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*Editorial*

# Special Issue "Public Policy Analysis of Integrated Water Resource Management"

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**Abstract:** Public policy analysis is interested in how policies emerge and develop in order to address societal problems. Issues related to water, such as the contamination of surface waters, floods, or plastic pollution in oceans are often highly complex, concern different jurisdictions, and require the collaboration of public and private actors. This complexity is addressed through integrated water management principles. However, these principles give room to open questions such as: what are the main challenges of policy analysis (research and practice) in terms of multi-level actor involvement (politics), cross-sectoral solutions (policies), and new institutional arrangements (polity)? To answer these questions, the seven papers of this Special Issue combine approaches borrowed from policy analysis with principles of Integrated Water Resources Management (IWRM). Each article tackles a complex, water-related problem and collectively, the papers present empirical evidence from case studies located around the world. We learn from all these analyses that adopting a policy perspective helps disentangling the procedural components of IWRM (the involvement of actors, the definition of the appropriate management area, the attribution of competences, etc.) from more substantial ones (like the development of a management plan and the implementation of measures). Addressing cross-sectoral and multi-level challenges is a difficult task, and policy analysis can help shedding light on both, the legitimacy of processes, and the effectiveness of their outputs and outcomes.

**Keywords:** complexity; cross-sectoral policies; Integrated Water Resources Management; multi-level actor involvement; policy analysis

## 1. Introduction

Societies all over the world face increasingly complex water-related problems that are characterized by high uncertainty about their sources and effects, and that occur at diverse levels, scales, and temporalities [1–3]. Problems like water scarcity, floods, droughts, or water pollution are furthermore heavily interrelated with issues of biodiversity, climate change, land use changes, and socio-economic issues [4]. In this multi-dimensional setting, the question of what increases our capacity to solve such complex water problems arises.

One answer was given by the World Summit on Sustainable Development in 2002 that called for the development of Integrated Water Resources Management (IWRM) and related management plans [5]. IWRM is defined as a process where the management of the resource water, together with other

natural resources and sectors, is coordinated in an integrative manner [6,7]. Furthermore, depending on the extent of the problem, IWRM also asks for an appropriate (re-) definition of the scale or area of management: in order to effectively solve a problem, the "fit" between the social and the ecological system should be increased and management areas that come close to the area of the problem per se be identified [8–12]. This often means that effective integrated management crosses borders within, but also across, constituencies and countries [13,14]. The challenge of IWRM is its own definition and structure: it is cross-sectoral, multi-level, and very often asking for new institutional, governance, and management arrangements. To make such arrangements operational, considerable institutional capacity is needed, which poses a serious impediment to transition and developing countries [15].

In this special issue, we argue that tools and approaches traditionally anchored in policy analysis and policy studies can help structure those integration processes.

Policy analysis traditionally focuses on three main pillars: policy, politics, and polity [16].

- Policy is the substantive aspects of policymaking;
- Politics embraces the procedural aspects involving actors and negotiations;
- Polity means the institutional arrangements setting the rules of the games.

What we know from policy research is that outcomes (e.g., the state of the environment, or water quality of a certain water course or lake) can be related back to those three dimensions (see also [17]). Consequently, policy scholars have a tendency to relate environmental outcomes back to the performance of policies in terms of defined targets and introduced instruments and their implementation [18–21]. Moreover, also politics, and the way actors interact, the quality of their collaboration, and the venues they shop for, impact outputs and outcomes [22–24]. Finally, polity, institutions, and the rules of the game can enlarge the room of maneuver of some actors, but also act as barriers on others. In this context, also complex socio-ecological interdependencies need to be addressed when considering the effective management of natural resources [4,9,25,26]. The closer the social and ecological systems are entangled, the more effective the outcomes, is the major conclusion here.

