Article

Action Research's Potential to Foster Institutional Change for Urban Water Management

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Abstract: The paper discusses the potential of action research to meet the challenges entailed in institutional design for urban water management. Our overall aim is to briefly present action research and discuss its methodological merits with regard to the challenges posed by the different conceptual bases for extrapolating the effects of institutional design on institutional change. Thus, our aim is to explore how Action Research meets the challenge of scoping the field in an open fashion for determining the appropriate mechanisms of institutional change and supporting the emerging of new water institutions. To accomplish this aim, we select the Water Framework Directive (WFD) as an illustrative driving force requiring changes in water management practices and implying the need for the emergence of new institutions. We employ a case of urban water management in the Volos Metropolitan Area, part of the Thessaly region in Greece, where a Pilot River Basin Plan was implemented. By applying action research and being involved in a long process of interaction between stakeholders, we examine the emergence of new institutions dealing with urban water management under the general principles of the major driving force for change: the WFD.

1. Introduction

In social-ecological systems (SES), such as urban water service supply and consumption systems, institutional change does not only encounter social complexity, but it is also embedded into wider and complex ecological systems. We define such a [1] SES as an "ecological system intricately linked with and affected by one or more social systems" [2], *cf.* [3,4]. In SES, institutions "regulate relationships among individuals and between the social and ecological systems (…and therefore) link social and ecological systems" [5]. Large parts of the system into which institutions are embedded are, therefore, beyond the researchers' or the policy-makers' control. Furthermore, as we will argue, in order to change the way institutions regulate relationships between social and ecological systems, what we describe as multifaceted institutional change needs to unfold. This combines several notions of institutions and their interrelated change. Thus, we reconceptualize our understanding of urban water management and its governance within this framework, in which we refer to the processes whereby elements in municipal society wield power, authority and influence and enact policies and decisions concerning public life, environmental, economic, social and cultural development within the wider ecological system.

Against this background, the authors evaluate Action Research (AR) within processes of intended institutional change, which has widely been termed institutional design [6]. Bobrow and Dryzek [7] argue: "design is the creation of an actionable form to promote valued outcomes in a particular context". We reason that AR is particularly useful, because it functions as a conduit for conveying change. This argument is supported by the evaluation of the empirical background we encountered in Volos Metropolitan Area, Greece, where the implementation of the European Water Framework Directive (WFD) required significant changes in water management practices.

In what follows, we discuss the potential of action research to meet the described challenges entailed in intended institutional change for social-ecological system management, focusing specifically on urban water management. Our aim is to present the key features of AR and discuss its value for initiating, accompanying and understanding intended, (multifaceted) institutional change in complex SES, such as urban water systems.

The paper first describes the need for multifaceted institutional change that emerges from the legal and procedural requirements of the WFD. Then, it describes our conception of multifaceted institutional change, relying on a "multi-layered" understanding of institutions and the mechanisms that drive their change and connects the implications of the WFD to this understanding. Further, the paper introduces AR and describes its potential within processes of intended institutional change, and finally, it illustrates its use in the case of changing urban water management in Volos, Greece. Through this case, we address the question of how science can engage with the problem of producing valid knowledge and legitimizing its findings and policy recommendations in complex SES in a way that fruitfully informs multifaceted processes of intended institutional change.

2. The Water Framework Directive and the Case of Multifaceted Institutional Change

The European Water Framework Directive (WFD) 2000/60/CE [8] requires significant changes in the procedures and performance of water management all over Europe. It replaced older pieces of

European water legislation, such as the Directives 76/160/EEC [9] (quality of bathing water), 76/464/EEC [10] (water pollution by discharges of certain dangerous substances), 80/68/EEC [11] (groundwater protection against dangerous substances), 91/676/EEC [12] (nitrates directive) and 91/271/EEC [13] (urban waste water treatment). At the time, it reflected the changing socio-political and economic context of the 1990s: (1) the increasing internationalization and complexity of water resource management; (2) the rising number of actors and institutions involved; (3) the newly vested economic interests in water supply; and (4) the growing concern and sensitivity towards environmental protection [14]. The Directive promotes an integrated and holistic water management approach, targeting all water bodies and pursuing a sustainable use of water resources, both from a quantitative and a qualitative perspective. Economic, environmental and ethical issues are incorporated in the overall aim of achieving good water status by 2015 [15,16].

The Directive's objective of "good ecological and chemical status of all European waters" introduces an indirect incentive for member states to address functional, temporal and spatial interrelations between multiple water uses, various water systems and the institutions to mediate their interdependencies. Petersen *et al.* [17], therefore, argue that a fundamental shift in the public mandate to regulate water use has occurred. The WFD has significantly enlarged the scope of responsibilities of the state in water management by demanding provision of good environmental status, a task, which the authors associate with greater state interference.

Specifically, the WFD introduces a series of key innovations, including the organization of water management around river basins and the widening of participation in water policymaking [18]. For river basin overviews of key characteristics, a prediction of the impact of human activity on the quality and quantity of the basin's waters and a program of measures for the achievement of good ecological and chemical status have to be devised. The corresponding processes often require significant changes in national water management and planning practices (*cf.* [1]).

