



Water governance diversity across Europe: Does legacy generate sticking points in implementing multi-level governance?

Jenny Rowbottom, Morten Graversgaard, Isobel Wright, Karl Dudman, Susanne Klages, Claudia Heidecke, Nicolas Surdyk, Laurence Gourcy, Ines Amorim Leitão, António Dinis Ferreira, et al.

► To cite this version:

Jenny Rowbottom, Morten Graversgaard, Isobel Wright, Karl Dudman, Susanne Klages, et al.. Water governance diversity across Europe: Does legacy generate sticking points in implementing multi-level governance?. Journal of Environmental Management, 2022, 319, pp.115598. 10.1016/j.jenvman.2022.115598 . hal-03717169

HAL Id: hal-03717169

<https://brgm.hal.science/hal-03717169>

Submitted on 8 Jul 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Water governance diversity across Europe: Does legacy generate sticking points in implementing multi-level governance?

Jenny Rowbottom^a, Morten Graversgaard^{b,c,*}, Isobel Wright^a, Karl Dudman^{a,d},
 Susanne Klages^e, Claudia Heidecke^e, Nicolas Surdyk^f, Laurence Gourcy^f, Ines Amorim Leitão^g,
 António Dinis Ferreira^{g,h}, Susanne Wuijts^{i,j}, Sandra Boekholdⁱ, Donnacha G. Doody^k,
 Matjaž Glavan^l, Rozalija Cvejić^l, Gerard Velthof^m

^a Lincoln Institute for Agri-food Technology, University of Lincoln, Lincoln, LN6 7TS, UK

^b Department of Agroecology, Aarhus University, Blichers Alle 20, 8830-DK, Tjele, Denmark

^c Centre for Water Technology (WATEC), Aarhus University, Aarhus, Denmark

^d Institute for Science Innovation and Society, University of Oxford, 64 Banbury Road, Oxford, OX2 6PN, UK

^e Coordination Unit Climate, Johann Heinrich von Thünen-Institute, Bundesallee 49, 38116, Braunschweig, Germany

^f BRGM, F-45060 Orleans, France

^g Research Centre for Natural Resources, Environment and Society (CERNAS), Polytechnic Institute of Coimbra, Escola Superior Agrária de Coimbra, Bencanta, 3045-601, Coimbra, Portugal

^h Instituto Politécnico de Coimbra, Escola Superior Agrária, 3045-601, Coimbra, Portugal

ⁱ National Institute for Public Health and the Environment (RIVM), P.O. Box 1, 3720 BA, Bilthoven, the Netherlands

^j Utrecht Centre for Water, Oceans and Sustainability Law, Utrecht University, Newtonlaan 231, 3584 BH, Utrecht, the Netherlands

^k Agri Food and Biosciences Institute, Belfast, Northern Ireland, UK

^l Department of Agronomy, University of Ljubljana, Biotechnical Faculty, Jamnikarjeva 101, 1000, Ljubljana, Slovenia

^m Wageningen Environmental Research, Wageningen University and Research, P.O. Box 47, 6700 AA, Wageningen, the Netherlands

ARTICLE INFO

Keywords:

River basin approach
 Governance arrangements
 Water quality
 Sticking points
 Diffuse water pollution from agriculture
 Policy implementation
 Compliance

ABSTRACT

The Water Framework Directive (WFD) aims to protect and improve water quality across Europe through an integrative and multi-level water governance approach. The goal is to ensure that water quality in Europe meets good ecological status by 2027. Whilst the WFD has been hailed as a cornerstone for governance innovation in water management, most EU member states (MS) still struggle to achieve good ecological status of their waters. The realignment to a multi-level governance structure under the WFD is discretionary, and has generated diversity in WFD multi-level governance implementation approaches and final governance arrangements across MS. This diversity may contribute to low goal achievement and weak compliance. This paper investigates how visual impressions of legislative structure across nine MS can illustrate and contribute to understanding the differences in multi-level implementation of WFD and associated water protection directives. We explore, in-depth, the drivers of visual differences in Portugal, Germany (Lower Saxony) and France. We hypothesise that many of the challenges of WFD implementation, and resulting governance arrangements can be explained in terms of the legacy effects of previous water governance choices. With this conceptual framework of investigating the history and legacy, we found the three in depth studies have had different starting points, paths, and end points in their water governance, with sticking points influencing the decision-making processes and compliance required by the WFD. Sticking points include the complexity of existing water governance structures, lobbying by different sectors, and the mandatory WFD timeline for implementation. Portugal had to resolve its focus on water infrastructure and engineering to enable a re-focus on water quality. France and Portugal experienced 'top down' governance at different points in time, slowing the shift to a multi-level governance system. Lower Saxony, representing just one of 16 federal state systems in Germany, highlighted the complex historic governance structures which cannot easily be restructured, generating a layering effect where new governance systems are fitted to old governance systems. We conclude that there is a need to implement a hybrid approach to water governance and WFD implementation including decentralisation (discretionary) to ensure collaboration and engagement of stakeholders at the local level. This hybrid governance system should run in

* Corresponding author. Department of Agroecology, Aarhus University, Blichers Alle 20, 8830-DK, Tjele, Denmark.

E-mail address: Morten.Graversgaard@agro.au.dk (M. Graversgaard).

<https://doi.org/10.1016/j.jenvman.2022.115598>

Received 2 July 2021; Received in revised form 27 May 2022; Accepted 19 June 2022

Available online 7 July 2022

0301-4797/© 2022 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

parallel with a centralised (mandatory) governance and regulatory system to enable national environmental standards to be set and enforced. Such systems may provide the best of both worlds (bottom-up involvement of stakeholders meeting top-down goal achievements) and is worthy of further research.

1. Introduction

Safe drinking water is vital for public welfare and contributes to a healthy economy. Throughout the European Union (EU), diffuse pollution from agriculture, viz. nitrates and pesticides, is a major source of contamination of water resources (EEA, 2018). In response, the EU has implemented an extensive set of directives to include the Water Framework Directive (2000/60/EC, WFD), Drinking Water Directive (98/83/EC; 2020/2184/EC, DWD), Ground Water Directive (2006/118/EC, GWD), Nitrates Directive (91/676/EC, ND), and the Directive on Sustainable Use of Pesticides (2009/128/EC, SUD); these have all been transposed by Member States (MS) into national law. Yet, despite several decades of EU and national environmental legislation plus policy implementation, these pollutants continue to be problematic (EEA, 2018). Furthermore, most MS have experienced difficulties in fulfilling and complying with the requirements of the ND and to some degree with the requirements of the WFD (European Commission, 2021; Ptak et al., 2020).

With the introduction of the WFD in 2000, there was a shift from a traditional water governance paradigm to a more holistic, coordinated, integrated and common framework approach to water governance (Wiering et al., 2020), based on the concept of river basin planning, and the requirements of consulting and involving stakeholders in participatory planning (European Commission, 2003). The WFD is based on a common set of baseline requirements with defined procedural requirements, timelines for implementation across all MS, and common and generic targets to achieve 'good' ecological and chemical status for all water bodies by 2027. In addition, the WFD incorporates wide norms across the EU for priority substances (certain pesticides, herbicides and fungicides); these aspects are mandatory with little room for discretion by individual nations. In all other aspects, the WFD offers a high degree of discretion to the MS, with the MS pursuing their own implementation choices, governance arrangements and implementation of Programmes of Measures (PoM) (Keessen et al., 2010; European Commission, 2019a).

One example of a high degree of discretion is the adoption of the river basin planning approach into existing structures at national, regional, and local levels (Nielsen et al., 2013). The MS are relatively free to implement a centralised or decentralised approach in their governance arrangements, understood in terms of where decisions are taken and responsibilities allocated (Liefverink et al. 2009, 2011; Nielsen et al., 2013; Pellegrini et al., 2019). Decentralised implementation refers to a more bottom-up governance structure, where the main decision-making and responsibilities are taken at the provincial, regional or local level. Centralised implementation implies a top-down governance structure, based on a national-level decision-making. Both governance approaches should ensure that decision-making utilises information and knowledge available at all levels of the policy implementation cycle (Newig and Fritsch, 2009; Nielsen et al., 2013; Graversgaard et al., 2018; Graversgaard, 2018). From the common WFD framework, a diversity of water governance systems has evolved across MS. The literature on water governance structures and WFD implementation indeed indicates that MS have approached the implementation of the WFD very differently. Some MS favour decentralisation and the allocation of responsibilities to local municipalities in charge of implementation; in contrast, in other MS, centralised state-level actors are implementing the PoM (Albrecht, 2013; Boeuf and Fritsch, 2016; Bourblanc et al., 2013; Da Silva Costa, 2018; De Vito et al., 2020; Jager et al., 2016; Kastens and Newig, 2007; Kochskämper et al., 2016; Liefverink et al. 2011, 2021; Pellegrini et al., 2019; Watson et al., 2009; Wiering et al., 2020).

Diversity in water governance across the EU as a result of WFD implementation has long been debated in the policy implementation literature. It is argued that three explanations can describe the progress towards the present WFD structures in MS. First, the 'legacy effect'¹ of pre- WFD water governance structures in each MS which may result in: (i) a full restructuring to match the WFD framework; (ii) a decentralised water governance framework is already in situ, thus requiring minimal adjustments to be WFD compliant (Pellegrini et al., 2019); (iii) the current water governance structure is very complex so any restructuring just meets the minimal WFD requirements (Maia, 2017).

Second, 'sticking points'² (frequently generated by the legacy effect) are influenced by domestic impact on implementation choice, concerning culture, historical and political stances. Third, the discretionary nature of the WFD has allowed diversity (Jager et al., 2016). The latter explanation is in part supported by the WFD 2019 Fitness Check (European Commission, 2019b). These three causative agents may not work in isolation, with the diversity in implementation of WFD structures across MS being influenced by all or a combination of the three causes.

In 2019, the EU Commission published a WFD fitness check (European Commission, 2019b), investigating the overall effectiveness and condition of WFD implementation across MS. This fitness check concluded that the overall discretionary nature and flexibility of the WFD was one of the causes that impedes achievement of compliance, leading to differences in WFD implementation. The discretionary nature of the WFD has been postulated as a main influencer in MS pursuing their own implementation choices and resulting governance arrangements (Keessen et al., 2010). Less frequently considered is the possibility of how a legacy effect (path dependency) generates resistance to change, together with lock-in mechanisms (which reinforce a pathway) have led to potential sticking points (Waylen et al., 2015), and the future impact on WFD implementation.

Further research on the diversity of WFD implementation patterns is required to provide a greater insight into the differences between MS to inform future directions in water governance policy. The literature on EU policy implementation generally focuses on macro-scale (national and centralised) compliance (Ptak, 2022; Börzel, 2000; Juntti and Potter, 2002; Moss et al., 2004; Keessen et al., 2010). Taking a uniform approach to policy implementation performance neglects the variations in predisposing conditions (Moss et al., 2004; Keessen et al., 2010) and the diversity of implementation patterns (Liefverink et al., 2011; Ptak, 2022). This paper both highlights and identifies gaps in the academic understanding of what determines the degree of diversity and adherence to compliance during WFD implementation; the paper aims to demonstrate how the knowledge gaps are related to i) legacy effects of existing water governance structures, and ii) the sticking points generated through historical, socio-political differences that influenced the implemented WFD governance structure.

Waylen et al. (2015) identify three sticking point types: institutional, cognitive, and political. Institutional sticking points arise from previous working methods and include: i) formal, arising from pre-existing policy, legislation, and plans, and ii) non-formal, arising from existing organisational processes and ways of working. Cognitive sticking points refer to the ways issues are framed and how knowledge is formed. These can be more abstract and difficult to illustrate directly, yet they are experienced (Waylen et al., 2015). An example is the silo culture of

¹ Legacy effect: the persistence of impacts/structure/policies which remains from an earlier time.

² Sticking points: an obstacle to progress towards an agreement or goal.

sectoralism and the resultant work culture, which stifles the ability to collaborate across different sectors who maybe in competition for similar resources e.g., water. Finally, political sticking points arise from pre-existing power relations and the tendency to use power to defend existing interests and benefits.

