CRC for
Water Sensitive Cities

Governance structures and strategies to support innovation and adaptability

Yvette Bettini and Brian W. Head

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Governance structures and strategies to support innovation and adaptability
Better governance for complex decision-making (Project A3.1)
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Authors
Yvette Bettini[1,2] and Brian W. Head[1,2]

[1] The University of Queensland
[2] CRC for Water Sensitive Cities

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Cooperative Research Centre for Water Sensitive Cities
Level 1, 8 Scenic Blvd, Clayton Campus
Monash University
Clayton, VIC 3800

p. +61 3 9902 4985
e. info@crcwsc.org.au
w. www.watersensitivecities.org.au

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Cover image: Innovative water sensitive urban design is a feature of the Cova residential development in Queensland. Source: Frasers Property Australia

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Executive summary

This report sets out an innovation model for influencing governance change. The premise for the study was that, in order to pursue the fundamental changes to institutions needed to support water sensitive cities (WSC), incremental policy changes which progressively challenge these institutions need to be actively fostered. The model has been developed from research on a series of case studies at different stages of adopting innovative technologies, policies, and policy mechanisms.

The research adopted a model based on three phases of innovation – initiation, experimentation, and integration – which move from project ideas through pilot schemes to wider delivery systems and institutionalisation. This report collates the results of a range of empirical case studies at various phases of the model, to identify lessons and strategies that practitioners can adopt in their own contexts. The key success factors and strategies identified in each phase of the innovation process are illustrated in Figure 1.

