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Reflexive Adaptation for resilient water services: lessons for theory and practice

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Abstract

‘Adaptive management’ concern attempts to manage complex social-ecological and socio-technical systems in nimble ways to enhance their resilience. In this paper, three forms of adaptive management are identified, ‘scientific’ forms focused on collation of scientific data in response to management experiments, but more recent developments adding processes of collaboration as well as emphasising the need for reflexivity, that is, conscious processes of opening up debates to different perspectives and values. While reflexive adaptive management has been increasingly discussed in theory, there is a lack of examples of what its application means in practice.

As a response, this paper examines an ‘Adaptive Planning Process’ (APP), seeking to apply reflexive adaptive management as a means to improve climate resilience in the UK water sector. The APP’s three inter linked workshops - Aspiration, Scenario and Roadmapping - were co-developed and trialled in a water utility. By describing and justifying the choices made in the development of the APP, the paper aims to reveal some of the challenges that arise when trying to design processes that achieve reflexive adaptation.

The paper concludes that, if applied to planning for climate change, reflexive adaptation has the potential to explore multiple value positions, highlight different potential futures and acknowledge (and hence, partly address) power differentials, and therefore to offer the possibility of real change. On the basis of the trial, we argue that through tapping the depth and breadth of internal knowledge the APP process created the potential for decision making to be joined up across different parts of the utility, and hence offering

new strategies and routes for addressing uncertainties and delivering more resilient water services.

Keywords: Adaptive water management; climate adaptation; reflexive governance; collaborative planning; UK water sector; climate change; uncertainty

Introduction

According to the IPCC, climate adaptation is ‘the process of adjustment to actual or expected climate and its effects [...] to moderate or avoid harm or exploit beneficial opportunities’ (IPCC, 2014:5). While climate change has foregrounded such ‘adaptation’ in much recent academic discussion (IPCC, 2014), the term has a longer academic lineage with a subtly different meaning. As far back as the 1970s, the concept of ‘adaptation’ was developed to challenge traditional ways of dealing with uncertainty that focus on prediction and control (Holling, 1978; Folke, 2006). Rather than predicting the future, advocates argued that systems managers should ensure processes are ‘adaptive’, or flexible and nimble, and hence resilient in the face of change. In recent years these ideas have developed from a focus on the need to learn from ‘real-world’ physical experiments, to greater recognition of stakeholder perspectives, to recent calls for ‘reflexive adaptation’, opening policy up to a wider set of ideas and perspectives. Although the nature of reflexive adaptation has been widely discussed in theory, there are few documented attempts to translate these aspirations into practice (Eriksen *et al.*, 2015). In this paper, we build upon the adaptive management and climate adaptation literatures to address this gap by examining how reflexive adaptation can be practiced to aid utilities in adapting to climate change.

Reviewing this literature below, we argue that reflexive adaptation requires three inter-linked processes. First, organisations build adaptive capacity by being open and creative in the development of (and learning from) experiments. Second, to learn from their experiments, organisations interact with their stakeholders to see the effects of their actions from a variety of perspectives, and hence to institute changes in a variety of spheres. Third, there is a need for reflexivity. Reflexivity enables organisations to draw together the diverse threads arising from experimentation and stakeholder engagement, to open up debates to achieve mutual recognition of different values and interests, but nevertheless, to develop paths for the future.

We examine how reflexive adaptation can be applied in practice through describing the Adaptation Planning Process (APP). The APP consists of three linked workshops (Aspiration, Scenario and Roadmapping), and was developed in partnership with the water utility Dwr Cymru Welsh Water (DCWW) in the period 2010-2014 as part of the EU sponsored PREPARED – enabling change project (henceforth PREPARED) (PREPARED, 2009). By describing and justifying the choices made in the development of the APP, the paper aims to reveal some of the challenges that arise when trying to design processes that achieve reflexive adaptation. The result, according to our partner utility, is a process that is grounded yet focused and challenging.

The privatised English and Welsh water industry might be seen as a challengingly conservative context in which to apply reflexive adaptation, potentially enhancing the APP’s robustness and suitability for application in varied utility management contexts.

The water sector faces many changes of circumstances to which it must adapt, relating not only to climate change but also to population growth, changing consumption patterns and ageing assets (e.g. ACT Government, 2014; Defra, 2017). To date, documented climate adaptation by the English and Welsh water sector has focused on assessing and reducing the climate vulnerability of critical assets primarily as a response to the UK Climate Change Act, introduced in 2008 (Stationary Office, 2008). The sector also has a reputation for risk averse and compliance-oriented management (Speight, 2015). Seeking to move beyond physical climate adaptation measures towards system-wide reflexive adaptation is therefore a significant change.

The APP fulfils an important need in helping utilities consider what it takes to become more adaptive. This is arguably a requirement for all management, but is particularly pertinent in the anticipation of climate change. Building on the genuinely three-way partnership between academic social scientists, academic engineers and engineering practitioners involved in its development, application of the APP brings social science critiques and engineering science into utility management. Moving beyond crude responses to climate change predictions, the APP seeks to help utilities to open up and consider their activities in the light of different values and different scenarios. It provides a route to 'join up' some parts of the utility in thinking about adaptation, and hence (it is to be hoped) makes the process of adaptation one that may improve efficiency, effectiveness and the smoothness of change over traditional management processes.

This paper begins by exploring understandings of adaptation and considering the challenges this poses for the water sector. We then introduce the Adaptation Planning Process (APP) and describe the contexts in which it is envisaged to be useful. Third, we describe each workshop of the APP, explaining and justifying the choices made, as well as briefly describing how the process evolved through collective experimentation and learning. The paper concludes by highlighting the potential contribution and limitations of the APP in helping to support a more widespread shift towards greater adaptive capacity, through embedding reflexivity in the water sector in England and Wales and beyond.

Adaptive management

The past three decades have seen the emergence of 'adaptive management', a mode of governance that is advocated for systems that are complex, uncertain and unpredictable (e.g. Holling 1978, Folke *et al.* 2005). Whereas traditional methods of governing uncertainty sought to predict and control, adaptive management recognises that knowledge is incomplete and hence emphasises the need for flexibility and adaptive capacity so that emergent problems and opportunities can be quickly identified and responses generated (e.g. Folke 2006). The adaptive management literature's purposeful focus on managing uncertainty provides a marked contrast with much documented activity and literature on climate adaptation, which is often oriented to preparing for the *certainty* of a changed future climate – for example, for more precipitation. Here, our review of how management should be flexible in the face of uncertainties primarily considers how ideas about 'adaptive management' have evolved. In the latter part of the section, however, we highlight how recent developments in the climate adaptation literature show some parallel concerns.