In this study, we use visual impressions to strengthen the concept of water governance diversity across the implementation of the EU WFD directive and four water quality-related directives (Drinking Water Directive, Ground Water Directive, Nitrates Directive, and the Directive on Sustainable Use of Pesticides) down to their local implementation within nine MS (Denmark, England, France, Germany (Lower Saxony), Netherlands, Northern Ireland, Portugal, Romania and Slovenia). Using these visual impressions, we investigate if, how, and with what consequences the range of MS have implemented multi-level governance structures for the WFD related to pesticide and nitrogen use and losses in agriculture. The paper probes deeper into the choices made by France, Germany (Lower Saxony) and Portugal during WFD implementation, the function of a legacy effect and sticking points and how that has influenced governance arrangements. It is hypothesised that a better understanding of sticking points (institutional, cognitive, and political), generated through a legacy effect, can impact the implementation of different directives into existing governance structures of the EU MS. Finally, we discuss how these findings can be key for ensuring future compliance of water policies in the EU.

2. Research design and methods

2.1. Comparative case study research design

A multiple case study design was applied to nine MS (Denmark, England, France, Germany [Lower Saxony], Netherlands, Northern Ireland, Portugal, Romania and Slovenia) (Table 1); the case studies were an integral component of the EU Horizon 2020 funded FAIRWAY project.³ The case studies were underpinned by a multi-actor approach in which actors were already involved and considered 'living labs', and this formed the starting point for the multi actor platforms (MAPs), facilitating data collection and exchange across all FAIRWAY work packages. The involvement of the case studies and the MAPs provided opportunity to use a set of different methods for data collection and analysis (Yin, 2013), generating an in-depth comparative assessment of governance arrangements of water related EU Directives in the case studies. This comparative design aimed to seek explanations of similarities and differences, and to better understand WFD implementation of multi-level governance structures in different and contrasting contexts (Bryman, 2012). The case study approach enables the study of legacy effects and factors affecting the context and conditions of WFD implementation. The case study findings provided a rich picture for further comparative research to identify patterns and divergences to discern broader policy implications. The case studies were located in areas with vulnerable drinking water resources (groundwater and surface water) with nitrates and/or pesticide pollution. They represented a diversity with respect to the type of water supply zones (in terms of volume of water distributed or number inhabitants in a supply zone), pedo-climatic zones, scales, type of farming, land use (rural and mixed rural-urban) (Table 1).

³ The EU Horizon 2020 funded FAIRWAY project was established in 2017, to review current approaches and measures for the protection of drinking water resources against pollution caused by pesticides and nitrate from agriculture in the EU. In addition, the purpose was to identify and develop innovative approaches to more effective drinking water protection. One of the specific objectives of FAIRWAY was to make a comparative assessment of governance arrangements across the FAIRWAY case studies (FAIRWAY, 2021).

2.2. Data collection: The cascade of governance

The data collection involved informed stakeholders at the case study level (farm/catchment). Each case study engaged a leader, who was a member of the FAIRWAY consortium, and had a good working knowledge of the case study area. The case study leaders liaised with representatives on the MAP; the MAP membership was diverse and often fluid, to include farmers and other local stakeholders (drinking water companies, municipalities, water boards, agronomists etc.). Some case studies had pre-existing MAPs (The Netherlands, Germany [Lower Saxony], France, Northern Ireland, Portugal), whilst others were created during the FAIRWAY project (England, Denmark, Slovenia) (Nesheim et al., 2021). The collected data represents the perception of experts and stakeholders working at the catchment/farm level, not necessarily in governance roles, and as such it offers insights grounded in practical experience of local implementation and its challenges. Data collection took place over the period 2018–2019.

The data collection comprised three distinct stages:

Stages 1 and 2: Development of a multi-conceptual visualisation of the national, regional, river basin, catchment and local (farm) governance structures (Impressions). This approach is novel and developed as part of the FAIRWAY project (Rowbottom et al., 2019). The visualisation method have not been applied in other studies before, but consist of data collected through a survey and follow up interviews with key informants.

Stage 3: Three of the FAIRWAY case studies were chosen for a further in-depth study of WFD implementation, to include France, Portugal and Germany (Lower Saxony). The three MS were chosen for i) their pre-WFD water governance structure, ii) an ambition to include Northern and Southern Europe, iii) to highlight the contrasting water issues of North and South Europe (pollution vs water scarcity), and iv) length of EU membership. In stage 3, the typology of sticking points was applied (Waylen et al., 2015) to consider the impact of legacy and the resultant water governance arrangements.

2.2.1. Stage 1 - Developing the governance cascade

Stage 1 generated the visualisation of the cascade from EU directives (WFD and four water quality-related directives - Drinking Water Directive, Ground Water Directive, Nitrates Directive, the Directive on Sustainable Use of Pesticides, and the Common Agricultural Policy) to national, regional, river basin, catchment and local (farm) scales. These representations included legislation, policy, regulation and support (e.g., guidelines, advisory services). An Excel template was developed and completed for England, along with instructions and a key (Appendix 1). Together with blank templates, these were distributed to all the FAIRWAY cases to be completed for their case study area.

2.2.2. Stage 2 - conversion to impressions

The completed Excel spreadsheets were converted into Impressions using Adobe illustrator (Appendix 1 and 2). The Impressions enabled an accessible, 'at a glance' comparison, providing an opportunity to analyse the multi-level governance structures across the participating case studies. The development of the Impressions was an iterative process for each case study to reach the final version. Each Impression was interpreted in the context of centralised/decentralised governance structures, followed by a further iterative review process with the case studies and stakeholders holding governance and policy expertise. The method for stage 1 and stage 2 collection of data is described in Appendix 1 and 2.

2.2.3. Stage 3 - the in-depth case studies

This involved in depth studies three FAIRWAY case studies - France, Portugal and Germany (Lower Saxony). A literature review of the historical and socio-political situation for water governance in each of the chosen MS was conducted, both pre- and post-WFD implementation. Literature was selected by searching Google, Google Scholar and

Table 1

Overview of the nine Member States' Case Studies involved in the Cascade of Governance questionnaire.

Member State	Case Study	Case study research focus	
		Main drinking water source: Ground water (GW)/Surface water (SW)	Main concern for this study: Nitrates (N)/Pesticides (Ps)
Denmark	Tunø	GW	N
	Aalborg	GW	N & Ps
England	Anglian Region	SW	Ps
France	La Voulzie	GW (Springs)	N & Ps
Germany	Lower Saxony	GW	N
N. Ireland	Derg	SW	Ps
The Netherlands	Overijssel	GW	N & Ps
	Noord Brabant	GW	Ps
Portugal	Baixo Mondego	GW & SW	N & Ps
Romania	Arges-Videa	GW	N
Slovenia	Dravsko polje	GW	N & Ps

academic library sites (WoS), using the country names in association with 'Water Framework Directive; 'WFD', 'water governance', 'water policy', 'historical water governance/policy'. The corpus, together with the expertise and knowledge of FAIRWAY members for the three MS, were used to develop a narrative highlighting different water governance approaches and assessing the potential impact of legacy and 'sticking points' of water governance and WFD implementation in the respective MS case study.

2.3. Strengths and limitations of the methodology

The case study approach for data collection uniquely gains insights into local implementation and understanding of the WFD and water related Directives and the potential challenges it has presented. The cascades were generated through a qualitative process based on the perception of the local stakeholders, potentially working outside of their expertise, as such there is a realization of the limitations and potential knowledge gaps. The Excel spreadsheet showing the cascades and their representation as Impressions was an innovative process developed to facilitate a comparative assessment of governance arrangements in the case studies. The large number and breadth of MS contributing to the process, including less studied MS, provided an insight into the diversity of implementation of the WFD and other water-related directives. Unusually the method used a 'bottom-up' approach, asking stakeholders working at the local level - (catchment/farm), to provide their perceptions of how well the water governance cascades from EU directives were working.

Limitations to consider were the small sample population and variation in the interpretation of the instructions and the key provided for the stakeholders; this may have been due to the language translation and the interpretation in context of their own national policy/regulations. The diversity of case studies was considerable (size, contaminant at stake, type of water resource, etc.), with implications for interpretation and comparison across the nine case studies. Finally, the cascades and Impressions represent a specific moment in time regarding active policy. In some instances, the Impressions were specific to the case study and/or regional perspective and may not be representative of the entire MS governance structure. Nevertheless, these apparent 'inaccuracies' capture idiosyncratic ways that top-down policies and regulations are interpreted and responded to at the local level, which is crucial to understand. These results thus should be seen to a degree as a strength of the methodology rather than a failure.

3. Results

3.1. Multi-level governance structures – indications from the impressions for nine case studies

The Impressions are shown in Fig. 1 (and in appendix 3). The impressions demonstrate diversity in WFD and other water-related

directive implementation across the nine case studies. For each MS the following descriptors consider the governance arrangements in terms of centralisation/decentralisation. Further, the status of the legislative/policy instruments (statutory, non-statutory and code of practice/guidance) used by the MS at the different levels of governance are interpreted. The descriptions are based on the authors' interpretation of the Impressions.

3.1.1. Denmark (Tunø and Aalborg)

The Impression indicates a top-down approach with a high level of statutory legislation at the national level, which feeds directly to the farm level of both statutory and non-statutory status. At regional, river basin or catchment level of legislation/policy the Impression implies a highly centralised governance arrangement at national level.

3.1.2. England (The Anglian region)

In England, the transposition of EU Directives is devolved to the regional level. The Impression shows a high level of statutory legislation at the catchment level, much of which feeds directly to farm level, indicating a predominantly centralised water governance arrangement. There is some degree of statutory and non-statutory legislation at the catchment level, perhaps implying a degree of movement towards decentralisation.

3.1.3. France (la Voulzie)

At the national level, legislation is predominantly statutory, indicating EU directive transposition and a degree of control indicative of centralisation; this then feeds into regional, river basin and catchment level prior to reaching farm level. This distribution pattern across the horizontal layers indicates a decentralised water governance arrangement.

3.1.4. Germany (Lower Saxony⁴)

At the national level, legislation is predominantly statutory, indicating EU directive transposition. Statutory legislation is active at the regional (*Länder*) level, which feeds into a mixture of statutory, non-statutory and codes of practice at catchment level before feeding into farm level. The Impression implies a centralised approach at the national level, and movement to decentralisation at the regional level in the Federal State of Lower Saxony.

3.1.5. The Netherlands (Overijssel and Noord Brabant)

The Impression indicates a centralised approach with a high level of statutory legislation at the national level, suggesting policy formation through transposition. The statutory legislation at the national level feeds into a combination of statutory and non-statutory legislation to a

⁴ Please note the Lower Saxony cascade was focused very narrowly on the case study, and in particular nitrates.

