved actor in planning)						
Hamburg Port Authority	-	-	-	-	-	-	0

**Tab. 3 Responsibilities and goals of decision-making centers in Hamburg:** \* goals of these actors fit or do not fit to goals of the water management authority, but goals are never the same; Goal of this actor: x; Matching of Water Management Goals with these of the respective actor: +; Contradictions of Water Management Goals with these of the respective actor: -; Partially contradicting goals (context dependence): ~; Neutral (irrelevant for actor): 0; Unknown: ?; Mixed: first is a tendency, second is the range of possibilities; (a) certain species are preferred; (b) Protection of a certain status (e.g. a problem is cutting trees of a certain size for river restoration); (c) differing definition of invasive 'alien' species; (d) priority of fast drainage and navigability for shipment

### 3.4 Multiple levels of involved actors

Berlin and Hamburg differ in the number of relevant levels as well as in where the key decision-making centers are located. Both Cities share the River Basin Community as a level on top of local implementation. None of them attributed high influencing power of the RBC on how their planning processes are conducted in terms of coordination and public participation. Below the RBC in Berlin two levels can be identified, the Senate level (which matches somehow with authorities in Brandenburg) and the level of Citizens and nature conservation associations. The latter level one is mainly active in participating in info-fora

and workshops initiated by the water management authority. In Hamburg up to four levels with key actors can be identified whereas a hierarchy in levels is difficult to define. There is the water management at the Senate level (a department of the BSU<sup>18</sup>), the water management at district level and citizens being active as creek godparents, in projects of the nature conservation associations or action days in districts and as participants in one of the few experiments with public participation in the planning processes. The nature conservation associations can be considered here as an extra level if the scale is used to identify levels, but this level is interwoven with the other levels through projects of differing scale and differing collaborations with authorities, citizens and very local groups of members of nature conservation associations.

In Hamburg district authorities in water management indicated problems accessing monitoring data collected in the responsibility of the water management authority at Senate level before planning. This caused unexpected conflicts and lowers the performance of that system. For performance analysis of polycentric governance systems this raises the question whether there is a generalizable impact of spreading responsibilities across levels on the performance of a specified good/ problem. Based on transaction cost theory spreading any responsibilities across levels might increase transaction costs for coordination to overcome conflicts if physical distance between actors is increased through this. In the cases of Berlin and Hamburg also the ideological distance between different actors was analyzed and was assumed to be comparable between water management and water course maintenance authorities at Hamburg's district level and Berlins Senate level. Although this pair of groups it located at the same level in each city, in Hamburg water management and maintenance are belonging to one department with one head of department (which functions as the water authority). The interviewed districts indicated that this physical and departmental vicinity lead to better cooperation in implementing WFD measures in line with maintenance measures. Maintenance measures are faster to implement and to a certain extent more cost-efficient than other measures. In Berlin the water management authorities indicated problems to just come together to discuss on one table. This raises the questions whether physical or ideological distances between different decision-making centers are more relevant for the performance of a system and whether lowering the physical distance may help to reduce ideological distances resulting from different goals and backgrounds of actors.

### *3.5 Overlapping: The scale of involved actors*

Both, Berlin and Hamburg, share basins with their surrounding federal states in a similar way. In this form of horizontal functional overlapping they need to solve similar issues with their surrounding counterparts such as water quality and quantity and connectivity of rivers. Issues in river restoration (beside influences on flood protection) create narrower functional overlaps, but would be more effective and/ or more cost-efficient if coordinated across jurisdictional borders. Berlin needs only Brandenburg to consider<sup>19</sup>, whereas Hamburg is sharing basins with the Land Schleswig-Holstein and Lower-Saxony. Both Länder are following different implementation strategies. Hamburg authorities indicated that they just tolerate what Lower-Saxony is doing, because they share only a very small area with Lower-

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<sup>18</sup> BSU = Behörde für Stadtentwicklung und Umwelt (Authority for City development and Environment). In 2015 they separated city development and environment. These kinds of reorganizations happen on regular bases after local elections in Berlin and Hamburg at the Senate level and at district levels. Sub-units as water management may stay together but they belong then to different houses/ Senators. This alters the way whether conflicts between sub-units may be solved in a hierarchical manner within one house or whether the ways to address conflicts are more difficult because the relevant actor is 'sitting in another house' (this refers more to the structure of distributing responsibilities than physical location).

<sup>19</sup> But different decision-making units may be responsible among the different basins.

Saxony and it would be very difficult to agree with both Länder on one implementation strategy to not have two different implementation strategies within the jurisdiction of Hamburg.

In contrast to Berlin, Hamburg additionally features vertical territorial overlapping between the water management of the Senate level and the district level and horizontal functional overlapping among districts within the jurisdiction of Hamburg. As mentioned in chapter 3.3 nature conservation associations are active in various ways, this creates another layer of functional and territorial overlapping specific to each project.

What is not shown here is the overlapping with the numerous other decision-making centers within and around the city jurisdiction – this would draw a very complex picture. However, just to imagine, this picture shows that for every local measure there is varying number of affected or affecting decision-making centers which can form various constellations of coalitions for or against a planned measure. Is there a way that this system performs well without considering all these functional overlaps at least to a certain extent?