The elaboration of such plans is informed by the operationalization of the directive in so-called pilot river basins. Measures to improve waters are to be founded on in-depth data gathering exercises. The WFD contains further institutional prescriptions concerning water management, such as "increasing public participation and balancing interest of various groups", as well as ensuring that the "price charged to water users integrates the true costs" [19]. Broad integration with other policies and coordinated procedures for data gathering throughout stock-taking exercises are also prescribed. The process by which the WFD was elaborated, its transposition through the so-called Common Implementation Process in which high-level water managers participated, has to be seen as a top-down process, which obtained local, bottom-up input and legitimization only in a very abstract fashion [8]. Only later, participation and consultation exercises throughout the elaboration of River Basin Plans potentially allowed for more bottom-up involvement, necessitating a case-by-case analysis of the construction of legitimacy. Several authors have concluded that participation exercises have varied greatly [20]. Below, we present action research and examine its value concerning processes of gathering information about water management problems, bringing actors together in order to develop and legitimize measures and potentially changing water use and management culture and, at the same time, researching such processes of transformation. The processes of implementing these various aspects of the Directive, meanwhile, became a veritable field of social science studies. Early assessments highlighted the need for collaboration across sectors and levels and set out agendas for

research to support the implementation of the WFD [21–24], *cf.* [25]. Another set of studies highlighted the potential role of social learning as a necessary ingredient to meet the integrative management challenges and the uncertainties involved in achieving the objectives of the WFD (*cf.* [26–28]). As we will argue in Chapter 4, action research addresses many of these challenges in designing processes that contribute to achieving the integrative aims of the WFD.

The WFD has substantive, performance-related and procedural aims with regards to water management. In all European member states, changes are required in water management practices, and therefore, extensive institutional change, formal and informal, is implied. As such, the WFD constitutes a typical top-down policy, aiming at changing water institutions. For doing so, it relies on a variety of mechanisms being aware of the need for interrelated, multifaceted institutional change. For example, prescriptions concerning the organization of water planning and management in river basin districts aim at the change of institutions external to people's practices. They require water managers and users to adapt in the face of possible European sanctions in case of non-compliance. Similarly, prescriptions concerning the achievement of good ecological and chemical status and the introduction of water pricing policies presume changes of rational actors' practices, as a result of changes in formal requirements. In contrast, reliance of the WFD on extensive data and knowledge gathering as an input for water planning can be considered a prerequisite for endogenous mechanisms triggering institutional change through learning about challenges for water management. They are necessary to adapt to the substantive aims of the WFD and adaptation of practices in order to achieve these aims. Similarly, the Common Implementation Strategy (CIS) of the WFD aims at institutional change by bringing European high-level water managers into a collective learning process. Furthermore, the WFD's prescriptions on participation and consultation often require changes in formal institutions in order to avoid EU sanctioning. They finally aim at unleashing information exchange and learning processes among local water users and managers in order to draw up cohesive and legitimate measures for attaining the substantive objectives of the WFD. Thus, in the context of the WFD, intended institutional change relies on an understanding of institutional change as being multifaceted. In what follows, we will conceptualize institutional change to allow us a better understanding of European water governance within which our case will be examined.

3. Conceptualizing Institutional Change

In what follows, we characterize different conceptualizations of institutional change, so as to unfold our understanding of intended institutional change as "intended multifaceted institutional change", as implied in the WFD. This argument prepares the ground for our evaluation of action research in regard to its ability to facilitate such multifaceted institutional change.

Institutions regularize human, behavioral interdependencies by structuring humans' interaction [29,30]. They provide information and distribute costs and benefits from actions and, in that way, cater for an immaterial structure that informs courses of action [31]. Institutions are embedded into a complex set of interrelations with other actions and institutions. In contexts where interdependence between actors is mediated by complex, non-linear, biophysical systems, such as non-human nature, we assume that many of the institutional and biophysical interrelations at stake are significant, but insufficiently understood [32]. In this paper, we specifically look at intended institutional change, implying

deliberate replacement of existing, formal (backed by a third party power and valid for entire collectives, often codified) or informal institutions (idiosyncratic, often specified to situations and contexts and not codified) or the creation of new institutions with the aim of changing *de facto* institutions regularizing actors' interactions.

A variety of theories of institutional change have been proposed [33]. Authors distinguish between an endogenous or an exogenous role for institutions in the way they shape people's behavior, and they distinguish between bottom-up, induced, decentral institutional change and top-down, imposed institutional change. [34,35]. Schmid [29] proposes a classification highlighting functional, power and learning evolutionary theories of institutional change.

Rational choice based theories of institutional change view institutions as exogenous to actors. In such theories, actors hold stable preferences and behave instrumentally in maximizing attainment of these preferences. They act strategically and calculate their actions in regard to the outcomes of the different options they have [36]. After the introduction of "new" institutions, actors will decide for the option with the lowest ratio of costs and benefits/or perceived utility gains and losses. Therefore, given knowledge about their institutional option and how they evaluate them, choices about institutions become predictable. Theesfeld [37] captures the essence of distributional theories of institutional change when she describes the process of institutional change as negotiation between differentially resourceful actors (*cf.* [38]). The economic theory of institutional change, on the other hand, holds that institutions that result from actors' choices will be Pareto-efficient under consideration of the costs of coordinating actors and organizing transactions (*i.e.*, transaction costs). Thus, it predicts that actors will choose the institution that is most beneficial in terms of transaction costs. However, competition between institutions is assumed to result in socially optimal institutions [38]. We would equate this with a functional theory of institutional change [35]. In contrast, in what we termed the distributional theory of institutional change, institutions reflect the bargaining positions of individual actors and their incentives derived from the distributional outcome associated with different institutions. In either theory, institutional change as a result of changes in actors' behavior, because of changes in external incentives implicated in rules, can be considered as predictable. This is because actors either follow self-seeking preferences or a social optimum. Thus, changing institutions and behavior in an intended fashion seems possible.