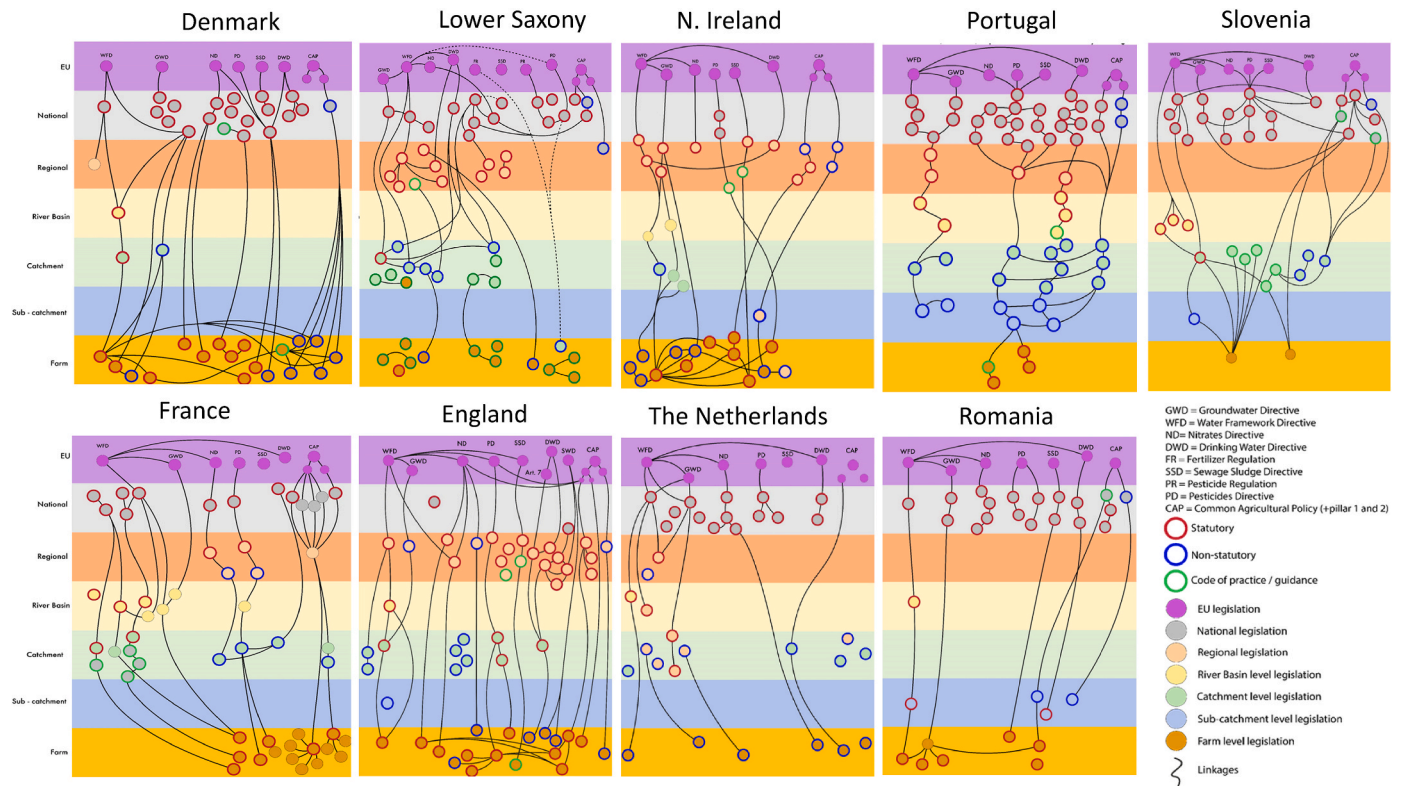


Fig. 1. Impressions: A visual representation of the cascades showing nine MS water governance arrangements from directive to farm level.

lesser extent at regional, and more so at river basin and catchment, before reaching farm level; this implies decentralisation at the practical implementation level.

3.1.6. Northern Ireland (Derg)

The transposition of EU Directives forms part of the devolution of powers from the UK to Northern Ireland. As such, Northern Ireland is responsible for the implementation of these directives within the region. The Impression shows a high level of statutory legislation at the regional level, much of which feeds directly to farm level, indicating a predominantly centralised water governance arrangement.

3.1.7. Portugal (Baixo Mondego)

There is a high level of statutory legislation at the national level, indicating transposition of EU directives with a centralised approach. The legislation is primarily statutory at the regional and river basin level, and feeds into catchment level. At the catchment and sub-catchment level, the legislation becomes non-statutory. The Impression indicates a predominantly decentralised water governance system.

3.1.8. Romania (Arges-Videa)

The Impression indicates a highly centralised water governance arrangement, with transposition of EU directives at the national level, which feeds directly into statutory legislation at the farm level.

3.1.9. Slovenia (Dravsko Polje)

The Impression indicates a centralised approach to statutory legislation at the national level. This feeds into river basin and catchment level, with the latter being predominantly non-statutory legislation and codes of practice; the latter indicates a decentralisation at practical implementation levels.

3.1.10. Overview of all impressions

The Impressions show that Denmark and Romania have the most centralised water governance framework, with France and Portugal

showing the greatest degree of decentralisation of the water governance framework.

For England and Northern Ireland, the transposition of EU Directives is devolved to regional level, with both MS having a high proportion of regional statutory legislation feeding directly to farm level. This indicates a centralised governance structure. England has some degree of statutory and non-statutory legislation at the catchment level, suggesting a movement to decentralisation. Statutory legislation at the national level is UK derived, and is enforce UK wide. In Germany (Lower Saxony), the transposition of EU Directives occurs at the national level, suggesting a centralised approach at this level. This feeds into regional, then to catchment and farm levels, indicating a more decentralised arrangement. Both The Netherlands and Slovenia also show a centralised approach at the national level, with movement to decentralisation at regional, catchment and farm levels.

The Impressions indicate that all MS have adopted a centralised approach at the national level, with devolution in Northern Ireland and England occurring at the regional level. With perhaps the exception of Romania, most MS indicate varying degrees of decentralisation at the regional level (with Northern Ireland and England at river basin/catchment level) which feed into lower levels of governance. The Impressions provide a visual insight into the legislative arrangements underlying diversity of governance arrangements across the nine MS, along a scale of centralisation and decentralisation, often with a hybrid of the two approaches. The resulting diversity implies different interpretations of the route taken to WFD implementation (Maia, 2017).

3.2. In-depth assessments of legacy water governance in Portugal, Germany (Lower Saxony) and France

The Impressions provide a visual representation and indication of the diversity of the governance frameworks (centralisation and decentralisation). However, the Impressions do not provide detailed insights into the pathways chosen and factors influencing the choices made by the nine MS when implementing the WFD and other water-related

directives. In this section, we explore further the current water governance frameworks emanating from WFD implementation in three FAIRWAY case studies – Portugal, Germany (Lower Saxony) and France – in the context of the legacy effect, sticking points and historical milestones in water governance. An overview of these milestones and the degree of restructuring/re-scaling due to the WFD implementation is shown in Table 2.

3.2.1. Sticking points in Portugal

For many decades, the major influence and driver in Portuguese water policy and governance has been the hydraulic paradigm that utilised water as an economic resource, developing irrigation, hydro-electric power (HEP), and public infrastructure projects. The hydraulic paradigm has been a strong political and institutional sticking point which has hindered and slowed the modernisation of water governance in Portugal and, consequently, the implementation of the WFD. The public and private organisations implementing the hydraulic projects had high levels of professional and political competencies and have been both the beneficiaries and determinants of water policy (Da Silva Costa, 2018; Thiel and Egerton, 2011), creating dependency at the local level whilst sustaining the centralised approach of the State government (Thiel, 2009). In the 1990s, The Water Institute (INAG) had been a principal and powerful actor shaping the strategic orientation of the sector, influencing the implementation of regulations and spending, and holding authority over surface water supply (Thiel, 2009) (Table 2). It seems that Portugal had to resolve their focus on water infrastructure (hydraulic paradigm) to enable a subsequent re-focus on water quality, and that was (and in part still is) the sticking point for the mode of implementation of the WFD. The hydraulic paradigm also perpetuated a cognitive sticking point in Portugal due to the dominant technocratic (engineering) view of water governance. The continuity of staff in key positions with ideological preferences maintained the hydraulic mindset at the national level and within institutions; even post WFD introduction, cultural change in new organisations was difficult due to the re-deployment of staff from pre-existing institutions (Thiel and Egerton, 2011). As a result, there was little opportunity for developing a framework for water policy to achieve a multi-level governance approach (Martínez-Fernández et al., 2020).

In 2005, the Portuguese water governance reframing began, made possible by the majority win of the Socialist Party. Hugely influential in shifting the sticking points (institutional, cognitive and political) was the mindset of the Minister of Environment at the time, an advocate of the multi-level governance approach, and this, plus the warning of non-compliance of EU deadlines moved the commitment to water governance reform. This stance gained credibility due to: i) the urgency to meet EU deadlines ii) the government majority, iii) the additional influence gained by the Ministry of the Environment over other actors (farming, electricity and administration) through increased EU funding to invest in water projects, iv) the Ministry of the Environment taking over most of the competencies of Regional Directorates (CCDR) and INAG, reducing their power and influence. There was opposition to the reforms, mainly from agriculture, electricity, and administration, though consensus was achieved (Thiel and Egerton, 2011).

The hydraulic paradigm persisted. For example, in 2007, the National Programme for Dams for HEP was approved, then in 2018 National Irrigation Plan, with 90,000 ha of newly irrigated land proposed, together with several multipurpose dams to be situated along the Tagus River Basin; all projects of high capital investment. Portugal has a Mediterranean climate with water scarcity and drought challenges exacerbated by climate change. Climate change is considered both the driver and justification for the continuance of the hydraulic paradigm (Martínez-Fernández et al., 2020).

Through political will, a majority government, and the threat of non-compliance, the sticking points were modified, enabling Portugal to achieve a more decentralised multi-level governance structure in line with the WFD philosophy of good governance as a contributing factor to

improving water quality. This is supported by the Portuguese case study Impression generated through this research (Fig. 1). Austerity (Da Silva Costa, 2018; Martínez-Fernández et al., 2020) and the need for cost-effectiveness brought a new political direction and decision-making processes. Through re-centralisation, several institutions merged to form the Portuguese Environment Agency; water planning was also re-centralised. Time will tell if this generates further sticking points.

3.2.2. Sticking points in Germany

In Germany, the Water Resources Act (Wasserhaushaltsgesetz-WHG, 1957) provided the legal basis for the three-tier national, federal and districts (districts in rural areas and municipalities in urban and peri-urban areas) governance system, with the decision to direct major responsibilities to the federal states. This was deemed to have major repercussion to present-day (Rüdiger and Kraemer, 1994; Moss et al., 2004; Thiel, 2015; Meergans et al., 2019). German water policy is strongly influenced by its federal structure and autonomy for the 16 federal states embedded in the German constitution. Set up in 1949, the constitution was influenced by both its former history and the allied states' support for re-establishment of a democracy after the second world war (Möller et al., 2020). Changes in responsibilities between federal states and national central government require a two-thirds majority in the German parliament and the Council of states (Thiel, 2015), making reform challenging. The WFD was transposed in 2002 into German legislation as a first step by modifying the existing national Water Resources Act. This was followed by amendments of the federal state water acts (Thiel, 2015) (Table 2). The concept of River Basin Districts (RBD) was implemented into German structures by establishing a non-binding co-ordination unit at the basin level without any responsibilities and funds (Thiel, 2015). By doing this, the existing structures remained structurally and politically unchanged (Moss et al., 2004).

In 2006, the parliament voted to reform the federal system. At that time Germany was governed by the then two most popular parties, thus attaining the necessary two-thirds majority. This enabled national water law to be transferred from a framework law to competing legislation, leaving the federal states less space to manoeuvre. In the process, environmental legislation was streamlined to meet targets set by the European Commission (Thiel, 2015).

There are five large river basins (RB) in Germany, and each RBD comprises a territory belonging to a range of federal states. Co-ordination between the RBD is overseen by LAWA,⁵ and includes taking care of updating the national Programme of Measures (PoM). On this basis, each federal state develops (including participatory planning) and publishes its management plan for each RB sub-area within its jurisdiction. The establishment of RBDs in Germany has added an additional organisational level. As PoMs are published separately by the federal states and financed by CAP, there is no apparent link between the PoM and the RBD; this is why RBDs are not reflected in the Lower Saxony Impressions. In this context, it should also be noted that the federal structures referred to in Table 2 are presented 16-fold, i.e., per each Federal State, necessitating considerable co-ordination efforts between the different Länder, as well as at the national level. A rescaling of governance structures across the borders of the federal states as envisioned by the EU in the WFD is at odds with the federal states structure (Thiel, 2015) and therefore not feasible for constitutional reasons. The competencies of the federal state provide a dominant role for the maintenance of the federal states (Thiel and Egerton, 2011). The federal structure of Germany can therefore be perceived as an institutional sticking point, with a 'layering effect' (Waylen et al., 2015) of RBDs added to existing structures.

⁵ The LAWA is the German Working Group on water issues of the Federal States and the Federal Government represented by the Federal Environment Ministry.

Table 2

Milestones in developing legal frameworks, institutional settings, and policy plans to establish multi-level water governance structures.

