

Article

Transformation to Healthy Water Ecology—Institutional Requirements, Deficits and Options in European and German Perspective

Moritz Reese

Helmholtz Centre for Environmental Research, 04318 Leipzig, Germany; moritz.reese@ufz.de

Abstract: The EU Water Framework Directive (WFD) obliges EU Member States to achieve good ecological status in all surface waters by 2027 at the latest. In many regions, this implies fundamental transformation from engineered water landscapes back to near-natural structures. By example of the German State of Lower Saxony it is shown how this transformation of water landscapes essentially requires a transformation of the institutional foundations of water management, too. It is argued from a legal perspective that certain general, justiciable minimum requirements are to be deduced from the WFD as to (1) planning and enforcement of restoration measures, (2) land acquisition, (3) organisation and (4) finance which delimit the ample margins Member States enjoy in designing the institutional substructure. With regard to Lower Saxony, it is explained why this State is clearly failing to meet the minimum requirements and how it needs to transform its institutional arrangements to make them fit for purpose. The article concludes that WFD enforcement should pay more attention to the institutional underpinning and it submits that examples and benchmarks should be further explored by comparative research.



Citation: Reese, M. Transformation to Healthy Water Ecology—Institutional Requirements, Deficits and Options in European and German Perspective. *Sustainability* **2021**, *13*, 3368. <https://doi.org/10.3390/su13063368>

Academic Editor: Andrzej Wałęga

Received: 23 February 2021

Accepted: 17 March 2021

Published: 18 March 2021

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2021 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Keywords: EU water framework directive; Germany; Lower Saxony; ecologic water quality; river restoration; planning; organization; finance

1. Introduction

The EU Water Framework Directive (WFD) [1] is a pioneering piece of transformative environmental legislation aimed at long-termed implementation of ambitious environmental quality objectives by a planned, cyclic and integrated river basin management approach. By adopting the Directive in the year 2000, the EU Member States committed themselves to involve all relevant actors in order to achieve a good ecological and chemical status of surface waters by 2015 or—by exemption—by 2027, at the latest. Although, today, the regular implementation period has long passed and the ultimate 2027 deadline is coming into sight, many states are still far away from fully achieving the status objectives [2]. As to ecological status, only about 40% of the European surface water bodies were in a good status at the outset of the 2nd management cycle [2] (p. 23). Germany belongs to the states particularly lagging behind with around 90 % of its water bodies still missing the targets, many of them by far [2] (p. 31). Significant implementation deficits have also emerged in other EU Member States. Recently, 22 states were addressed by a Commission's pilot query as first step towards official infringement procedures on diverse aspects of the WFD implementation [3]. As was already shown by earlier implementation reviews, the WFD is suffering from serious implementation gaps in most Member States [2,4].

In the meantime, the sobering state of implementation has also amplified fundamental doubts against the WFD, criticising its objectives and target-oriented management approach as overambitious, inapt and unenforceable [5,6]. The EU Commission, instead, has concluded from its "Fitness Check" in 2019 that the WFD needs no revision and that all parties should focus on more effective implementation [7]. Hence, the ambitious experiment of the WFD is now approaching its ultimate practical and political litmus test. It is

now that Europe and its Member State need to find out precisely why implementation is not proceeding at sufficient pace and what should be done to accelerate it.

As a contribution to such scrutiny, this article aims to show—by the example of the German State of Lower Saxony and with a focus on ecological river restoration—how progress towards the ecologic transformation targets may suffer, above all, from a persisting lack of essential institutional underpinnings. Moreover, it is submitted from a legal perspective that certain general and justiciable minimum requirements are to be deduced from the WFD as to (1) planning and enforcement of restoration measures, (2) land acquisition, (3) organisation and (4) finance which delimit the ample leeway Member States enjoy in designing their institutional substructure. With regard to Lower Saxony, it is explained why the state is clearly failing to meet these minimum requirements and how it needs to revise and substantially transform its institutional arrangements to make them fit for purpose.

Although the analysis presented below is focused on the example of Lower Saxony, it is assumed that the findings are relevant for many other European states and regions. From previous assessments, it appears that most EU Member States have avoided substantial restructuring of their institutional arrangements [4,8], and the widespread delays in ecological restoration are providing increasing evidence that the predominant business-as-usual approach is inapt and fails to meet the deeper transformation requirements of the WFD. Hence, the example of Lower Saxony is also used to incite a stronger European debate on legal minimum requirements of institutional implementation. Beyond the legal perspective, this article also aims to outline development options for the institutional wheelwork of ecological river restoration and to inspire further R&D projects in that regard.

After a brief explanation of the underlying material and methods, we proceed by explicating: the ecological objectives and basic instruments of the WFD, their general transposition in German law and the lack of progress in terms of measures and ecological quality (Section 3); the underlying institutional implementation deficits in Germany and its State of Lower Saxony, in particular (Section 4); the illegality of these deficits in light of the WFD (Section 5); and possible options to overcome the deficits and move forward towards the 3rd management cycle (Section 6). The article closes with some conclusions on the basic institutional requirements of ecological transformation in water management and beyond (Section 7).

2. Materials and Methods

The article presents results and insights from a broader study that the author has conducted with a group of investigators on behalf of the German State of Lower Saxony [9]. In this study we analysed (1) the relevant legal requirements and the implementation deficits in the state, (2) the structural causes behind and (3) possible ways to adapt the institutional arrangements to the WFD requirements. By the notion of “institutional” arrangements, we mainly refer to established legal, organisational and fiscal orders. The concept of “social institutions”, as is known, has found various interpretations according to the particular heuristic context [10].