We argue, in this Special Issue, that IWRM has implications on all three dimensions: substantive, procedural, and institutional (Table 1). Very often, all three dimensions are involved or concerned when policymakers apply the IWRM lens to solve a water-related problem. However, as the contributions of this Special Issue show, we consider it an added value when researchers are clear about what policy dimension (substantive, procedural, or institutional) is most relevant for the case under study (see [27]). Some authors present their water-related challenges and try to explain one dimension (typically policy outputs) through specificities of the other two dimensions: the process (politics) or the institutional setting (polity) that lead to this output (see [28–31]). Others try to understand the whole IWRM design or implementation process, being interested in IWRM outcomes such as irrigation efficiency or water quality [29,30]. Furthermore, Schaub [31] includes external factors, such as issue salience, for the explanation of policy change in German agricultural and water policy. We present more details about the special issue and the contributions to it below.

**Table 1.** Policy Analysis of Integrated Water Resources Management (IWRM).

| Dimension | Policy (Substantive) | Politics (Procedural) | Polity (Institutional) |
|---|---|---|---|
| **Policy Explanation** | Public policy programs including targets and instruments | Actors involved in decision-making, design, implementation, and evaluation processes | Rules and laws impacting actors' behavior |
| **IWRM Explanation** | Cross-sectoral implications for the design of management plans and implementation measures | Integrative and participative processes of actors' involvement | Multi-level and transboundary aspects; design of new scales and spaces |

## 2. Content of the Special Issue

Authors should discuss the results and how they can be interpreted in perspective of previous studies and of the working hypotheses. The findings and their implications should be discussed in the broadest context possible. Future research directions may also be highlighted.

Metz and Glaus [28] explicitly apply approaches and theories from public policy studies to the concept of IWRM. They focus on flood prevention in Switzerland and investigate the development of flood policies over almost two centuries. They thus investigate the substantial aspect of policymaking (policy) and ask how policy design evolves over time and in the direction of IWRM. On the one hand, flood prevention is a typical water-related issue that is cross-sectoral in nature and overlaps with issues such as landscape protection, climate change adaptation, or spatial planning. So IWRM, and the integration of policies from different sectors, seems an appropriate approach to tackle floods in a sustainable and effective manner. On the other hand, due to Swiss topography, flood prevention is one of the oldest policy domains in Switzerland, and many different policy instruments exist at the local, regional, and national levels to protect people and infrastructure from these extreme events. Abolishing existing policy measures, especially if they also heavily rely on infrastructure and spatial planning (such as dams or protection areas), is not easy and, thus, cross-sectoral integration is a difficult task. Said differently, during the last 169 years, a dense portfolio of policy instruments developed in Swiss flood prevention. Hence, the authors first put together an inventory of all the policy instruments and then evaluated them following 10 different indicators such as budget, cross-sectoral integration, and compliance. They then conducted an expert survey in three river catchment areas and asked about important features of an effective, sustainable, and integrated policy mix for flood prevention. In all three regions, four design features stood out: the integration of flood measures with other sectors and within the existing portfolio of instruments; that target groups are directly addressed through the introduced flood prevention measures; that sanctions for noncompliance exist; and that the budget allocation allows for effective implementation. Those expert preferences only partially converge with reality: for policy measures to be integrated and coordinated with the already existing portfolio of instruments, this would mean that already introduced instruments or their design, would need to be adapted. The authors, however, show that the instruments as well as the design features remain in place and are difficult to adapt. For IWRM to be more comprehensive and effectively implemented, they recommend adopting more flexible design features in order to make flood, or any water policy, also more responsive towards new challenges, such as climate or land use changes.

Pellegrini et al. [29] study irrigation management in the Italian Eastern Alps region. More concretely, they are interested in the implementation of the European Water Framework Directive and in the effective identification of the River Basin District related to the Italian Alps region. Identifying the Basin District as the appropriate area of river management has subsequent consequences on both, the coordination among stakeholders (politics) and the adoption of new irrigation management practices (policy). They completed 21 interviews with experts and stakeholders, as well as carried out a document analysis. They conclude that the stronger coordination among stakeholders had very positive effects on the outcomes (i.e., the irrigation efficiency) on the one side, and on how satisfied stakeholders were with the process on the other. In terms of "the appropriate scale of decision-making and implementation", however, they conclude that the lower level, the sub-district of the river basin, would be a more suitable level if the larger public should further be involved in the process.

