Article

Water Governance in England: Improving Understandings and Practices through Systemic Co-Inquiry

Natalie Foster *, Kevin Collins, Ray Ison and Chris Blackmore

Applied Systems Thinking in Practice Group, School of Engineering and Innovation, Faculty of Mathematics, Computing and Technology, The Open University, Walton Hall, Milton Keynes MK7 6AA, UK; kevin.collins@open.ac.uk (K.C.); ray.ison@open.ac.uk (R.I.); chris.blackmore@open.ac.uk (C.B.)
* Correspondence: natalie.foster@open.ac.uk

Abstract: In 2015, water governance in England finds itself part way through perhaps the most significant changes since the privatisation of the water industry in 1989. Each of the changes is a response to the specific challenges that fall within the realm of improving water governance. However, they also raise many questions: How will the changes play out in practice? Will they work together to form a coherent 'whole'? Can collaborative and competitive approaches really co-exist? This research aims to engage researchers, policy-makers and practitioners in a systemic co-inquiry in order to improve understandings and practices in relation to water governance in England. The two workshops undertaken as part of the research focused on the current and future water governance situation in England, respectively. The findings from the workshops demonstrate that the systemic co-inquiry process generally proved very successful and useful for this group of stakeholders. The workshops provided the opportunity for participants to share, explore and challenge their ideas, knowledge and experiences in water governance; and in doing so, they brought about shared understandings, revealed new insights and identified concerted actions to improve (transform) water governance. However, it is recognised that whilst significant progress has been made towards improving understanding and practices in relation to water governance in England, there is still further work required in order to implement these improvements on a local, national or global scale.

Keywords: systemic co-inquiry; systems thinking; water governance; England; UK

1. Introduction

Water is vital for our health and well-being: we use it for drinking, cooking and washing, as well as for industry, agriculture, fishing, transport, recreation and other purposes [1]. However, evidence demonstrates that our current levels of water use are harming the natural environment. For example, the Environment Agency believes that 13 percent of surface water bodies and 42 percent of ground water bodies in England are failing to achieve 'good' status due to over-abstraction [2]. In addition, significant floods and droughts across England in 2010–2012 and again in 2014–2015 brought into sharp relief the impacts to human health and well-being arising from too much or too little water [3–5].

Climate change, population growth and changing demands for water are predicted to exacerbate the situation in the future. The 2009 UK Climate Projection Report suggests that on average, the UK will experience warmer temperatures, changes in seasonal precipitation with more rain during the summer and less rain during the winter, and more frequent and intense extreme weather events, such as floods and droughts [6]. Water companies forecast that average personal water consumption will

decrease from 154 L per day in 2010/2011 to 144 L per day in 2030/2031. However, the population of England is forecast to rise by 9.2 million people by the 2030s, so despite forecasts of reductions in per capita consumption, household demand is expected to rise by the equivalent of 3 percent of current public water supply [1].

In 2015, water governance in England finds itself part way through perhaps the most significant changes since the privatisation of the water industry in 1989. These changes have already witnessed the adoption of the catchment-based approach, which offers an opportunity to fundamentally reshape how we manage water in the environment by devolving responsibilities to 100+ community-led catchment partnerships [7]. The enactment of the Water Act 2014 also brings significant reforms to the water sector, including putting in place measures to tackle unsustainable abstraction, the introduction of competition in the retail market and provision for a cross-border market between England, Wales and Scotland [8]. Each of the changes is a response to the specific challenges that fall within the realm of improving water governance. However, they also raise many questions: How will the changes play out in practice? Will they work together to form a coherent 'whole'? Can collaborative and competitive approaches really co-exist?

This research aimed to to engage researchers, policy-makers and practitioners in a systemic co-inquiry in order to collectively develop a better understanding of the current water governance situation and how it might be improved in practice. Evidence suggests that systemic transformations in governance are required to realise effective responses to complex environment issues; and furthermore, that such transformations are based on an integration of knowledge and an orchestration of practices between multiple actors (e.g., [9–14]). However, there is relatively little evidence about the process by which such integration and orchestration can be achieved. The research presented in this paper contributes to addressing this knowledge gap. It comprised two workshops, held at the Open University in London on 27 April 2015 and 10 June 2015, respectively. This paper presents an overview of the research design, then summarises the outputs and outcomes from each of the workshops and their implications.

2. Data and Methods

2.1. Participants

Potential participants were identified by stakeholder analysis; some of those identified were known through existing networks from current and previous research, and some were suggested by other participants. Approximately 55 potential participants were invited by the researchers, of which 16 participants attended the first workshop, and 13 participants attended the second workshop (9 participants attended both workshops). Participants from almost all major stakeholder groups were represented at the workshops, including government bodies, consultants, NGOs and academics (Table S1). Notable omissions at the first workshop included representatives from the water companies, who are considered to be key stakeholders in water governance. Representatives from these companies were invited to participate, but either declined or were unable to attend the workshop.

2.2. Workshop Design

The workshops were designed as a systemic co-inquiry into water governance. Co-operative (or collaborative) inquiry was proposed by John Heron in 1971, and subsequently developed with Peter Reason. It involves researching with people, rather than on people. Thus, participants are able to be involved as co-researchers, and may contribute to the design, implementation, monitoring and evaluation of the research [15]. Systemic co-inquiry is a specific type of co-inquiry, which draws on systems theories, methodologies and techniques [16–20]. It is a mode of investigation that is open to changing situations, pursuing new directions and engaging with new or different theoretical/methodological frameworks. In contrast to programmes and projects, which tend to focus on timelines and outputs, systemic co-inquiries proceed by enacting a social learning process

with those who have a stake in a situation experienced as problematic or as presenting an opportunity. Thereby, they enable participants to begin their investigations in a different emotional space to that which accompanies the emotion of certainty usually associated with programmes and projects. Systemic co-inquiries are flexible and do not always have a specific end-point: there is no 'right' way to do a systemic co-inquiry. They can precede, run in parallel with or incorporate a programme or project, and they can be as short as a few hours or run indefinitely until those engaged agree to stop [21–23].