This study combines legal interpretation and implementation analysis and builds strongly on previous exploratory work of the relevant administrations as well as text mining, qualitative interviews and intense exchange with stakeholders [11]. The broader study also includes economic analysis of the financing schemes, which, however, is not presented below as this article is more focused on the legal and regulatory perspective. To some extent, this perspective does include the manifold “non-legal” research regarding challenges of institutional fit and design associated with the WFD and its integrated approach [12]. However, the present analysis is less aimed at advancing the theoretical groundwork of political implementation theory or at tracing the diverse manifestations of WFD implementation than explicating, indeed, “hard” legal implementation requirements and pertaining development needs.

3. The Ecological Restoration Objectives and Key Implementation Challenges

3.1. Transformation of the Surface Water Landscape to Good Ecological Status or Good Ecological Potential

Art. 4 WFD obliges Member States to “protect, enhance and restore all bodies of surface water (. . .) with the aim of achieving a good ecological and a good chemical status by the End of 2015”. The “good ecological status” is defined in Annex V as showing only slight deviations from the pristine “high status” one would find in a (reference) water body of the same type in the absence of human impacts. Leading status criteria is the composition of species of that reference water body subdivided into the compounds (1) phytoplankton, (2) macrophytes and phytobenthos, (3) benthic invertebrate fauna and (4) fish.

Hydromorphological and chemical conditions are only referred to as supplementary criteria. However, it is apparent from the assessment reports that hydromorphological conditions are a dominant reason surface waters do not achieve a good ecological status in many European regions next to nutrient and pesticide pollution from agricultural sources [2]. Improving the ecological status of rivers and streams mostly requires, above all, two things: (1) a restoration of nearly natural hydromorphology with sufficient passage, natural banks, side structures and floodplains, meanders, littoral vegetation etc., and (2) a strong reduction of nutrient and pesticide emissions from agricultural fertilisation [13] (p. 23) [14]. Restoring natural structures often implies considerable construction work and, hence, high investment. In any case it requires sufficient land in the periphery of the water bodies which in most cases is agricultural land thus to be acquired from farmers. In some cases, renaturation objects also come into conflict with further uses such as, in particular, flood-protection for settlements, navigation or energy production.

With regard to all these uses—and for agriculture in particular—the ecologic objectives of the WFD imply a principle change of course in water management. In a long history, waters were basically only managed and engineered to facilitate exactly these human purposes and, most notably, farming, settlement and navigation. In many regions—and especially in lowlands—rivers were strongly altered, converted into waterways, straightened by bank reinforcements and dikes, regulated by locks, barrages and weirs and cut off from floodplains and wetlands through dams and dikes. Engineered water landscapes were long praised as blessings of technological development and enablers of intensive land-use [15]. Institutions, laws and agents of water management were mainly determined to maintain domesticated water landscapes while protection of aquatic ecology was mostly limited to protected areas and regulated under nature protection law, not water law. Beyond these areas, water engineers hardly paid attention to water ecology. Under the WFD, this has fundamentally changed. The Directive has made healthy ecology a prior objective of water management requiring ubiquitous restoration towards near natural structures. This includes a recast of existing water body structures and, as the case may be, also a retraction of uses—predominantly of agricultural kind [13] (p. 88).

However, the WFD does not neglect those human uses that depend on previous accomplishments of water engineering. In fact, it seeks a compromise by lowering its ecological quality objective with regard to water bodies that were artificially built or strongly modified in order to facilitate human purposes as mentioned above. According to Art. 4.3 WFD, such “artificial or heavily modified water bodies” (AHMWB) are to achieve a “good ecological potential”. Read in connection with the conditions of AHMBW designation (Art. 4.3), this special target requires renaturation only in so far as the measures would not have “significant adverse effects on” the human purposes served by the modifications (4.3(a) WFD) [16]. This term is, of course, open for interpretation especially as regards the question of when adverse effects are to be considered “significant”. Is it, for example, a significant effect on agricultural land-use if farmers have to relinquish riverine premises for the restoration of natural structures that were historically removed to enable extended farming? In the CIS Guidance Document No. 4, the notion of significance has been convincingly interpreted as requiring socio-economic weighing and precluding only minor effects with regard to the total scope of the effected human activity [17]. In German implementation

practice, accordingly, the concepts of AHMWB and “good ecological potential” have not been applied as precluding, for example, structural renaturation on farmed land. The German river basin plans and programs also demonstrate that a lot can be done to improve AHMWBs by recasting the modifications in a more environmental friendly fashion and by resorting to modern technologies of eco-friendly water engineering (fish passes, ecological stepping stones, etc.) [18].

Of course, such renaturation measures are often costly and difficult to design. In order to be both effective and cost efficient, they need to be developed within a coherent restoration concept and with due regard to the ecologic and economic context both locally and in the wider catchment [19] (p. 56). This is why river restoration requires a planned implementation process as is provided by the Directive (Section 3.2 below). Planning, adapting, funding and actually executing such measures regularly takes time and resources and can sometimes even be overly costly. Moreover, there is often considerable uncertainty as to whether and in what timespan the measures will eventually be effective in the light of the WFD status criteria. This is why the Directive provides a set of exemptions allowing for revision, deadline extensions and, to a limited extent, also an adaption of the objectives (Section 3.3 below).