It is assumed here that every overlapping of decision-making centers may cause conflicts as well as synergies (if the achievement of goals is coordinated sufficiently). Derived from this systems with more overall overlapping face higher potentials for conflicts as well as synergies. Whether potential conflicts or potential synergies are dominant depends on the constellation of what kind of decision-making centers overlap and the institutional framework (e.g. whether there is institutional interplay next to functional interplay). Based on these assumptions, more overlapping may result in a higher need for conflict resolution mechanisms or coordination to reach a good or more efficient performance. However, based on transaction cost theory (voluntary) coordination seems to be become less likely to happen with an increasing number of different kinds of overlapping at the same area, as the transaction costs for coordination are increasing with the number of decision-making centers. May empirical findings on performance of polycentric governance systems verify this influence of overlapping?

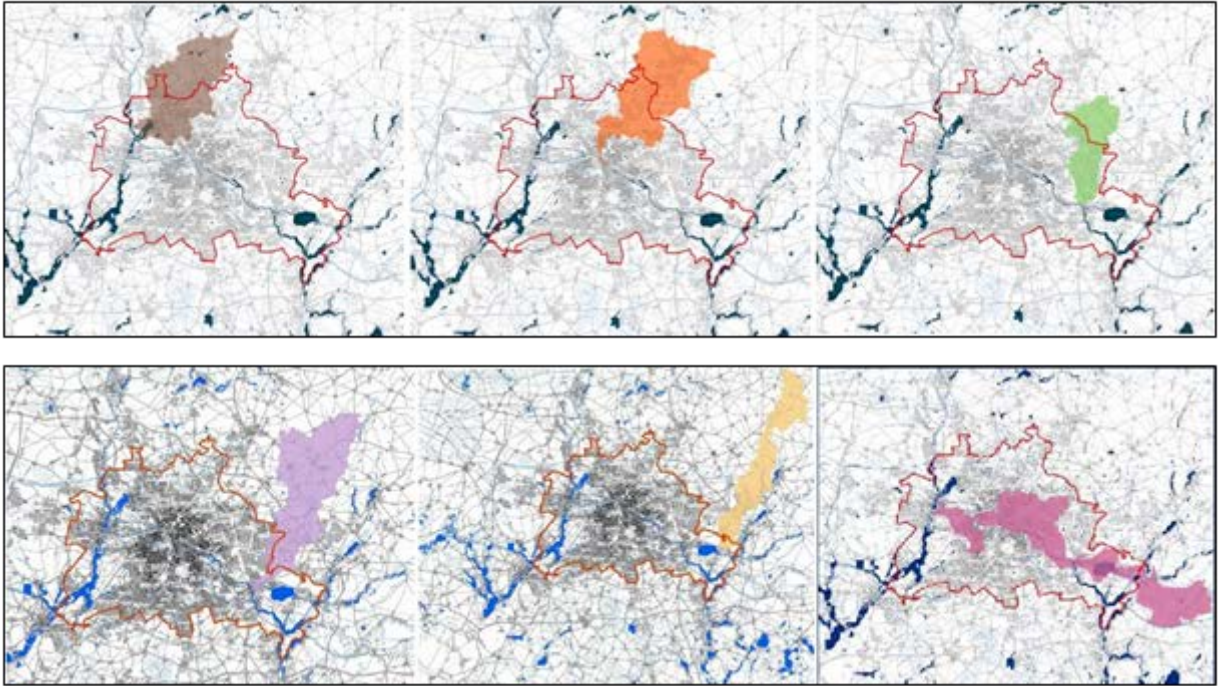
Through territorial overlapping Hamburg shows a higher potential for redundancy than Berlin does. In fact, nature conservation associations as non-state actors started to work on state-responsibilities<sup>20</sup>, but they do that voluntarily. They created this form of redundancy themselves, and even so there needs to be a leeway for other decision-making units to become active fulfilling these tasks (it is questionable whether there is this leeway in Berlin<sup>21</sup>), it seems that this was more a spontaneous development of processes in combination with a longer tradition of creek godparenthoods in Hamburg (since 1986). Whether the territorial overlapping between Senate and districts causes redundancy in way that this is improving performance in Hamburg is difficult to evaluate, in fact they cannot sufficiently take over tasks of each other. This raises the question how strong redundancy of tasks (or the leeway) between decision-making units needs to be that redundancy has the positive effect on system performance that units are fulfilling the tasks of others if these are failing to do so.