The two workshops focused on the current and future water governance situation in England, respectively. Each workshop comprised an informal introduction, a series of three interactive participatory sessions and short presentations (Table 1). The participatory sessions were designed to actively engage participants in systems thinking, modelling, negotiating and evaluating in order to explore water governance, to formulate problems and opportunities, to identify feasible and desirable changes and identify concerted actions. The systems concepts and techniques used in the participatory sessions, and the purposes for their use, are explained where appropriate in Section 3. The short presentations enabled the participants to contribute different perspectives of the current and future water governance situation.

Table 1. Workshop schedule.

Workshop 1	
Time	**Session**
09:00–09:30	*Registration and coffee*
09:30–09:40	Welcome, introductions and house-keeping
09:40–09:50	Aims of the day
09:50–10:00	Introduction to CADWAGO
10:00–11:00	Participatory session 1: Understanding the water governance situation
	Coffee available during this session
11:00–11:30	Plenary 1: Key points and reportage
11:30–12:15	Presentations 1 + Q&A: Aspects of water governance
12:15–12:45	Participatory session 2: Modelling water governance
12:45–13:15	*Lunch*
13:15–14:00	Participatory session 2: Modelling water governance (continued)
14:00–14:30	Plenary 2: Key points and reportage
14:30–15:15	Presentations 2 + Q&A: Challenges to water governance
15:15–15:30	*Coffee*
15:30–16:00	Participatory session 3: Rethinking water governance
16:00–16:15	Plenary 3: Key points and reportage
16:15–16:30	Round-up, next steps and close

Workshop 2	
Time	**Session**
09:00–09:30	*Registration and coffee*
09:30–09:40	Welcome, introductions and house-keeping
09:40–09:50	Aims of the day
09:50–10:00	Introduction to CADWAGO
10:00–10:45	Participatory session 1: Imagining future water governance in England
	Coffee available during this session
10:45–11:15	Plenary 1: Key points and reportage
11:15–11:45	Presentations 1 + Q&A: Challenges for future water governance
11:45–12:45	Participatory session 2: Modelling future water governance in England
12:45–13:15	*Lunch*
13:15–13:45	Plenary 2: Key points and reportage
13:45–14:15	Presentations 2 + Q&A: Opportunities for innovation in water governance
14:15–15:15	Participatory session 3: Actions for future water governance in England
15:15–15:30	*Coffee*
15:30–16:15	Plenary 3: Key points and reportage
16:15–16:30	Round-up, next steps and close

It was assumed that the participants had at least some knowledge and experiences of the issues associated with water governance, but no prior knowledge or experiences in using systems techniques. A brief explanation of the relevant techniques was given before each task in the participatory sessions. At the start of each workshop, the participants were asked to form groups consisting of people from different organisations, such that multiple different perspectives of water governance were represented in each group. The participants remained in the same groups for the duration of each workshop. The four researchers from the Open University (who are also the authors of this paper) acted as facilitators throughout the workshops, to help and guide the participants through activities and discussions in a timely manner. For each participatory session, one of the researchers acted as the overall facilitator, and the other three researchers acted as group facilitators (one per group of participants). In doing so, the researchers were able to contribute their own knowledge and experiences in water governance and also to learn from the knowledge and experiences of other participants. It is acknowledged that the design of the workshop is always a choice, and the process and facilitation will always shape the outcomes. The views expressed and encapsulated in the models for the purpose of facilitating discussion represent those of the workshop participants based on their knowledge and experiences of water governance.

3. Results and Discussion
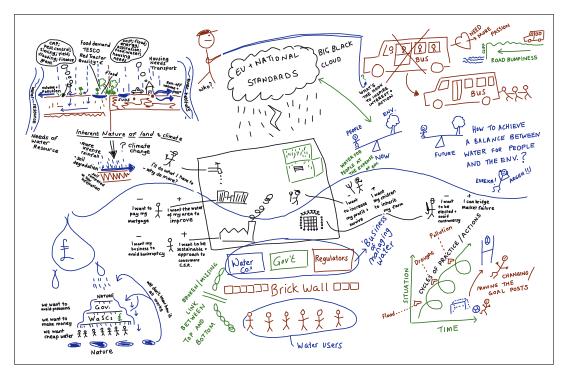
3.1. Workshop 1: Current Water Governance

The first workshop focused on current water governance in England. Sections 3.1.1–3.1.3 report on each of the three participatory sessions, providing a summary of the tasks undertaken and the outcomes. Section 3.1.4 provides a summary of the presentations given by the workshop participants.

3.1.1. Participatory Session 1: Understanding the Water Governance Situation

The first participatory session focused on developing systemic awareness of the current water governance situation by exploring the participants' experiences using rich pictures. Systemic awareness, an awareness of the situation as a whole, comes from exploring and understanding cycles, counter-intuitive effects and unintended consequences. The process of developing systemic awareness begins with 'standing back' and resisting pressures to rush towards a preconceived solution by exploring (or re-exploring) the wider context of a situation using tools and techniques that encourage divergent thinking, such as rich pictures [24].

Rich pictures originate from soft systems methodology [25–27]. They comprise a pictorial representation of anything and everything that is perceived to be relevant to a given situation by the person (or people) who drew it. The process of collectively creating a rich picture entails both drawing and describing what is being drawn to the other participants in the group; participants should also include themselves within the rich picture to make explicit their own perspectives. The process continues until all of the participants responses have been discussed and recorded on the rich picture (see [28] for further details).

Working together in small groups, the workshop participants created three rich pictures (one per group) depicting the main actors and elements in the current water governance situation and the relationships between them from their perspectives (e.g., Figure 1). Subsequently, they were asked to collectively identify themes emerging from their rich pictures. Then, by facilitated discussion, the rich pictures and emergent themes from each group were talked through in plenary. The aim here was to capture their perspectives of the situation and to communicate it to others; furthermore, to start the process of thinking systemically about the problem situation, viewing it from multiple perspectives, and to initiate dialogue between the participants.