Case study	Entry to EU	Milestones		
Portugal	1986	PRE WFD 1919: Water Law Ministry of Spatial Planning and Management Water Institute (INAG); 5 regional Directorates (CCR, became CCDD) The National Water Board National Water Resources Information System. 1997–2001 National Water Plan ; 1st generation of RBMP.	POST WFD 2002: National Water Plan (delayed 4 years), 15 Hydrological Region Management Plans (= RBMPs) (delayed 5/6 years). 2005: National Framework Law (WFD transposition) River Basin Councils Administration of Hydrological Regions (AHG); Regional Hydrographic Councils	AUSTERITY & RE-CENTRALISATION AHG and the National Institute of Water merged to form the Portuguese Environment Agency.
Germany (Lower Saxony)	1958 of Federal Republic of Germany	PRE WFD Federal Republic of Germany: National Water Resources Act (=WRA; 1957; effective 1960): [German Democratic Republic: Water Act (1963)]. Water management frame- work plan- > quantity/Water management plan- > quality (1976). WRA = framework law for federal state water acts (1960–62). Co-ordination by a board of water affairs of the federal states (LAWA ; established in 1956). Lower Saxony Water Act (1992): Voluntary co-operations between farmers and water suppliers; financed by water fees. Federal Water Act 1957 amended 2002	TRANSITIONAL PERIOD Federal Republic of Germany: Water Resources Act (2002) RBMPs- > quantity and quality Co-ordination of RBMPs by (1) non-binding co-ordination fora (RBOs) at basin level without own responsibilities or funds and (2) LAWA.	POST WFD Federal Republic of Germany: National Water Resources Act (2009; effective 2010). Reform of federalism (2006): “competing” national and federal legislation: central regulation of water management, but federal states may deviate from national rules. RBO, LAWA Lower Saxony Water Act (2010; last amended 2020; effective 2021) (2010: § 117 – PoM) for Lower Saxony parts of RBs of Ems, Weser, Elbe and Rhine: contribution to PoM; if the reason for not reaching management targets of WFD are natural or force majeure or could not be anticipated, no additional PoM have to be 2010–2015 3rd decentralisation act 2010/2014: MAPTAM-responsibilities of local and regional authorities 2015: NOT re- empowering local authorities new competencies and redefined the competencies granted to each territorial collectively (including water and floods) 2020 French Biodiversity Office (FBO)
France	1958	PRE WFD 1964: Water Act (polycentric water governance and stakeholder involvement) Water management based on hydrological planning. River basins – unit for water management. Water administration: Basin committees; 6 Water Agencies 1990s to WFD 1992 Water Act SDAGE water policy at river basin scale (RBMPs); SAGE water management plans for sub river basins	WFD transposed in 2004 2003–2004: 2nd stage of decentralisation 2006: Law on Water and Aquatic Environments (Lema) ONEMA – Central Office of Freshwater. Water Agencies and <i>délégues de basin</i> take on new roles for WFD 2009: Grenelle de l’environnement and Grenelle Priority Catchments.	

References

- PORTUGAL:** Da Silva Costa (2018); Fidelis and Rodrigues (2019); Ioris (2012); Thiel (2009); Martínez-Fernández, et al. (2020); Thiel and Egerton (2011).
GERMANY: Albrecht (2013); Kastens and Newig (2007); Kirschke et al. (2016); Kochskämper et al. (2016); Theesfeld and Schleyer (2013); Rüdiger and Kraemer (1994).
FRANCE: Barataud et al. (2014); Colon et al. (2018); Feuillette et al. (2016); Giménez-Sánchez (2003); Richard et al. (2010).

In 2009, only a few water bodies were likely to achieve “good status” by 2015. According to studies by [Kastens and Newig \(2007\)](#) and [Albrecht \(2013\)](#) this was due to the extensive use of exemptions. As listed in [Table 2](#), the Lower Saxony National Water Act was thoroughly updated in 2010, presumably as a reaction to the reform of federalism and in expectation that in this federal state with intensive animal breeding activities, the PoM implemented to counteract water pollution would turn out not to be sufficient to satisfy WFD targets for 2027 ([Kastens and Newig, 2007](#)). For the Lower Saxony Water Act, this indicates the administration authorities’ awareness that the PoM implemented in their federal state were insufficient. Despite the more extensive legislative competence of the national government since the reform of federalism in 2006, Lower Saxony continues to counteract strategies devised in national legislation. For example, not submitting the economic analysis demanded by the WFD in time even contravenes EU rules. The shared legislative competence between national and federal governments can thus be interpreted as a political sticking point. It arises from pre-existing relations and the tendency to defend existing interests and benefits ([Waylen et al., 2015](#)).

According to a cabinet decision in 2004, Lower Saxony established 28, area-cooperations (AC), working as multi actor platforms (Gebietsskooperationen), for its share of the RBs Elbe, Ems, Rhine and Weser at sub-river basin scale (MU, 2021), to support the WFD participatory approach ([Kastens and Newig, 2007](#)). These ACs comprise representatives of water suppliers, agricultural associations, agricultural advisors, industry, environmental groups and other interest groups. The ACs serve

as the public participation delivery of the WFD but were also established to deal with the most pressing regional issues, for which significant leeway for implementation decisions was given. The role of the MAPs is clearly consultative while competent authorities take necessary action ([Kastens and Newig, 2007](#)). In the last decades, the northwestern part of Lower Saxony developed from an economically weak region to a prosperous, well-structured region based on animal production and associated supply chains ([Köhler, 2007](#); [BMEL, 2015](#)). [Kastens and Newig \(2007\)](#) state, giving the example of the Hase catchment, that the key actors show a protective stance to the region’s agriculture, primarily due to the social and economic significance of intensive livestock farming and implications in achieving the deadline to reach WFD-objectives for water quality and the conditions for PoM, as water-conserving/improving farming practices without financial compensation are depreciated ([Kastens and Newig, 2007](#)). Consequently, the drinking water sector works with farmers using non-statutory/voluntary mechanisms, e.g. advice and incentives.

In fact, the cooperation principle already was laid out in the German environmental program of 1971, and the German Minister of Agriculture suggested in 1984 that if farmers had to limit their use of fertilisers, they should be financially compensated ([Rüdiger and Kraemer, 1994](#)). This prepared the ground for voluntary cooperations between farmers and water suppliers (e.g. in Lower Saxony), at first on bilateral level ([Quirin and Hoetmer, 2019](#)), and later introduced with the 8th amendment of the Lower Saxony Water Act (NWG) in 1992. In water protection and abstraction zones, farmers receive advisory services free

and receive financial compensation for implementing mitigation measures (PoMs). The advisory service is paid by the EU funds (ELER = GAP pillar 2 for the development of rural areas).

The financial compensation for agricultural measures is financed by a water abstraction fee, as laid out in the NWG, to be paid by industry and water suppliers using ground water. Unique in Lower Saxony (as compared to other federal states), is the fee called “water cent”. The coordination unit is the Lower Saxony Water Management, Coastal Defence and Nature Conservation Agency (NLWKN). The detail of the five-year financial support are laid out in a special ordinance on Federal State level (MU, 2007, MU, 2017a). In 2016, 74 cooperations in 374 drinking water abstraction areas were organised in the “Lower Saxony cooperation model” (Quirin and Hoetmer, 2019).

Regional networks (e.g., MAPs) may support change and growth, but may also inhibit change and development (Grabner, 1993) and may create a ‘lock in’ (Waylen et al., 2015). The described situation can be seen as having both political and cognitive sticking points in Lower Saxony (Waylen et al., 2015). The opportunity of framing a water policy to achieve a decentralised multi-level governance approach across Germany would be challenging. The WFD in Germany has successfully raised the importance and need for water management planning and participatory planning, yet in the context of existing structures.

3.2.3. Sticking points in France

Historically, France has a unique water resource governance system already following the river basin approach. It is derived from an extensive and historic regulatory framework combining bottom-up and top-down processes (Colon et al., 2018). The water policy framework combines: i) an autonomous water policy where water agencies play a central role, ii) decentralised water resource management at basin scale, iii) state regulation, and iv) participatory process for conciliation between users and engaging civil society (Colon et al., 2018). So, where are there sticking points?

France has historically experienced similar institutional, cognitive, and political sticking points as MS currently implementing WFD multi-level governance approaches (hierarchical administrative tradition, a conflict between users, water as an economic instrument and weak environmental policy) (Whiteside et al., 2010 cited in Bourblanc et al., 2013). Currently France has arrived at a seemingly stable multi-level governance arrangement. Four major legislative steps have been made to enable this situation, including implementation of three decentralisation acts (Table 2).

Transposition of the WFD into French Law (Water Act 2006) posed no major structural challenges (Giménez-Sánchez, 2003) due to the existing river basin structures. However, at the local political level, sticking points have arisen with the Water Agencies and the Basin Committees, who were challenged to fulfil the mandate of the WFD (Colon et al., 2018). The implications were manifold: local water management institutions gained new functions to meet the WFD objectives, mayors struggled to translate the complex technical processes into a clear overall vision (Giménez-Sánchez, 2003), and sectoral conflicts arose. For the latter, participation in local institutions was traditionally dominated by agriculture and industry who sometimes regarded NGOs as ‘troublemakers’ (Giménez-Sánchez, 2003). As a result, the status quo of the local institutions was challenged, and in defending their interests, they presented both cognitive and political sticking points. Over time, other stakeholders (e.g., municipalities) set up joint boards dedicated to integration, legitimising staff employment. For example, ‘Animateurs’ were employed by Water Agencies and Chambers of Agriculture to facilitate the local participation processes (Colon et al., 2018).

France’s delay in its environmental policy made the mandatory WFD water quality monitoring challenging; this became a sticking point. With transposition in 2004, the French National Agency for Water and Aquatic Environments (ONEMA), was maintained as a centralised body to ensure cost-effectiveness and monitoring standards. ONEMA, worked with organisations at the basin level, and implemented and operated the

national network to monitor the water bodies. In 2014/15, the third decentralisation act (MAPTAM modernisation of the territorial public action and Metropoles) restructured and empowered municipalities with more responsibility in water resource management and flood prevention (GEMAPI). This necessitated a new framework of knowledge and with it the potential to generate cognitive sticking points due to lack of competencies. This was minimised, however, by involving the local water agencies in the mechanics of the reforms. The French water governance system is fluid and seemingly progressive, with the Biodiversity Act (2016) creating new tools and structures to bridge the gap between water and other environmental issues, and ONEMA merging with other public institutions to form the French Biodiversity Office (FBO) (Colon et al., 2018). The role of FBO is to work hand in hand with national and local partners to generate innovative approaches to environmental issues. It could be argued that in some aspects of French water governance, there was a move towards centralisation to enable national standardization.

4. Discussion

4.1. Heterogeneity in implementation

The Impressions in Fig. 1 visualise the diversity of water governance structures and chosen governance approaches across nine MS, emanating from the WFD and its four-water quality-related directives. These Impressions support previous research findings on water governance diversity across the EU, with MS approaching the implementation of the WFD very differently, resulting in a range of WFD governance frameworks and arrangements across the EU (Jager et al., 2016; Graversgaard et al., 2018; Kastens and Newig, 2007; Kochskämper et al., 2016; Loefflerink et al., 2011; Pellegrini et al., 2019; Watson et al., 2009; Wiering et al., 2020; Wuijts et al., (2021)).

In previous studies, frequently cited MS have included Denmark, Germany, The Netherlands, England, France, and Northern Ireland (Bourblanc et al., 2013; Graversgaard et al., 2016, 2017; Jager et al., 2016; Loefflerink et al., 2011; Nielsen et al., 2013; Pellegrini et al., 2019; Wiering et al., 2020; Jager et al., 2016; Kochskämper et al., 2016; Uitenboogaart et al., 2009.), with the literature identifying the WFD governance approaches for these individual MS. This literature supports the findings of this study. For example, Denmark has two administration levels - State and local municipality councils-with minimal activity at the regional level (Uitenboogaart et al., 2009). This lends itself to a highly centralised framework with decentralisation at the local level (Loefflerink et al., 2011), and this is represented in the Danish Impression. France is recognised as a water governance pioneer (Jager et al., 2016), with an in-situ, decentralised river basin framework pre-dating the WFD. France still maintains a degree of central control (Loefflerink et al., 2011; Pellegrini et al., 2019), and this is represented in the French Impression. England has employed a centralised approach to policy planning (Jager et al., 2016; Pellegrini et al., 2019). In the second cycle of the WFD (2015–2021), a catchment-based approach was introduced, with a reduced central control, indicating a move to decentralisation (Pellegrini et al., 2019), and this is represented in the English Impression.