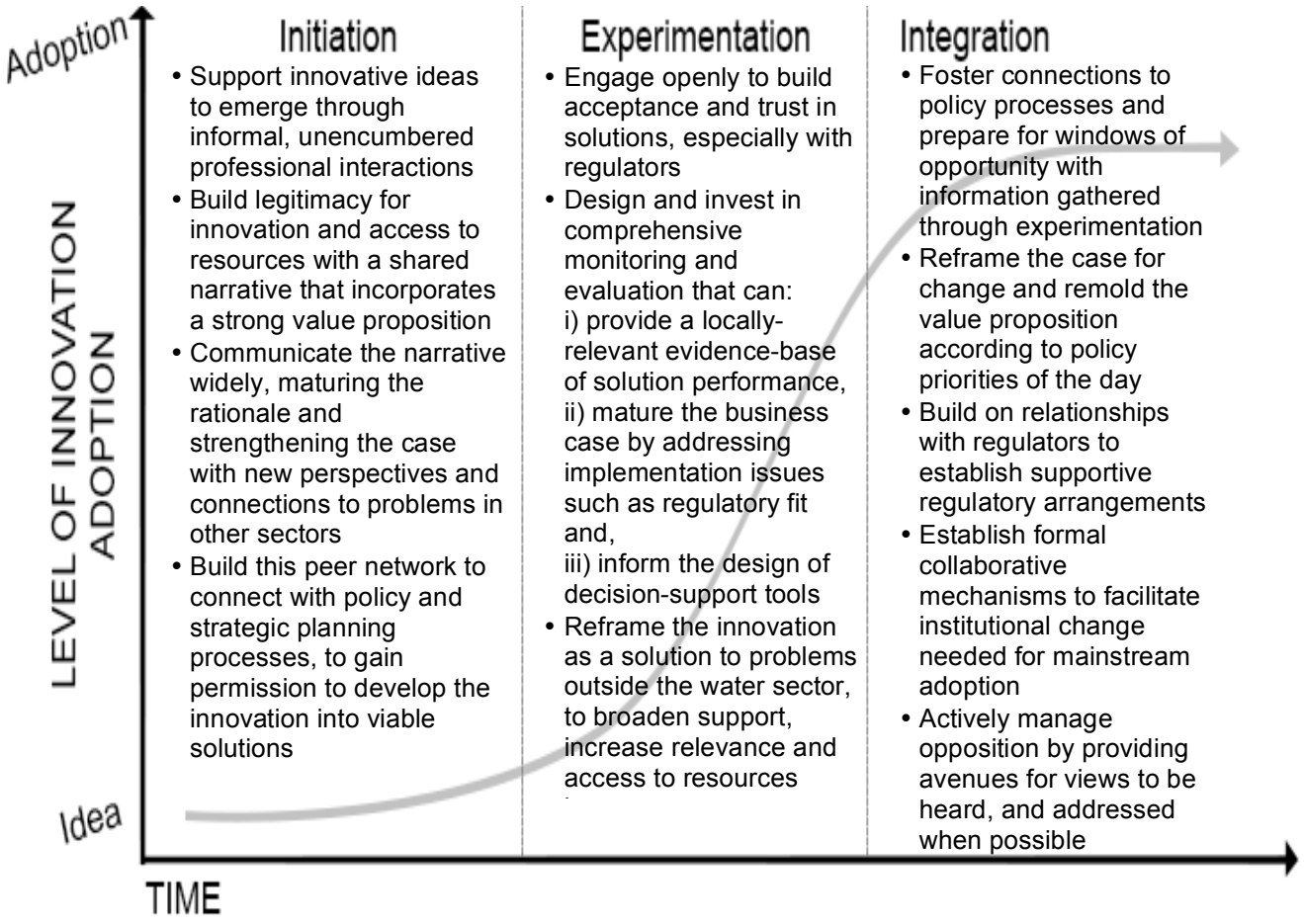

Figure 1. Key strategies to progress through innovation adoption

Overall, the key insights from the research on how to successfully progress along an innovation adoption trajectory include:

- Planning for adoption as the final end point, rather than seeking only to demonstrate the viability of a solution. This invites consideration and testing of other aspects critical to the adoption pathway, such as community acceptance and regulatory fit, during the experimental phase – thus paving the way for uptake.
- Bringing rule makers and enforcers along on the journey, as innovation will inevitably challenge existing rules. Acknowledging the likely points of contention upfront, and working toward finding an acceptable fit within the rule structures, or agreement that these rules are hindering a suitable solution or outcome, appears to be the best strategy for overcoming institutional barriers.
- Using an open collaborative and participatory approach as early as possible is needed for the key actors to come together, agree on the problem, see the value of the innovative approach, and thereby build the legitimacy and justification for applying their authority and power in alternative ways. The implementation of innovative ideas and options will require a combination of roles and redistribution of responsibility, and particularly powers to act, to deliver solutions. Negotiation to determine who can do what in this cross-organisational context can be contested process, and thus will require significant collaboration.

Introduction

This report sets out an innovation model for influencing governance change. The model has been developed from research on a series of case studies at different stages of adopting innovative technologies, policies, and policy mechanisms. The premise for the study was that, in order to pursue the fundamental changes to inert institutions needed to support water sensitive cities (WSC), incremental policy changes which progressively challenge these institutions need to be actively fostered. This assumption is supported by recent arguments for attention to policy change in the water governance literature (Huitema and Meijerink, 2010). Overtime, increasing the capacity for policy innovation will increase the flexibility in governance systems for proactive and adaptive water management.

The CRC for Water Sensitive Cities project, *Better governance for complex decision-making* (Project A3.1), has explored the history of urban water governance in Australia (Bettini and Head, 2013), reviewed a range of literatures on transformative system change and policy studies (Bettini and Head, 2014) and examined empirical examples of technological and policy innovation (this report). This research is distilled in this report, which presents an innovation model for influencing governance change, and provides guidance on how to better connect innovation processes to policy change.

Governance can be defined as the traditions, institutions and processes that determine the exercise of power in society. Governance systems and structures define how society makes decisions on issues of public concern, how citizens are given voice in public decision-making, and how social partners work together to create public goods (Denhardt and Denhardt, 2003). Governments provide the democratic institutions to define the agenda, and the leadership; governance are the interlinked formal and informal institutional arrangements which shape how the agenda is realised in practice. In this way, public benefits result from the contribution of multiple partners working together inside and outside government to achieve common results (Bourgon, 2008).