Figure 1. A rich picture of the current water governance situation in England drawn by a group of workshop participants (redrawn from the version created at the workshop; see also Figure S1) [29].

The rich pictures depict the current water governance situation as a dynamic and complex 'mess' of actors and elements. For example, they show conflicting interests within and between different stakeholder groups, cycles of activities triggered by water crises, such as floods, droughts and pollution, as well as governance structures, and the influence of EU and national standards on water governance practices.

From the rich pictures, the participants identified 15 themes (5 per group):

Group 1

- Uncertainty regarding accountability (ownership) of water governance;
- Lack of incentives for water/sewerage companies to consider the whole environment;
- Principal aim/goal of water governance to achieve EU and national standards;
- Need for a call to action; and
- Disconnect between water 'managers' and water 'users'.

Group 2

- Relationship between policy and regulation;
- Levels of governance: local-global, top-bottom?
- Communication needs to be all ways: up, down and across organisations/sectors;
- Scale of systemic governance problem: global and/or local?
- Leadership: who has the big picture?

Group 3

- Series of disconnects between actors and elements;
- Local government needs an overhaul: the catchment-based approach needs legitimacy;
- Current system rewards certain personality types;
- Governance has a pendulum effect; and
- Key to success is too narrow: leaves out social, systemic effects of EU policies, systemic relationship between soil and water, questions about the efficiency of farming system, as well as the catchment-based approach and Water Framework Directive (WFD) 2021–2027.
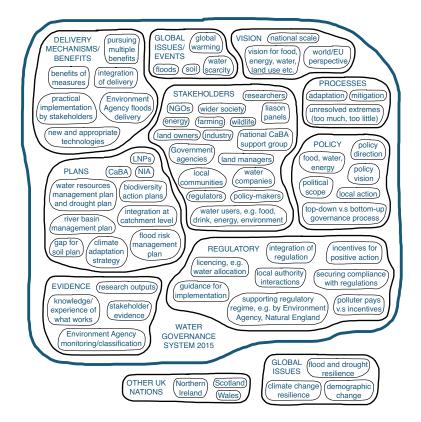
The process of collaboratively creating the rich pictures in small groups was effective in terms of initiating and engaging the participants in a dialogue with each other about their experiences of water governance. It enabled them to voice their own perspective and also to see water governance from a variety of different partial perspectives, as well as to appreciate and learn from the different perspectives because of the different insights into water governance that they evoked.

3.1.2. Participatory Session 2: Modelling Water Governance

The second participatory session focused explicitly on developing shared understandings by defining the participants' system of interest (i.e., the current water governance system from their point of view) using a combination of systems maps, BATWOVE analysis and root definitions to identify the key parts of the system and to formulate a concise description of it.

Having identified themes for consideration from techniques, such as rich pictures, it is useful to identify boundaries within a system of interest and to classify components of the system within a nested set of boundaries. This process helps to develop new insights into the system from the participants' perspectives. Systems maps, which were developed by the Open University for teaching purposes, are an important modelling technique for this purpose [24].

The participants created three systems maps (one per group) identifying the actors and elements incorporated within their system of interest and those in its environment, which affect it and are affected by it (e.g., Figure 2). The immediate aim was to define the structure and boundary of the participants' system of interest. In doing so, the intention was to further develop the participants' systemic awareness, working towards achieving a shared understanding of their system of interest.

Figure 2. A systems map of the current water governance system in England constructed by a group of workshop participants (redrawn from the version created at the workshop; see also Figure S2) [29].

The systems maps enabled the identification of the actors and elements in the water governance situation that the participants perceived to be important. By completing the systems maps,

the participants were able to appreciate that few people had an overall understanding of the elements in the system (or the system as a whole) and did not always agree on where the boundaries should sit. The task also surfaced issues such as knowing the many acronyms used in the systems maps. The participants stated that they found the task challenging because it was difficult to decide what was relevant or not, but that it was worthwhile in terms of helping them to unravel the complex 'mess' depicted in the rich pictures. Thus, although the systems maps are a simplified representation of the water governance situation, the task of constructing them implicitly developed shared understandings of the situation and served to inform subsequent tasks in the workshop.

The key to understanding any system of interest is to identify its purpose, which can be done by developing a root definition. Root definition is a part of the terminology of soft systems methodology [25–27]. It is a statement that concisely describes a system of interest, and it should include mention of all of the key elements of the system. It takes the form: a system to do P (what) by Q (how) in order to achieve R (why). Various mnemonics have been suggested to help the process of formulating a root definition; BATWOVE (beneficiaries, actors, transformation, world-view, owners, victims and environmental constraints) was used in this instance because it makes explicit the beneficiaries and victims of the system.

Working together in groups, the participants identified the key parts of their system of interest from Figure 2 using the mnemonic BATWOVE and formulated three root definitions (one per group) incorporating all of the key parts (e.g., Table 2). Subsequently, the root definitions were shared with the other workshop participants in plenary. The aim here was to provide a base from which to identify feasible and desirable changes to improve the current water governance situation and also to alleviate clashes of perspective and purpose that can lead to conflict when identifying such changes or inaction because there is no agreement on what the objective of intervention is, how it should be achieved and for what purpose (why) [24].

Table 2. BATWOVE (beneficiaries, actors, transformation, world-view, owners, victims and environmental constraints) and root definition applied to the water governance situation by a group of workshop participants (redrawn from the version created at the workshop; see also Table S2) [29].