Holland et al. [27] shed light on another critical aspect in IWRM: the individual level, and how experience or ideology can shape attitudes and behavior. The authors carry out experimental research in the United States and investigate the issue of water scarcity. Complex water-related problems are only effectively solved when target groups and individuals change their respective behavior. This is the added value of this study: it focuses on attitudes and the potential of behavioral change, while many other policy studies are myopic about the effect of policies on individuals, the so-called policy addressees. The authors conclude that experience matters: those individuals who had already experienced water scarcity in the past are most likely to conserve water today and in the future.

Additionally, message framing had a certain effect: those individuals who received messages about the positive relationship between water scarcity and gain on the personal water bill in the survey, were also those being most willing to conserve water. Interestingly, ideology and party affiliation only had an indirect effect on the degree of how credible the individuals evaluated framing messages. Overall, experience is the most effective driver for behavioral change. Where behavioral change is desired without experience related to water scarcity, water managers and policymakers need to frame messages and information appropriately in order to raise concern.

Steinebach [30] establishes a connection between policy outputs and outcomes. In the study, he examines the effectiveness of 17 member states in implementing the EU water policy. Through a large-N quantitative study, the author compares water quality standards over time and relates them back to policies, and more concretely to the policy instruments the individual member states introduced to reach set water quality targets. The main hypothesis posits that besides the type of policy instruments, also the national administrative capacity (polity), as well as implementation structures and interest intermediation (politics) impact the policy effectiveness. Steinebach concludes that in general, water quality improved over the years in the 17 countries examined. Interestingly, top-down instruments appear more effective than the bottom-up ones. The administrative capacities of the member states, as well as interest mediation structures only played a minor role. The fact that administrative capacities did not play a large role is surprising since this represents one of the most consistently reported findings in Europeanization studies. Steinebach contends that these capacities might still be important, but that public authorities have little influence on effective behavioral change of the target group, even if it possesses the formal power to control for compliance.

Schaub [31] investigates party politics in Germany and shows that ideological division and conflict hampers the adoption of effective policies to tackle problems of water pollution stemming from agriculture. Methodologically, this study is based on a qualitative content analysis of election manifestos and applies a systematic coding to identify main party ideologies as well as policy positions in relation to fertilizer applications in agriculture and related (ground-) water pollution. The case under study is intriguing; even the EU put Germany under pressure to introduce more effective regulation to control the nitrate problem, and concentrations, in groundwater. This top-down threat, and the obvious need for action, however, were not sufficient to force political parties in finding a compromise solution. There is a deep divide: first, in how parties evaluate the urgency of the problem, and second, in what measures they see as appropriate for addressing it. If the green and left parties advocate for a fundamental paradigm change, the center-right, and right parties advocate for technical measures preserving economic welfare and agricultural freedom. Decisive actors, like the Christian Democrats, which have been at the head of the agricultural ministry since 2005, have shown little support for cross-sectoral policy solutions in the sense of IWRM.

Similarly, Vogeler et al. [32] investigate the case of water (and soil) pollution in relation to agriculture, energy, and food production. They also highlight the low policy effectiveness even though high pressure from the EU exists on adopting more environmentally compatible policies also in agriculture, energy, and food production. Moreover, the authors locate their study in the context of the water-energy-food nexus and apply the social-ecological systems framework in order to draw evidence between policymaking (mainly policy, but also polity, see Table 2) and its outputs and outcomes. The authors confirm that sectoral policies are designed, and policy targets set, without coordinating with other sectors, and with already existing policies, laws, and programs. In the case outlined here, the promotion of biogas plants led to rivalries in terms of land use, and intensified agricultural and food production. Both biogas and livestock production resulted in increased water and soil pollution. The authors further conclude that, besides the cross-sectoral integration challenge, also the multi-level issues, be it between EU and German legislation or between Germans central state and the sub-national constituencies, further complicates the situation.