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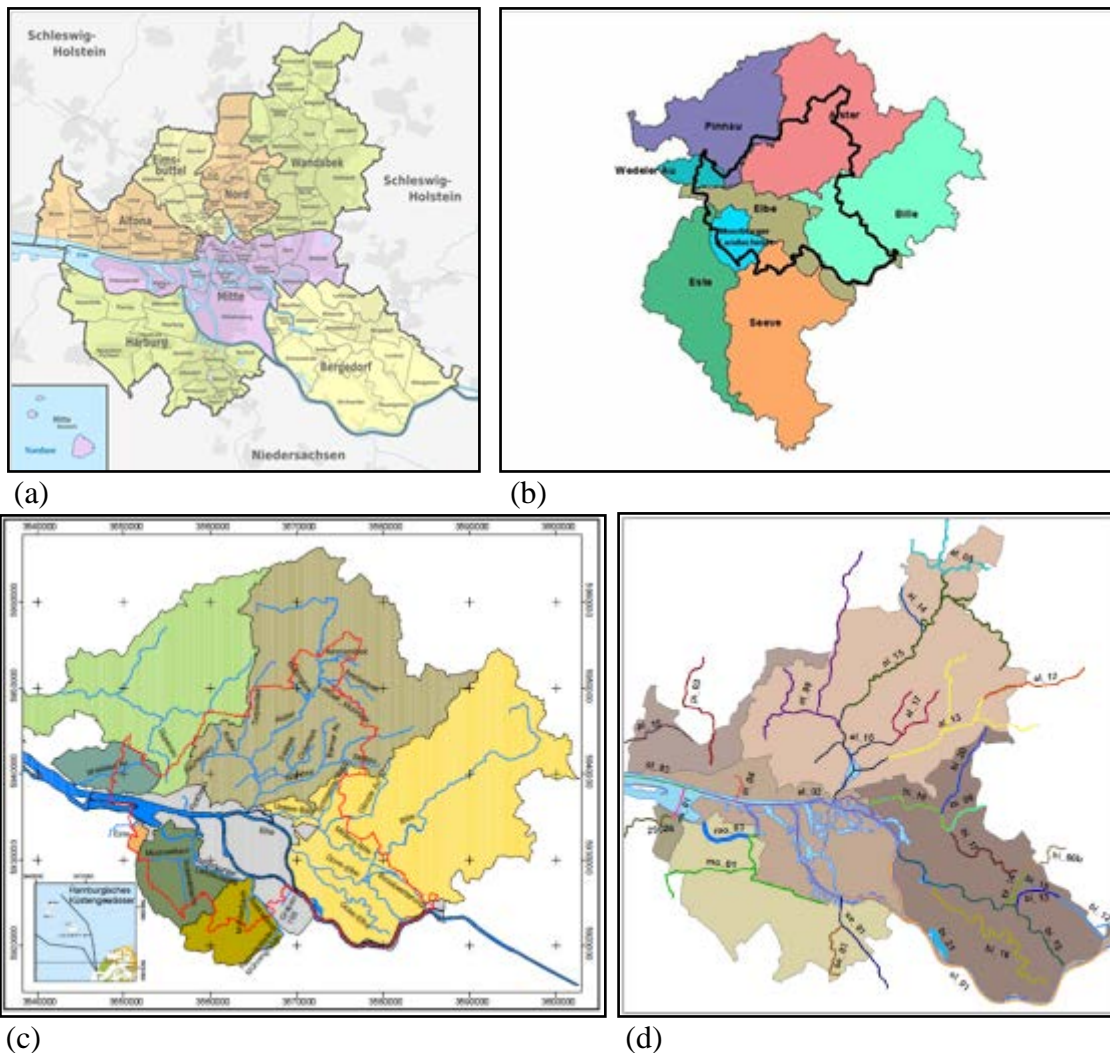
<sup>20</sup> They are on the edge of fulfilling sovereign tasks. Hamburg used its creative leeway to not describe WFD measures in river management plans in detail, because if it is described in detail these tasks become sovereign tasks and then non-state actors are not allowed to do them.

<sup>21</sup> Or, next to the possible discretion the willingness of authorities to let non-state actors dealing with these tasks. The water management in Berlin would like to have activities of associations like in Hamburg, but the unwillingness of the maintenance authority in Berlin seems to be the restricting factor.





**Fig. 1 Sub-Basins of the Land Berlin shared with the surrounding Land Brandenburg:** *horizontal functional overlapping between water management authorities of Berlin and Brandenburg. To integrate planning activities the leading actor is defined for each sub-basin according to the larger territorial share in the basin and whole sub-basin development plans are elaborated.*; Additional overlapping is created with actors which are officially not implementing measures in favor of the Water Framework Directive but in favor of e.g. Nature Conservation, Maintenance of Waterways and drainage systems and drinking water production and waste water treatment.



**Fig. 2 Overlapping Hamburg** (a) 7 Districts within Hamburg and borders to the Land Schleswig-Holstein in the north and to the Land Lower Saxony in the south; (b) Sub-Basins shared among districts and with the surrounding federal states: *horizontal functional overlapping in river basins crossing district and federal state borders*; (c) Designated responsibility of area coordinators on Senate Level of Hamburg, but authority only within borders of Hamburg (red): *vertical territorial overlapping with districts*; (d) Water bodies (parts of similar characterization) in the river network of Hamburg (characteristics between connected water bodies may differ because of e.g. barriers or point pollution): *functional and territorial overlapping in any case non-state-actors implementing measures in the basins of water bodies*; Additional overlapping is created with actors which are officially not implementing measures in favor of the Water Framework Directive but in favor of e.g. Nature Conservation, Maintenance of Waterways and drainage systems and drinking water production and waste water treatment.

### 3.6 Institutional in-/interdependence identified by veto-player constellations

Through the differing distributions of responsibilities as well as the institutional frame organizing the relations between the centers up to a certain extent (e.g. who has veto-power on content and who has veto-power for financial issues) very different pictures can be drawn on interdependence in Berlin and Hamburg.