3.2. The Planned and Cyclic Transformation Approach

The WFD obliges Member States to develop their pathways and measures to good water status by means of River Basin Management Plans (RBMPs, Art. 13 WFD) and Programs of Measures (PoMs, Art. 11 WFD). RBMPs basically comprise a comprehensive mapping of all water bodies and a description of the status quo, determined quality objectives, exemptions, implemented measures, projected effects and trends, economic analysis and monitoring programs (Annex VII of the WFD). Based on the RBMPs, the PoMs must determine the measures that will be taken to achieve good status in each water body. The PoMs shall be coordinated within the catchments with the aim of determining cost-efficient combinations of measures. RBMPs and PoMs are to be revised every six years. The first planning/management cycle lasted from 2009 to 2015, the ongoing second cycle extends to 2022 and the 3rd cycle is currently under preparation. In principle, Member States were obliged to achieve the status objectives within the first management cycle, i.e., by December 2015. However, as mentioned, the Directive acknowledges that this regular time-frame may not be adequate in some cases and therefore provides some room for adaption and improvement in subsequent cycles.

3.3. The Exemptions: Deadline Extension (Art. 4.4) and Lowered Objectives (Art 4.5)

According to Art. 4.4 WFD, Member States are allowed to extend the 2015 deadline with regard to single water bodies for two further management cycles (6 years each and until 2027 at the longest), if they provide evidence by their management plans that completing the improvements within the timescale would be disproportionately expensive or infeasible due to technical reasons or natural conditions. Further than this, Member States may also determine less stringent objectives as far as they prove that completing the improvements would be disproportionately expensive or infeasible even in the long run and beyond the 2027 horizon.

All exemptions assume that every reasonable effort is taken to minimise deviation from the regular quality objectives and achieve, at least, best possible status. In any event, a detailed motivation must be provided in the RBMPs in order to make the use of exemptions transparent and to facilitate effective participation and review (Art. 4.4(d) and 4.5(d) WFD) [16]. At the same time, it is obvious that the exemptions provided in Article 4 WFD are very vaguely formulated, thus leaving ample room for interpretation and administrative discretion especially about disproportionality of costs [20,21]. All the more it is important that the use of exemptions is embedded in a transparent planning and participation process [20].

3.4. Legislative and Administrative Implementation in Germany—Basic Orientation

For basic understanding of the German Case presented herewith, it is important to bring into mind the federal structure of the Country and the distribution of competences following its particular approach of “administrative federalism” [22]. Essentially, this means that the federal level holds broad and preemptive legislative competences while it is for the (sixteen) regional states to implement and execute the federal laws. It is the paramount responsibility of the regional states to provide adequate administrative capacities and fiscal means for effective implementation. As part of their executive role the states are competent to regulate by state laws details of implementation as well as issues not exhaustively covered by federal legislation.

With regard to the WFD, federal legislation has mostly limited itself to transposing the Directives’ stipulations literally to the German Water Act (Wasserhaushaltsgesetz-WHG) and has barely provided supplementary clarifications or instrumentation. The WFD regulations on water quality objectives and exemptions were basically copy-pasted to Sec. 27–31 WHG and the stipulations on RBMPs and PoMs to Sec. 83 and 82 WHG. Sec. 7 WHG transposes the obligation to coordinate water management within the river basins but it does not provide particular forms or procedures. In sum, it is widely left to the regional states to develop the legal, organisational and fiscal substructure for effective implementation (with federal waterways partly forming an exemption). Therefore, the present implementation analysis is focused mainly on the states level and on the example of Lower Saxony, in particular.

3.5. The Wide Implementation Gap and Vast Use of Exemptions in Germany and Particularly in Lower Saxony

Germany—along with many other Member States—widely failed to meet the regular 2015 deadline. At that time, only around 8% of the surface water bodies were reported to achieve a good ecological status. As a consequence, deadline extensions were extensively used—for more than 90% of the surface water bodies—in the first management cycle, and even in the ongoing second management cycle this rate has not significantly changed [11] (p. 20) [9] (p. 152). The explanations given for these exemptions in the RBMPs mainly refer to technical and economic barriers to structural renaturation. Most frequently, they point to: lacking availability of riverside spaces; lack of capacities at local implementation levels; duration of planning and permitting processes; and duration of natural attenuation [4] (p. 114).

These implementation barriers appear to be particularly high in the German State of Lower Saxony where the overall situation of water ecology is even worse. By December 2015 only 2% of the rivers were reported to be in a good status and improvements in the lower quality classes were limited to a few percent [23]. In the second management cycle, too, no significant improvements are expected and, hence, deadline extensions until 2027 were used almost ubiquitously across the state. The reasons why Lower Saxony is so far behind in improving its ecological water quality are twofold: on the one hand, this is owing to the geography of the state with its vast areas of fruitful lowlands and a strong tradition in water engineering and intense agricultural land-use. As to its initial situation, this region is certainly among those furthest from the ideal of the WFD. On the other hand, the poor progress is also strongly owing to institutional and fiscal implementation deficits as will be explained in the following.

4. The Institutional Implementation Deficits in Germany and Lower Saxony in Particular

4.1. Lack of Concrete and Binding Implementation Planning

River restoration is—as explained above—a complex undertaking and demands coordination of various measures and multiple stakeholders on local and catchment scales. It thus requires effective planning regimes extending from basin to local scales and leading to concrete implementation plans with binding measures and timelines. Prima facie, the WFD planning instruments (RBMP and PoMs) are framed as catchment-scale plans. However, the wording of Art. 82 WFD suggests that PoMs are to determine concrete

and binding measures, and this effectively implies that local implementation plans be established as an indispensable part of the planning approach. Apparently, this requires Member States to supplement the catchment scale planning by a local planning level where specific local issues are adequately assessed and solved. Local restoration planning is essentially needed for regulating local conflicts and coordinating restoration projects with relevant spatial plans and developments. Moreover, it is an indispensable means for assessing and realising synergies with flood-protection and nature conservation objectives and capacities [19] (p. 56) [9] (p. 219). It is for these grounds that informal planning approaches for “river development” (Gewässerentwicklungspläne) have already been developed for selected river stretches back in the 1990s when river restoration was merely a matter of nature conservation and performed in selected sites only [9] (p. 140, p. 219). When the restoration task was extended to basically all streams by the WFD, it should have been clear that adequate planning instruments would need to be established and made obligatory on a ubiquitous basis. However, this is not exactly how the planning needs were tackled in Germany, and Lower Saxony in particular.