These examples indicate that the methodology employing stakeholders at the local level has provided a good representation of the water governance framework for the different MS, in line with existing literature on governance arrangements in their own countries. Therefore, for MS rarely quoted in policy implementation (Portugal, Slovenia and Romania), it could be inferred that the governance structures described by their respective Impression will be similarly representative.

The in-depth studies of Portugal, Germany (Lower Saxony) showed progress towards the WFD multi-level governance approach from different starting points, paths and endpoints, with the legacy effect and sticking points influencing the decision-making processes. At various times, France and Portugal have experienced a legacy of top-down,

hierarchical governance which slowed the shift to a multi-level governance approach. Germany (Lower Saxony) has existing, long-lasting, and complex structures that cannot easily be restructured, particularly within a national system with 16 Federal State subsystems and high constitutional barriers at the national level against change. Consequently, there is a layering effect where new systems are fitted to existing ones.

The in-depth studies of Portugal, Germany (Lower Saxony), and France indicate historical, socio-political legacies influencing the decision-making processes in WFD implementation. All three MS have experienced a legacy of top-down, less participatory governance, historical institutions, and organisational processes at different points in time. These have presented sticking points in the shift to a more decentralised, participatory governance system.

The hydraulic paradigm and the top-down, centralised approach of the State shaped Portuguese water management and policy for several decades, created a form of lock-in. In the 1990s, the New Water Culture Foundation (FNCA) led the movement to shift the hydraulic paradigm. This came to fruition in 2004 with the WFD providing an opportunity to modernise Portuguese water policy. In 2005, a Minister who had a vision, experience, knowledge of the water sector, the ability to shift the power culture, and the support of a parliamentary majority, was able to secure further reforms of the water sector.

For France, the catalyst for decentralisation was the 1964 Water Act, and since then France has experienced three decentralisation acts. The 1964 Water Act introduced water management based on hydrological planning, river basins as the unit for water management and increased stakeholder involvement. Both France and Portugal have moved to a multi-level governance approach, achieved by significant changes in the political culture and the rescaling of institutions and organisational processes. The extent of rescaling in each MS is summarised in [Appendix 1 and 2](#). In France, the need for centralisation in some areas of water governance was for cost-effectiveness (e.g., merging ONEMA with other institutions) and to ensure that national standards were maintained, for example, in monitoring. There has been a movement back to centralisation during austerity for Portugal, primarily for cost-effectiveness. In France, with the third Decentralisation Act (MAPTAM and GEMAPI), a multi-level governance approach, working at regional level, would seem to run in conjunction to the centralisation at national level.

Germany has implemented the WFD as a new layer within existing structures. Understanding the development of the federal system in Germany provides reasoning for this. The federal states within the framework provided by the national government have their Water Acts in addition to the national legislation, which frequently even differ across the federal states. The principle of autonomy of the federal states is firmly embedded in the German constitution and reinforces the governance structure. As a result, the German water governance is well coordinated, complex, fragmented and diverse. It would require significant efforts to change it. However, it follows the WFD-guidelines with respect to the river basin structure.

The analysis of the legacy effect on WFD implementation illustrates that MS can achieve the aspired multi-level governance approach of the WFD relatively easily, depending on existing water governance arrangements. If a MS already has many existing river basin structures in situ, compliance with the WFD within the required timeline. Other MS used the WFD as an opportunity to reform their water governance structures; to enable this, all their 'political ducks needed to be in a row', as was the case with Portugal. In Germany, due to the existing political structures, it was most likely that the WFD multi-level governance approach was realised in a rather bureaucratic manner, with a considerable coordination effort and some frictional losses.

It could be argued that the strict timelines set by the EU, have themselves, generated institutional and political sticking points in the development of the multi-level governance approach it aspires to achieve. In 2016, France celebrated its 50th year of multi-level governance water management ([Colon et al., 2018](#)). France has taken 50 years to

establish river basin systems, allowing timely WFD compliance in terms of implementation into national law and developing RBMPs. In contrast, the EU required MS to develop RBMP in just nine years (2000–2009). Portugal decided to significantly reform its water policy and management systems even though it caused delays in the National Water Plan and the RBMP. As a consequence, Portugal became WFD non-compliant. If Portugal had been compliant by following the EU/WFD timeline, institutional water reform would have been compromised to the detriment of a multi-level governance approach, thus weakening Portugal's quest for modernisation. Equally, the governance structure would have fallen short of WFD aspirations. Has the EU 'shot itself in the foot' by setting strict deadlines and penalties for non-compliance? It could be argued that there needs to be more flexibility in the setting of timelines to accommodate existing governance structures and starting points of the individual MS. This is especially pertinent with the eastern enlargement of the EU. For some new MS, reaching WFD compliance will be difficult in the required timeframe ([Ptak et al., 2020](#)).

4.2. Development of strategies to improve governance – recommendations for future WFD implementation

As experienced in Portugal, the sectoral approach used water as an economic resource, often in isolation from other industries and environmental considerations, potentially creating institutional and political sticking points. In contrast, the WFD approach is more holistic and participatory, linking sectors and governance levels. France has embraced stakeholder engagement since the 1964 Water Act and has developed innovative ways to address and manage sectoral differences and conflicts, e.g., by employing *animateurs* and basin committees. The literature indicates contrary benefits to this approach; [Baudoin and Gittins \(2021\)](#) found that the basin committees in France could lead to increased power struggles. However, only few articles have directly tried to link collaborative governance and participatory approaches to ecological conditions ([Newig and Fritsch, 2009](#); [Scott, 2015, 2016](#); [Biddle, 2017](#)).

Denmark initially took a very open and participatory approach to the implementation of the WFD, setting up 'Actor groups', composed of stakeholders and municipalities, to advise on WFD implementation ([Nielsen et al., 2013](#)). However, a fear of out-of-control spiraling costs of WFD implementation reduced the stakeholder engagement, reverting to the rigid top-down approach in the first RBMP implementation ([Lief-ferink et al., 2011](#)). This continued in the second RBMP, yet with attempts to include a higher level of stakeholder engagement ([Graversgaard et al., 2015, 2016, 2017](#)). During the initial WFD implementation in England, the conflicts between sectors were poorly addressed, with policy makers avoiding consultation with the farming interest groups to bypass opposition ([De Vito et al., 2020](#)). For example, the Royal Society for the Protection of Birds (RSPB) - a UK NGO - had concerns that not enough had been done to engage farming, NGOs, or industrial partnerships ([De Vito et al., 2020](#)). The influence of the agricultural sector on water policy has also been experienced in Germany (Lower Saxony) ([Kastens and Newig, 2007](#)) and is recognised as a potential political and cognitive sticking point in the in-depth analysis of this study.

In The Netherlands, stakeholder engagement occurs at different government levels ([Lief-ferink et al., 2011](#)). At a local level, stakeholder groups consist of government authorities in the area, and relevant fields in agriculture, nature conservation and the environment. Some local authorities chose to create a process of integrated regional planning, resulting in a series of water programmes to address water quality and quantity, flooding and urban management; these exist in an informal, decentralised and highly integrated process ([Lief-ferink et al., 2011](#)).

In England, during the second WFD cycle (2015–2021), engagement at a local level was introduced through a catchment-based approach (CaBA), based on Catchment Partnerships to address local needs ([Lief-ferink et al., 2011](#)). As described in the in-depth study, Germany (Lower

Saxony) works at a sub-river basin scale (MU, 2021) to support the WFD participatory approach (Kastens and Newig, 2007). ACs includes representatives from water suppliers, agricultural associations, agricultural advisors, industry, environmental and other interest groups. The ACs serve as the public participation arm of the WFD and deal with the most pressing regional issues.

It could be said that the personnel responsible for the participatory approach of the WFD has a very important role in developing the partnerships between the different sectors, and their success is critical to addressing the legacy of institutional and political sticking points in WFD implementation. Nevertheless, it has been shown that the importance of stakeholder engagement has been secondary in some MS due to the 'fear' of opposition, and the considerable costs incurred in the engagement process.

Waylen et al. (2015) highlighted the need for 'people skills' for engagement with partners and other stakeholders, yet many working in the environmental field frequently received little or no training in stakeholder engagement, finding it 'tortuous, too long winded and too difficult'. France, The Netherlands and Germany (Lower Saxony) are working at the local level, engaging stakeholders, whilst other MS; e.g., England, are moving towards a more local level. Working increasingly at the local level, overseen centrally, and developing a well-trained and highly skilled stakeholder engagement team could address the institutional and political sticking points, create improved partnerships, and improve water governance and ultimately contribute to water quality goals.

While having a long history of a decentralised river basin governance arrangement, France has maintained a level of centralised control. As a national body, ONEMA was created, in part, to work with organisations at the basin level to implement and operate the national network for monitoring the water bodies. ONEMA merged with other public institutions to form the French Biodiversity Office (OFB).

France centralises some specific tasks with the OFB taking on central roles, such as R & D funding, supporting stakeholders, and mobilising civil society, juxtaposed with maintaining a decentralised collaborative, participatory governance approach. With France as an example, does this set a precedent implying that a fully multi-level governance approach alone is not enough to reach 'good' ecological and chemical status in water bodies? Is there a need to maintain a centralised 'handle' on aspects such as monitoring to ensure standardisation for comparison, evaluation and improvement – both across individual MS and the EU in total? The cost-effectiveness of a 'pure' decentralised, multi-level governance approach may also be brought into question concerning the economies of scale. This was highlighted by Portugal's need to *re-centralise* due to austerity, i.e., the cost effectiveness of multiple regional institutes versus one national institution.

Within the context of WFD implementation, there may be a need to relinquish the 'ideal' in favour of a degree of central control to enable standardisation, for example, in water quality monitoring. The importance of stakeholder engagement at the local level and the requirement to decentralise this process to address local needs has already been highlighted; the findings at the local level should provide feedback to the central government to inform policy.

The three in-depth studies have highlighted the different starting points, paths and endpoints in WFD implementation, depending on the pre WFD water governance system, associated legacies and sticking points. The discretionary nature of the WFD has enabled MS to choose an implementation strategy to suit their circumstances. It took France 50 years to establish river basin systems, enabling on-time WFD compliance. Other MS have been given short timelines to implement WFD, albeit over three cycles. Achieving WFD governance structures by MS may or may not be achievable depending on the existing water governance structure; in some instances, it may never be truly achievable depending on the complexity of the existing governance structure. Nevertheless, the WFD's discretionary nature allows the MS to adapt accordingly and thereby respect regional circumstances.

A further consideration in WFD implementation would be the adoption of the adaptive approach in setting the timeline for achieving compliance. For example, Portugal has shown that a prolonged timeline better aligned their water governance with the WFD framework.

5. Conclusions

This paper seeks to contribute to research regarding WFD implementation in the EU focusing on the diversity of the implementation of WFD and four water-related EU Directives and the implementation choices made by MS using a novel methodology to visualise governance approaches. Whilst we acknowledge the limitations of the methodology used, the Impressions have provided a good representation of the water governance framework across nine MS and its results are supported by existing literature on governance diversity across the EU and the governance approaches in individual MS included in this study. Taking this forward, for MS in this study rarely quoted in the policy implementation literature (viz. Portugal, Slovenia and Romania) using this methodology, it could be inferred that the governance structure in the Impression is potentially representative. The visualisation of the differences in multi-level governance arrangements across the nine MS, together with an in-depth analysis of legacy and sticking points which steered implementation choice can guide MS, policy-makers and decisions-takers to find areas for improvements in the implementation of these new generation directives.

In the longer term, this could contribute to achieving the water governance goals and ambitions of the WFD going forward. This paper demonstrates that individual MS have utilised the discretionary nature of the WFD implementation to adapt the legacy framework of an existing governance structure. Analysed MS used different approaches to comply with the WFD: (i) a complete restructure (Portugal), (ii) minimal adjustment to an existing multi-level framework (France), or (iii) implementation to meet the minimum WFD requirements due to in situ governance complexity (Germany). This analysis of implementation approaches has shown that the legacy effect does generate sticking points in implementing multi-level governance and that these are intertwining of various institutional, cognitive, and political sticking points. It could be argued that the EU Commission generates its own sticking points, and that these are to be better addressed in future water policy development. For example, is there a need for more bespoke timelines, allowances for complexity and rigidity of current MS governance set-up, more enforcement at farmer level, differential finance across MS to allow MS countries to meet the WFD requirements? Future research could focus on some of these aspects of WFD implementation with a link to how stakeholder engagement processes and training for personnel (cognitive sticking point) could be better facilitated and supported, i.e., looking for good practice which potentially reduces sectoral conflict.