In Berlin (see Fig. 3) plans of the Senate administration on water management need to be processed by the authority of construction planning and/ or by the authority for water course maintenance. These are strong veto-players as they are able to change the plans in a way which was not intended by the water management. If the plan contains construction plans, it

needs to pass a plan-approval procedure<sup>22</sup> which is conducted by the water authority. The water authority is responsible for weighing up all objections in this plan, to give it back to the water management for changes and to finally decide whether the plan will be implemented in the way it was handed in (this procedure can take several years). Due to the fact that water authorities shall execute the German water law on the protection of surface waters and ground water they are only a veto-player to that extent that they have to weigh up objections of all other affected actors which become indirect veto-players through plan-approval procedures. Two minor veto-players in Berlin are the financial administration (competition for financial resources with other projects) and district authorities (e.g. for the approval of jetties or other regulations on accessing rivers and river banks).

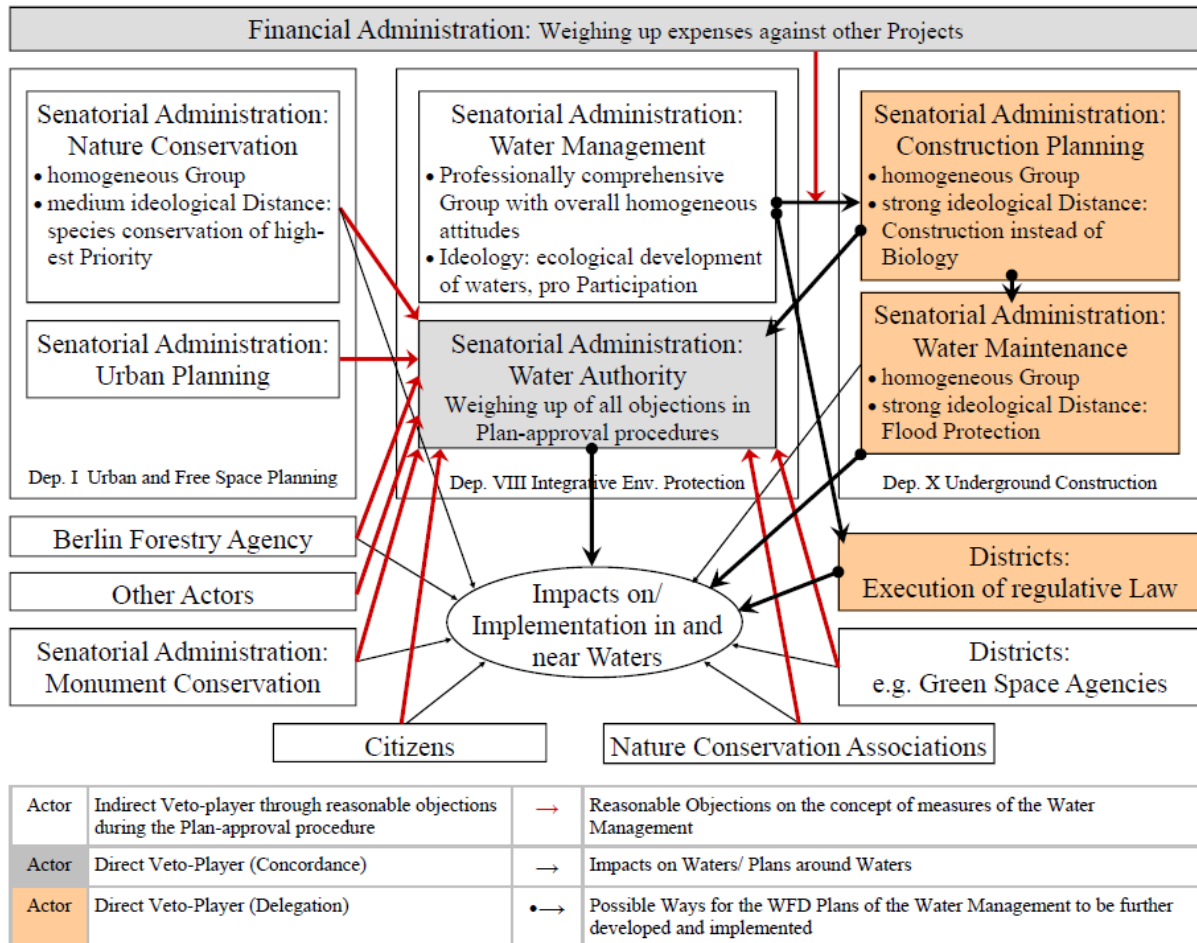
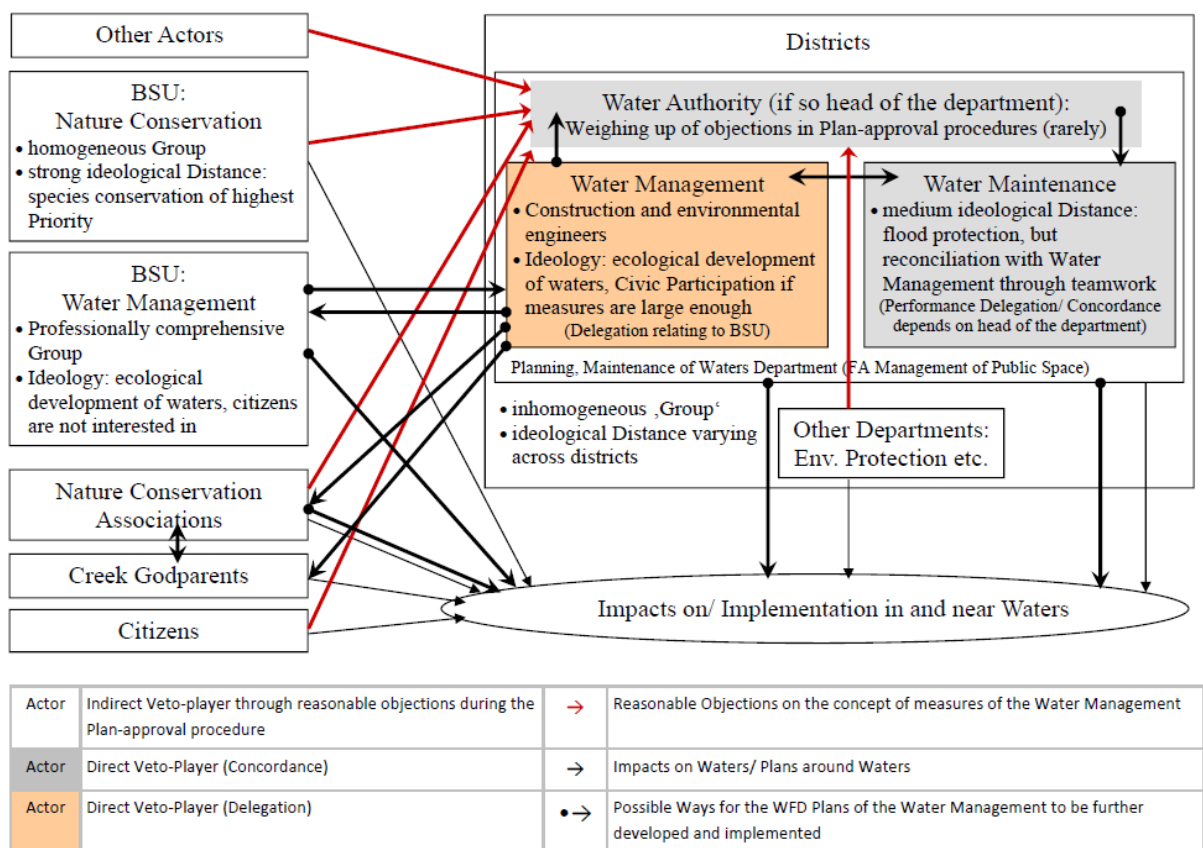