March and Olsen's logic of appropriateness offers an alternative theory, focusing on legitimate rules about informing role-specific action in well- or less well-specified situations. According to March and Olsen ([39], p. 4): "Actors engage into a process of matching of identities, situations and behavioral rules, which is based on experience, expert knowledge or intuition". Role expectations or appropriate behaviors determine more or less precisely what appropriate action is. In this conception, institutional change can emerge as an outcome of changes of perceptions about roles, identities, normative values, cognitive frames and rules. Still, the outcomes of intended institutional change are essentially unpredictable in this context, but depend on the specificities of the problem situation and the way in which experience, expert knowledge or intuition are applied.

In the theories of institutional change described above, institutions are viewed as predominantly external to actors. In other theories, though, at least their source is viewed as endogenous to actors, implying that also their change requires endogenous, cognitive change [40]. For example, Hodgson's idea of habituation distinguishes habits as the key element linking institutions to individuals. Habits

change as a result of "reconstitutive downward causation" ([41], p.108). Thus, social structures act to some degree upon individual habits of thought and action [41]. This kind of conception of institutional change can be considered an evolutionary, open-ended view ([42], p. 186).

Some authors relate the latter perspective, engendering endogenous cognitive change to different types of learning. Stagl, for example, details learning as an interdependent, intermingled processes of social organizational and individual-based learning [43]. While usually associated with the economic theory of institutional change, even North captures the multiple mechanisms through which institutions change: "it is usually some mixture of external change and internal learning that triggers the choices that lead to institutional change" [44]. He further argues that responsible factors are changes in relative prices and learning, leading to new mental models [45]. North derives that individuals compare gains from an existing institutional framework to gains from devoting resources to altering that framework and that "Bargaining strength and the incidence of transaction costs" are key [45]. We follow this understanding and see institutional change as a phenomenon interrelating determinants of the regularization of practices that are exogenous and endogenous to actors. Thus, changes in exogenous institutions, at some point, may affect internalized habits of actors, as well as changes in habits may "up-scale" to changes in exogenous or even formal institutions, whose change is subject to rational evaluation, competition or bargaining, depending on the specific context of institutional choice.

The perspectives presented can be related to different understandings about the possibility to change institutions and the underlying methodologies applied for this purpose. Alexander [46] usefully distinguishes objective and subjective institutional design. In objective institutional design we presume that we have theories that tell us how to affect intentional institutional change and deliberately create and change institutions, with the aim of affecting practices. Still, outcomes are presumed to be predictable. We associate this with an understanding of institutional change as propagated by rational choice orientations. In contrast, in subjective-dialogic institutional design, we do not have conclusive understanding about how institutional change unfolds and need to understand the transformation that is unleashed by intended institutional change; we require descriptive-explanatory knowledge based on reflexive experience, empirical observation and analysis in order to come to adequate proposals that guide development of institutions into the intended direction [46]. Outcomes are presumed to be unintended and unpredictable, to a large extent. This understanding would be associated with theories that emphasize the endogenous, cognitive dimension of institutions, as in learning and evolution-oriented theories of institutional change. In the latter category, we would include the understanding that institutions mediate relational dynamics between a social and a biophysical system [27].

As we described so far, the WFD is a typical effort, common in many European directives, of a top-down attempt to change water institutions. However, it integrates many innovative aspects. The different conceptualizations of institutional change discussed here are viewed as "intended multifaceted institutional change", as implied in the European WFD. In what follows, we will illustrate the potential of Action Research to facilitate the process of multifaceted institutional change.

4. The Methodological Value of Action Research

The basic principles of action research can be traced back to the original work of Kurt Lewin [47] and John Collier [48] and to Chris Argyris's notion of action science [49]. Many of the epistemological

foundations of action research, such as being context bound, focusing on practical problem-solving, seeking for diversity in approaches, having strong democratic aspirations, embedding the notion of interdisciplinarity, highlighting the importance of community participation [50], have a lot in common with various disciplines and their methodological toolbox (with ecological economics, for instance); however, it was not until the key work of Reason and Bradbury [51] that the quality of this methodology was reinstated as a concern and the term "action research" was established as the umbrella term for participatory and action-oriented approaches.

Action research is a reflective research methodology that crosses and bridges various disciplines and can be understood as a special way of thinking about scientific inquiry, as well as an attitude towards the role of science within society [50]. It moves beyond single-dimensional knowledge created by outside experts sampling variables to an interactive inquiry process, where knowledge is generated through a reflective cyclical process of continues improvement (Figure 1), where researchers actively participate in the research process by becoming the object, as well as the subject, of analysis [52].
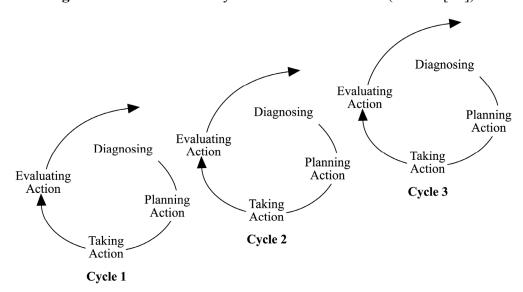
Figure 1. The continuous cycles of Action Research (source: [53]).

According to Reason and Bradbury [51], such a process balances problem-solving actions implemented in a collaborative context with data-driven analysis, in order to understand underlying causes and enable future predictions about change. By exposing himself to a certain situation under study, the researcher understands an institutional change process in order to transform the social environment through the critical inquiry. From this perspective, the analytic task is to study action-related constructs, by "unpacking taken for granted views and detecting invisible but oppressive structures" ([54], p. 9).

After the long process of AR's evolution, Reason and Bradbury [55] offer an inclusive definition of action research:

"a participatory process concerned with developing practical knowing in the pursuit of worthwhile human purposes... It seeks to bring together action and reflection, theory and practice." ([55], p. 4).