Beneficiaries	Politicians, ministers, bill payers, fish and shellfish industry, water users/consumers, some ecosystems, recreational users, irrigators
Actors	Press (media), academics, teachers, farmers, NGOs and other third sector volunteers, water and sewerage companies, Environment Agency, Natural England, OFWAT
Transformation	Public water supplied and waste water treated
Worldview	Provide goods and services to society, provide clean drinking water, natural capital under-valued
Owners	Property owners, water and sewerage companies, government, voters, regulators, EU Parliament and Council
Victims	Ecosystems, current citizens, future generations
Environment	Climate change, capitalism dominates, risk aversion
Root definition	A disconnected and opaque system, nominally owned by everyone but managed by EU, government and water companies, to provide goods and services by delivering public water supply and waste water treatment using inefficient high energy, engineering, top-down regulatory approaches in order to support economic growth and welfare

Albeit that the groups used different wording in their BATWOVE analyses and root definitions, it is notable that there are some significant areas of overlap and consensus about the aim (W) and objective (T) of the current water governance system, as well as about the persons involved (BAOV) and the constraints imposed upon it (E). As with the systems maps, the participants stated that they found the task challenging, particularly in terms of staying focused on the current water governance situation rather than what it ought to be in the ideal world; this is perhaps an inherent consequence of the fact that in trying to understand what is done, there is a tendency for discussion about what

could (or should) be done, i.e., how it could be improved in practice. However, at least one of the participants noted that 'staying with the current situation' and 'having the opportunity to explore it thoroughly from multiple viewpoints' was particularly helpful.

Note that these root definitions represent the perspective of the workshop participants, and thus, they are relevant only to the participants in the context of the workshop. Other people may have different world-views, and hence, have a different system of interest. Nonetheless, together with the rich pictures and systems maps, the root definitions sufficed to bring about common understandings and shared expressions of the water governance situation from the participants' perspectives, from which feasible and desirable changes (improvements) were later identified.

3.1.3. Participatory Session 3: Rethinking Water Governance

The third participatory session focused on identifying systemically feasible and desirable changes in the participants' situation of interest. It used the systems models created in the previous participatory sessions (and the insights that emerged from them) to inform and structure the discussion about the current water governance situation and the actions required to improve it.

Systemically feasible and desirable changes (perceived improvements) can be identified by comparing what 'is' with what 'ought to be' from a theoretical perspective [30]. Working together in groups, the participants compiled a table showing in one column what is happening in the current situation and, in another column, what perhaps ought to be done in an ideal world (Table 3). The aim here was to think systemically about how the current water governance situation could be improved in practice.

Table 3. 'Is' versus 'ought to be' in the context of water governance from the perspective of the workshop participants (redrawn from the versions created at the workshop) [29].

'Is'	'Ought to Be'
Group 1	
Natural capital/services under-valued or un-valued	Fully-valued natural capital and services
Belief in 'hard' engineering solutions	Belief and trust in catchment management
Market failures	Markets working for ecosystem services (incentives)
Focus on compliance with EU and national standards	EU and national standards is one of many drivers/measures of performance
Disconnected system	Link between water 'users' and providers/managers
Group 2	
Some sectors lose out when there's not enough water to go around	To have coping strategy to manage water scarcity fairly
Catchment-based approach (CaBA) is a declared method by government for managing the aquatic environment but is not yet working	To be able to understand and address all of the obstacles to delivering an effective catchment-based approach
Cautious political decisions about what should happen in crisis	A clear vision for a more certain allocation of water as part of evidence-based wider water management
Policy is driven by evidence largely from government agencies	Policy to be driven by a wide evidence base, drawing from all available sources
Group 3	
Inequitable power arrangements	More equitable power arrangements
Narrow valuation by the Treasury	Wider valuation on socio-ecological by the Treasury
City infrastructure beyond design thresholds	Liveable cities
Distrust between actors	Accommodation in PPPs
Lack institutional arrangements for co-operation	Co-operation and collaboration, common platform for NGOs
Competition for limited resources	?
Eco-indifference	Citizen eco-literacy, context specific responsible autonomy, local autonomy and accountability, democratic accountability, security of income

As with the first and second participatory sessions, there were choices of focus in considering what 'is' and what 'ought to be' that might well be different with a different groups of participants at a different time. In this sense, the outputs from this session (and for the workshop as a whole) are a snapshot of issues emerging and experiences of relevance to water governance in England. The task concurrently brought to an end the first cycle of inquiry and provided a start point for the second cycle of inquiry. What should be, i.e., what is desirable, and what could be, i.e., what is both feasible and desirable, were key topics in the second workshop, which focused on future water governance in England (see Section 3.2).

3.1.4. Participants' Presentations: Aspects and Challenges in Water Governance

Systems thinker, West Churchman, once claimed that systems thinking begins when you see the world through the eyes of another [17], which conveys that a key aspect of developing systemic awareness is to allow for multiple partial perspectives to inform a decision-making process. Adopting this principle, in between the participatory sessions, five of the workshop participants presented their perspective of the current water governance situation to the other workshop participants; in doing so, the presentations formed a key part of the co-inquiry. The participants were asked to consider the presentations as part of their inquiry and to use them to explore their own thinking and ideas in the discussions. Thus, the presentations contributed new perspectives, evidence and understandings of different aspects of water governance. Collectively, the presentations covered a diverse range of topics, such as the impact of the Water Act 2014, water abstraction reform, the 'gap' between top-down and bottom-up governance approaches, and communication and language issues.
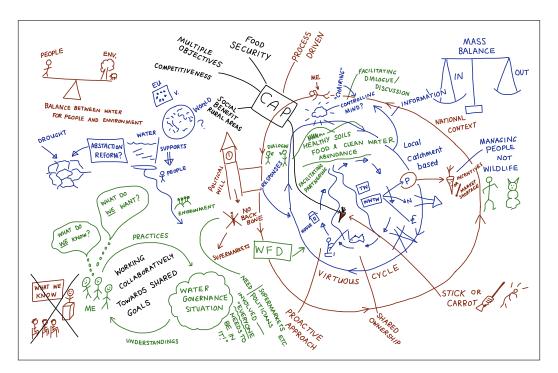
3.2. Workshop 2: Future Water Governance

The second workshop focused on future water governance in England. Sections 3.2.1–3.2.3 report on each of the three participatory sessions, providing a summary of the tasks undertaken and the outcomes. Section 3.2.4 provides a summary of the presentations given by the workshop participants.