The development of adaptive management is widely understood to have arisen in relation to ecosystems management and the work of Holling (1978). Commenting on the application of Holling's methods, McLain and Lee (1996) highlight the central role played by feedback about system functioning. What they call 'scientific adaptive management' generates hypotheses about management techniques that are then tested through the collation of quantitative information. As well as the appraisal of such planned actions, monitoring the impact of 'surprises', or unexpected events, further enhances opportunities to learn about the system (Fernandez-Gimenez *et al.*, 2008). Scientific adaptive management hence brought the practices of the laboratory (hypothesis generation, data collection and hypothesis testing) into the field of practice. Although adaptive management may be argued to have developed significantly since this time, a central tenet remains the recognition that management practices are interim and changeable ('experiments'), and as such they need to be monitored with the potential for lessons to be learnt and practices revised. As Pahl-Wostl explains: 'the paradigm of "management as control" has to be replaced by "management as learning"' (Pahl-Wostl, 2007: 59).

McLain and Lee (1996) critique scientific adaptive management for discounting non-scientific forms of knowledge, for example, residents' knowledge about the local impacts of an ecosystem management policy. In this respect, their work can be seen to advocate adaptive management as a 'collaborative approach' that collates and values different types of knowledge. Jacobson *et al.*, (2009) explicitly differentiate between an 'experimentation discourse' focused on 'how' to manage (our scientific adaptive management) and a 'collaboration discourse', which draws in multiple perspectives to address uncertainties and value conflicts and therefore concentrates on 'what' to manage and who to include. Summarised in the maxim of 'learning together to manage together' (Pahl-Wostl *et al.*, 2007), the notion of social learning further develops collaborative approaches to adaptation to include processes of intentional self-reflection and dialogue through which the stakeholders of a social-ecological system explore how the system might be made more resilient, and how that resilience might be maintained (Olsson *et al.*, 2004; Folke, 2006; Pahl-Wostl *et al.*, 2007; Fernandez-Gimenez *et al.*, 2008; Wei *et al.*, 2012). A common feature to all of these forms of collaborative adaptation is highlighted by MacKenzie and colleagues who stress practitioners' commitment to 'effective and authentic dialogue including dispute resolution and safe spaces/arrangements where *diverse* stakeholders can interact and learn together in a context open to critical analysis and examination unimpeded by power and knowledge differentials' (MacKenzie *et al.*, 2012: 11).

Critical commentary about collaborative adaptation has questioned the assumption that a common vision about the 'best' adaptive or resilient state can be generated (Berkhout *et al.* 2004). Similarly, there is a problematic assumption that 'good' dialogue can overcome stakeholders' differences in values, interests or power (Stirling, 2006, Smith and Stirling, 2010; Eriksen *et al.*, 2015). These critiques are further supported by empirical evidence suggesting that in many cases stakeholders have been reluctant to commit to adaptive management, as they judge the process to be too time consuming, costly and risky (Medema *et al.*, 2008). Comparing social-ecological adaptive management with socio-technical governance of transitions literature, Smith and Stirling (2010) identify several common challenges. First, they question whether any system can be clearly bounded (physically or conceptually) to identify who should or

should not participate. Second, they note a co-ordination challenge between different ‘polities’; in an interconnected system, they ask, how can diverse multi-level participative forums ensure co-ordinated action? Finally, they identify the difficulty in achieving change among powerful organisations linked to the incumbent way of managing the system; existing managers of utilities are only likely to agree to change if faced with significant external pressure, such as a public clamour for new action, they suggest. Taken together these critiques highlight issues of power and politics as barriers to adaptive management, paralleling concerns that have been raised about other forms of collaborative planning (e.g. Richardson, 1996; Flyvbjerg, 1998).

By encouraging a collective awareness about different values and beliefs, reflexivity has been identified as one route through which some of these difficulties with a collaborative approach to adaptive management can be overcome (Stirling 2006, Lövbrand 2011, Voß and Bornemann 2011, Mackenzie *et al.* 2012, Phillips *et al.* 2013). When applied to research, Finlay described ‘reflexivity’ as ‘examining how the researcher and inter-subjective elements impinge on, and even transform, research’ (2002: 210). Allowing for reflexivity in policy research therefore provides a space for opening up questions, debate, and assumptions (Lövbrand 2011, Phillips *et al.* 2013) and hence to ‘develop a collective capacity to reflect upon the salient narratives and their roles in shaping society’ (Felt and Wynne 2007, p. 75). Reflexivity has also gained attention in environmental governance (e.g. Stirling, 2006, Voß and Kemp 2006, Beck, 2006, Grin 2006, Hendriks and Grin 2007, Smith and Stirling 2010, Voß and Bornemann 2011) including adaptive management (e.g. Jacobson *et al.*, 2009; Swart *et al.*, 2014; Fazey *et al.*, 2018), where reflexivity requires that a range of stakeholders collectively envision a diversity of alternatives to current action modes and strategies (Beck 2006). Hence reflexivity is a point of departure requiring a plurality of options emphasising that there is no ‘single-truth’ and no universal solution to a problem (Grin 2006, p. 69).

Stirling (2006) refers to such reflexive processes as a mode of ‘opening up’ debate in terms of revealing how different knowledge, value-conflicts and interests as well as power differentials impact upon the interpretation of evidence and decision-making processes. By opening up, reflexivity may direct attention to previously excluded marginalised viewpoints, new issues, and ignored uncertainties to identify new options to assist the development of more informed decisions. Stirling contrasts ‘opening up’ with the ‘closing down’ mode that reduces complexity by avoiding conflict-prone contradictory views to provide focused authoritative and prescriptive advice (Stirling 2006; Stirling, 2010). Developing these ideas further, Voß and Kemp (2005) call the contradiction between opening up and closing down the ‘efficacy paradox’ (2005, p. 2), and argue that both processes are essential to reflexive governance. An approach to adaptation based on reflexive governance therefore acknowledges differences in values and power between participants during the opening up stage of identifying diverse alternative routes forward, it also recognises that the selection of a route forward (or ‘closing down’ in the terminology of Voß and Kemp, 2005) may involve those with power choosing between these routes and their associated value positions. However, whilst we agree with Voß and Kemp in that reflexive approaches need to enable routes forward, in our view decision-making processes too often and too quickly tend to close down debate and hence, as Stirling argues (2014), ‘closing-down’ processes tend to take care of themselves. In this paper, we are therefore more interested in the roles of opening up debates and how these influence routes forward.