Generally, a researcher uses certain scientific procedures and conventions to arrive at proposals for institutions that are to shape individual behavior. In doing so, we argue that scientists explicitly or implicitly always rely on a theory that informs institutional design.

Traditionally, action researchers, however, reject theories associated with positivist research methodologies [56]. Instead, they are fundamentally interested in the interpretation of a process and of the resulting change and, thus, see positivist theorizing as antagonistic to these aims [56]. Broadly speaking, these characteristic of AR suggest that theory needs to be both sensitive to the meanings participants give to their situation (and as such, cannot be decided before the involvement of the researcher), yet go beyond these to explore unseen causal dimensions of actors' behavior and the environment and the interactions between the social and ecological system.

Buchy and Ahmed [57] name the example of the collaboration between NGOs and academics to highlight this distinctive characteristic of AR. This collaboration, Buchy and Ahmed argue, offers great potential for improving practical intervention, as well as testing theories and challenging theoretical assumptions. However, for some of the pitfalls that could easily be dismissed as bad practice, this is not always the case, as a critical analysis uncovers structural and cultural issues inherent to collaborative work between academics and practitioners [57].

Reductionist, structuralist theories, such as rational choice-based theories of institutional change, provide straight forward recommendations for institutional design. They assume that actors will adapt to newly introduced or altered external institutions in a rational fashion, making institutional change predictable. However, the case for rational choice is rather weak in many cases. In local, urban water management, we argue that intended institutional change is a multifaceted process that requires an open ontology and epistemology, perceptive of local conditions and specificities. AR can potentially contribute to finding such policies, which are better fitted to serving the needs and capabilities of local communities by acknowledging and building upon the agency of such communities. This process of change is what we will highlight in the following chapter.

5. The Case: Changing Urban Water Management in Volos

5.1. The Research Setting

During the 2001/2002 Common Implementation Strategy (CIS) of the WFD, a series of Guidance Documents concerning all major aspects of its implementation were developed. A European network of 15 Pilot River Basins (PRB) was established in order to test the guidelines established in the documents. It was foreseen that PRBs would contribute to the implementation of the WFD, leading to the development of long-term implementation policies and guidelines and coherent River Basin Management Plans. Pinios River Basin in the region of Thessaly was the PRB of Greece that participated in the scheme. The overall aim of Pinios PRB was to identify the technical and management problems that may arise in the WFD implementation and to develop pragmatic solutions to these problems. Other aims were to test the practicability and efficiency of the technical and supporting Guidance Documents on key aspects of the WFD before they are applied at the national level in order to attain a concrete example of the application of these documents and to inform interested parties on the implementation of the WFD by involving the stakeholders (including local

and regional authorities) in the process from an early stage. The PRB highlighted some indicative problems for the Greek context, but, despite the difficulties encountered, several assessments characterized the project as a success, as most targets were successfully met and useful recommendations were made [47]. However, it failed to address—or better, did not engage—with issues of local importance, especially those related to the inherited problem of water governance in Greece: a highly hierarchical and centralized administrative structure that leaves no space for the participation of local stakeholders [58].

The municipality of Volos, one of the largest urban agglomerations in Greece, is located in the prefecture of Magnesia, part of the Thessaly region, in central Greece. One of the authors being involved in the European Project Intermediaries [59] conducted thorough research on urban water management practices in the area. This was based on previous studies (mainly technical papers) and extensive interviews with the dominant actors in the local water sector. At this initial stage, the researchers identified the most important pressures and problems of water resources. Such problems can be summarized in the inadequate water quantity and quality during the summer period, the pollution of the underground water reservoirs from uncontrolled disposal of industrial and agricultural wastes and conflicts between neighboring municipalities on water property rights [58]. Although an in depth review of these issues is beyond the scope of this paper and has been thoroughly discussed elsewhere [58,60], it must be noted that many problems were directly or indirectly related to the dysfunctional transactions and transformations taking place between the social and ecological system in the area and the institutions regulating them.

The intense interest of various stakeholders (NGOs, private sector, civil society) for further involvement in urban water management, combined with the implementation of a pilot river-basin (PRB) project on the Water Framework Directive (WFD) in the region [61], raised expectations that the ground was fertile enough, in the sense of stakeholders' willingness to participate and accept responsibility, to create possibilities for drastic improvements in the urban water management system of Volos and changes in the institutional structures regarding water. As this picture was rather the result of the intuition rather than the outcome of a long process of interaction between the interested parties, the major question that arose was: what form this change would take and how it would be implemented? Would it follow the usual top-down, command and control, mostly authoritative approach in Greek water governance reform or was this indeed an alternative with the potential to become a great show-case? Also, if the potential was indeed there to design new institutions in a bottom-up way, would it be picked up by the dominant state actors?

The researchers opted for an AR approach, hoping that it would initiate a process of deliberate change, while it would allow the thorough observation and detailed study of the interactions taking place between the stakeholders without influencing the outcome. During the initial phase, all the organizations and institutional actors involved in the area's water sector had been identified. Fourteen key organizations (see Table 1) with different competencies, responsibilities and power were identified and classified in five categories: local government, state actors, private companies/entities, NGOs/civil society organizations and universities/research institutes. Following this phase, an initial mapping of the water problems and the water governance structure of the area was conducted, based mainly on previous studies and personal contacts. This valuable information constituted the background knowledge required to launch a process of joint dialogue with the actors who had been identified. It

should be pointed out that during the process, more stakeholders joined the initial group and contributed to the dialogue. However, for the purposes of this paper, we focus on those actors who took part in the network from the beginning to the very end.

Table 1. The fourteen organizations that participated in the process of change (adopted by [59]).