Author statement

Conceptualization, J.R., I.W. and K.D.; Methodology, J.R., K.D.; Formal analysis, J.R., M.G (Morten Graversgaard) and I.W.; Data curation, J.R., M.G., (Morten Graversgaard) I.W., S.K., N.S., L.G., I.A.L., A.D.F., S.W., S.B., D.G.D., M.G (Matjaz Glavan), R.C.; writing—original draft preparation, J.R. I.W. and M.G. (Morten Graversgaard); writing—review and editing, All.; Project administration, S.B., G.V. All authors have read and agreed to the published version of the manuscript.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

This research was carried out through funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 727984. The authors had immense support in data

provision from the project case studies and associated multi-actor platform teams. We thank all who contributed to the development of the templates and a special acknowledgement to partners in France, Portugal and Germany for their role in analysing the case studies.

Appendix 1. Description of process of Excel spreadsheet template completion

The six directives were allocated different background colours in the template, and the different governance levels were colour coded. The template had to be populated by adding 'boxes' containing a written descriptor of the legislation/non-statutory or code of practice for the EU Directives and the Common Agriculture Policy (CAP) in the appropriate location. The periphery of each box was colour coded to indicate the status of the policy instrument/legislation (statutory, non-statutory or a code of practice) (Figure A1). On occasion, a policy instrument might be termed a "hybrid" (i.e., voluntary to sign up for, after which requirements become mandatory). This was represented by 50/50 of the appropriate peripheral colours. A black line indicated links between the different boxes, either vertically (multi-level) or horizontally (integration). The competent authorities/significant organisations involved in the legislation/governance were added positioned outside the main template. Instructions given to the contributors may be seen in Figure A1 and Figure A2.

An option to complete separate templates for each individual Directives and the CAP was provided. Later amendments were made through an iterative process. The England 'all directives' template was provided as a working example (Figure A1) and transcript guidance (Figure A2). The contributors were asked to complete the template from the case study perspective to gauge the perception of the governance cascade from a case study point of view. As informed stakeholders, their primary expertise at the local level was the knowledge about synergies between agriculture, drinking water resources and associated legislation/policy. To support the case study leaders and MAP members, each MS case studies was offered a mentor who had broader knowledge about legislation/policy of their case and MS. The development of the Excel spreadsheet templates was an iterative process between the impression study leaders and the case study leader with policy and governance expertise.

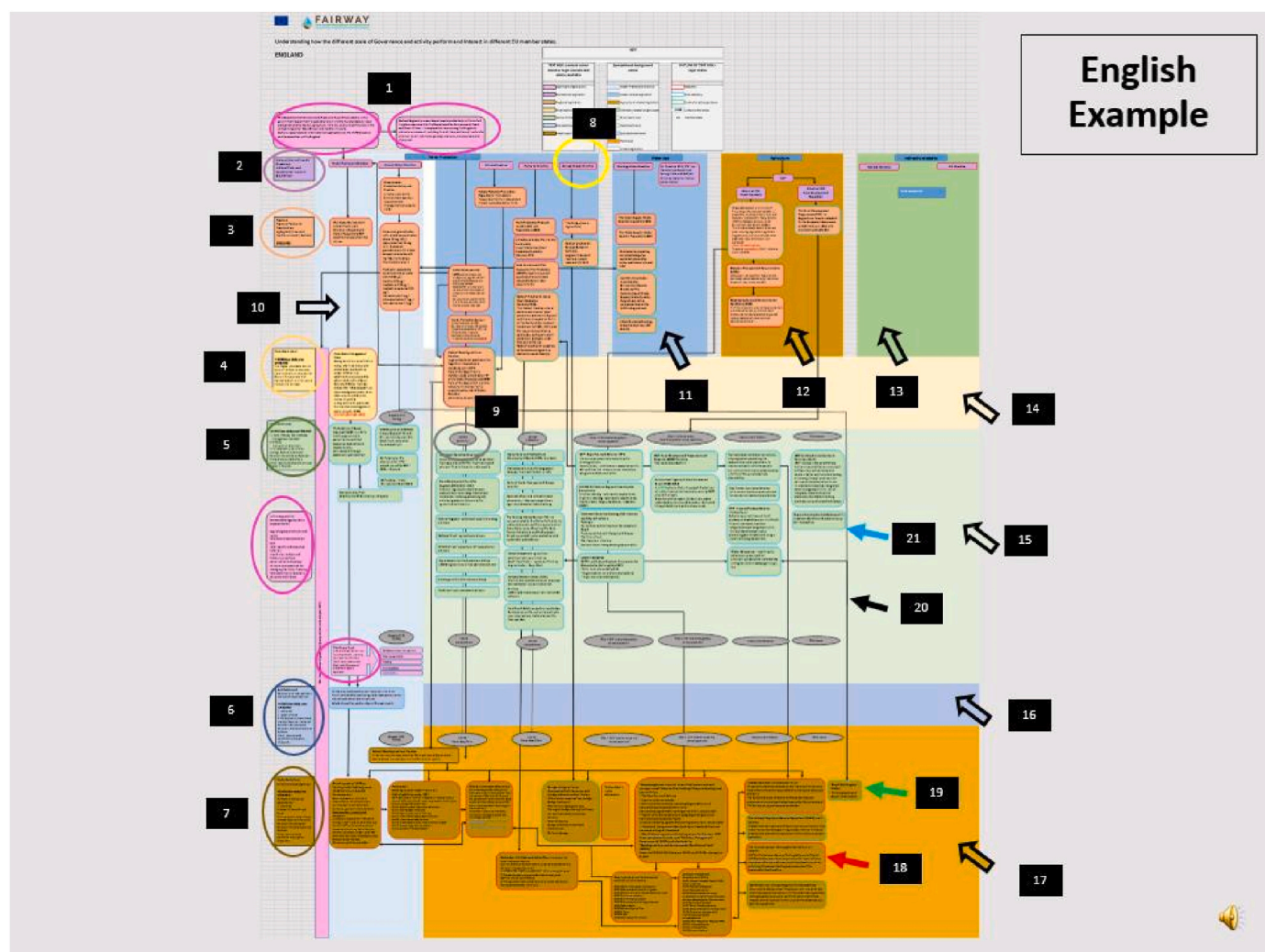


Fig. A1. The English example provided for all case study leaders.

The English example is Tab 8 on the spread sheet.

I will use this example to go through the colour codes and what they mean.

1. "Significant Organizations" involved in the transposition and implementation of the legislation E.g. in England we have Defra, a Government body which transposed EU Directives into English Law. We also have the Environment Agency, which under the direction of Defra are responsible for compliance and orchestrate most of the WFD
2. The purple boxes represent the EU Directives being considered in this H2020 project.
3. Regional – but you will see on the main spreadsheet I have added another box which is white and labelled "national". For us, this is the UK, but for the English case study, I won't be adding further information at this level as it is not relevant; this might be different for your case study.
4. So for us the regions include Scotland, Wales, England and NI. For our case study the region is England and I will only make reference to English Law.

In the **ORANGE** boxes you will see various legislative Acts and Codes of Practice; where possible I have added the title of the document and the date it was written (or enacted). If you are able to do this as well, that would be really helpful.

The next set of numbers represents the geographical units at which the legislation might be implemented.

4. River basin level. The River Basin is also here as it is integral to the WFD.
5. Catchment level. There may be several catchments assigned to the River Basin; this will differ from MS to MS. In England, at the catchment level there are many initiatives/funding opportunities and advice available for 'on ground actions' to help address diffuse pollution. There are provided by a wide range of organizations – wildlife, agronomist, advisory, Government, water companies and supermarkets. These are nearly all accessible to the farmers in the English case study.
6. Sub catchment – this is a smaller geographical unit; at this level in England, there may be initiatives community driven.
7. Farm/local level.
Again, in England, there are initiatives, funding opportunities and advice to encourage on 'farm best practice' for diffuse pollution. Some of these might be Government lead, some might be industry initiatives.
It may be voluntary for a farmer to join a Government scheme, but once part of the scheme there may be compliance e.g. Under the CAP, basic payment scheme is voluntary to join, but once joined, there is cross compliance legislation.
Other EU Directives may find their way to this level e.g. The Nitrates Directive appears as NVZ or Nitrate Vulnerable Zones. These are just some examples.
8. This just highlights that some EU Directives may not be relevant to all Case Studies E.g. in England, farmers are allowed to apply Biosolids whilst in other MS this is not the case.
9. Grey Ovals – these just represent the initiatives/funding/ advice at the different levels – catchment, sub catchment and farm/local level.

The next sets of numbers represent the background colours: -

10. WFD
11. The two blocks of blue represent Water protection and Water Use
12. Is agriculture and includes the CAP
13. Indirectly related EU Directives - so I have included the Habitats Directive and the EIA Directive. As yet these need to be completed for the English example

The next sets of numbers represent the colours of the geographical units where the legislation might be implemented: -

14. River Basins
15. Catchment level
16. Sub Catchment level
17. Farm/local level

You will see the boxes are surrounded by different colour borders so: -

18. Red is statutory
19. Green – codes of practice/guidelines
20. Please ignore 20 for a minute
21. Blue – non statutory

Coming back to 20, this line – black line - represents links between the different activities on the spread sheet

Fig. A2. An explanation for numbering and Transcript to accompany the PowerPoint (Figure A1) with instructions for case study members to complete the Excel template.

Appendix 2. Description of Key for filling out template

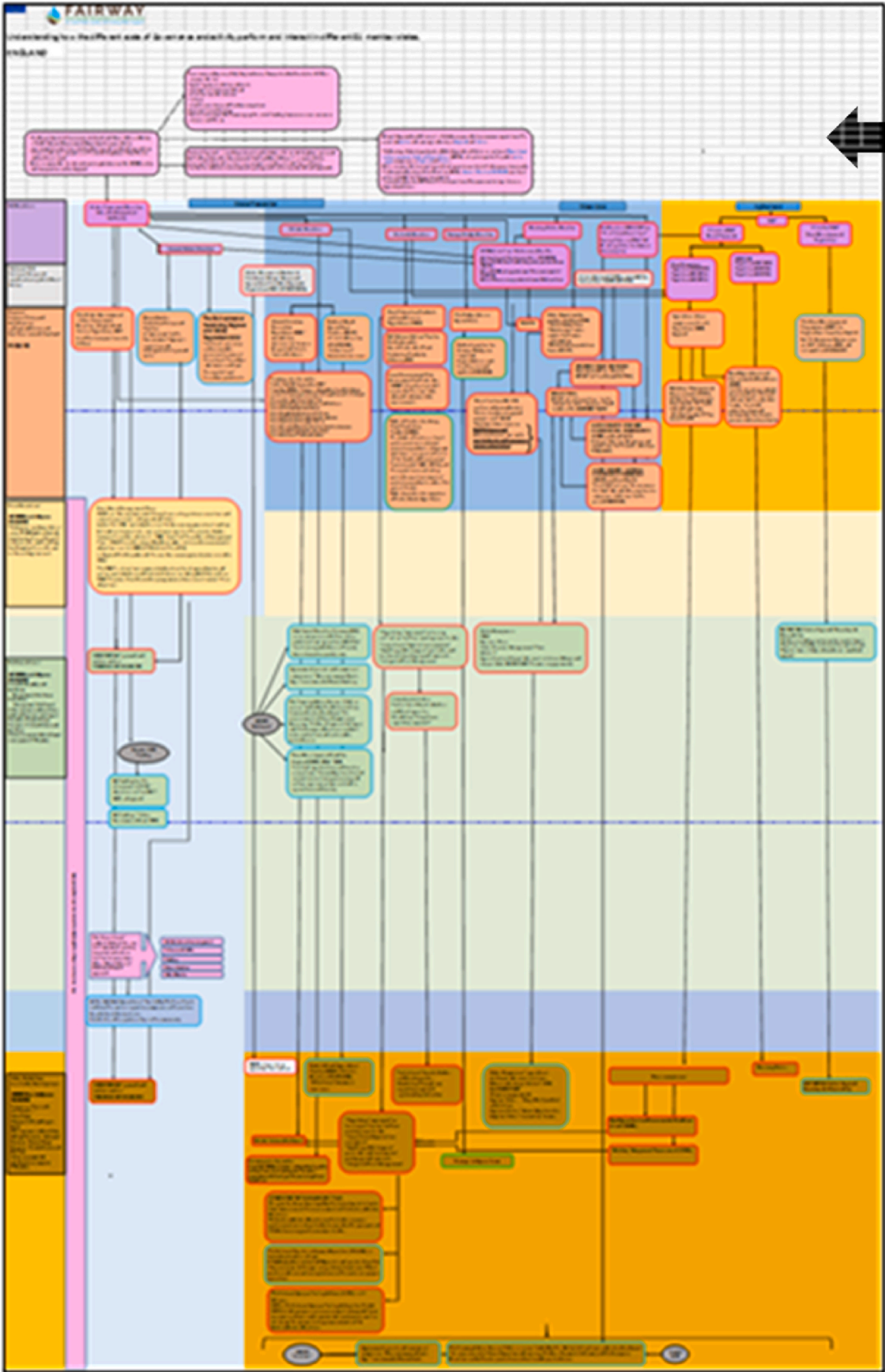


Fig. A3. Stage 1 example of a Cascade: England showing indicative use of colours and outlines to illustrate methodology process.