Governance of water involves a complex web of institutional arrangements (administrative configurations, legislative and policy frameworks, and regulatory regimes) which place value on water, establish decision-making processes, and provide the authority to organisations and individuals to use water in ways commiserate with society's values and aspirations for water use. A governance perspective in this research has focused attention on the incentive structures for innovation in institutional arrangements, identifying the capacity requirements to connect practice change to policy processes, and understanding the collaborative processes that are needed to negotiate the 'fit' of new solutions and approaches in current administrative roles and responsibilities, and regulatory frameworks.

This report collates the results of a range of empirical case studies of varying stages of policy change, to identify lessons and strategies that practitioners can adopt in their own contexts to foster and develop innovative ideas, solutions and approaches, and connect these to policy changes, in order to prompt the institutional changes needed to embed new ideas as standard practice. Over time, these incremental adaptions will build institutions that support the adaptive water management needed for a water sensitive city.

The first section of the report presents a short literature review on innovation in the public sector. In order to understand process of policy innovation, it is important to understand some of the features of public administration, and the constraints and opportunities for innovation within this operating context. This section concludes with a model for understanding phases of innovation development and adoption. A brief overview of the research approach is then presented, followed by the results of the case study analyses. The final section draws out success strategies and lessons from the empirical research to provide guidance on how to progress the adoption of innovative solutions and approaches. Further detail on the research method and case study results are provided in the Appendices.

Innovation in the public sector

A broad range of internal and external influences have changed the work practices of modern bureaucracies over the last two decades. Public agencies in Australia underwent a radical change from the late 1980s, driven by a need for greater economic efficiency and performance effectiveness (Tiernan, 2015). The expectation was that business techniques from the private sector, increasing competition, and utilising market-based policy instruments would bring down the costs of delivering services to the public, while also improving the level of service available to customers (Pollitt and Bouckaert, 2011). The ambition was for the public sector to become more innovative; less trapped in red tape and routine and more focused on adding value, increasing customer choice, and being more responsive to external developments.

This New Public Management (NPM) approach has been widely debated as the cause of a perceived erosion of policy capacity across the public sector (Tiernan, 2011), and specifically a weakening of policy-advisory capacity (Lindquist and Tiernan, 2011). However, other factors have also been identified as having a sizeable influence over public administration, and particularly policy process: the 24 hour media cycle and rise of social media, increasing expectations of citizens, and the opening up of the policy system to greater influence from beyond the bureaucracy (Tiernan, 2015). As Martin Stewart-Weeks reflects, these influences have also impacted the appetite for innovation of leaders within the public sector: '*I wonder if the public sector…has recently become more hesitant, fearful, and 'tight' about innovation—often driven by hostile budget and political constraints—and therefore is becoming increasingly inhospitable to the innovation bug.' (Stewart-Weeks and Kastelle, 2015: 67)*

Why should innovation be an integral part of public sector activity? To innovate is, according to Kastelle and Steen, to execute a new idea to create value (Kastelle and Steen, 2011). According to these authors and others, the innovation process can produce value in a range of forms: from new goods or sources of supply, improved processes and new markets, to new business models. All of these forms of innovation have something to offer the public sector, and in turn their customer-citizens. However, improvement of public sector activities and services is not the only value-adding function of innovation. New Public Management sought to drive innovation in the interests of economic savings (Hood, 1991). For Borins (2000) innovation represented a particular leadership strategy to solve common public sector problems such as crises and machinery of government changes. Sørensen and Torfing (2012) add the ability of innovation to break policy deadlocks, while Mulgan (2014) sees innovation as a risk management strategy in itself; helping navigate the turbid conditions characteristic of the problems the public sector must manage on behalf of the public, by providing a process to quickly test small-scale solutions to minimise the costs of failure and avoid issues reaching catastrophic proportions.