Category	Actor	Role	Institutional Power and Resources
State (National)	S1	Public state institution, located in Volos, but functions regionally. Groundwater quality control, consultation to farmers.	Important, but only at the regional level
Local Government	G1	Non-profit private company, run by the municipality. Water management, protection, supply, treatment, *etc*.	Absolute dominance at the local level
	G2	Administration	Respected at the local level, but not focusing on water
	G3	Municipal enterprise focused on urban development and regional planning in the prefecture. Conducts studies, construction and development of water works.	Not significant
NGO/Civil Organization	N1	Non-profit organization located in Volos and focused on crucial environmental problems, mainly related with the pollution of the adjacent gulf by wastewater.	Insignificant, some pressure
	N2	Network of citizen groups, voluntary organization, non-focused on environmental issues, but on the empowerment of Volos' civil society and the weakening of the state actors.	Insignificant
	N3	Local, sub-regional environmental NGO.	Insignificant, some pressure, ties with N4
	N4	Network of Ecological Organizations. Headquarters located in Volos. In the past, much eco-activism and radical positions on environmental issues. Recently, often legal action taken against governmental actors.	Weak, but often taken into account, as direct confrontation usually ends up in a court room
University/ Research	U1	Public institution, located in Volos, but active in the greater area of Thessaly. Education and research.	"Knowledge holder", authority with "expertise"
	U2	University non-profit research institute.	"Knowledge holder", authority with "expertise"
Market	M1	Private commercial company, located in Volos, but provides services in the Thessaly Region.	Insignificant
	M2	Private company, based in Volos, but its products and services are exported globally. Research and innovation, especially on water treatment installations.	Insignificant
	M3	Commercial company located in Volos, but providing water sanitation products at the sub-regional level.	Insignificant
	M4	Private company/association based in Volos, but operating at sub-regional level. Industrial and household waste water transfer and disposal.	Insignificant, but with recognized technical knowledge

The meetings that followed the establishment of the network in 2004 opened up a broad dialogue on water and wastewater-related problems that exist in the area. Based on a background study drawing on a thorough literature review on documents related to the PRB and the processes related to the

testing of the WFD in the area, the initial aim was to open up a discussion focusing entirely on these processes. This would allow the field researchers to identify how the emerging institutions would be adopted and what role the local actors would play in the design process. One of our principle assumptions was that all concerned would have heard of/been involved in the WFD (or at least the PRB that was taking place in their region), so we were shocked to find that not a single participant (including those formally engaged, according to the literature) was aware of either! As a result, the researchers' idea of focusing on what was assumed as a problem of institutional change and design was abandoned and reformulated according to the participants' perceptions and capacities in line with AR's methodological steps. It gradually became apparent that there was a huge gap between theories of institutional change and practices described in the manuals of implementing participatory measures under the WFD, on one hand [62–64], and the local reality (see Figure 2), on the other.

Figure 2. Quotes describing the initial perception of the setting.

Quotations from the participants

G1: "Oh there's a PRB taking place in Thessaly? So that's why I was invited by the Ministry to attend a meeting some time ago whose context and purpose I never fully understood!"

M2: "Let's be reasonable and begin with the basics. How much money do you want?"

G3, U1, U2 (*in private*): "You shouldn't have asked all those people to participate. Especially M4—he is completely illiterate and will only cause trouble without offering anything."

U1, U2: "There are solutions to these problems. We have the solutions. We keep telling them but they simply don't listen!"

G1: "Yes it is true that from time to time there are a few minor problems with the neighboring municipalities in terms of the allocation of water resources. But usually they are not so intense….except, of course, for the time when the locals took guns in order to resist our plans to connect our water supply networks."

G1 to N4 (*after a verbal skirmish on who possesses the best data and who is better informed*): "OK, we are willing to share information with you, give you access to our data, and accept your data input—but in exchange stop dragging us to court every time you suspect we are hiding something from the public!"

All M, N to G1, G2: "As long as G1 and G2 allow us to take part in this network we would be glad to do so"

G3 (*in private*)**:** "The network is a great idea but it will fail. People are not ready for such things."

Despite the background study conducted and the theoretical propositions on water governance and institutions and the value of participation the researchers brought into play, the actual situation in the area was still largely unknown to the researchers and was not necessarily reflecting the way in which change in fact took place. These initial observations highlighted the need for ontological and epistemological openness in order to facilitate the multifaceted institutional change necessary for successful implementation of the WFD. Based on this preliminary conclusion, the researchers assumed a facilitating role in the ongoing process of change, where the field researchers could observe that subtle change was already taking place, without trying to influence it towards a certain direction. AR offered a methodological framework of continuous cyclical steps of planning, action, observation and reflection (see Figure 1) that, on one hand, would allow researchers to structure their work

scientifically, while allowing the locals to lead the process of finding ways to deal with what they themselves considered water problems.

5.2. The Use of AR to Facilitate Intended Multifaceted Institutional Change

A network of stakeholders was established as an experimental, pioneering forum to discuss and address critical water management problems in a more participatory and innovative way that would first foster social learning [65] and would further enable deliberation of the stakeholders, resulting in the emergence of new collective rules to deal with existing problems. Within this process, the field researcher's active role could be characterized as "initiator", "facilitator", "bridge builder" and, from a certain point onwards, simply "observer".

Our facilitating research was based on structured and unstructured questionnaires, interviews and the devoted following up of the network's meetings. In order to identify people's motives for joining the network, their perception of local problems and their expectations of the network, we used a questionnaire, which was circulated at the early stages of the research. A second series of interviews took place one-and-a-half years after the establishment of the network, in order to assess the learning experience of members within the network, identify occurred and ongoing changes in perceptions, but also grasp changes in the water management practices. Additionally, we maintained open channels of communication with each member of the network at all times and organized numerous informal meetings (restaurants, cafes, bars, *etc.*) based on an open invitation, at which some of the most interesting developments and discussions took place. This approach strengthened the relationships between the participants considerably. The steps were carefully designed, so as to include individual- and group-level contributions in the planning. As the first "cycle" (see Figure 1) of our action research came to a close, problems identified at the start had been largely reformulated by the participants.