Beyond the field of adaptive management, the IPCC's 2014 report indicated the increasing purchase of adaptive approaches to climatic adaptation in their comment "adaptation options adopted to date [...] are starting to emphasize flexibility and learning" (IPCC, 2014: 8). More reflexive or value-based climate adaptation decision making processes are advocated by commentators including O'Brien and Wolf, (2010), Wise *et al.*, (2014) and Preston *et al.*, (2015). Similar to the critiques of adaptive management described above, planning for climate change has been criticised for relying too heavily on climate model data which underestimates the full range of uncertainty (e.g. Hallegatte, 2009), for ignoring value and power differences, (e.g. O'Brien and Wolf, 2010; Wise, 2014) and for failing to deliver decision-making frameworks needed to address climate change impacts in practice (e.g. Hallegatte, 2009; Preston *et al.*, 2015). Hence, transparent processes incorporating knowledge from different actors, including publics to design and assess policy options has been argued essential in order to deliver robust adaptation strategies (Carter *et al.*, 2007; Hallegatte, 2009). O'Brien and Wolf (2010) propose a 'value-based' approach which not only stress the importance of the incorporation of different knowledges, but critically allows space for negotiations about different meanings of what is 'desirable'. In line with Berkhout *et al.* (2004), the authors argue that because multiple ideas of what is 'desirable' exist, different interests and powers are likely to influence who's values to prioritise and who's to ignore. Similar to Grin (2006) above, O'Brien and Wolf (2010) stress that because people view the world differently, different values may be pursued, meaning that climate change cannot be interpreted and acted upon in one particular way. Instead, the authors argue that by focusing on values, the adaptation processes seen as desirable by a range of actors become explicit and hence could lead to more transparent debate around suitable adaptation responses and pathways to be taken forward. Preston *et al.*, (2015) further argue that the knowledge underpinning adaptive responses to climate change impacts needs to be conducted reflexively in order to deliver both more robust research and practice. In their review of adaptation research, the authors distinguish between research *about* adaptation (predominantly 'expert-led' and intended to be 'pure' science), and research *for* adaptation (more applied often including multiple stakeholders and disciplines) and highlight how they both fail to critically engage with how adaptation research is conducted and implemented in practice. They propose a reflexive approach to adaptation or 'research on adaptation research' (p.131) that reflects upon the role of the researcher and the practitioner to enhance adaptive capacity and more effective governance responses to climate change impacts. Hence, it is argued that reflexive approaches to adaptation can provide greater scrutiny of adaptation research, but also of adaptation processes in practice (Preston *et al.*, 2013).

However, it has been noted that adaptation research and practice to date have had limited success in influencing policy and deliver effective transformative change (e.g. Park *et al.*, 2012; Wise *et al.*, 2014; Lindegaard, 2018). To address this gap, recent literature has increasingly focused on adaptation as transformation and a range of new frameworks to aid adaptation planning have been introduced (e.g. Pelling, 2011, Park *et al.*, 2012; Wise *et al.*, 2014). Wise *et al.*, (2014) for example suggest a 'pathways' approach to adaptation allowing for the opening up of policy processes through negotiations about multiple goals and values to be debated and prioritised. They argue such pathway processes could encourage funding mechanisms for small scale innovative policy alternatives to be developed to support 'the evidence base for novel

effective transformative responses' (334) to be implemented. Underpinned by transition theory (e.g. Loorbach, 2007), Park *et al.*, (2012), introduce the 'Adaptation Action Cycle' (116), as a means to aid decision-making in organisations when moving between incremental and more transformative adaptation actions. Similar to the 'efficacy paradox' identified by Voß and Kemp (2005), frameworks approaching adaptation as transformation as described here, aspire to, on the one hand, open up debate about values and goals through participatory processes, and on the other, ensure a commitment to agreed routes forward in order to implement change. Such action-oriented approaches, have the potential to address the critiques of climate adaptation for neither succeeding in influencing policy and nor in providing actionable responses to address climate change related impacts. This is a point that we return to later in the paper.

The above discussion has demonstrated how research and practice on both adaptive management and climate adaptation have evolved over time from originally dealing with scientific experiments or climate modelling to more socially oriented approaches allowing values, priorities and routes forward to become more explicit and transparent. Hence, recent forms of reflexive adaptation are not suggested as an alternative to the other approaches, but rather incorporating their learning and adding something to it. Table 1 draws on this discussion to summarise how progressively more conceptual elements have been expected of adaptive management and climate adaptation through time. As well as illustrating key components of adaptation from the two sets of literatures, Table 1 also provide a framework through which attempts to practice reflexive adaptation are evaluated later in the paper.

Conceptual component	Adaptation type			References (selected)
	Scientific	Collaborative	Reflexive	
Systems are complex, uncertain and unpredictable	✓	✓	✓	Holling (1978, 2001); Folke (2006); IPCC (2014)
Management processes are experiments & should be monitored for impact	✓	✓	✓	Holling (2001); Folke 2006
Learning may lead to changed technical management	✓	✓	✓	Holling (1978, 2001); IPCC (2014)
Lay and intangible information is valuable as well as quantifiable scientific information		✓	✓	McLain and Lee (1996); Hallegatte, (2009)
Learning may lead to changes in institutional arrangements		✓	✓	Pahl-Wostl <i>et al.</i> , (2007); MacKenzie <i>et al.</i> , (2012)
Learning process acknowledges differences in values between participants			✓	Berkhout <i>et al.</i> (2004); Voß and Kemp (2005); O'Brien and Wolf (2010); Wise, 2014
Learning process acknowledges differences in power between participants			✓	Berkhout <i>et al.</i> (2004); Smith and Stirling (2010); Voß and Kemp (2005); O'Brien and Wolf (2010); Wise, 2014
Acknowledgement that the selection of a route forward may involve those with power choosing between conflicting values			✓	Smith and Stirling (2010); Voß and Kemp (2005); Preston <i>et al.</i> , (2015)

Table 1: Summary of components underpinning different approaches to adaptive management

The above review has highlighted the increasing importance that relevant literature has given to processes of reflexivity, in which policies and processes are opened up to a wider variety of perspectives and values. Drawing on this review as a framework for evaluating our work with the water utility DCWW, in the rest of this paper we explore how a more reflexive approach plays out in practice. Specifically, the paper seeks to address: *what is the role of reflexivity and more specifically, how does opening up occur in reflexive adaptation? In what ways do processes of reflexivity challenge and enhance*

theories related to adaptive management and practice? How does reflexive adaptation fit with other trends or calls for change in the water sector and utility management?