Fig. 3 Veto-player constellations in Berlin

In Hamburg (see Fig. 4) WFD plans are elaborated by district water management authorities. They try to keep the measures as small that it does not need longsome plan-approval procedures, e.g. to declare them as maintenance measures. Basically districts are somehow competing for money what is distributed by the senate water management (the Senate try to spread the money in a way that personnel planning resource of the districts are met too). Conflicts with water maintenance stay within the same department, in case of non-agreement between water management and water maintenance the head of the department is finally deciding (in favor of the WFD or against). The interviewed districts indicated learning processes of personnel responsible for water maintenance (WFD measures do not necessarily

<sup>22</sup> Basically Berlin and Hamburg have the same regulations on when plan-approval procedures and other formal procedures have to be conducted.

need to worsen flood protection), also it took several years. It seems to be positive, compared to Berlin, that water management and water maintenance cannot avoid sitting together on one table to agree on measures. The district water management can be a veto-player for the Senate water management if they want to enforce measures. The Senate water management authority indicated problems when district mayors were not in favor of the WFD because of election campaigns and withdrew personnel capacities away from the district water management departments. Districts can partially avoid the ‘financial’ influence of the Senate through implementing measures financed by nature conservation authorities, nature conservation foundations or other private actors. Partially tasks carried out by creek godparents (individuals or groups). The creek godparents program itself is in some districts supported by the environmental protection/ nature conservation department of the district. By an initiative of one of these environmental departments a ‘gravel pot’ (Kiestopf) was established in 2009 to finance creek action days with the public to bring gravel in the rivers.



**Fig. 4 Veto-player constellations in Hamburg**

Although there are similar actors (defined by their responsibilities) these constellations show how differently they can be institutionally interrelated. It becomes even more complex when responsibilities are clustered in other ways (e.g. in comparisons of international cases).

In their discretion for independent decisions key actors in Berlin and Hamburg are quite similar. Both are relatively free in choosing strategies for public participation (beside the regular official hearings) as well as collaborative planning with other authorities. These decisions are only restricted by the availability of resources of finance and personnel (basically no extra budget public participation in planning procedures), but they seem to face comparable constraints.

In Hamburg, district authorities additionally use their discretion to frame plenty of their measures as maintenance measures to avoid formally provided coordination processes. However, there are also districts experimenting with public participation approaches in their

planning. The Senate water management at the same time manages it to implement some of its ideas for pilot projects through cooperations with non-state actors, given that the senate is officially not allowed to construct measures (since a district administration reform in 2006). These institutional interrelations as well as the discretion of actors add to the tasks/ goals another layer of (potential) conflicts and possibilities for cooperation. These possibilities for cooperation emerge out of the reduced ability of some decision-making centers to reach their goals unilaterally. Due to that fact the willingness to coordinate/ cooperate with other centers might increase. The ability to achieve goals unilaterally, on the other hand, might decrease the willingness to coordinate with others. Aspects of goal achievement for major decision-making centers are included in the figures on coordination (Fig. 5 and Fig. 6). The question may be raised whether the extent of independence and interdependence, or the number and kind of veto-player-positions if in-/interdependence is mapped this way, has a generalizable impact on the performance of a polycentric governance system.