In accordance with the WFD, the German states have set up, coordinated and reported their RBMPs and PoMs on the river basin level. As the river-basin scale is quite large, often extending over several states, it is perceivable that basin-wide programmes cannot accommodate detailed local measures and implementation plans. As a consequence, the PoMs adopted for the 1st and 2nd management cycles did not include such measures. Rather, they only listed the general types of measures that would need to be taken for each water body to achieve good ecological status or potential. Hence, the PoMs do not determine where exactly, when and by whom the measures are to be taken.

Local planning instruments to solve these questions have not been established formally, so far. In contrast, Lower Saxony and most other German states have framed their PoMs explicitly as a “planned offer” (Angebotsplan) to the local agents and left it basically up to them to decide, when, where and by whom—and even if at all—these types of measures will be implemented on the ground. Hence, the planned approach of the WFD is not effectively extended to the level of local action. Specification and implementation of the PoMs is, instead, basically left to voluntary action of the local agents.

Instead of enforcing binding implementation plans, Lower Saxony has tried to facilitate local action by soft initiatives and fiscal support [24]. In particular, the state has devised informal regional WFD-implementation districts and initiated so-called “area-cooperation” of local communities and stakeholders as bottom-up facilitators of local restoration projects. Moreover, it has established a special restoration initiative (“Water-Alliance”) providing some additional staff and financial support for a selection of prioritised water stretches.

In the first term of WFD management, these bottom-up initiatives did harvest some low-hanging fruits but the potential of voluntary action was quickly exploited [11] (p. 60). It soon became clear that voluntary implementation ends abruptly wherever it meets with manifest opposing interests. Such interests are vastly present in Lower Saxony, mostly represented by farmers who have a strong stance in regional politics and widely refuse to accept higher flood risks, pay significant contributions or even relinquish land for river restoration purposes.

4.2. Lack of Effective Land Access

Ecological restoration of channeled waters is, however, rarely possible without access to riverine land. Since in most cases this land is in private hands and it is rarely possible to simply buy it on the market, Member States must also provide and use compulsory acquisition instruments including dispossession, land-swap and adequate compensation schemes. According to German water law, it is basically possible to expropriate private premises for purposes of ecological water construction (esp. Sec. 71 WHG) [9] (p. 123). Nevertheless, all German states have refused to avail themselves of incisive expropriation means. This is, of course, closely connected to the “voluntariness” approach the state governments have principally taken and to the lack of concrete local planning. Expropriation

does not match such a soft approach and compulsory acquisition of land would regularly require a formal restoration plan that justifies why exactly the affected plot is needed for the renaturation purposes.

4.3. Lack of Clear Responsibilities and Adequate Actors

It is self-suggesting that effective action requires clear responsibilities and adequate actors. Member States must clearly assign the diverse tasks of ecologic water construction and maintenance to capable public or private agents. Since ecological restoration implies various new tasks which are often contrary to traditional user-oriented water management, it may not be adequate to simply rely on existing responsibilities—especially where these refer to private users like farmers, land-owners or waterway users. While in the traditional system these actors were intrinsically motivated and could be obligated as beneficiaries, the situation is essentially different with ecological restoration. Nevertheless, German states have often refrained from reshaping responsibilities and thus induced considerable uncertainties, inner resistance and responsibility gaps.

In Lower Saxony and in further northern German regions, management of smaller and intermediate waters is traditionally organised as a matter of regulated self-government by so-called “Water-Associations” (WAs) (also Schleswig-Holstein, Brandenburg). WAs are regularly composed of the land owners and users in the territorial realm of the association. As a rule, the spatial scope of WAs is rather small; 107 WAs currently share the territory of Lower Saxony. Historically, WAs were established—often centuries ago—by the landowners as joint forces to promote land drainage, flood protection, straightening of streams, and further measures of user oriented water engineering and maintenance [25] (p. 173). This self-governed approach of water management has been generally regulated as an organisational option by a federal “Water Association Act”, but it remains to state legislation to make WAs responsible for water management measures (maintenance and construction).

As regards the new tasks of ecological restoration, Lower Saxony mainly went on by extending the traditional responsibility of the WAs for surface water maintenance to the new assignments which were introduced by federal water law as requirements of “ecologic maintenance”. As to measures of water construction—including structural renaturation—the state upheld its traditional entitlement to oblige WAs on a case-basis. However, this entitlement has not been used for renaturation purposes as a consequence of the “voluntary approach”, nor have state authorities taken responsibility themselves.

WAs, in the meantime, have assumed divergent attitudes towards their new role as protagonists of ecological restoration. Interviews and practice reviews revealed that some WAs—especially bigger ones—show remarkable willingness to take on this role, and they refer to laudable examples of successful renaturation projects. Nevertheless, these examples remain exemptions whereas the majority of WAs clearly refuse to accept costly ecological responsibilities, and this does not come as surprise. These WAs are dominated by farmers and primed by their traditional self-conception as user-oriented landscape-managers [11] (p. 27). They are often far too small and ill-equipped to adequately implement major renaturation projects. It could not reasonably be expected that these agents would voluntarily transform the landscapes they have historically built to match their vital economic interest. It is rather obvious that the aspired ecologic transformation of these landscapes requires a clear departure from traditional user-based agents and responsibilities.