3.2.1. Participatory Session 1: Imagining Future Water Governance

Building on the outcomes from the previous workshop, the first participatory session focused on developing the process of thinking systemically about how the current water governance situation could be improved in practice by exploring the participants' insights and ideas using rich pictures.

Rich pictures were used as a means of capturing, and communicating to others, the participants' perspectives of what the water governance situation ought to be in an ideal world, based on their own understandings, knowledge and experiences. Working together in small groups, the workshop participants created three rich pictures (one per group) depicting the main actors and elements in their 'ideal' water governance situation and the relationships between them from their perspectives (e.g., Figure 3). Subsequently, they were asked to collectively identify themes emerging from their rich pictures. Then, by facilitated discussion, the rich pictures and emergent themes from each group were talked through in plenary. The aim here was to capture their perspectives and ideas about water governance in the ideal world, and to communicate it to others; and also, to initiate dialogue between the participants.

The rich pictures again depict the 'ideal' water governance situation as a dynamic and complex 'mess' of actors and elements. However, in contrast to the rich pictures from the first workshop, these rich pictures show water governance as a virtuous circle (or cycle) in which the various different actors and elements in the situation work together towards shared goals. For example, there is a distinct focus on social/community-led learning and action, shared ownership and responsibility and collaboration. There is also more emphasis on recognising (and measuring progress towards) multiple benefits of water governance, including human health and well-being, in addition to water quality and other legislative standards.

Figure 3. A rich picture of an 'ideal' water governance situation in England drawn by a group of workshop participants (redrawn from the version created at the workshop; see also Figure S3) [29].

From the rich pictures, the participants identified 15 themes (4–6 per group):

Group 1

- Self-organisation, enabled by policy/ideological state approach;
- Valuing nature in a different way (embedded in a system);
- Virtuous circle: capital, natural capital and social well-being;
- Crises, social movements and problems leveraged and cracked current blocks of privilege and power; and
- New ideas flow in through new global and national knowledge networks.

Group 2

- Interactions between people and/about the environment;
- Many goals, achieving multiple benefits;
- 'One vision' realised through subsidiarity principle (local governance);
- Motivation: stick and/or carrot?
- Collaboration rather than competition; and
- Culture change, planning for the long-term.

Group 3

- How can we maintain a creative relationship between formal and informal, e.g., knowledge?
- Who is the 'conductor'? Defra, Ofwat, Environment Agency, local authorities, water companies, Rivers Trusts?
- Creating the stages for the emergence of 'catchment theatre'; and
- Creating the conditions for citizen leadership and choice.

Consistent with the first workshop, the process of collaboratively creating the rich pictures in small groups was effective in terms of initiating and engaging the participants in dialogue with each other about water governance. It was particularly effective in this instance for revealing and over-coming (mis-)perceived conflicts of interests and/or understandings between some of the participants resulting from different people using different language to describe the same thing (e.g., an issue, concern, idea, etc.).

3.2.2. Participatory Session 2: Modelling Future Water Governance

The second participatory session focused explicitly on developing shared understandings by identifying the key parts of the participants' system of interest (i.e., the 'ideal' water governance system from their point of view) using BATWOVE analysis and formulating a concise description the system using root definitions.

Working together in groups, the participants identified the key parts of their system of interest from Figure 3 using the mnemonic BATWOVE and formulated three root definitions (one per group) incorporating all of the key parts (Table S3). Subsequently, by facilitated discussion, the root definitions were debated and amended until a 'preferred' root definition was collectively agreed:

> "An iterative, place-based, reflexive, English learning system operated by a 'system operator' on behalf of everyone and within a set framework, to optimise the management of water in all its forms by: engaging and empowering society to make equitable decisions and take collective/concerted actions; developing new markets for valuing natural capital; and developing social infrastructure for knowing the value of natural capital, in order to deliver human health and well-being (with recognition that health and well-being depends upon a healthy, functioning natural environment) within the constrains of social, environmental and economic capital."

The aim here was arrive at an accommodation of perspectives amongst the participants regarding what the objective of the water governance system should be in the ideal world, how it should be achieved and for what purpose (why) and, furthermore, to provide a base from which to begin to identify actions to improve water governance in the real world.
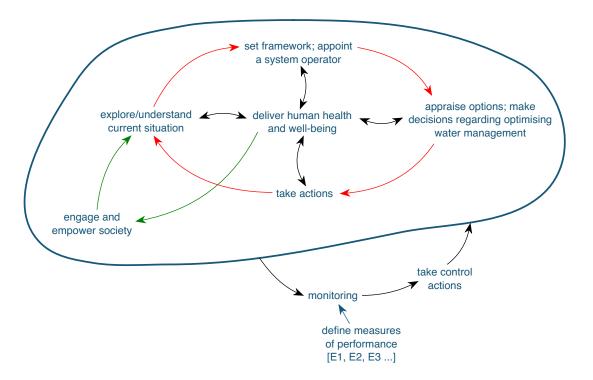
Many of the ideas and suggestions about what 'ought to be' in the ideal world, which were first conceived of in the previous workshop (Section 3.1.3) and then explored in the rich pictures in this workshop (Figure 3), were further developed and clarified in these root definitions. The decision to collectively formulate a 'preferred' root definition, which was adapted from one of the root definitions developed by the groups, was based on the recognition that whilst each of the root definitions was unique in the sense that they each stated a different aim (W) and objective (T), there were also some notable similarities, particularly regarding who should (or could) be involved or affected by the system (BAOV) and, to a lesser extent, about the constraints imposed upon it (E).