Case study context and method

The research leading to the APP was carried out as part of the PREPARED project with the overall aim to support water utilities in preparing for climate change across Europe and Australia. The research presented here was a collaboration between social scientists, academic engineers and staff of the Welsh water company, Dwr Cymru Welsh Water (DCWW). DCWW was involved as a partner utility in the PREPARED project, which was designed to provide links between academic research and utility strategy to improve their preparedness to climate change (PREPARED, 2009). Details of the research process have been reported elsewhere (Westling *et al.*, 2014). However, the project's emergent goal was the development of a process through which utility teams could explore and develop their policies and practices in an adaptive and reflexive manner.

The last and least popular of Mrs Thatcher's programme of utility privatisations occurring during her tenure as Prime Minister from 1979-1990, the 1989 privatisation of English and Welsh water authorities was justified by the perceived failure of the public sector to invest in infrastructure improvements (Bakker, 2003a). The water companies resulting from privatisation are private regional monopolies in the domestic market. The water is not their property, but the infrastructure is, and they also hold licences to provide water and sewerage services. A form of competition between companies occurs through a quinquennial 'price review' in which companies' investment and pricing plans are compared by the economic regulator 'Ofwat' (Ofwat, 2017c). Environmental and drinking water regulators help direct priorities and regulatory targets for water company investments through interpreting and enforcing EU directives for example, concerning river water quality, and through applying government policy, for example, Defra's decision in 2008 concerning the need for infrastructure companies to report on vulnerability to climate change (see below). The system permits water companies to keep a proportion of efficiency savings insofar as they exceed the targets set by Ofwat at the last price review. DCWW is a somewhat unusual water company, as in the year 2001 the utility gained permission to transfer from shareholder ownership to a not-for-profit company owned by the customers (Bakker, 2003b). DCWW is the only not-for-profit company in England and Wales but is subject to the same regulatory framework as all other companies.

According to Bakker (2001) the privatisation of the water sector shifted the focus away from social equity to instead prioritise economic efficiency in water charging. This in turn was followed by a process of re-regulation, as progressively more aspects of water services were deemed worthy of control and oversight. Recent years can be argued to have seen a further change in regulatory priorities. A critique that the regulatory processes drives short termism and a minimalist compliance-oriented culture (e.g. CIWEM, 2010; Speight, 2015) has driven a shift away from the tight imposition of closely specified targets towards the water companies interacting with their stakeholders to define and impose their own regional priorities (Ofwat, 2017c). The period under consideration in this paper involved the run up to the 2014 price review with company business plans to be delivered between 2015-2019. It can be seen as the

culmination of this regulatory shift. Though at the time of the research it was not yet clear what weight the regulator would subsequently give to customer perspectives, the research process was characterised by a recognition that customer and other stakeholder concerns were of increasing relevance to water company operations in a way they had not been in the past. Some more detail about this recent shift in regulatory emphasis is found at the end of the paper.

In relation to the water sector in England and Wales, one particular context for the work is the concern over the vulnerability of critical energy and water infrastructure that arose after severe flooding in the UK in 2007. The alliance of Engineering Professional bodies, 'Engineering the Future' have since highlighted the key role of infrastructure providers in not only ensuring that their own systems are resilient to extreme events, but also in seeking to help resolve some of society's challenges arising from climate trends (2011). Since 2008 England's main infrastructure providers have been required to produce climate adaptation reports to Government under the Climate Change Act 2008 (Stationary Office, 2008), with a second round of voluntary reporting in 2015. Though it is not subject to this requirement, our project partner, DCWW, also produced an adaptation report. In practice, and in line with norms reported in the previous section, the emphasis of these reports tends to be providers' plans to deal with extreme weather, rather than the strategic need to build flexibility into their planning and development processes.

The need for an adaptation planning process became apparent in DCWW as a result of over 40 in-depth interviews conducted with employees and their immediate stakeholders including policy makers and regulators. The interviews illustrated a diverse set of ideas about what adaptation meant and how it was going to be addressed. The interviews also revealed perceived constraints to planning in an adaptive manner. These observations motivated the first workshop, which sought to capture different meanings of adaptation, exploring their underlying values and how they were enabled and constrained. Findings from this first ('Aspiration') workshop then propelled the planning and joint development of the APP's subsequent elements, focused respectively on taking account of external uncertainties, including climate change ('Scenario workshop'), and on the practicalities of operationalising identified objectives ('Roadmapping workshop'). In this way, the workshop process was not a planned output of the research from the beginning, but an emergent goal, with needs and details becoming apparent as the relationship between the researchers and DCWW progressed. The APP process was consequently trialled as it was developed, and each workshop was the subject of reflection and discussion between all partners (Westling et al, 2014). This means that the final published process (Rychlewski *et al.*, 2013) has been improved through experimentation and learning. However, it also means that those elements of the process that have been changed from the original format have not yet been trialled.

While the research originally proposed to focus on adaptation of the whole water system across Wales, the APP was developed through workshops including only DCWW staff and their contractors, and was hence more focused on the engineered system rather than the natural water system. In this sense, some expertise was excluded and avenues for adaptation 'closed down' at an early stage - for example, neither the Welsh Government nor the environmental regulator participated in the process. This was a pragmatic decision linked to DCWW's responsibilities and priorities, but may

also relate to the ongoing development of trust. By keeping the process internal, DCWW precluded exposing external contacts to a process that was not yet proven, and also avoided asking others to change before fully working out the internal implications of a new way of managing water assets. In line with the expectation of Stringer *et al.*, (2006) that collaboration and learning will occur at multiple levels and Smith and Stirling's assertion (2010) that no system is ever clearly bounded, the academics saw this internal focus as a 'good enough' way to develop and explore processes of adaptive management. In the next section, the APP is introduced and discussed in relation to how a more reflexive strand to adaptation can be developed in practice. Drawing on Stirling (2006), reflexivity in this sense is primarily focused on the opening up of debates and values and how these can be considered in terms of developing routes forward.