In this regard, the organisational setup in Lower Saxony appears particularly inadequate and other regions and states seem to have better solutions in place [9] (p. 156) [26] (p. 212):

- A community-based approach of local responsibility (e.g., Baden-Württemberg, Rhineland-Palatinate and partly also North-Rhine Westphalia) ascribes a leading role to municipalities sometimes also as part of WAs. At the municipal level, ecological water management usually meets with a more balanced mixture of interests, more adequate capacities and closer links to spatial planning, water and nature protection authorities. Communities can also avail themselves of well-established procedures of intermunicipal cooperation to manage regional issues and enable coherent catchment concepts.

- The basin association approach (North-Rhine Westfalia) builds on huge associations covering larger catchments as for example those of the *Ruhr* [27], *Emscher* [28] or *Wupper* [29] rivers. These associations take over a wide array of water management and service tasks for large regions, involve communities and state agencies, generate large funds and hold strong capacities to also tackle renaturation measures.
- A state-based approach (e.g., Bavaria) basically ascribes the responsibility to state water authorities. This brings into play a more powerful actor depending, however, on the shape and fiscal equipment of local water authorities.
- The Dutch water boards (*Waterschappen*) are frequently mentioned as an example to follow in water management organisation [30] (p. 74) [31] [9] (p. 159). They merge state and local agents to take on, in particular, tasks of water construction and maintenance. The Dutch water boards govern larger catchment areas, have far-reaching competences and they rely on a special water tax paid by every resident in the district. Hence, the Dutch water boards are comparatively powerful agents. However, they do not seem to particularly use their capacities in favor of ecologic water management as in The Netherlands improvements of the ecological water status are not significantly higher than in Germany [2] (p. 26).

The above overview gives an impression of how the task of ecological restoration could be underpinned in organisational terms so as to provide sufficient capacities and a stronger representation of the ecological objectives versus traditional user interests. Yet, it is clear that the user interests will remain an overriding force as long as there are no clear and enforceable obligations to plan and execute adequate restoration measures, and even then will implementation deficits remain unless sufficient funding and staff is provided from public sources.

4.4. Lack of Public Investment and Deficient Funding Schemes

Building adequate capacity and providing sufficient funds is certainly a most eminent requisite of implementation and a foremost responsibility of the Member States. In this regard, too, the German states and Lower Saxony in particular have failed to meet the demands of the WFD. Investigations showed that the state has invested far too little in new staff and equipment. Neither the local water authorities nor the responsible central agency have enjoyed significant capacity building. Officials explained that available staff is by far too small to tackle all relevant water bodies simultaneously and that tight capacities make it necessary to concentrate forces on a small selection of prioritised river stretches [11] (p. 19), [32] (p. 19).

Next to adequate manpower, restoration projects require considerable funds to be provided either from public households or the WAs and land- or water-users respectively. WAs have largely refused to accept ecological measures as a task they can pass on to their members cost-wise within their regular fees. Therefore, they basically only accept renaturation projects if—nearly full—public funding is safely granted.

As to household funds, Lower Saxony has pursued a rather mean policy. As a principle, the state has decided to limit public funding to required co-financing of EU funds. Hence, the state relies mainly on the “European Agricultural Fund for Rural Development” (EAFRD) as the EU’s major allocation instrument for rural development including green restructuring projects. Under this premise, state officials have estimated that a total of around 180 Mio. € will be available from EU and state sources for river restoration projects between 2009 and 2027 [9] (p. 189). In contrast, they estimate that a budget of at least 750 Mio. € would be needed to accomplish the ecological status objectives in the priority water bodies alone (which make for 9500 of 18,000 reported stream-kilometers). Apparently thus, surface water restoration is strongly underfinanced in Lower Saxony.

The extensive referral to EU regional funds implies further problems relating to the daunting conditions of the relevant EAFRD programs. Far too long procedures, legal insecurity, high reclamation risks, pre-financing burdens and co-payment requirements are

increasingly deterring WAs and other actors [11] (p. 21). Absurdly, this is currently leading to a strong recession of activities in times when action should urgently be boosted.

5. Illegality of the Institutional Gaps

The previous demonstrates that Germany's insufficient progress in improving its surface water ecology is strongly related to manifest deficiencies in institutional implementation. In legal terms, these institutional deficiencies are to be appraised as a breach of the WFD and the EU treaty respectively [9] (p. 78). The European Court of Justice (ECJ) has clarified by longstanding adjudication that Member States are obliged to effectively implement Directives as to both targets and instruments and that they are obliged to take all necessary measures in legal, organisational and fiscal terms to actually achieve the targets and to implement and supplement the instruments to that effect [33,34]. As to the WFD in particular, the ECJ has stated in several judgments that the environmental targets of the Directive are binding objectives [35,36]. Consequentially, their implementation must not be made subject to voluntary action of local actors [9] (p. 78). In the light of the binding character and in accordance with the strict regulation of the exemptions the PoMs are to be interpreted as binding, too, and, therefore, as requiring concrete and transparent local implementation plans. Importantly, a lowering of targets for "disproportionate costs" according to Art. 4.5 WFD presupposes a realistic estimation of implementation costs which can only be conducted on the basis of concrete and binding implementation plans [37]. The EU Commission has, therefore, rightly urged Germany to present such planning and data when invoking further exemptions for the 3rd management cycle [38] (p. 119). However, it is very doubtful that Germany and its states will be able to accomplish this legal requirement on the basis of its insufficient institutional groundwork and previous practice [14]. Too little has been done up until now to improve the institutional setup and boost local implementation in planning, land acquisition, capacity and finance.