All these views of what value is added by innovation can readily translate to the challenges faced in the urban water sector: finding greater economic efficiency; dealing with drought, flood, political change and other crises; and developing 'next' practice approaches in preparation for uncertain future conditions. Innovation therefore, can provide improvements to current approaches, and a means of incubating solutions to future problems so as to avoid crisis-led decisions with lasting legacies. Why then, is the Australian urban water sector beset by continued challenges to innovative approaches?

Lack of innovation is certainly not a substantiated argument. The recent drought provided the crisis driver for innovation to occur across the sector, with many examples of innovation now adopted and in use in every capital city. However, these new technologies are struggling to break the dependency on traditional water servicing solutions; new water services such as fit-for-purpose use remain on the margins of levels of service, and new water sources like stormwater are struggling to fit within regulatory frameworks. Innovation in Australia's urban water sector, it seems, is struggling to progress past invention to widespread diffusion and delivery of outcomes, following Jordan and Huitema's (2014) forms of innovation. This is not to say the innovations are not delivering results, but that the difficult shift from a novel but viable idea to routine adoption is not occurring. This is certainly evinced by the analysis of demonstration projects not progressing to the mainstream (Farrelly and Brown, 2011) and practitioners' perceptions of barriers as being predominantly institutional in nature (Brown et al., 2009).

How then, can the urban water sector develop the innovation capacity beyond proof-of-concept to diffusion and mainstream adoption? It is perhaps worth reflecting on the constraints to innovation in the public sector, which have been well canvassed in the public administration literature. The Australian government review of public sector innovation identified three main types of impediments: political and public service attitudes to risk; the importance of short-term delivery pressures; and the conservative effects of administrative policies, procedures and structures (Management Advisory Committee, 2010). Traditionally viewed as cumbersome, inert and beset by red tape (Sørensen and Torfing, 2012), there is no doubt that the multi-layered hierarchies, fragmented administration, limited economic incentives, and partisan political leadership structures play a role in limiting innovation within public sector organisations and systems (Halvorsen et al., 2005). However, these criticisms tend to emerge when the public sector is compared to the private sector. As Kay and Goldspink (2013) point out, this compares apples with oranges.

Unlike the private sector, public sector does not operate in a market context; only the bureaucracy provides well-developed policy programs to government, and government can only seek such programs from within its public service (Potts and Kastelle, 2010). While there are a growing number of influences on policy processes (Tiernan, 2011), only the public service has the authority and institutional resources to deliver public policy (which may include contracting services out to private providers). And while there is competition within the bureaucracy for resources, the driver for this is to ensure delivery of responsibilities, and for advancement of career public servants. Thus, public agency competition does not mirror competition for 'market' share as in the private sector (Potts and Kastelle, 2010). For example, the environment department would not aim to compete with the primary industries department to provide policy options on natural resource management to Government. Indeed departments and agencies must think of the cross-portfolio implications of their own policy ideas and test these with relevant agencies before progressing a policy package for the consideration of Ministers and Cabinet. Thus, competition is not the driving force on innovation in the public sector.

What does the public sector innovation process look like, and where does it need improvement? Many authors pose different views on this process, but most identify three phases which refer back to the classic work of Rogers (2003) on the diffusion of innovation. Potts and Kastelle (2010) propose origination, adoption, retention; Stewart-Weeks (2015) proposes a virus metaphor of infection, inspiration and implementation; Stewart-Weeks and Kastelle (2015) propose three action based phases that are easier to translate: manage innovation as a process, think more explicitly about risks, and experiment to learn, reduce risk and trigger value creation. As explained in the following sections, we have adopted a model based on three phases – initiation, experimentation, and integration – which moves from project ideas through pilot schemes to wider delivery systems and institutionalisation. Overall, innovation in the public sector is distinguished from private sector innovation, in that it often goes beyond the development of a novel solution to a problem, to requiring a raft of systemic changes to the policy frameworks and regulatory regimes that shape public sector activity. As Potts and Kastelle surmise, innovation is understood as, '…not simply something new, but rather a micro and macro dynamic process by which agents, organisations, [and] institutions are transformed by the effects of a novel idea.' (Potts and Kastelle, 2010:123).