As with the root definitions in the first workshop, the participants said that they found the task challenging; and it was also later acknowledged that some of the participants found it difficult (but not insurmountable) to adapt from the root definition developed by their group to the 'preferred' root definition in the subsequent participatory session. However, as a whole, the task served to bring about a common understanding and shared expression about water governance in the ideal world, which informed the tasks in the subsequent participatory session.

3.2.3. Participatory Session 3: Actions for Future Water Governance

The third participatory session focused explicitly on identifying actions to improve water governance by making conceptual (system) models relevant to the 'ideal' water governance situation and using the models to inform and structure discussion about the current situation and the actions required to improve it.

Working together in groups, the participants created three conceptual models (one per group) representing the sequence of activities that would have to be undertaken if the 'ideal' water governance system described in the preferred root definition were to function in the real-world (e.g., Figure 4). Then, the conceptual models were compared with each other, and with the current water governance situation, by asking pertinent questions, such as: If this activity is missing in the real world, is that a good thing? Does it matter? What are the implications of filling a gap? How might it be filled [31]? The purpose of the task was to engage the participants in further discussions about water governance and the actions required to improve it.

Figure 4. A conceptual model of an 'ideal' water governance system constructed by a group of workshop participants (redrawn from the version created at the workshop; see also Figure S4) [29].

It is notable that each of the conceptual models recognise that 'delivering human health and well-being' is not something that can just be done, but rather that it is an emergent outcome of the system as a whole; and at least one of the models recognises that it is also an input to engaging people in water governance. In addition, the models show water governance as an iterative learning system, i.e., not something that can be done once to solve the problem situation, but rather something that is ongoing and adaptive to the changing (improving) water governance situation.

The actions to improve water governance, which were identified by the workshop participants using the models as a visual and mental aid, are summarised in Figure 5. They fall broadly into four categories: stakes and stakeholding; facilitation; institutions and policies; and knowing and learning about water governance. Realising these actions is perceived by the workshop participants to be a key step towards improving water governance in England.
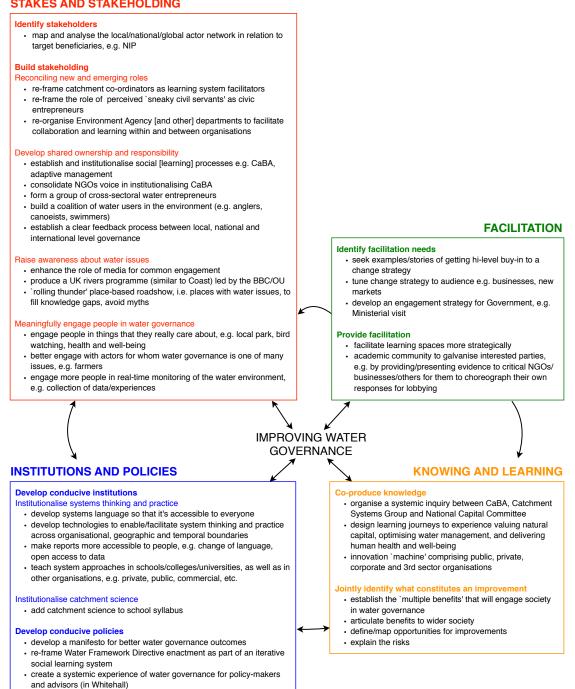
STAKES AND STAKEHOLDING

Identify stakeholders
- map and analyse the local/national/global actor network in relation to target beneficiaries, e.g. NIP

Build stakeholding
Reconciling new and emerging roles
- re-frame catchment co-ordinators as learning system facilitators
- re-frame the role of perceived `sneaky civil servants' as civic entrepreneurs
- re-organise Environment Agency [and other] departments to facilitate collaboration and learning within and between organisations

Develop shared ownership and responsibility
- establish and institutionalise social [learning] processes e.g. CaBA, adaptive management
- consolidate NGOs voice in institutionalising CaBA
- form a group of cross-sectoral water entrepreneurs
- build a coalition of water users in the environment (e.g. anglers, canoeists, swimmers)
- establish a clear feedback process between local, national and international level governance

Raise awareness about water issues
- enhance the role of media for common engagement
- produce a UK rivers programme (similar to Coast) led by the BBC/OU
- `rolling thunder' place-based roadshow, i.e. places with water issues, to fill knowledge gaps, avoid myths

Meaningfully engage people in water governance
- engage people in things that they really care about, e.g. local park, bird watching, health and well-being
- better engage with actors for whom water governance is one of many issues, e.g. farmers
- engage more people in real-time monitoring of the water environment, e.g. collection of data/experiences

FACILITATION

Identify facilitation needs
- seek examples/stories of getting hi-level buy-in to a change strategy
- tune change strategy to audience e.g. businesses, new markets
- develop an engagement strategy for Government, e.g. Ministerial visit

Provide facilitation
- facilitate learning spaces more strategically
- academic community to galvanise interested parties, e.g. by providing/presenting evidence to critical NGOs/ businesses/others for them to choreograph their own responses for lobbying

IMPROVING WATER GOVERNANCE

INSTITUTIONS AND POLICIES

Develop conducive institutions
Institutionalise systems thinking and practice
- develop systems language so that it's accessible to everyone
- develop technologies to enable/facilitate system thinking and practice across organisational, geographic and temporal boundaries
- make reports more accessible to people, e.g. change of language, open access to data
- teach system approaches in schools/colleges/universities, as well as in other organisations, e.g. private, public, commercial, etc.

Institutionalise catchment science
- add catchment science to school syllabus

Develop conducive policies
- develop a manifesto for better water governance outcomes
- re-frame Water Framework Directive enactment as part of an iterative social learning system
- create a systemic experience of water governance for policy-makers and advisors (in Whitehall)

KNOWING AND LEARNING

Co-produce knowledge
- organise a systemic inquiry between CaBA, Catchment Systems Group and National Capital Committee
- design learning journeys to experience valuing natural capital, optimising water management, and delivering human health and well-being
- innovation `machine' comprising public, private, corporate and 3rd sector organisations

Jointly identify what constitutes an improvement
- establish the `multiple benefits' that will engage society in water governance
- articulate benefits to wider society
- define/map opportunities for improvements
- explain the risks

Figure 5. Actions to improve water governance in England (summarised and redrawn from the versions created at the workshop using an adapted version of a framework developed by Ison et al. [22]) [29].