6. Possible Ways Forward in the 3rd Management Cycle

How can and how should Germany and other EU states and the EU as a whole deal with these far-reaching implementation deficits? Furthermore, what can be learned in view of the 3rd management cycle and the ultimate 2027 deadline?

As to Germany and its regional states, it is—apparently—high time to tackle the above mentioned implementation gaps and provide, in particular:

- A formal planning regime for local river restoration as supplement to the river-basin wide PoMs that determines concrete measures, responsibilities and timelines, provides for meaningful participation, is well integrated in the adjacent context of spatial planning, nature and flood protection and sets a solid basis for fiscal calculations and—as necessary—land acquisition and target exemptions;
- Based on the latter, tailored instruments and compensation programs for land acquisition;
- Development of adequate organisations/agents for the planning and execution of measures with sufficient power and a balanced composition suited to both include and hedge dominant user interests;
- Adequate public finance and administrative capacity and development of effective funding programs and support.

All these essential requirements of effective WFD implementation refer, of course, to fundamental institutional supplements that take time to develop and should have been established—ideally—before the 1st management cycle. Today, on the brink of the ultimate 3rd cycle, these basic steps will certainly come too late to fully retain the 2027 implementation schedule. Besides, we still do not observe notable political efforts to seriously tackle these institutional challenges.

Certainly, Germany is not alone in this laggard position, as is clearly demonstrated by the status assessment of the European Environmental Agency [2] (p. 23), the EU-Commissions' implementation report [39] and its recent infringement pilot [3]. These

official assessments and literature, too, indicate that other Member States are similarly behind and stuck in insufficient institutional and fiscal arrangements.

It is remarkable that, despite these fundamental backlogs, the Commission has advised against amending the WFD and not even conceded a one-time extension of the target deadline for a further management cycle (to 2033). It will be very interesting to see how the Union and the authority of its (water) law will come out of this unprecedented legal pull test.

7. Conclusions and Call for More In-Depth Comparative Research in Transformative (Water) Governance

In any event, lessons to be learned on all levels of implementation are about the importance of effective institutional substructures. The importance of local implementation (planning) regimes, adequate organisational restructuring and adapted funding schemes has too long been neglected. The EU commission has invested great effort to monitor the implementation process and involve the Member States in the “Common implementation Strategy”. However, these efforts were mainly focused on technical aspects and on coherent interpretation of various vague terms of the Directive whereas the institutional grounding was widely kept as a black-box of national authority.

Likewise, on the national and subnational levels, institutional transformation needs were underestimated. Too little effort was spent to assess adequacy of traditional systems and explore concrete development needs and options. For the German part, the exploratory work underlying this contribution constitutes a rare exemption of governmentally commissioned reflection of these gaps and opportunities. Next to the problem analysis, it also assessed concrete development options to improve the institutional settings and adapt them to the demands of transformative water management.

Of course, there is ample room for maneuver as to how to adapt the institutional settings (including fiscal) to the requirements of effective WFD implementation, and it is up to each state and region to develop and fine-tune their arrangements in accordance with its specific preliminaries. However, as is demonstrated by legal analysis, they are all to adhere to certain minimum requirements and benchmarks deriving from the regulations of the Directive in the light of the EU treaty, the ECJ jurisdiction and the principle of effective implementation (*effet utile*). These minimum requirements include an effective planning system reaching down to the local level of implementation, effective means of land acquisition, adequate organisational underpinning and sufficient funding.

In order to promote the development of these indispensable, mandatory foundations of WFD implementation, further effort should be taken to assess design options, examples, and benchmarks beyond the legal measure and especially in a comparative perspective. WFD research has, of course, always been aware of the institutional challenges and manifoldly studied the implications of basin-wide, integrated and planned water management [12]. However, much of that research remained rather descriptive and was based on earlier implementation phases where settings were still under development and the potential and (mal-)performance could not be fully evaluated [12]. More recent case studies, in-depth comparative evaluations—as presented, for example, by Wiering et al. [40]—and transdisciplinary efforts in institutional development still remain exemptions.

We therefore submit that this field of research should be canvassed more intensively and comparative projects be launched to explore examples to follow and common benchmarks for institutional implementation. Advanced knowledge is needed to facilitate both institutional developments at national and subnational levels as well as effective oversight by the EU Commission. As regards implementation of the WFD’s ecological transformation targets, eminent points of comparative interest were outlined above and relate to:

- how the top-down long-termed targets can be effectively broken down from river basin via water bodies through to concrete local measures, responsibilities and timelines. This includes the quest for effective planning instruments and implies complex challenges of coordination, participation, participation, adaptiveness, amongst others;

- how states handle the fact that considerable amounts of riverine lands are needed to be rededicated to natural uses and how they facilitate and compensate land acquisition;
- how the costly, controversial and laborious tasks of river restoration are allocated and managed in organisational terms including, in particular, the question how to break up traditional user-oriented structures, engage change agents and build powerful transformation alliances;
- how public households and users can be engaged, costs allocated and funding schemes (including EU co-funding) amended to ensure sufficient financial resources.

While these questions are eminent for achieving the WFD restoration targets, in the first place, they are—to considerable extent—similarly important in other fields of transformative governance as, in particular, greenhouse gas mitigation or ambient air pollution policy. In these fields, too, the EU has established long-termed environmental targets and obliged Member States to devise and implement national transformation paths. In these fields, likewise, Member States are to develop effective planning regimes, new organisational structures and fiscal foundations. The research called for above will thus also yield to the growing field of overarching transformation governance science.

Funding: This research received funding from the German State of Lower Saxony.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data referred to in this article is contained within the article.

Conflicts of Interest: The author declares no conflict of interest.