Introduction to the Adaptation Planning Process

The APP was collaboratively designed to support the development of policy and practice in water utility teams. The APP contrasts with traditional processes of strategy development because: a) it seeks to open up questions and options beyond current practice in a reflexive manner, b) options are tested in terms of their robustness in the light of uncertain futures and c) it involves developing policy in a team rather than policy documents being drafted by an individual. If a utility were to fully embrace the advantages of the APP it might be applied across the organisation to a variety of utility teams as part of an overall strategic review. Equally, the application of the APP to selected areas / functions of the utility might be appropriate when a review of that area is needed. For applications of the APP to be fully effective they would be accompanied by a commitment from senior management to give serious consideration to the recommended outputs of the APP process. It should be noted that the 'trial' nature of the activity reported below meant it was not possible to obtain such a commitment in the work with DCWW. Nevertheless, as evidenced below, many of the actions generated from the APP have now been addressed indicating that the participants did engage with the process as a 'real' planning exercise including scenarios and actions that the utility team needed to prioritise. In the trial run, the APP process focused on the Asset Strategy and Planning team in DCWW, and in particular, their concern with surface water management, an area in which this utility was already seeking to push forward best practice.

In the *Aspiration* and *Scenario* workshops the APP focused on the development of strategy. These workshops are envisaged as involving the core team of utility operators and managers with an interest in the topic. The final workshop (*Roadmap*) concentrated on the development of an action plan to put the agreed strategies into practice. This workshop appropriately extends beyond the core team, drawing on other areas of the water utility (and potentially associated external activities) because it requires consideration about how the new strategy changes and influences other activity. In the trial process, for example, the involvement of the legal and customer services team proved useful in highlighting the overlaps between surface water management and other domains of utility activity. Below we introduce each workshop included in the APP and how the process can aid implementation of reflexive approaches to adaptation in practice.

Aspiration Workshop

The Aspiration workshop trial included 13 participants from the Asset Strategy and Planning team and the Wastewater Operations team. The aim of the workshop is to stimulate debate about strategic options for the organisation in relation to the function carried out by the utility team. Water utility managers are busy people frequently needing to react and deal with multiple demand and challenges; they are not often given the opportunity to reflect on how their activities are shaped, or could be shaped to meet current and future challenges. The workshop encourages participants to ‘open up’ debate, albeit in a contained and manageable way. The output of the workshop is a statement about how participants believe policy and practice in the function needs to change to be in keeping with both external expectations and internal organisational goals and values. Our trial workshop used different language (e.g. it was originally called the ‘frames’ workshop (Westling *et al.*, 2014)) and the process described below is the revised version developed with our partners following the benefit of our experiences.

The process of the workshop begins with the identification of key challenges that the organisation faces in the area addressed by the utility team, which are then ranked in order of priority. In the next step, the participants identify their current aspirations about how they would like to see these challenges met. The workshop then moves on to seek to ‘open up’ debate through the mechanism of the three – environmental, social and economic – pillars of sustainability, as a means of ensuring that multiple routes forward are considered. In relation to the primary challenge identified, participants are asked (for example), ‘what would be a socially oriented way of meeting this challenge?’ and ‘what external or internal institutions with associated rules, processes and norms are supporting or constraining you from taking a social approach to addressing this challenge?’ An example is that a socially oriented way of addressing excess rain in sewers is to encourage households upstream from flood-challenged sewers to drain water from their household roofs into garden soakaways, while a contrasting economic approach might be to vary water charges according to the area of hardstanding on a property. A barrier to the implementation of the social approach is that, unlike the construction of a new concrete tank, the impact of such a public campaign is unknown, and hence expenditure is hard to justify through internal cost-benefit mechanisms (which in turn are linked to the regulator’s price review processes). Through mapping out how they are currently supported or constrained from fulfilling each of the environmental/ economic /social actions, participants identify the balance of current influences upon them. Discussion is then thrown back to the participants – is the current balance of influences ‘right’ in their opinion? Alternatively, if they had power to change things, would the balance of influences, and hence of their activities, be different? Through this discussion an indicative ‘aspired-for’ balance of influences is identified. Diagrams like those shown in Figure 1 can illustrate the current and desired balance of influences – these are helpful indicating shared ideas about how things are now and how they could change. The trial Aspiration workshop in DCWW led to the conclusion that there was a need for a greater emphasis on social responses to challenges relating to surface water management, rather than dominated by economics as was believed to be the current situation.

Figure 1. Current and desired for influences based on social, economic and environmental factors



Scenario workshop

The Scenario workshop pilot involved nine participants from the water utility’s Asset Strategy and Planning team, the Environment team and Wastewater Operations team. The aim of the Scenario workshop is to offer a structured process for utility teams to consider strategies through which the shifts in policy identified in the Aspiration workshop are occurring or could occur. These strategies are then evaluated in terms of their robustness in the context of plausible different future scenarios, including scenarios for climate change. The methodology utilized drew on the ‘Foresight Future’ planning processes (Evans *et al.*, 2008).

The workshop requires the advance identification of a set of plausible future scenarios, and a future date at which they are imagined. Varying along two axes, these four scenarios provide a structured way to explore future uncertainties. The choice of which areas of uncertainty are to be explored needs to give appropriate attention to the values and ‘challenges’ identified by the participants in the Aspiration workshop, as well as to the wider motivation for running the APP.

The Scenario workshop begins by asking participants to use the challenges identified in the Aspiration workshop as the basis for ‘driver-consequence-impact’ chains. For example, the driver climate change could lead to the consequence of more extreme rainfall events that has the potential impact of overflowing sewers. Other examples included in the trail workshop were climate change (driver) – changing weather patterns (consequence) – changes in land use (impact) or urbanisation (driver) developments of floodplains (consequence) flooding of homes and businesses (impact). Participants are then invited to define responses to these impacts and asked to sense check the suggested responses against the values and priorities identified in the Aspiration workshop. The term ‘response’ was purposefully selected over the more usual engineering term, ‘solution’, in order to stress that challenges are severe, that responses may well be partial, but still valuable and that several responses might be appropriately co-delivered. The scenarios are introduced through narratives and climate change data and participants engage with them through drawing a picture of one scenario in a small group. Groups then rate the extent to which the identified responses are robust in the context of their scenario on a simple three-point scale: for example, a positive rating would indicate “if we take this response now it will address this impact in this scenario”.

Each group then carries out the same rating process of their responses with each scenario. For example, the group might explore whether campaigns to encourage members of the public to direct their roof water to soakways to reduce surface water entering the sewer system would be robust in addressing flood risk under different scenarios. Summation enables an overall comparative rating about the robustness of the different responses in the combined scenarios. The workshop ends with some discussion and collective representation of the highest-ranking responses to aid attendees at the final workshop; participants are asked ‘what sentence or sentences will accurately capture what is meant by each response?’