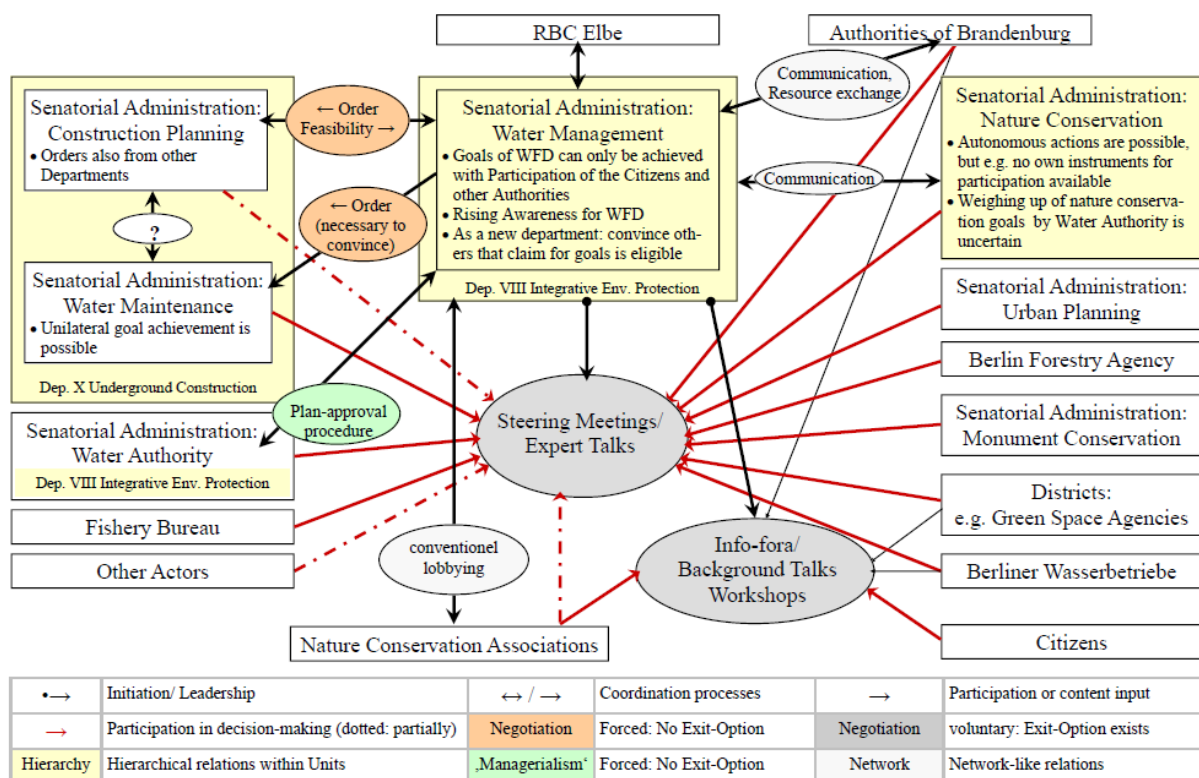


Fig. 5 WFD Coordination processes in Berlin

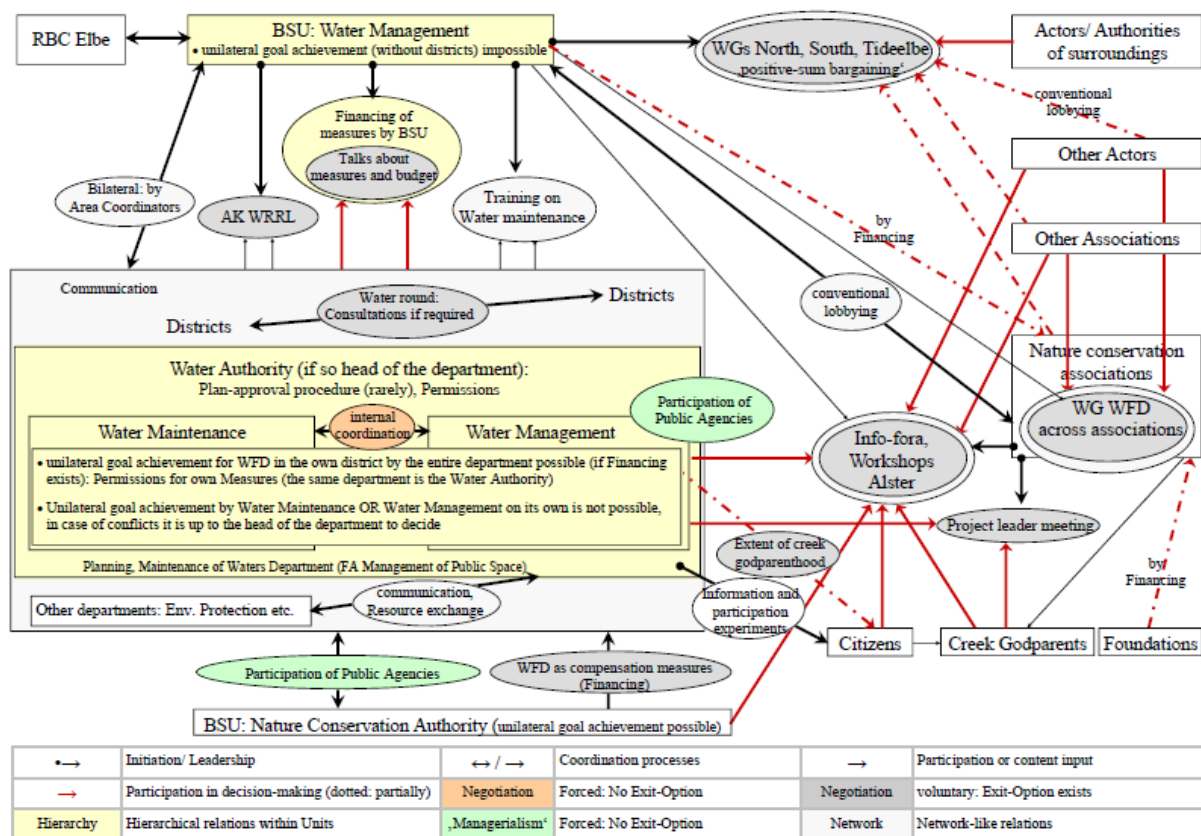


Fig. 6 WFD Coordination processes in Hamburg

### 3.7 The role of coordination in these cases

For some authors coordination is a defining characteristic of polycentric governance systems. Pahl-Wostl et al. [2012] are using high ‘effective coordination’ to distinguish polycentric from fragmented governance regime types. However, with this understanding Polycentricity becomes highly normative and it remains unclear what exactly high coordination is compared to low coordination and how to draw the distinction line in the middle. Galaz et al. [2012] are using communication patterns, ranging from information sharing to very permanent coordinating interactions, and the degree of their formalization to distinguish different systems in their degree of Polycentricity. Though, might a strong formalization of a large number of coordination processes not lead to a lower independence of decision-making centers, is it in this case still reasonable to say that this system has a stronger polycentric order than a system with the same distribution of responsibilities/ functions but a lower degree of formalization of coordination processes between them? A higher degree of formalization might provide a higher reliability, but at the same time it might lower the possibilities of discretion to adjust these processes to changing or varying purposes.

It is assumed here that coordination<sup>23</sup> processes need to fit the purposes to govern the good or problem in an effective (and efficient) way to let a governance system perform well. To fit a purpose, the coordination need to occur in adequate frequency between relevant actors and needs to be formalized adequately, but certainly neither the formalization nor the quantity of coordination alone would provide a good indicator for good performance. Purposes of coordination can be information sharing, the increase of efficiency (e.g. to avoid duplication), the avoidance of negative effects or conflicts, conflict resolution and the use of synergies.

<sup>23</sup> Coordination is used here as a term comprising loose contacts, information exchanges (direct or indirect), consultations, joint projects, joint decision-making, singular and repeated processes, voluntary and forced processes, with varying intensities, qualities, frequencies.

(The quality of processes in terms of legitimacy and democracy, e.g. derived from research in collaborative governance, can be evaluated separately if useful.)

This paper has no hidden intention to argue for or against the inclusion of coordination in the definition of polycentric governance systems, but it shall show that the actual shape of interactions between decision-making centers is a very important variable in making governance systems well performing or not. It is argued here that two systems which are characterized by the same distribution of responsibilities (tasks and functions of different actors), with the same functional