References

1. Directive 2000/60/EC of the European Parliament and of the Council Establishing a Framework for the Community Action in the Field of Water Policy of 23 October 2000, OJ L 327. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32000L0060> (accessed on 15 March 2021).
2. European Environmental Agency. European waters—Assessment of status and pressures, Report No. 7/2018, July 2018. 85p. Available online: <https://www.eea.europa.eu/publications/state-of-water> (accessed on 15 March 2021).
3. European Commission. *Pilot procedure EUP 2020/9796 of 20.11.2020*; European Commission: Brussels, Belgium.
4. European Commission. *Report from the Commission to the European Parliament and the Council on the Implementation of the Water Framework Directive (2000/60/EC) and the Floods Directive (2007/60/EC)—Second River Basin Management Plans*; SWD (2019) 41 Final; European Commission: Brussels, Belgium, 2019. Available online: <https://eur-lex.europa.eu/legal-content/GA/TXT/?uri=CELEX:52019DC0095> (accessed on 15 March 2021).
5. Reinhardt, M. Inventur der Wasserrahmenrichtlinie. *Natur Recht* **2013**, *35*, 765–773. [CrossRef]
6. Hering, D.; Borjab, A.; Carstensen, J.; Carvalho, L.; Elliott, M.; Felda, C.K.; Heiskanen, A.S.; Johnson, R.K.; Moeh, J.; PontAnne, D.; et al. The European Water Framework Directive at the age of 10: A critical review of the achievements with recommendations for the future. *Sci. Total Environ.* **2010**, *408*, 4007–4019. [CrossRef] [PubMed]
7. European Commission. *Commission Staff Working Document: Fitness Check the Water Framework Directive, Groundwater Directive, Environmental Quality Standards Directive and Floods Directive*; 10.12.2019 SWD (2019) 439 Final; European Commission: Brussels, Belgium, 2019.
8. Lifferink, D.; Wiering, M.; Uitenbogart, Y. The EU Water Framework Directive: A multi-dimensional analysis of implementation and domestic impact. *Land Use Policy* **2011**, *28*, 712–722. [CrossRef]
9. Reese, M.; Bedtke, N.; Gawel, E.; Klauer, B.; Köck, W.; Möckel, S. *Wasserrahmenrichtlinie—Wege aus der Umsetzungskrise, Rechtliche, organisatorische und fiskalische Wege zu einer richtlinienkonformen Gewässerentwicklung am Beispiel Niedersachsens*; Nomos: Baden, Germany, 2018; 248p.
10. Miller, S.; Social Institutions. The Stanford Encyclopedia of Philosophy; Edward, N.Z., Ed. 2019. Available online: <https://plato.stanford.edu/archives/sum2019/entries/social-institutions/> (accessed on 15 March 2021).
11. Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten-und Naturschutz (NLWKN). *Pilotprojekt Maßnahmenakquise und Teilprojekte NLWKN. Abschlussbericht (Final Report)*; Niedersächsischer Landesbetrieb für Wasserwirtschaft, Küsten-und Naturschutz: Göttingen, Germany, 2012; 95p.
12. Boeuf, B.; Fritsch, O. Studying the implementation of the Water Framework Directive in Europe: A meta-analysis of 89 journal articles. *Ecol. Soc.* **2016**, *21*, 21. [CrossRef]