In our trial process, the Scenario workshop led to three prioritised responses: (1) working with the Welsh Government to develop appropriate legislation and policy to support the retention and detention of surface water; (2) directing surface water investment to achieve equitable benefits; (3) taking account of local knowledge in relation to simple local more sustainable surface water management solutions (Rychlewski et al., 2014).

Roadmapping workshop

The Roadmapping workshop develops an action plan to put into practice the top ranked responses produced by the Scenario workshop. Adapting the established process of Technology Roadmapping (Phaal *et al.*, 2004: 5-15), the workshop has three objectives:

1. To determine the extent to which the identified response has been implemented,
2. To elaborate short, medium and long term actions to implement each response
3. To estimate when the response will be fully embedded.

Whereas the previous workshops drew on just individuals who formed part of a utility team devoted to a particular function, the Roadmapping workshop included related functions that are crucial to the achievement of the main utility team’s aims. In total, the trial workshop involved 14 participants and although the focus was on the Asset Strategy and Planning team within DCWW, participants were also drawn from the Regulations, Environment, Legal, Wastewater Operations, Water Efficiency, Innovation and Business Information Systems functions of the utility. The workshop involves the development and iteration of action plans concerned with each response. Participants are split into teams and each team initially works to achieve the objectives in relation to one of the three responses identified in the Scenario workshop. The most substantial process concerns objective 2, in which teams are invited to specify activities that are then placed in categories for short, medium and long-term actions. The issues about the current extent of implementation and the expected timescale for a response being embedded are also facilitated through reference to an implementation curve, through which participants are invited to select the current position of the organization, and then to suggest the date when the response would be fully embedded if all suggested actions were followed. Having addressed each objective for one response, teams then move together to address another response, but this time working to revise and develop the plans made by the previous team. In our trial in DCWW, each of three responses was allocated a room and a facilitator and the three teams rotated between responses on a set timetable, hence generating three iterations of each action plan. In practice there

were many overlaps between actions proposed for each response, so the three action plans were subsequently rationalised to form one action plan output from the workshop.

In our trial the most substantial contributions to the action plans were developed from the first team working on each response. The second and third iterations added supplementary branches or ideas. Teams developing second and third iterations of one response often made connections with points which had been covered in relation to the response they had worked on in the first round. For example, the action ‘create space/money to be proactive and move outside your immediate role [if you have a good idea]’ came up in relation to response 1 (regulation and policy) and response 2 (equitable investment). In this way the ‘merry-go-round’ for teams served to cement the overlaps and interconnections between the responses.

In the following section, we return to our research questions and discuss the role of reflexivity in the Adaptation Planning Process and how it enhances adaptive management theory more generally. We then discuss how new modes of adaptive management fits with the trends of current and future water management requirements.

Is the Adaptation Planning Process reflexive?

The Adaptation Planning Process (APP) was developed as a strategic tool to help utility teams to deliver more adaptive responses to uncertainties such as those driven by climate change. Table 2 summarises the means through which the different conceptual components of reflexive adaptation are met through the envisaged application of the process. The workshops are then discussed in terms of how they enable reflexive adaptation

<i>Conceptual component of reflexive adaptation (taken from Table 1)</i>	<i>Component acknowledged in fully applied APP through...</i>	<i>Examples from the application of the APP</i>
Systems are complex, uncertain and unpredictable	Future uncertainty acknowledged in Aspiration and Scenario workshops	Uncertainties acknowledged through negotiations of different value-futures and development of multiple ‘driver-consequence-impact’ chains
Management processes are experiments & should be monitored for impact	Iterations of the APP to coincide with utility’s 5-year mandatory Price Review process (Ofwat, 2017c)	Participation in the workshops arose from desire to explore how adaptation could be further developed in DCWW
Learning may lead to changed technical management	Though not widely seen as problematic in the water sector, implementation of technology could form a component of the action plan	Actions identified meant that non-technology options were prioritised. Examples include strengthening collaborations with regulators and ‘customers’ to co-deliver surface water management solutions
Lay and intangible information is valuable as well as quantifiable scientific information	The APP acknowledges the different forms of expertise of its participants – internal or external	Actions generated to: strengthen internal working and knowledge sharing as well as with external partners and members of the public through engagement and education campaigns to co-create surface water management plans; Quantify the whole life costs and outcomes of Surface water Management investments, for the utility and society, through an ecosystems services approach

Learning may lead to changes in institutional arrangements	This is one of the key purposes of the action plan generated in the Roadmapping workshop	Action generated to support: Joined up internal working through creating a surface water management group, improving communication and sharing of knowledge, and co-ordinating internally so joined up messages could be presented to partners; accelerated decision-making processes; institutional changes to be fully embedded
Learning process acknowledges differences in values between participants	The Aspiration workshop makes space for the implications of some different values to be considered	Drawing on the Aspiration workshop, co-create DCWW's vision for surface water management futures
Learning process acknowledges differences in power between participants	Implicit acknowledgement comes with recognition of senior management power as well as external constraints	Strengthen collaborative partnerships with regulators and Government to address Surface Water Management issues, including those outside the utility's responsibility
Acknowledgement that the selection of a route forward may involve those with power choosing between conflicting values	The APP action plans should be seriously considered by senior management'	Many of the actions identified in the Roadmapping workshop have been implemented, but not possible to precisely determine if the same actions would have been taken without the APP.

Table 2: Application of the different components of reflexive adaptation (left hand column) through the APP ideal (middle column) and examples from the APP trial (right hand column).

The Aspiration workshop enables reflexivity through opening up policy debate among those participating and hence making space to consider how the team's function is shaped by different (environmental, social and economic) values. It 'opens up' because it helps participants to do some 'what if' thinking in terms of both external and internal priorities. Through the questions asked the workshop process acknowledges that the actions of the utility team may be quite constrained by a set of external regulations, targets or expectations. Nevertheless, by asking 'what if priorities were different' it helps the utility team to think about their own priorities and hence, albeit just implicitly, to recognise that their actions too have a role in shaping the policy and practice world in which they operate.

Readers may regard the process described as a fairly muted form of ‘opening up’; it is certainly correct that no new information or expertise was used to encourage the participants to move outside their usual assumptions. On the basis of our trial run, however, it is clear that this is not an appropriate response. Busy people working at a mid-management level within a large organisation very seldom have the opportunity to step back and to consider fundamental questions about the activities and influence of their team. Exploring these questions was revelatory for individuals; doing so with their colleagues enabled the team to examine and develop their collective understandings and identities. One of the participants explicitly expressed:

The bit that was novel and exciting was [...] the [first workshop] and starting to think about a different way of highlighting some of the issues to people [...] It’s not data driven, it’s people opinions. The workshop ideas I think worked well. Getting people together and building that picture, rather than just trying to do it in isolation. I think all too often we would have driven strategy from data. I think it was nice to start seeing a different way of doing that. It’s not that we haven’t used workshops before, it’s just a different way of trying to build it.