Until late 2005, we carefully assessed the ideas that were presented during the meetings. We observed, planned, acted, changed and re-researched certain issues that arose. We critically reflected on our activities in a systematic and cyclical way, gradually gaining deeper insights into what locals considered important, what institutions in place were dysfunctional and what might be a structure that could replace them [66]. For example, shared responsibility concerning urban water management activities was ensured via the establishment of a conflict resolution mechanism that included a constant flow of information, release of data whenever required by a network member, announcement of planned decisions before their implementation and efforts to achieve consensus. Even a potential legal dispute between an NGO and the water utility was swiftly dealt with jointly and solved before reaching the courtrooms. Following this logic, five organized meetings and workshops took place (1–2 days each), in addition to an "extra" meeting that was requested by many participants as a response to an urgent situation (wastewater leakage). There had also been two meetings with primary education representatives (with the aim of taking common action on environmental education activities), one press release, one conference and numerous completely informal individual or group meetings.

Through further facilitation and collaborative activities (e.g., a joint conference, publication of leaflets, public awareness activities, *etc.*), various attempts were made to first establish and then reinforce a communicative space for deliberation between equal participants. However, limits to

establishing this Habermasian ideal kept arising, such as difficulties of changing the traditional relationship between local people and local government, the lack of a sense of self-efficacy, the inadequate rhetoric skills of some participants and the lack of self-confidence of powerless actors to express their opinion.

5.3. First Results of AR in Facilitating Intended Multifaceted Institutional Change

The "outside the network" informal meetings (sometimes more lengthy, time-consuming and passionate than the regular meetings) proved extremely helpful, cementing strong personal ties between the participants and providing a deep insight into each other's views and ways of reasoning.

Any conflicts that emerged between the participants were solved by means of dialogue and negotiation. As time went on, the most active members of the network developed greater expectations and envisaged broadening the scope and the range of the network to cover issues outside the metropolitan region of Volos (such as water for agriculture). In parallel, they sought support from other European examples of water management issues in an attempt to improve their knowledge. What was an astonishing experience for us as scientists and researchers, though, was to observe the way the participants' behavior changed over time (see Figure 3).

Figure 3. The astonishing experience of a changing reality.

Quotations and observations

G1: "We must work together and expand to include other stakeholders from neighboring municipalities and prefectures! After all, the WFD requires such collaboration…"

M2: "But please tell me… are you absolutely certain that you won't need any money? Whenever you need, just ask, alright?"

M4: *He presented an extremely interesting paper at the conference organized by the network, making* **G3** *recognize his valuable contribution to the network.* **U1** *and* **U2** *kept their distance, almost boycotting the conference.*

U1, U2: "Then what is our role here as long as they keep on not listening?"

G1: "Everything is ok now with the neighboring municipalities after the successful bargaining process that took place. We reached a mutually beneficial solution."

G1 to N4: "…and I am very glad that we haven't had any more confrontations in the courts during the last two years."

All G1, G2 to M, N: "We are very glad that we have with us M and N with their valuable and constructive comments, and we are trying to take their suggestions into account in our future policies."

G3: "Yeah, it seems that the network works after all. But let's wait and see."

From only the second meeting onwards, the shared leadership among the network's members and the horizontal structure of the network itself facilitated a more fruitful and open dialogue. Some participants realized the opportunities to improve their knowledge and put considerable time and effort into the network (e.g., M2), while others maintained a distance or even displayed elitist behavior (U1, U2). Despite this, the stakeholders' group had already developed its own dynamic, which resulted in a gradual willingness to acknowledge the contributions of certain (initially less highly regarded)

participants, on the one hand, and a tendency to disregard unproductive interventions on the other, regardless of the institutional power and influence of those making them. At this point, the WFD and the PRB had been completely taken out from the agenda, and the stakeholders were focusing entirely on finding responses to their local problems related—but not limited—to urban water management. Despite the growing interest of the researchers on the evolving process of change, their formal involvement was concluded, and they departed from the area.

5.4. Post-Evaluation of Action Research

More than seven years have passed since this exercise. However, in a post-evaluation attempt, we contacted the participants, and we tried to identify the actual changes that occurred. The implementation of the WFD was again a key issue for our inquiry. The summary of our findings is presented in Figure 4.

Figure 4. Summary of post-evaluation findings (in 2009).

Evidence of change and relevant quotations

EVIDENCE G1: It is the most active local actor at the regional level concerning WFD implementation.

M2: "We submitted a highly innovative plan for a wastewater plant and reuse for gardening, we have more ideas, and we will keep seeking local involvement."

M4: "We are illiterate people in our profession. So, we used the nicely written principles of the network as the founding principles of our association. We stick to them, and we follow them to the last letter."

EVIDENCE U1, U2: They are back working closely with G stakeholders and are offering training at PhD level to an employee of G1, exchanging knowledge.

EVIDENCE G1: No problems with neighboring municipalities, series of efforts for sustainable water resource management, relatively open to participatory processes, information flow.

EVIDENCE G1 and N: Only 1 legal dispute (ended in favor of G1) since the demise of the network. N actors have diverted their focus to really pressing environmental issues, and they agree that water is generally well managed.

G3: "I never expected that, after all, the network would have such an impact in the long term!"