interlinkages and overlapping, may perform differently on the one hand due to different institutional interdependencies, but on the other hand, if this variable is kept constant too, also due to their ways of using their discretion. Beside using their discretion to avoid formal mechanisms as shown in the case of Hamburg the decision-making centers may self-organize themselves to a certain extent through voluntary interactions. They may do so with differing priorities and differing degrees of success.

Although Berlin and Hamburg do not share the same way of distributing responsibilities to govern the good ecological status in rivers, they give interesting insights in the role of coordination in polycentric governance systems.

Fig. 5 and Fig. 6 map the coordination processes in Berlin and Hamburg. They can show which actors are connected by coordination mechanisms, but they cannot show the frequency of processes. In Berlin the water management authority attempts to get all relevant actors within one basin on one table at an early planning stage of the concept. With steering meetings it captures authorities and experts and with Info-Fora/ Workshops it addresses the public. This procedure is followed for each basin to develop an integrative concept which enters later, after the construction detailing (or the change) through the authority for construction planning, the plan-approval-procedure.

In Hamburg, however, there are no such processes for developing measures. Only the local nature conservation association tries to establish a similar process for public participation<sup>24</sup> in a pilot project to show the state authorities how it works. The processes bringing the most actors on one table are the WGs (Working Groups) North, South and Tideelbe. Beside criticism of nature conservation associations how often and when they meet, this working groups only have the purpose to discuss whether transboundary water bodies<sup>25</sup> (across Hamburgs borders) shall be classified as natural, heavily modified or artificial (which has implications on the ecological aims which need to be reached). Processes which bring all district authorities together are the budget talks of the Senate water management (once a year and mostly only on budget), the AK WRRL (working circle of the WFD) on general information exchange on WFD topics and the Water Round which was established among districts for exchange on other water governance topics and which is sometimes used for exchange on WFD topics without the Senate authority. None of them facilitates integrative planning across jurisdictions. In general coordination processes initiated by water management authorities in Hamburg are predominantly bilateral, irregular, unpredictable and often restricted to information exchange. Indicated conflicts due to a lack of public participation and coordination with other authorities during the construction phase (or short time before) is an indicator that conflicts are not treated adequately in favor of well-performance and may increase further later on.