In this sense, the activity of collectively reflecting on both individual and organisational values and priorities within the Aspiration workshop the reflexive element enabled new ways of thinking and for overcoming problems.

The Scenario workshop performs a different sort of opening up than the Aspiration workshop. The Aspiration workshop opens up discussions about which aspirations drive (or should drive) internal policy and practice; in contrast, the Scenario workshop opens up external uncertainties – in other words, how the world might change. The focus on external uncertainties was more familiar to the workshop participants compared to the questions about internal aspirations and values that shaped the first workshop. In this sense, as well as stimulating more discussion, the scenarios workshop brought added academic expertise to areas where the utility was already working. The activities of opening up related to uncertain futures in this workshop not only bridged the gap between utility participants as described above, but also between water practitioner and the academics. From the second workshop trial the legitimacy of us as academics, the PREPARED project and the workshop processes grew substantially in DCWW. For example, the participants realised that the workshops were developing into a strategic tool that could be implemented and used across the utility to identify and act on adaptive routes forward. The utility officer responsible for climate adaptation was particularly enthusiastic about how the workshop engendered real engagement with climate change scenarios and discussion about routes forward. This was quite a different approach to that taken to date, which had tasked small teams with generating adaptation plans for the whole organisation. More broadly, the processes of rating and ranking responses was seen as ‘scientific’ which was perceived to give the process and its outcomes validity.

Finally, the Roadmapping workshop could be seen as being primarily focused on ‘closing down’ debate through the generation of an action plan. Though correct, such an understanding gives too little recognition to the productive and creative buzz that was our experience of this workshop. For our participants the experience seemed to be one of naming problems within and beyond their organisation and considering which

actions by whom would enable those problems to be overcome. The holistic perspective they were able to take gave them the opportunity to 'open up' specific problems and to consider how they could be solved. Hence, the workshop provided new forms of opening up in terms of 'reality-checking' the outputs of the previous workshops and consider how the planning elements of the APP could be translated into practice across the organisation.

As illustrated in Table 2, the APP process to a large extent fulfils the conceptual components of reflexive adaptation. In particular, the Aspiration workshop ensures that alternative values are considered while the Scenario workshop focuses on external uncertainties. As the action plan in our trial showed, institutional reform forms a major component of the changes resulting from the APP. The only conceptual component that is not explicitly fulfilled through the APP process is the acknowledgement of the different nature and extent of participants' powers. This is a difficult issue, and relates closely to the final component, that is, recognition that implementation depends differentially on different people's actions. Though power can be conceptualized in a number of different ways (Lukes, 1973; Sharp and Richardson, 2001), for our purposes power can be understood as related to someone's ability to make change happen – an ability which is often conferred by their position in formal and informal institutional networks. Differentials in levels of power run through all elements of participation from the choice to carry out a process, through decisions on invitations and agendas, to the inter-personal exchanges within the participative forum, through to the crucial matter of whether and how decisions made by the participative forum are instituted (Sharp and Connelly, 2002). By recognizing differentials in power, reflexive processes should provide a ring of authenticity for participants, which is likely to add to their commitment to the process. Within the APP, there is no point at which explicit statements are made about differentials in power between participants. However, the process does acknowledge that implementation depends – at least in part – on the buy in and commitment of senior management and potential external constraints. This statement grounds the process in the real institutions and hence provides at least an implicit acknowledgement that power is not equal between participants.

For the APP trial to be a truly authentic pilot of the APP process, participants would choose to be involved because senior management had made a commitment to seriously consider the result of their deliberations. It would be seen as a 'real' policy review process operating with the same probability of influencing practice as would be expected in applications of the final APP. In the APP trial such a commitment was not possible. Our DCWW partners required us to be cautious and avoid setting expectations about policy changes that could not be guaranteed; this meant that the trial occurred without the grounding of any commitment that its results would be used, or even considered, by senior management. This experience illustrates how utilising scientific understandings of experiments within social contexts creates the potential for a vicious circle of in-authenticity. DCWW wanted to see the APP fully tested before they would sign up to considering acting on its results. For the research team, however, a lack of commitment to act on the results of the APP meant that a full trial could not be carried out, as the process would be inauthentic for participants. The difficulty arises because workshop participants' ability to think and reflect differentiates them from physical objects in experiments; participants know they are part of a social process and their behaviour is unavoidably influenced by their understanding and expectations about how the outcomes from their behaviour will be used or not (Flyvbjerg, 2001). In this

case the trial nature of the process made it less authentic, because participants did not feel as if their ideas had much potential to lead to changes in company policy. In addition to recognising that agreed actions offer the potential to deliver actual change, the dialogue leading up to these actions also needs to be seen as authentic. In this respect, Innes and Booher (2003) note that an authentic process must allow for multiple interests and potential conflicts to be shared among participants at the outset of the process. Further, it is important that the participants set their own rules and purpose for the process, rather than being given these from an external authority. A third aspect of an authentic collaborative dialogue identified by Innes and Booher (2003) is the ability to challenge norms and assumptions. According to the authors, participants in a collaborative process tend to conceal their interests and, rather than seeking to agree on a common ground, ignore perspectives assumed to be in conflict with theirs. In terms of the APP, the very purpose is to challenge assumptions and the current position, through explicitly defining internal and external pressures as part of the Aspirations workshop, and to provide a space for discussing potential value differences. Although, the APP provides a structure for the discussion and route forward, it is up to the participants to determine concepts and actions to be progressed. In this respect, the APP could be seen as 'authentic'. However, it is interesting to note that although the APP encourages value differences to be debated, in the trial, participants actively avoided different values and potential disagreements and, instead, highlighted that core values were shared across the utility. In the Aspiration workshop, it was clear that participants were more comfortable with discussing assumed external value conflicts, compared to those potentially existing within the utility.