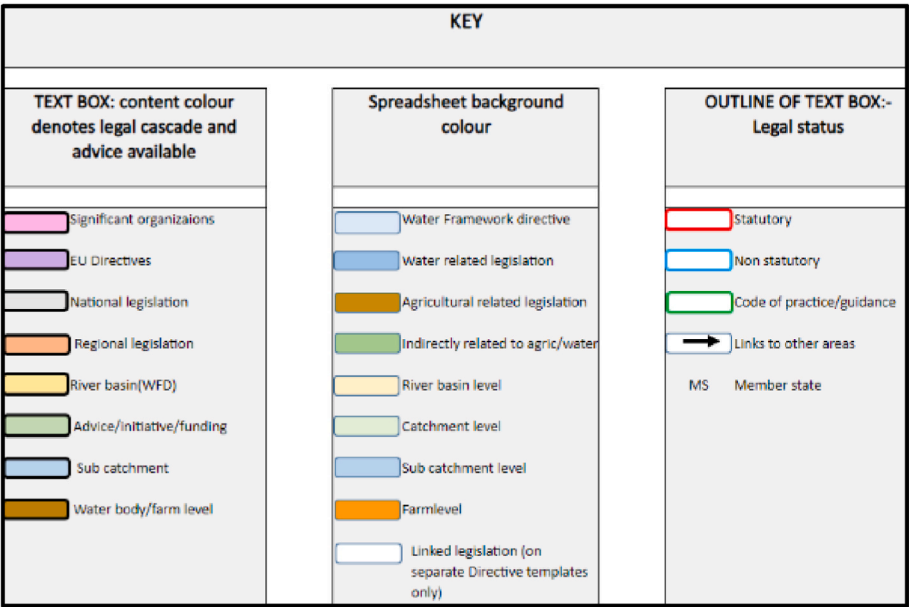


Fig. A4. Stage 1 Cascade legend with key elements.

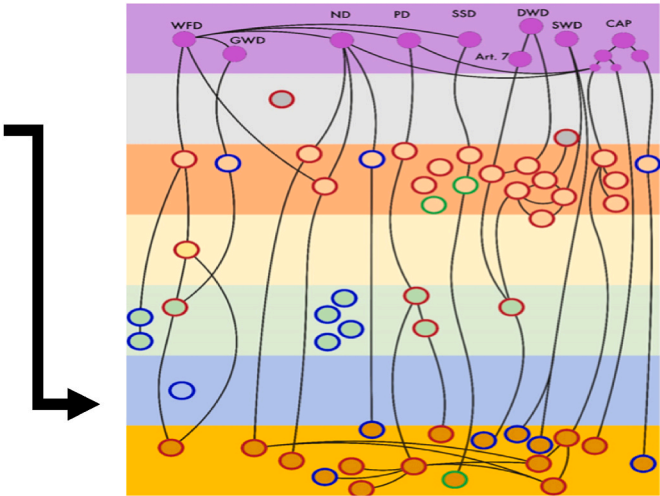
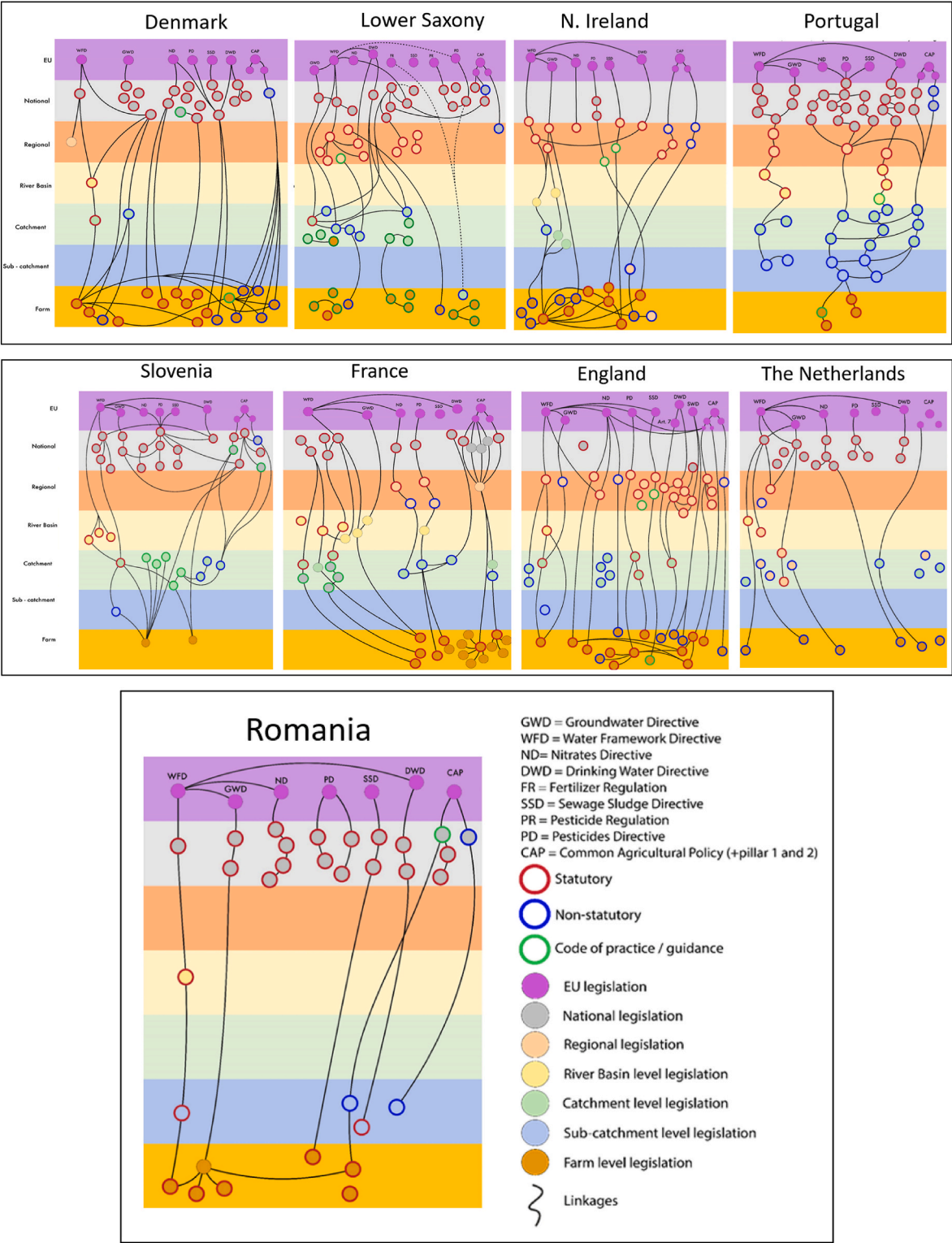


Fig. A5. Stage 2 example of an Impression: England.

Appendix 3. Four figures breaking up Fig. 1: A visual representation of the cascades showing nine MS water governance arrangements from directive to farm level