3.2.4. Participants' Presentations: Challenges and Innovation Opportunities for Future Water Governance

Consistent with the previous workshop, participants' presentations formed a key part of the co-inquiry process. In this workshop, four of the participants shared their thoughts, ideas and suggestions about the perceived challenges and innovation opportunities for future water governance. The participants were asked to consider the presentations as part of their inquiry and to use them to explore their own thinking and ideas in the discussions. In this way, the presentations contributed

new perspectives, evidence and understandings of different aspects of water governance. In summary, the presentations discussed:

- challenges and concerns about how forthcoming water retail markets will operate in practice given the perceived need for further collaboration rather than competition in water governance;
- the history of water governance in England and, in particular, the proposed solution of a 1927 Royal Commission to have 100 catchment boards responsible for each main river, with powers over individual drainage boards;
- Thames Conference 2015, 'A Better River; A Better City', held at Fishmongers' Hall in London on 9 June 2015; and
- contribution of the Catchment Systems Group (an affiliation of academics from various organisations across the UK) to the OECD's recent consultation on draft Water Governance Principles, leading to some significant changes and new opportunities, such as funding bids, other consultations, etc.

3.3. Workshop Evaluation

The participants provided formal feedback (via anonymous responses to evaluation questions) and informal feedback (via email) to the researchers following each of the workshops, which helps to evaluate the performance of the systemic co-inquiry process from the participants' perspectives. The participants comments and recommendations are summarised in Table 4.

Table 4. Participants' responses to workshop evaluation questions [29].

What Have You Found Useful?	How Can the Workshop Be Improved?
Opportunity to listen to informed comments and ideas	It would have been good to have some other private sectors
Opportunity for blue-sky thinking	A bit more explanation of *why* systemic co-inquiry: how does it help us understand?
Good range of people	
System-focus of inquiry	
Chance to examine the current system thoroughly	
Mix of interactive and presentations; liked interactive first	
Good to get stuck into producing outputs	
Sufficiently balanced between conceptual and practical	
Right balance ambition for the exercises within the time; good preparation of the exercises really helped; well done!	
Well done [...] for your hard work on these workshops, they have been really helpful and I hope you can continue to play a useful role in helping facilitate change from a neutral position	
I found the workshop very interesting, as well as challenging! It was an intense day, and in my humble opinion, I think a lot of aspects were covered considering the amount of time we had	
I certainly enjoyed the workshop and have been reflecting on it since	

The responses are generally self-explanatory. However, there are two key points which merit further consideration:

1. The participants' feedback demonstrates that the systemic co-inquiry process generally proved very successful and useful for this group of stakeholders. The participants appreciated the balance

between different aspects of the workshops (e.g., participatory and presentation sessions) and also the opportunities to share and challenge their own perspectives in water governance, as well as to listen to (and learn from) the perspectives of other participants in a facilitated, neutral process. It is also notable that some of the participants are subsequently implementing (or exploring the potential for implementing) systems thinking and systemic co-inquiry within their own organisations.

2. The diversity of the participants was valued by those involved in the workshops. However, as noted by one of the participants, further increasing the diversity of the participants, particularly in relation to the involvement of water companies, could help to further develop new networks, as well as to reveal new/different insights or avenues for further investigation into water governance. Future research should seek to understand why some of these companies chose not to participate in this systemic co-inquiry and how to better engage with them (and others) in the future.

4. Conclusions

The research presented in this paper aimed to engage researchers, policy-makers and practitioners in a systemic co-inquiry in order to improve understandings and practices in relation to water governance in England. The two workshops undertaken as part of the research focused on the current and future water governance situation in England, respectively. The outputs and outcomes from the workshops demonstrate that the systemic co-inquiry process generally proved very successful and useful for this group of stakeholders. The workshops provided the opportunity for participants to share, explore and challenge their ideas, knowledge and experiences in water governance; and in doing so, they brought about shared understandings, revealed new insights and identified concerted actions to improve (transform) water governance.

Since the workshop, these actions continue to be further developed. For example, some of the participants have initiated systemic inquiries or other social learning processes within their own organisations and projects; others are collaboratively developing ways of integrating the implementation of the EU Water Framework Directive with other policies and initiatives through community action at the catchment scale. Thus, although the participants openly stated that they found the workshop tasks challenging, the overall systemic inquiry process has opened up new pathways and options for change that have the potential to fundamentally transform water governance in England.

Notwithstanding that there are some refinements that can be made to improve the systemic co-inquiry process as a result of 'lessons learned' from these workshops, the participants' feedback confirms that it was appropriate in this context and also subsequently within some of their own organisations and contexts. Furthermore, the concepts and methods applied in this study are transferable (subject to the availability of resources and willingness of stakeholders to participate) to other areas where there is a need to improve understanding and practices in water governance within the UK and elsewhere; and also to other complex problem situations, such as those concerning spatial planning, green infrastructure, transportation, climate change and energy use. Nonetheless, it is recognised that whilst significant progress has been made in this research towards improving understanding and practices in relation to water governance in England, there is still further work required in order to implement these improvements on a local, national or global scale.