The general analysis is that to ensure water governance adapts overtime, conditions for innovation to emerge and flourish need to be created, processes put in place to develop these ideas into viable alternatives, and strategies employed to ensure these new options become embedded in policy and practice. In this way, more supportive governance arrangements will be incrementally developed overtime. Figure 1 represents this innovation adoption process in a classic S-curve, often used to depict generic system change processes, with time on the x-axis and an arbitrary measurement of 'change' in the system on the y-axis. This curve has been used to depict the process of innovation diffusion (Rogers, 2003) and transitions to new system configurations (Rotmans et al, 2001), two scholarships relevant to the problem of initiating more systemic change in the urban water sector.

For the purpose of encouraging incremental adjustments to governance arrangements, it is arguable that the key intervention points to target within the innovation adoption process would be: first, trying to foster the policy and practice conditions that can incubate and catalyse inventive new technologies and approaches; second, better understanding the experimentation process; and third, closely examining how the process of institutionalisation

can shift administrative, regulative and/or legislative arrangements to integrate the new ideas into common practice occurs. Studies of cases which stalled at some point in the adoption process, those that experienced a backlash against them, or even the business as usual case, may be interesting to examine in order to identify potential barriers to progressing along the innovation adoption trajectory. However, this research prioritised cases progressing along the adoption pathway to identify success strategies. The phases and trajectories of the innovation process are illustrated in Figure 2. We now briefly outline the research approach taken to examine these three intervention points, through the analysis of a range of policy innovation case studies.