**Table 2.** Policy analysis dimensions and IWRM aspects of the seven SI contributions.

| Article | Case | Policy | Politics | Polity | IWRM Aspect(s) |
|---|---|---|---|---|---|
| Metz and Glaus, 2019 [28] | Flood prevention in Switzerland, three case study regions | **Policy instruments for flood prevention** | Flood experts' policy preferences | Multi-level policy design; Swiss federalism | Cross-sectoral integration in flood prevention |
| Pellegrini et al., 2019 [29] | Irrigation management in the Italian Eastern Alps River Basin District | Water management practices | European Water Framework Directive (EWFD) process from planning to implementation; stakeholder involvement and coordination | **EWFD and the establishment of River Basin Districts** | New scale or functional space for the integrated management of irrigation systems |
| Holland et al., 2019 [27] | Water scarcity and water conservation attitudes in the US | | **Experience, message framing and ideology as divers for attitudes and behavioral change** | | Including societal, political, and economic incentives in water conservation decision-making |
| Steinebach 2019 [30] | Water quality in 17 EU member states | **Water policy effectiveness** | Implementation structures and interest intermediation | EWFD and national compliance | Multi-level policy integration and compliance |
| Schaub 2019 [31] | Water pollution in Germany | **Policy change** | Party politics and partisan ideology | | Cross-sectoral policy integration between agriculture and water |
| Vogeler et al. 2019 [32] | Water-energy-food nexus and German livestock framing | **Policy coherence (related to policy goals)** | | Cross-sectoral policy coordination | Cross-sectoral policy integration on the water-energy-food nexus |
| Pacheco-Vega 2020 [33] | Water scarcity in San Miguel de Allende, Mexico | | | **Appropriate scale of water management and decision making (micro-watershed versus river basin)** | Cross-sectoral policy integration between tourism, water, and urban infrastructure/ spatial planning |

Note: the categories in bold correspond to the main focus of the respective study.

Pacheco-Vega [33] adds another unit of analysis and expands the geographical scope of this special issue to cities. The author investigates urban water management, particularly water scarcity challenges, that arise in San Miguel de Allende, a Mexican city and popular tourist destination. He uses a multitude of different data gathering techniques, such as text analysis and expert interviews, to draw evidence about the appropriate scale of management, and the reason for the existing urban water conflicts in San Miguel de Allende. Pacheco-Vega critically discusses the usefulness of river basin districts, and the related geographical area and competence distribution for local water issues such as urban water management in a city. The author concludes that the river basin as an area, and the basin council as decision organs, are too far from the problems and concrete management tasks and challenges of a city. This makes the definition and the identification of jurisdictional responsibilities very diffuse. Pacheco-Vega therefore suggests "going local" and enhancing the fit between the scale of the problem and the scale of the management of the problem. More concretely, he suggests a local micro-watershed approach to tackle water challenges at the urban and peri-urban level.

## 3. Conclusions

Taken together, the contributions to this special issue have all demonstrated the value of concepts originating from policy analysis for studying empirical phenomena related to IWRM. The policy perspective produced valuable insights in the state-of-the-art instrument toolbox for putting IWRM into practice. The instruments themselves are an outcome of the political process, but they are also influenced by additional factors such as (expert) knowledge. The politics dimension brought the actors and their interactions to the forefront and demonstrated that the implementation of IWRM is as much subject to political contestation as other policy issues. We believe that this is a particularly important finding, since international organizations that recommend given policies are often not aware of the politics that take place in the individual countries when implementing such recommendations. The politics dimension can explain why we observe variation in how IWRM is put into practice in different countries, but it can also explain why the corresponding policy instruments change or remain

stable over time. Any interaction between actors takes place in an institutional context, which is provided by the polity. The polity defines the opportunity structures for the individual actor groups and is ultimately the critical variable for determining whether IWRM can be attained. The contributions included in this special issue have addressed some important questions regarding IWRM from the policy perspective. We invite future research to continue this line of inquiry and to contribute to cumulative knowledge building.

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