More specifically, we noticed that G1 is constantly looking for opportunities to collaborate with other local and regional stakeholders from various sectors and to institutionalize this cooperation. G1 is now involved actively in issues directly linked to the implementation of the WFD and has had a considerable influence on changing the—initially completely unrealistic—plans to restore the dried up Lake Karla within the Pinios River Basin as a drinking water reservoir and instead use the water for irrigation. In institutional terms, G1 is still responsible only for domestic and industrial water supply within the urban area. However, through its engagement in the new restoration plan with which groundwater quantity and quality will be enhanced, G1 acquired valuable knowledge and experience on broader water management issues through its close collaboration with other local stakeholders.

Moreover, the local academics and researchers are now working closely with local stakeholders on various projects and have abandoned their "elitism". An employee of G1 is being trained at the PhD level at the local university, and as has been pointed out, the exchange of knowledge is a two-way

process. G1 acquires scientific knowledge and expertise, while the university receives the practical and technical information it was lacking. In addition, university students pay regular visits to the water utility's installations and conduct research at the Ph.D. level on urban water management, laying the foundation for even closer cooperation in the future.

Conflicts from the past have been resolved almost entirely, and alternative dispute resolution mechanisms have been developed and internalized by the stakeholders of Volos. Negotiation, bargaining and communication now constitute the key to resolve disputes, either within the Metropolitan Area or between Volos' stakeholders and neighboring communities or regional and national actors. It is very important that this overall shift in the way of how problems between stakeholders are now conceptualized and resolved, and it has resulted in a strategic rethinking of the N stakeholders, who now concentrate on urgent environmental or social issues in the area and not on water issues, on which they work closely with G actors. Since 2004, there has been only one problem that was resolved in the court room. Later, the N actor that pushed the issue to the very end and admitted in an interview that it was more a spasmodic action of confrontation reflecting the old culture that prevailed in the past than a really necessary action today.

M2 has proven its character as a pioneer of eco-preneurship [67] companies in Greece, combining genuine environmental concerns with profit-oriented business. An ambitious plan for wastewater treatment was submitted to the municipal authority, while the company's water treatment services are now used by the tourism industry of the area. Moreover, there is collaboration with the local university on water innovation issues. According to the M2 participant, the insights offered by the network greatly facilitated these activities.

Perhaps the most personally rewarding feedback comes from participant, M4, who was the object of much discontent during the network's operations. Now, having reinforced its position as being president of a local association of wastewater transfer tankers, he stated that the learning he acquired through the network actually informed the principles of the association. Now, water protection is the principle guiding the companies' operation, and incidents of illegal disposal have ceased to exist. Moreover, the association operates in harmony with the other stakeholders, contributing to the wastewater management efforts of the utility.

Finally, although it is difficult to measure, it seems that the wider society is responding to and interacting better with water-related issues. According to the participants interviewed, the citizens' awareness has increased, as has the accountability of the utility and public acceptance and legitimacy of water-related works.

It seems that the employed AR did, after all, have a considerable impact, not only on the participants, but also on the local community as a whole in terms of deliberate institutional change. The bottom-up participatory process that took place, a concept completely alien to the region's social norms, influenced the perceptions of the members of the network to the point of altering their behavior. AR enhanced communication, offered a common vision and sparked a process of knowledge exchange, collective learning and joint action, which, although not constituting the solution to urban water management problems, can be viewed as a precondition for resolving these problems. Moreover, it created a shared pool of resources that may later contribute towards the implementation of the WFD.

More specifically, the dominant local actors realized that through participation, even institutionally weak stakeholders can influence a process; as a result, they played a major role at the regional level,

despite the fact that their institutional power was practically non-existent. Moreover, the participants recognized that there is not one, but many subjective realities in relation to water issues and that, through discussion, these realities can emerge to formulate a "reality-rich framework" in which all stakeholders can work together constructively. Seen in this perspective, conflicts can be solved through negotiation and discussion, and judicial mechanisms are only measures of last resort. A process of institutional change had been initiated through the network of participants. Dialogue slowly became the norm, and this allowed the convergence of different, often conflicting, interests of stakeholders. It allowed the identification of common problems and offered ways to solve them. Legitimacy and public acceptance of the taken decisions supported the change of old ineffective urban water management practices. Finally, it resulted in new water institutions, albeit many of them informal in the sense of constraints self-imposed by the actors, unofficial rules of conduct and norms developed between members of the participants' network, that, under legitimization and public acceptance acquired through the AR, can be observed today in various ways (for instance, joint water projects, institutionalization of information and resource sharing, public awareness campaigns). Tragicomic practices of the past, like informing the public with a megaphone and relying on rumors to control water demand (see Figure 5), were never to be repeated.

Figure 5. Practices of the past.

Practices of the Past: The Megaphone

During a period of severe drought in Volos, the water utility decided to take urgent action, informing the public on the crucial need to save water and reduce consumption. As there were no pre-existing mechanisms of interaction with the public, the utility took the only available option: an old van equipped with a megaphone. The van was driving around the city with a person shouting instructions to save water. To the utilities' surprise, the campaign was very successful. The citizens responded, and demand dropped considerably. The story that took place "behind the scenes" is even more interesting: there was a rumor that those in the van were imposing fines on anyone found to be wasting water. Soon, the utility heard the rumor, but chose not to deny it. After a few weeks, most citizens not only changed their behavior to save water, but reprimanded those who kept wasting water—or even threatened them by saying "we'll tell the utility, and they'll issue you with a fine". Gradually, such phenomena (mostly washing the car and watering the garden) ceased (at least in public view). This pattern of behavior, based on an invisible threat of fines, survives in the city of Volos today, although the van has long been withdrawn, no fines have ever been imposed and, now, the public awareness campaigns, although still led by the water utility, are based on long-term planning and strategic decisions, where a number of other actors (private companies, university, NGOs) are involved and actively support it.