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<sup>24</sup> They 'copied' the public participation concept from Berlin for this project, but they do not conduct steering meetings to bring authorities together. One of the interviewed districts tried to follow the public participation example in a pilot project for 100 m of a river. The copy of the copy was already significantly watered-down.

<sup>25</sup> Actually these groups are only addressing water bodies not the whole rivers in their full length containing these water bodies.

### *3.8 WFD Implementation progress in Berlin and Hamburg*

In general the progress of WFD implementation measures is difficult to evaluate and compare. Although if data on the construction process of projects would be easily accessible for the public, it would be difficult to state whether e.g. one project of removing a damn is the same, more or less progress than e.g. a project to restore 100 m of a river course. This complicates performance measures concerning the WFD in general.

In Berlin (status 2014: [Schröder, 2014]) are only a few river restoration measures constructed yet (e.g. in pilot projects). This is due to the fact that the first elaborated water measure development concept (Gewässerentwicklungskonzept) for the river Panke (the concept was finished in 2009) is still in the plan-approval procedure<sup>26</sup>. Concepts for further river basins were already developed but did not enter the plan-approval procedures by 2014. By 2014 the water maintenance authority could be only convinced to have a few experiments in changing maintenance practices in favor of the Water Framework Directive. Much further progress can be observed in the improvement of the mixed sewer system to reduce water pollution by over-spill during heavy rainfalls and the construction of rainwater treatment facilities by Berliner Wasserbetriebe. Indeed, these measures were already planned before the former Berlin regulation on waste water was replaced by the Water Framework Directive.

Hamburg achieved already a higher share of measures in construction phase or completed, but with a large number of connectivity measures (which are easier to be identified as tasks). Hamburg's authorities are not developing large integrated plans as Berlin is doing it and they only have a few attempts to involve other actors beside the water maintenance authorities.

Performance evaluation in the context of the WFD cannot be only the progress in constructions. Following the regulation of the WFD the planning should be integrative and the measures should be cost-efficient, this means that it should be evaluated during the planning process where along a river course measures are most cost-efficient. In comparison to Berlin this kind of planning does not happen in Hamburg. One of the reasons is that districts get finances only for planning within their own jurisdictions, this increases transaction costs for coordination additionally, which are already high if an agreement for cooperation in planning between two or more actors is needed. For joint and integrated plans they would need to authorize separately planning bureaus which then should create one plan which fulfils the contract regulations of all participating districts.

The third performance aspect for WFD measures is the real ecological outcome, which is in many measures not a guaranteed status. It is uncertain. It is not for sure that the construction of all measures finally results in reaching the aim of a good ecological status or potential. Next to all interrelated usage interests in European waters this is another reason for requesting planning in an integrative manner. Hamburg is now faster in constructing measures but will it reach the same, better or worse ecological results once it will be comparable with Berlin?

## **4 Conclusions**

This paper shows, also if only a minimum definition for polycentric governance systems is used - multiple de-facto independent but functionally overlapping decision-making centers are governing a certain good or problem within certain system boundaries - the operationalization of individual definitional elements 'multiplicity', 'in-/interdependence', 'overlapping', 'centers', 'governance', 'system' and 'boundaries' may alter pictures completely. Yet, analyzing these different elements carefully in a system gives interesting insights in the basic structure of that system as a precondition for interactions between decision-making centers which in turn affect the performance in governing that good or problem within the system

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<sup>26</sup> No progress was reported on websites of the Berlin water management authority by May 01<sup>st</sup> 2016.  
<http://www.stadtentwicklung.berlin.de/umwelt/wasser/eg-wrrl/de/inberlin/panke2015.shtml>



boundaries. Nevertheless, much further research is necessary how these elements are influencing the functioning of that system individually and in combination with each other. The analysis of centers and their multiplicity is giving insights in who is influencing the outcome, although some of the centers might not participate in processes intended to govern the specific good or problem, as well as how their tasks and goals may cause conflicts and synergies between them. The overlaps map where the potential conflicts and synergies as well as redundancy might appear. The institutional in-/interdependence patterns arrange the centers through their social relations, but these do not need to be much formalized. With increasing independence the discretion, but not necessarily the willingness, of centers to self-organize for cooperation and conflict resolutions may increase to, but interaction patterns might become more spontaneous and less predictable.

The cases of the EU Water Framework Directive implementation in Berlin and Hamburg have shown that, overall, both are characterized by a multiplicity of decision-making centers, but that it is highly relevant how responsibilities, functions, power and resources are distributed among them and among levels as well as the degree of distribution among key actors in relation to the distribution among actors with similar goals and only functionally interlinked actors. Overall, both might be called polycentric according to a minimum definition, but in terms of key actors directly responsible for the implementation of the WFD, Berlin's structure is significantly more centralized than Hamburg's structure.

The coordination patterns in both cases vary significantly in terms of purposes, quantity/frequency and quality. These patterns, however, shift their ability to address conflicts and to use synergies which are set out there through the underlying structure with goals, tasks and overlapping of actors. It throws another light on both cases. If only the construction progress for WFD measures is considered, Hamburg looks like out-performing Berlin. However, underlying conflicts are merely addressed in coordination processes in Hamburg. They might break through at a later date, some of them were already mentioned to happen in the construction stage.

For performance analysis of polycentric systems in comparisons this paper set out a number of important questions to be answered in further research.

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