13. Umweltbundesamt (German Environmental Agency). Die Wasserrahmenrichtlinie, Deutschlands Gewässer, 2015. p. 23. Available online: https://www.umweltbundesamt.de/sites/default/files/medien/1968/publikationen/final_broschure_wasserrahm_enrichtlinie_bf_112116.pdf (accessed on 15 March 2021).
14. Bund/Länder-Arbeitsgemeinschaft Wasser (LAWA). Vorgehen für eine harmonisierte Berichterstattung in den Bewirtschaftungsplänen und Maßnahmenprogrammen für den dritten Bewirtschaftungszeitraum, December 2020. Available online: https://www.lawa.de/documents/lawa_hintergrunddok_harmonisierte_berichte_final_1613467422.pdf (accessed on 15 March 2021).
15. Konold, W.; Ellen, K.; Brux, H.; Schirmer, M.; Scholle, J.; Binder, W.; Patt, H.; von Keitz, S.; Schrenk, G.; Schackers, B.; et al. Mensch und Fließgewässer. In *Fließgewässer und Auenentwicklung, Grundlagen und Erfahrungen*, 2nd ed.; Patt, H., Ed.; Springer: Berlin/Heidelberg, Germany, 2016; pp. 77–183.
16. Reese, M. Commentary on Sec. 27 WHG. In *GK-WHG*; Schink, A., Fellenberg, F., Eds.; Beck: Munich, Germany, 2021.
17. European Commission. CIS Guidance Document No. 4, Identification and Designation of Heavily Modified and Artificial Water Bodies, p. 26. 2003. Available online: <https://circabc.europa.eu/> (accessed on 15 March 2021).
18. Bund/Länder Arbeitsgemeinschaft Wasser (Ed.) Handbuch zur Bewertung und planerischen Bearbeitung von erheblich veränderten (HMWB) und künstlichen Wasserkörpern (AWB)—Version 3.0. 2015. Available online: <https://www.flussgebiete.nrw.de/hmwb-handbuch-7136> (accessed on 15 March 2021).
19. Speed, R.; Li, Y.; Tickner, D.; Huang, H.; Naiman, R.; Cao, J.; Lei, G.; Yu, L.; Sayers, P.; Zhao, Z.; et al. *River Restoration—A Strategic Approach to Management*; UNESCO: Paris, France, 2016; 202p. Available online: <https://unesdoc.unesco.org/ark:/48223/pf0000245644> (accessed on 15 March 2021).
20. EU Commission. CIS Guidance Document No. 20 on Exemptions to the Environmental Objectives. 2009. Available online: https://circabc.europa.eu/sd/a/2a3ec00a-d0e6-405f-bf6660e212555db1/Guidance_documentN%C2%B020_Mars09.pdf (accessed on 15 March 2021).
21. Boeuf, B.; Fritsch, O.; Martin-Ortega, J. Undermining European Environmental Policy Goals? The EU Water Framework Directive and the Politics of Exemptions. *Water* **2016**, *8*, 388–403. [CrossRef]
22. Reese, M. Distribution of Powers. In *Vinuales/Lees, Oxford Handbook on Comparative Environmental Law*; Oxford University: Oxford, UK, 2019; pp. 678–702.
23. Niedersächsisches Ministerium für Umwelt, Energie und Klimaschutz. *Niedersächsischer Beitrag zu den Bewirtschaftungsplänen 2015–2021 der Flussgebiete Elbe, Weser, Ems und Rhein nach § 118 des Niedersächsischen Wassergesetzes bzw. Art. 13 der EG-Wasserrahmenrichtlinie*; Niedersächsisches Ministerium für Umwelt, Energie und Klimaschutz: Hanover, Germany, December 2015.
24. Lower Saxony, Environmental Ministry. Available online: https://www.umwelt.niedersachsen.de/startseite/themen/wasser/eg_wasserrahmenrichtlinie/umsetzung_in_niedersachsen/die-umsetzung-der-eg-wrrl-in-niedersachsen-7371.html (accessed on 15 March 2021).
25. Kluth, W. *Funktionale Selbstverwaltung*; Mohr-Siebeck: Tübingen, Germany, 1997; 592p.
26. Sachverständigenrat für Umweltfragen (German Advisory Council on the Environment) Für eine entschlossene Umweltpolitik in Deutschland und Europa—Umweltgutachten 2020 (Environmental Policy Report 2020), Berlin, 555p. Available online: https://www.umweltrat.de/SharedDocs/Downloads/DE/01_Umweltgutachten/2016_2020/2020_Umweltgutachten_Entschlossene_Umweltpolitik.html (accessed on 15 March 2021).
27. Ruhrverband. Available online: <https://www.ruhrverband.de/en/home/> (accessed on 15 March 2021).
28. Emschergerossenschaft and Lippeverband. Available online: <https://www.eglv.de/en/> (accessed on 15 March 2021).
29. Wuppverband. Available online: <https://www.wuppverband.de/> (accessed on 15 March 2021).
30. OECD. Water Governance in The Netherlands—Fit for the Future? 298p. Available online: https://read.oecd-ilibrary.org/governance/water-governance-in-the-netherlands_9789264102637-en#page129 (accessed on 15 March 2021).
31. Havekes, H.; Koster, M.; Dekking, W.; Uijterlinde, R.; Wensink, W.; Walkier, R.; Water Governance. The Dutch Water Authority Model, Den Haag. 2017. Available online: <https://www.dutchwaterauthorities.com/wp-content/uploads/2017/08/Water-Governance-The-Dutch-Water-Authority-Model-2017-1.pdf> (accessed on 15 March 2021).
32. Bund/Länder Arbeitsgemeinschaft Wasser (LAWA). Weitere Vorschläge an die UMK zur Erreichung der Ziele der WRRL, Decision of 17.10.2018, 4p. Available online: https://www.umweltministerkonferenz.de/documents/top_25_lawa-wasserrahmenrichtlinie_anlage_1545313820.pdf (accessed on 15 March 2021).
33. European Court of Justice, judgement of 25.11.1992, C-337/89, No. 24. Available online: <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A61989CJ0337> (accessed on 15 March 2021).
34. European Court of Justice, judgement of 19.11.2014, C-404/13. Available online: <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A62013CJ0404> (accessed on 15 March 2021).
35. European Court of Justice, Judgement of 1.7.2015, C-461/13—Weser. Available online: <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX%3A62013CJ0461> (accessed on 15 March 2021).
36. European Court of Justice, judgement of 4.5.2016, C-346/14. Available online: <https://eur-lex.europa.eu/legal-content/DE/TXT/?uri=CELEX:62014CJ0346> (accessed on 15 March 2021).
37. Reese, M. Voraussetzungen für verminderte Gewässerschutzziele nach Art. 4 und 5 WRRL. *Zeitschrift für Umweltrecht (ZUR)* **2016**, *27*, 203–215.

-
38. European Commission. *Commission Staff Working Document Second River Basin Management Plans. Member State: Germany, Brussels*; 26.2.2019, SWD (2019) 41 Final; European Commission: Brussels, Belgium, 2019. Available online: <https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SWD:2019:0041:FIN:EN:PDF> (accessed on 15 March 2021).
 39. European Commission. *Commission Staff Working Document. European Overview—River Basin Management Plans; Brussels*; 26.2.2019, SWD (2019) 30 Final; European Commission: Brussels, Belgium, 2019. Available online: <https://eur-lex.europa.eu/LexUriServ/LeExUriServ.do?uri=SWD:2019:0030:FIN:EN:PDF> (accessed on 15 March 2021).
 40. Wiering, M.; Liefferink, D.; Kaufmann, M.; Kurstjens, N. *Final Report: The Implementation of the Water Framework Directive—A Focused Comparison of Governance Arrangements to Improve Water Quality*; Radboud University: Nymegen, NL, USA, 2018. Available online: <https://repository.ubn.ru.nl/bitstream/handle/2066/199699/199699pub.pdf> (accessed on 15 March 2021).