6. Conclusions

Based on our empirical research findings and subsequent analysis, we claim that AR meets the challenge of scoping the field of urban water management in an open fashion for determining the appropriate process of institutional change.

Although a series of joint actions indicating growing collective responses to common water management problems had taken place during the operation of the network, the authors have opted to

leave a detailed listing aside and focus on the changes that followed (from 2006 to 2010). It must be noted, though, that the results of the particular case in relation to the PRB plan and issues of public participation and the production/exchange of knowledge within an informal social network have recently been published [58,60]. In this paper, instead, the authors focus on the role that the AR played in the creation of new rules of conduct, the new formal and informal structures shaping the behavior of the stakeholders in Volos and the changes that followed. Thus, they argue for the methodological value of AR in a setting of changing urban water institutions.

We discussed changes in institutions that need to be enacted by actors as subjects of institutions and which, consequently, need to change their behavior. Very different conceptions exist with regards to how this process unfolds and why actors change institutions. As our case has shown, a gap between an imposed new institutional framework (WFD) as manifested through the implementation of a PRB and the change the actors-subjects to institutions require may be considerable. The role of the researcher here, through an action research methodology, may facilitate the process of institutional change and the emergence of new institutions towards the direction required. This does not necessarily mean that the outcome of such a process will conclude to the "desired" change, in this case, the successful implementation of WFD, but it might constitute a first crucial step. In such a case, we argued that the by-products of the process, as shaped by the actors (changes in urban water management practices, emergence of new institutions, fostering participation, increasing awareness and empowering local stakeholders), indirectly, but nevertheless, significantly, contribute to the overall targets of the WFD.

In our case, the purposive design for the desired change, required for the introduction of new water institutions, according to the WFD's requirements, as experienced through the PRB, was found to be extremely weak. The objective institutional design that the researchers attempted failed from the very beginning. Once a subjective-dialogic institutional design process was initiated, though a process of deliberate identification and evaluation of new systems by the actors, did this result in the emergence of new institutions inclusive to what the actors perceived as socially preferred outcomes.

By employing AR, we explored how structures shape agents' behavior and what data we need to gather in order to produce knowledge about this behavior. During the process, the actors themselves, through a deliberation process, offered the answer to the above questions, allowing the researchers to study the structures and facilitate the process of change towards the subjective, but still socially desired, direction.

In our case, however, just as the different theoretical suggestions on institutional change propose, different actors followed different logics, converging at the same result: the emergence of new institutions crafted for the local conditions and problems. This suggests a rather dialectical view of institutional change that provides a more coherent basis upon which we can track the value of action research as a methodology.

In this context, AR actually worked as the lubricant between the different rationales and rationalities of the actors towards institutional change as decided by themselves (subjective-dialogic institutional design).

Attempting to reflect on theoretical propositions on how institutions dynamically change, our findings strongly support the argument that:

"[i]n practice, processes such as learning, socialization, diffusion, regeneration, deliberate design and competitive selection, all have their imperfections and an improved understanding of these

imperfections may provide a key to a better understanding of the dynamics of rules" ([68], quoted in [69], p. 17). Action research in this context, provided a platform on which the understanding for each one of the above-mentioned processes became possible, not only for the involved stakeholders, but for the researchers as well, in a way that they were able to facilitate the process of change without influencing it towards a certain direction.

In this conception, institutional change following institutional design can emerge as an outcome of changes of perceptions about roles, identities, normative values, cognitive frames and rules. The outcomes of institutional design are essentially unpredictable in this context, but depend on the specificities of the problem situation and the way in which experience, expert knowledge or intuition are applied. Enhancing communication, fostering social learning, structuring of processes for information exchange, building of trust and developing dispute resolution mechanisms proved indispensable components for success, although they were initially viewed as issues of secondary importance to the research object. Indeed, our case shows that the results of the process had been rather unpredictable, and they evolved around specificities of problems that we as researchers were unable to conceive of prior to—but also during—the process. This became only possible when the first author returned to the "crime-scene" two years after AR was over. This provided a deep insight into the actual changes that had taken place and hinted at prospects for further change. The amount of time that elapsed between the first evaluation (based on the participants' views once the network had demised) and the second evaluation, which took place in 2009, covered a wide knowledge gap on the impact of the action research conducted in the past and, additionally, highlighted certain aspects of institutional change that we were not able to predict. This time gap between the conclusion of a process and the first tangible results related to institutional change might constitute a key element for evaluating the actual success of measures required by the WFD. Moreover, AR may provide a structured, but still open, methodological tool to support processes, alternative to the largely mechanistic procedures of "ticking boxes" adopted to a large extent, especially concerning the PRBs.

Summarizing our conclusions, we distinguish the value of our findings in a broader setting of urban water management, and we draw some lessons based on our case analysis through the lens of institutional change. In short, we claim that Action Research provides a paradigm for the way a researcher can be involved in the implementation processes of policies aiming at changing the water institutions, but often implying a requirement to change a whole series of other institutions and even beliefs, perceptions and culture. Our case highlighted the importance of the timing of such an involvement, as the initial findings of a long process that aims at changing long-standing and deeply rooted institutions may significantly differ when seen from a longer time perspective. In settings where the purposive design of the desired change might fail, action researchers might support a shift towards a subjective-dialogic institutional design and function as the lubricant between different interests, rationales and behaviors and spark the process of change. However, the researchers employing such an approach must be aware that the results might be socially desirable, but not necessarily compatible with what upper-level political decisions or state/European policies dictate.

Acknowledgements

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