However, notwithstanding the limitation of not directly being able to influence change, the contribution of days of participants' time suggests that many still considered the process useful and 'real', at least in providing an opportunity to build relationships and shared visions with colleagues. Moreover, four years after the workshop, follow up conversations with DCWW colleagues revealed that many actions listed in the action plan (Rychlewski *et al.*, 2014) have been implemented to some extent. This is all the more remarkable given that the APP action plan shows a clear 'social' emphasis that might be seen as leading English and Welsh water companies and the regulator Ofwat in the recent turn towards more engaged means of water management (e.g. Defra, 2017; Ofwat 2017a; Ofwat 2017b). It is difficult to evidence if this is a direct result of the APP trial or if these actions would have been developed in its absence, but it does indicate that change can happen without explicit senior management support for the process. Nevertheless, the role of the APP should not be completely minimised. Our key contacts who were driving change within the organisation have stated that the Aspiration and Scenario planning processes supported them in thinking outside of their immediate priorities and emphasising broader responses to their challenges. Moreover, the Roadmapping workshop, with its broader audience within the organisation, provided a means to build a shared vision and to develop relationships to support the process of implementing the identified responses. Overall, it seems reasonable to conclude that the APP served as part of the process of DCWW transitioning towards more decentralised and engaged means of managing surface water. Although, the APP is not formally used by the utility today, it has provided support for the development of other planning toolkits, including innovation training, and aspects of the APP are also used for structuring internal workshops and meetings by those participating in the trial. The preference for these hybrid options rather than the full use of the APP is explained with reference to the latter's need for high quality facilitation and the requirement for

fuller integration with other more established planning tools currently used by the utility.

Through the application of the APP illustrated above it is highlighted that reflexivity brings a new dimension to adaptive management theory. The new dimension is effectively a new epistemology that questions the status of all expertise and explicitly welcomes a plurality of knowledge, values and potential futures to enter the debate. In evaluative interviews with three of the workshop participants, the Aspiration workshop was perceived to have added particular value to the planning process. According to the interviewees the workshop provided new ways of coming together to build a collective picture of a problem, highlighting some of the key issues, enabling new ways of asking questions and inspiring participants to think about problems and priorities in a wider sense. It might be said that reflexive adaptation is a more tentative and humble approach to adaptive management than the preceding approaches underpinned by scientific experiments and limited acknowledgement of power arrangements. In this sense, the opening up processes of the APP did not only consider different values and priorities for adaptive action, but also encouraged participants of the workshops to think about a range of alternative plausible futures. Hence, reflexivity may provide a greater understanding of alternative priorities, norms and values and a greater openness to consider alternatives and sometimes even ‘wacky’ responses or routes forward. In the next section, the potential for more reflexive approaches to adaptive management and how they fit with other trends or calls for water management related change in England and Wales are discussed.

Reflexive Adaptation and Water Management in England and Wales

The water regulator Ofwat is expected to ensure that water utilities ‘carry out meaningful and effective engagement with their customers and to demonstrate that their plans overall are acceptable to customers’ to provide long-term resilience (Defra, 2017: 3). The price reviews in 2014 and 2019 both required each company to work with customer representatives and other stakeholders in ‘customer challenge groups’ to help develop their strategic priorities (CCW, 2019). Ofwat has also encouraged water utilities to look beyond technological change to develop a culture of innovation where customers actively participate in water management practices (Ofwat, 2017a). Effectively the previous regulatory regime, focused on economic efficiency, but seen as heavily constricted in its goals and scope for innovation, has given way to more participatory approaches (CIWEM, 2010; Speight, 2015). This may seem a surprising direction for regulation in a largely private sector water system: but it is not unique to the UK. Writing about water management at the global scale, Morgan (2004) points out conflicts between the ‘techno-bureaucratic rationality’ (5) and symbolic meanings for water recognising ‘images of water as a communal resource’, stressing that ownership forms in itself does not necessarily dictate which of these approaches that is preferred. While commenting that state regulation too often favours economic frameworks, she stresses that, at least in theory, privatised systems could move towards treating water as a basic human right rather than a commodity. The current shifts in UK regulation seem to point in this direction.

These new regulatory expectations are as applicable to adaptation as much as other areas of water company activity. The emphasis on partnership working might be said

to be requiring some form of collaborative adaptation, and also could be argued to open up the possibility for more reflexive approaches, centred on building and maintaining trustful relationships and achieving joined-up activity across public priorities and industry sectors. The shift towards the need to determine priorities regionally and in conversation with stakeholders invites water utilities to be more reflexive about their strategy and its impacts. In this respect, changes to the regulatory regime over the past decade, offer opportunities for the APP, or similar tools, to be more widely applied in the future. However, it must be noted that if innovation in the English and Welsh water sector continues to be driven by the regulator's continuous demands for economic efficiencies, the APP and similar tools are less likely to be considered as useful. Although collaborative approaches to water management, also including the public, are increasingly requested, a substantial regulatory shift would be needed to promote a move away from only prioritising economic efficiencies and towards also incorporating social equity aspects, underpinned by reflexive and value-based approaches to water management.

Conclusion

This paper has made two significant contributions. First, the paper has offered some conceptual clarity to the field of adaptation, differentiating between three forms of adaptive management. As summarised in Table 1, adaptive management is progressively more deeply informed by social science in its scientific, collaborative and reflexive modes respectively. Notwithstanding inevitable challenges in defining system boundaries, if applied to planning for climate change, reflexive adaptation has the potential to explore multiple value positions and to acknowledge (and hence, partly to address) power differentials, and therefore to offer the possibility of real change.

Second, the paper has demonstrated how reflexive adaptation to climate change can be practiced through describing the Adaptation Planning Process and showing how it can enable different knowledge and values to be collectively considered. In particular, the APP illustrates how water utilities and other organisations might move their operations towards reflexive adaptation. The trial demonstrated three specific elements of the APP that were highly valued by the water utility. First, the APP provided a forum for utility team members to consider whether and how a function could be carried out differently and to make explicit and conscious choices about organizational values and strategies. This has the potential to link corporate statements about mission and social responsibility to the ways that adaptation is practiced on the ground. Second, the APP provided a route for utility teams to make explicit and conscious decisions about the uncertain future through a scenario planning process. This process was informed by forecasting science but recognized uncertainties through the consideration of four scenarios. Third, but perhaps most importantly the process included the planning and operations staff in a way that is different from the standard planning and strategy processes drawn upon by utilities. Through tapping the depth and breadth of internal knowledge the APP process created the potential for decision making to be joined up across different part of the utility, and hence to offer new strategies and routes for addressing uncertainties and delivering more resilient utility services. However, for reflexive and value-based approaches to become properly embedded in current water management practices, a substantial regulatory shift is required in order to support utilities in broadening their focus beyond solely economic efficiency.

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