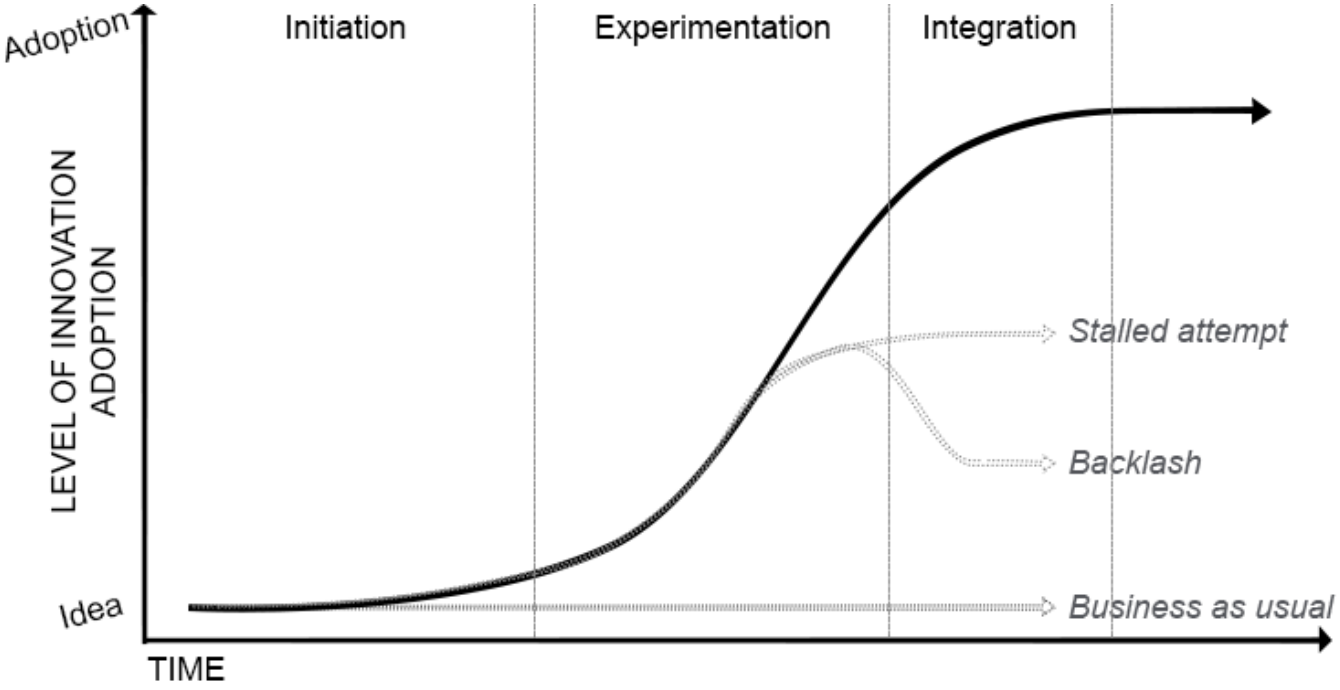

Figure 2. Conceptualisation of policy innovation: tracing ideas to adoption

Research approach

The approach used to investigate the governance factors behind the initiation, experimentation, and integration of policy innovations involved a qualitative assessment of the governance setting in each case study. A comprehensive account of this assessment is provided in Appendix A, but comprised of:

1. data collection and compilation into a case study report for each case (see Appendix B for case study descriptions);

2. positioning of cases on the innovation adoption curve (Figure 1) based on the initial case study analysis;

3. a governance assessment of each case (see Appendix C) based on a framework derived through the research to date, involving the qualitative assessment of a range of governance attributes (see Figure 3), and assignment of a score to reflect the positive or negative influence of these attributes on the progress of innovation adoption in each case (see Appendix A);

4. a comparison of cases clustered within each phase of the innovation adoption curve, identifying common attributes or development patterns by examining the governance attribute scores, and drawing on the qualitative materials to draw a picture of key governance features, processes, and successful strategies employed in each phase; and

5. a reflection on the temporal progression of cases, in particular experimentation and integration cases. Given the case assessments were cumulative, taking into account all the governance features present in each case, this reflection provided ideas as to what governance attributes might need to be fostered in one phase, in preparation for the next.

The case study analysis focused on the identification of a range of governance attributes, and a qualitative assessment of whether these attributes produced a positive, negative or neutral influence on the progress of innovation adoption. The governance attributes were drawn from a review of the literature, and are illustrated in Figure 3. Further descriptions of these attributes and their origins are provided in Appendix A.