References

- Albrecht, J., 2013. The Europeanization of water law by the Water Framework Directive: a second chance for water planning in Germany. *Land Use Pol.* 30 (1), 381–391.
- Barataud, F., Durpoix, A., Mignolet, C., 2014. Broad analysis of French priority catchment areas: a step towards adaption of the water Framework Directive? *Land Use Pol.* 36, 427–440.
- Baudoin, L., Gittins, J.R., 2021. The ecological outcomes of collaborative governance in large river basins: who is in the room and does it matter? *J. Environ. Manag.* 281.
- Biddle, J.C., 2017. Improving the effectiveness of collaborative governance regimes: lessons from watershed partnerships. *J. Water Resour. Plann. Manag.* 143 (9), 4017048.
- BMEI, 2015. *Ländliche Lebensverhältnisse im Wandel 1952, 1972, 1993 und 2012*, p. 103. https://www.bmei.de/SharedDocs/Downloads/DE/Broschueren/dorfstudie-ergebnisse.pdf?__blob=publicationFile&v=5.
- Boeuf, B., Fritsch, O., 2016. Studying the implementation of the water framework directive in Europe: a meta-analysis of 89 journal articles. *Ecol. Soc.* 21 (2), 19.
- Börzel, T.A., 2000. Why there is no 'southern problem'. On environmental leaders and laggards in the European union. *J. Eur. Public Policy* 7, 141–162. <https://doi.org/10.1080/135017600343313>.
- Bourblanc, M., Crabbé, A., Liefierink, D., Wiering, M., 2013. The marathon of the hare and the tortoise: implementing the EU Water Framework Directive. *J. Environ. Plann. Manag.* 56 (10), 1449–1467.
- Bryman, A., 2012. *Social Research Methods*, 5th Revised edition. Oxford University Press, Oxford (UK).
- Colon, M., Richard, S., Roche, P.A., 2018. The evolution of water governance in France from the 1960s: disputes as major drivers for radical changes within a consensual framework. *Water Int.* 43 (1), 109–132. Taylor and Francis, 2018. The OECD Principles on Water Governance: from policy standards to practice.
- Da Silva Costa, F., 2018. Water Policy (ies) in Portugal -Inertia and challenges within the European framework. *Méditerranée* 130.
- EEA, 2018. European Waters Assessment of Status and Pressures 2018. EEA Report No 7/2018.
- European Commission, 2003. Common implementation strategy for the water framework directive (2000/60/EC); guidance document No. 8; public participation in relation to the water framework directive. In: Produced by Working Group 2.9. European Commission, Brussels, Belgium.
- European Commission, 2019a. 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). <https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=COM:2019:95:FIN&from=EN>. (Accessed 2 December 2020). accessed.
- European Commission, 2019b. Fitness Check of the Water Framework Directive and the Floods Directive. [https://ec.europa.eu/environment/water/fitness_check_of_the_eu_water_legislation/documents/Water%20Fitness%20Check%20-%20SWD\(2019\)439%20-%20web.pdf](https://ec.europa.eu/environment/water/fitness_check_of_the_eu_water_legislation/documents/Water%20Fitness%20Check%20-%20SWD(2019)439%20-%20web.pdf). (Accessed 1 December 2021). accessed.
- European Commission, 2021. Report from the Commission to the Council and the European Parliament on the Implementation of Council Directive 91/676/EEC Concerning the Protection of Waters against Pollution Caused by Nitrates from Agricultural Sources Based on Member State Reports for the Period 2016–2019. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2021%3A1000%3AFIN&qid=1633953687154>.
- FAIRWAY, 2021. FAIRWAY Project Details seen on: <https://cordis.europa.eu/project/id/727984> or <https://www.fairway-project.eu/>. (Accessed 17 January 2021). accessed.
- Feuillet, L., Boeuf, B., Gorin, M., Penisson, R., 2016. The use of cost–benefit analysis in environmental policies: some issues raised by the Water Framework Directive implementation in France. *Environ. Sci. Pol.* 57, 79–85.
- Fidelis, T., Rodrigues, C., 2019. The integration of land use and climate change risks in the Programmes of Measures of River Basin Plans – assessing the influence of the Water Framework Directive in Portugal. *Environ. Sci. Pol.* 100, 158–171.
- Giménez-Sánchez, M., 2003. The implementation of the WFD in France and Spain: building up the future of water in Europe. In: A Thesis Submitted in Partial Fulfilment. University of Barcelona.
- Grabner, G., 1993. Wachstums-Koalitionen und Verhinderungs-Allianzen; Entwicklungsimpulse und -blockierungen durch regionale Netzwerke. Informationen zur Raumentwicklung. Heft 11, 749–958.
- Graversgaard, M., 2018. Stakeholder participation for effective governance: bridging the gap between top-down water resource management and bottom-up local implementation. In: Foulum. Aarhus University, Department of Agroecology. PhD thesis.
- Graversgaard, M., Gertz, F., Wiborg, I.A., Kjeldsen, C., Dalgaard, T., 2015. Vandråd- et nybrud i dansk vandforvaltning. Vand og Jord 22, 1.
- Graversgaard, M., Thorsøe, M.H., Kjeldsen, C., Dalgaard, T., 2016. Evaluating public participation in Denmark's water councils: how policy design and boundary judgements affect water governance. *Outlook Agric.* 45 (4), 225–230.
- Graversgaard, M., Jacobsen, B., Kjeldsen, C., Dalgaard, T., 2017. Stakeholder engagement and knowledge Co-creation in water planning: can public participation increase cost-effectiveness? *Water* 9 (3), 191.
- Graversgaard, M., Hedelin, B., Smith, L., Gertz, F., Højberg, A.L., Langford, J., Martinez, G., Mostert, E., Ptak, E.N., Peterson, H., Stelljes, N., van den Brink, C., Refsgaard, J.C., 2018. Opportunities and barriers for water co-governance – a critical analysis of seven cases of diffuse water pollution from agriculture in Europe, Australia and North America. *Sustainability* 10 (5), 1–39.
- Ioris, A.R., 2012. The political geography of environmental regulation: implementing the water framework directive in the douro river basin, Portugal. *Scot. Geogr. J.* 128 (1).
- Jager, N.W., et al., 2016. Transforming European water governance? Participation and river basin management under the EU water framework directive in 13 member states. *Water* 8 (4), 156 (20734441).
- Juntti, M., Potter, C., 2002. Interpreting and reinterpreting agri-environmental policy: Communication, trust and knowledge in the implementation process. *Sociol. Ruralis* 42, 215–232. <https://doi.org/10.1111/1467-9523.00212>.
- Kastens, B., Newig, J., 2007. The Water Framework Directive and agricultural nitrate pollution: will great expectations in Brussels be dashed in Lower Saxony? *European Environment. J. Eur. Environ. Pol.* 17 (4), 231–246.
- Keessen, A.M., van Kempen, J.J.H., van Rijswijk, M., Robbe, J., Backes, C.W., 2010. European river basin districts: are they swimming in the same implementation pool? *J. Environ. Law* 22, 197–221.
- Kirschke, S., Völker, J., Richter, S., 2016. Evaluating water management processes in Germany: conceptual approach and practical applications. *Environ. Earth Sci.* 75 (14).
- Kochskämper, E., et al., 2016. Participation for effective environmental governance? Evidence from water framework directive implementation in Germany, Spain and the United Kingdom. *J. Environ. Manag.* 181 (716), 737–748.
- Köhler, S. (Hrsg.), 2007. Wachstumsregionen fernab der Metropolen: Chancen, Potenziale und Strategien (Arbeitsmaterial, 334). Verl. d. ARL, Hannover. <https://nbn-resolving.org/urn:nbn:de:0168-ssao-284835>.
- Liefferink, D., Arts, B., Kamstra, J., Ooijevaar, J., 2009. Leaders and laggards in environmental policy: a quantitative analysis of domestic policy outputs. *J. Eur. Publ. Pol.* 16, 677–700.
- Liefferink, D., Wiering, M., Uitenboogaart, Y., 2011. The EU Water Framework Directive: a multi-dimensional analysis of implementation and domestic impact. *Land Use Pol.* 28 (4), 712–722.
- Liefferink, D., Graversgaard, M., Nielsen, H.Ø., Boezeman, D., Crabbé, A., Wiering, M., Kaufmann, M., 2021. How hercules cleans up the augean stables: differentiated implementation of the EU water framework directive. *Water Pol.* 23 (4), 1000–1016. <https://doi.org/10.2166/wp.2021.024>.
- Maia, R., 2017. The WFD implementation in the European member states. *Water Resour. Manag.* 31, 3043–3060.
- Martínez-Fernández, J., Neto, S., Hernández-Mora, N., Del Moral, La Roca, F., 2020. The role of the Water Framework Directive in the controversial transition of water policy paradigms in Spain and Portugal. *Water Altern* 13 (3), 556–581.
- Meergans, F., Schutze, N., Leuschow, A., Thiel, A., 2019. Coordination challenges in the implementation of the EU Water Framework Directive: a comparative case study of a German and a Spanish river basin. In: Paper Presented at 2019 EUSA International Biennial Conference.
- Möller, H., Bitterlich, J., Corni, G., Kießling, F., Munkel, D., Schlie, U., 2020. Agrarpolitik im 20. Jahrhundert: Das Bundesministerium für Ernährung und Landwirtschaft und seine Vorgänger. De Gruyter Oldenbourg, Berlin, Boston. <https://doi.org/10.1515/9783110655308>.
- Moss, T., 2004. The governance of land use in river basins: prospects for overcoming problems of institutional interplay with the EU Water Framework Directive'. *Land Use Pol.* 21 (1), 85.
- MU, 2007. Verordnung über die Finanzhilfe zum kooperativen Schutz von Trinkwassergewinnungsgebieten vom 3. September 2007. Nds. GVBl Nr. 27/2007. https://www.niedersachsen.de/politik/staat/gesetze_verordnungen_und_sonstige_vorschriften/verkundungsblätter_vorjahre/niedersaechsisches-gesetz-und-verordnungsblatt-2007-105443.html.
- MU, 2017a. Verordnung zur Änderung der über die Finanzhilfe zum kooperativen Schutz von Trinkwassergewinnungsgebieten vom 19. Juni 2017. Nds. GVBl Nr. 11/2017. https://www.niedersachsen.de/politik/staat/gesetze_verordnungen_und_sonstige_vorschriften/verkundungsblätter_vorjahre/niedersaechsisches-gesetz-und-verordnungsblatt-2017-161383.html.
- Nesheim, I., Sundnes, F., Enge, C., Graversgaard, M., van den Brink, C., Farrow, L., Glavan, M., Hansen, B., Leitão, I.A., Rowbottom, J., Tendler, L., 2021. Multi-actor platforms in the water–agriculture nexus: synergies and long-term meaningful engagement. *Water* 13 (22), 3204. <https://doi.org/10.3390/w13223204>.
- Newig, J., Fritsch, O., 2009. Environmental governance: participatory, multi-level and effective? *Environ. Pol. Gov.* 19, 197–214.
- Nielsen, H.Ø., Frederiksen, P., Saarikoski, H., Rytkönen, A.-M., Brandth-Pedersen, A., 2013. How different institutional arrangements promote integrated river basin management. Evidence from the Baltic Sea Region. *Land Use Pol.* 30 (1), 437–445.
- Pellegrini, E., Bortolini, L., Defrancesco, E., 2019. Coordination and participation boards under the European water framework directive: different approaches used in some EU countries. *Water* 11, 833.
- Ptak, E.N., 2022. Navigating Nexus Governance: The Role of Intermediaries in Agrifood System Transitions. PhD thesis. Aarhus University, Department of Agroecology, Foulum.
- Ptak, E.N., Graversgaard, M., Refsgaard, J.C., Dalgaard, T., 2020. Nitrate management discourses in Poland and Denmark—laggards or leaders in water quality protection? *Water* 12, 2371.
- Quirin, M., Hoetmer, M., 2019. Trinkwasserschutzkooperationen in Niedersachsen - Grundlagen des Kooperationsmodells und Darstellung der Ergebnisse. NLWKN, Grundwasser Band 34, 1–56. https://www.nlwkn.niedersachsen.de/startseite/ser vice/veroeffentlichungen_webshop/schriften_zum_downloaden/downloads_grundwasser_trinkwasser/veroeffentlichungen-zum-thema-grundwassertrinkwasser-zu m-downloaden-44047.html.
- Richard, S., Bouleau, R.G., Barone, S., 2010. In: Jacobi, P., Sinisgali, P. (Eds.), Water governance in France: institutional framework, stake- holders, arrangements and process. Water governance and public policies in Latin America and Europe, Anna Blume, pp. 137–178, 978-92-64-17453-5.

- Rowbottom, J.E., et al., 2019. Comparative assessment of governance arrangements in the case studies. FAIRWAY Project Deliverable 6, 2 151. Available at: www.fairway-is.eu/documents.
- Rüdiger, W., Kraemer, A., 1994. Networks of cooperation: water policy in Germany. *Environ. Polit.* 52–79.
- Scott, T., 2015. Does collaboration make any difference? Linking collaborative governance to environmental outcomes. *J. Pol. Anal. Manag.* 34 (3), 537–566.
- Scott, T., 2016. Is collaboration a good investment? Modelling the link between funds given to collaborative watershed councils and water quality. *J. Publ. Adm. Res. Theor.* 26 (4), 769–786.
- Theesfeld, I., Schleyer, C., 2013. Germany's light version of integrated water management. *Environmental policy and governance. Environ. Pol. Gov.* 23, 130–144.
- Thiel, A., 2009. Europeanisation and the rescaling of water services: Agency and state spatial strategies in the Algarve. *Portugal Water Alternat.* 2 (2), 225–244.
- Thiel, A., 2015. Constitutional state structure and scalar re-organization of natural resource governance: the transformation of polycentric water governance in Spain, Portugal and Germany. *Land Use Pol.* 45, 176–188.
- Thiel, A., Egerton, C., 2011. Re-scaling of Resource Governance as institutional change: the case of water governance in Portugal. *J. Environ. Plann. Manag.* 54 (3), 383–402.
- Uitenboogaart, Y., van Kempen, J.J.H., Wiering, M.A., von Rijswijk, H.F.M.W., 2009. Dealing with Complexity and Policy Discretion: A Comparison of the Implementation Process of the European Water Framework Directive in Five Member States. Sdu Uitgevers: Den Haag, The Netherlands.
- Watson, N., Deeming, H., Treffny, R., 2009. Beyond bureaucracy? Assessing institutional change in the governance of water in England. *Water Altern. (WaA)* 2 (3), 448–460.
- Waylen, K.A., Blackstock, K.L., Holstead, K.L., 2015. How does legacy create sticking points for environmental management? Insights from challenges to implementation of the ecosystem approach. *Ecol. Soc.* 20 (2), 21.
- Whiteside, K.H., Boy, D., Bourg, D., 2010. France's 'Grenelle de l'environnement': openings and closures in ecological democracy. *Environ. Polit.* 19 (3), 449–467.
- Wiering, M., Liefferink, D., Boezeman, D., Kaufmann, M., Crabbé, A., Kurstjens, N., 2020. The wicked problem the water framework directive cannot solve. The governance approach in dealing with pollution of nutrients in surface water in The Netherlands, Flanders, lower Saxony, Denmark and Ireland'. *Water* 12.
- Wuijts, S., Claessens, J., Farrow, L., Doody, D.G., Klages, S., Christophoridis, C., Cvejić, R., Glavan, M., Nesheim, I., Platjouw, F., Wright, I., Rowbottom, J., Graversgaard, M., Van den Brink, C., Leitão, I., Ferreira, A., Boekhold, S., 2021. Protection of drinking water resources from agricultural pressures: effectiveness of EU regulations in the context of local realities. *J. Environ. Manag.* 287, 112270.
- Yin, R.K., 2013. Case Study Research. Design and Methods, fifth ed. Sage Publications (Thousand Oaks. London. New Dehli).
- De Vito, L., Fairbrother, M., Russel, D., 2020. Implementing the Water Framework Directive and Tackling Diffuse Pollution from Agriculture: Lessons from England and Scotland. *Water* 12, 244.