References

1. Department for Environment, Food and Rural Affairs (DEFRA). *Water for Life, CM 8230*; The Stationery Office (TSO): London, UK, 2011.
2. Environment Agency. *Managing Water Abstraction*; Environment Agency: Bristol, UK, 2013.
3. Marsh, T.J.; Parry, S.; Kendon, M.C.; Hannaford, J. *The 2010–2012 Drought and Subsequent Extensive Flooding—A Remarkable Hydrological Transformation*; Centre for Ecology and Hydrology: Wallingford, UK, 2013.
4. BBC. Somerset Floods Crisis: How the Story Unfolded. 2014. Available online: http://www.bbc.co.uk/news/uk-england-somerset-26157538 (accessed on 12 May 2016).
5. BBC. Cumbria Floods: Some Areas Flooded for Third Time in a Month. 2015. Available online: http://www.bbc.co.uk/news/uk-england-cumbria-35159816 (accessed on 12 May 2016).
6. Jenkins, G.J.; Murphy, J.M.; Sexton, D.M.H.; Lowe, J.A.; Jones, P.; Kilsby, C.G. *UK Climate Projections: Briefing Report*; Met Office Hadley Centre: Exeter, UK, 2009.
7. Department for Environment, Food and Rural Affairs (DEFRA). *Catchment Based Approach: Improving the Quality of Our Water Environment*; Environment Agency: London, UK, 2013.
8. HMSO. Water Act 2014 (c. 21). Available online: http://www.legislation.gov.uk/ukpga/2014/21/pdfs/ukpga_20140021_en.pdf (accessed on 18 March 2015).
9. Hounkonnou, D.; Kossou, D.; Kuyper, T.W.; Leeuwis, C.; Nederlof, E.S.; Röling, N.; Sakyi-Dawson, O.; Traoré, M.; van Huis, A. An innovation systems approach to institutional change: Smallholder development in West Africa. *Agric. Syst.* **2012**, *108*, 74–83.
10. Leeuwis, C.; Pyburn, R. *Wheelbarrows Full of Frogs: Social Learning in Rural Resource Management*; Koninklijke Van Gorcum: Assen, The Netherlands, 2002.
11. Ison, R.L.; Bawden, R.J.; McKenzie, B.; Packham, R.G.; Sriskandarajah, N.; Armson, R. From sustainable to systemic development: An inquiry into transformations in discourse and praxis. In *Systemic Development: Local Solutions in a Global Environment*, Proceedings of the 13th ANZSYS Conference, Auckland, New Zealand, 2–5 December 2007; pp. 1–19.
12. Ison, R.; Röling, N.; Watson, D. Challenges to science and society in the sustainable management and use of water: Investigating the role of social learning. *Environ. Sci. Policy* **2007**, *10*, 499–511.
13. Pelling, M.; High, C. Understanding adaptation: What can social capital offer assessments of adaptive capacity? *Glob. Environ. Chang.* **2005**, *15*, 308–319.
14. Wals, A.E.J. *Social Learning towards a Sustainable World: Principles, Persepctives and Praxis*; Wageningen Academic Publishers: Wageningen, The Netherlands, 2009.
15. Heron, J.; Reason, P. The practice of co-operative inquiry. Research with rather than on people. In *Handbook of Action Research: Participative Inquiry and Practice*; Reason, P., Bradbury, H., Eds.; Sage Publications Limited: London, UK, 2001.
16. Dewey, J. *How We Think: A Restatement of the Relation of Reflective Thinking to the Educative Process*; D.C. Heath and Company: Boston, MA, USA, 1933.
17. Churchman, C.W. *The Design of Inquiring Systems*; Basic Books: New York, NY, USA, 1971.
18. Checkland, P. The role of the practitioner in a soft systems study, notes of a talk given to OuSyS and UKSS, Saturday 8 December 2001. In *Quarterly Newsletter of the Open University Systems Society (OUSyS)*; The Open University: Milton Keynes, UK, 2002; Volume 27, pp. S5–S11.
19. Blackmore, C.P. Learning Systems and Communities of Practice for Environmental Decision-Making. Ph.D. Thesis, The Open University, Milton Keynes, UK, 2009.
20. Ison, R. *Systems Practice: How to Act in a Climate-Change World*; Springer: London, UK, 2010.
21. Ison, R.L. Some reflections on a knowledge transfer strategy: A systemic inquiry. In *Farming and Rural Systems Research and Extension*, Proceedings of the 4th IFSA European Symposium, Florence, Italy, 8–11 April 2002; Cristovao, A., Zorini, L.O., Eds.; Agenzia Regionale per lo Sviluppo e l'Innovazione nel Settore Agricolo e Forestale: Firenze, Italy, 2002.

22. Ison, R.L.; Steyaert, P.; Roggero, P.P.; Hubert, B.; Jiggins, J. *Social Learning for the Integrated Management and Sustainable Use of Water at Catchment Scale*; The Open University: Milton Keynes, UK, 2004.

23. Wallis, P.J. Research as 'Inquiry'. 2015. Available online: http://learninglabmonash.blogspot.co.uk/2015/08/research-as-inquiry.html (accessed on 2 September 2015).

24. Open University. *T863 Book 2 Starting off Systemically in Environmental Decision Making*; The Open University: Milton Keynes, UK, 2006.

25. Checkland, P. *Systems Thinking, Systems Practice*; Wiley: Chichester, UK, 1981.

26. Checkland, P.; Scholes, J. *Soft Systems Methodology in Action*; Wiley: Chichester, UK, 1990.

27. Checkland, P. Soft systems methodology: A thirty year restrospective. *Syst. Res. Behav. Sci.* **2000**, *17*, S11–S58.

28. Open University. *T863 Techniques for Environmental Decision Making*; The Open University: Milton Keynes, UK, 2006.

29. Foster, N.; Collins, K.; Ison, R.; Blackmore, C. *Water Governance in England. Improving Understandings and Practices through Systemic Co-Inquiry*; Full Report; The Open University: Milton Keynes, UK, 2015.

30. Ulrich, W.; Reynolds, M. Critical Systems Heuristics. In *Systems Approaches to Managing Change: A Practical Guide*; Reynolds, M.; Holwell, S., Eds.; Springer in Association with The Open University: London, UK, 2010; pp. 243–292.

31. Checkland, P. Achieving 'Desirable and Feasible' Change: An Application of Soft Systems Methodology. *J. Oper. Res. Soc.* **1985**, *36*, 821–831.