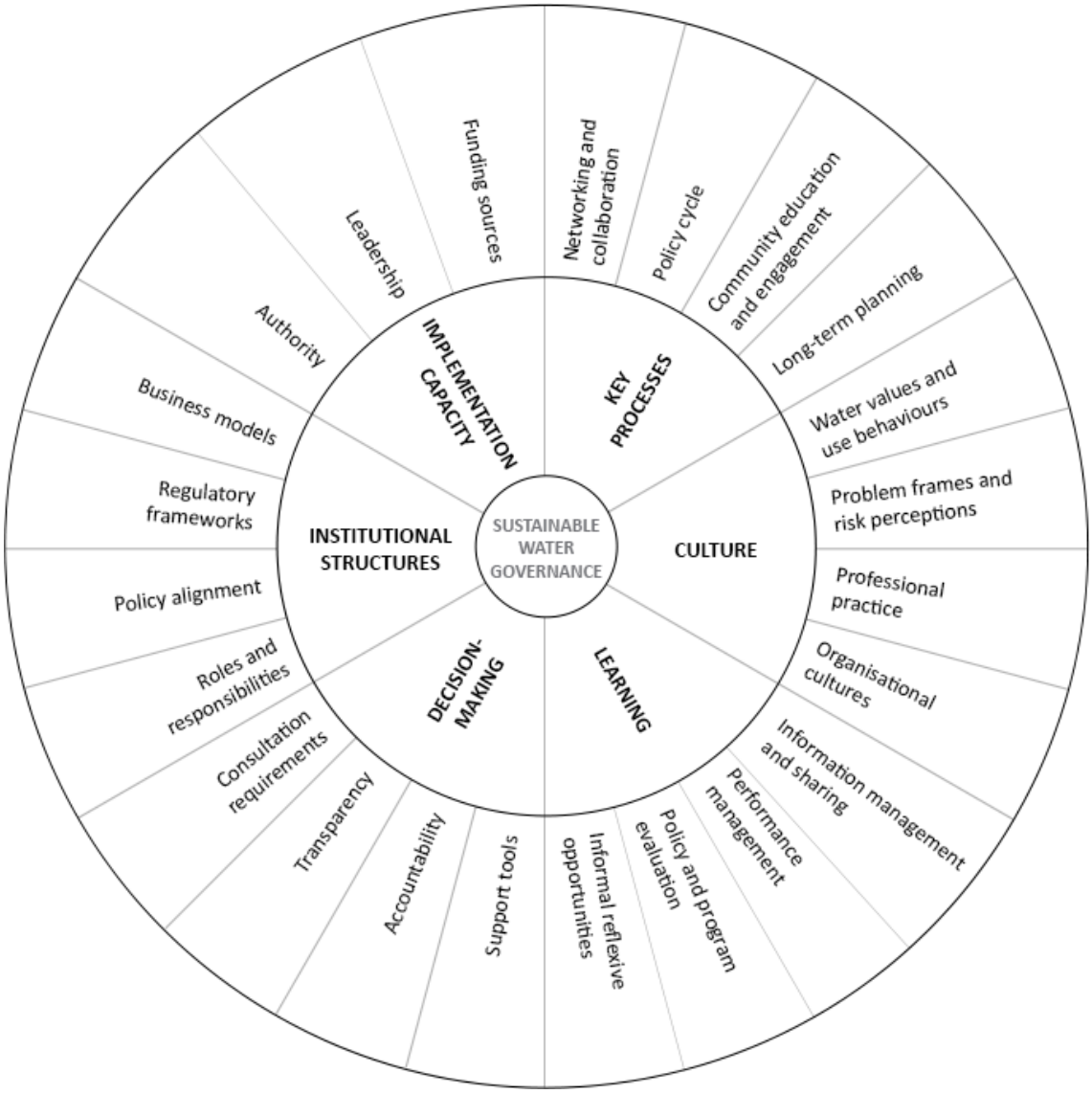

Figure 3. Governance change attributes wheel (Adapted from Gupta et al., 2010)

Case study selection

The premise of the research is that governance change will be bought about by more attention to policy change processes, in particular how to foster conditions for policy innovation, where new ideas and governance arrangements to support them can emerge, develop and be embedded in institutional and administrative arrangements. Jordan and Huitema's (2014) typology of policy innovation was used to frame the selection of cases, recognising innovative policy could be an entirely new approach to a problem (policy invention), a new approach to a particular jurisdiction (policy diffusion), or combine existing policy instruments into a new policy design aiming to deliver new outcomes (policy impact).

Cases showing signs of policy invention, diffusion or impact were identified through a literature review, research networks, and discussions with industry partners and other academics. A range of cases were sought, from examples of technological innovation influencing policy development, internal bottom-up policy development processes, to top-down policy imposition and translation. This provided a spread of diverse policy drivers in different contexts within which to explore policy development and change processes. Cases were selected where primary data collection was possible, or where there was sufficient published material to gather adequate secondary data to explore the case.

To situate the case studies in a framework for understanding how governance attributes influenced the policy innovation and adoption process, the cases were positioned as either cases of innovation initiation, experimentation, or integration (following Figure 1). A short description of each case is provided in Appendix B.

Case study analysis method

Based on the primary and secondary data collected for each case, a qualitative assessment of the governance attributes illustrated in Figure 2 was conducted. A positive or negative score was assigned, depending on the extent to which the governance attribute showed a positive influence on the progression of the innovation, or posed a barrier to adoption, respectively. Where no clear influence could be determined, a score of 0 was assigned. This method was adopted from the work of Gupta and colleagues (2010), who designed the assessment approach to examine the adaptability of institutions. Their approach has been tailored to the urban water sector, by including governance attributes identified as important to sustainable water resources management in other studies. Further detail on this governance assessment framework is provided in Appendix A.

Attribute scores were then averaged across the governance themes, identified in the inner circle of Figure 2. Radar plots of the aggregate scores for each case are provided in the following sections to illustrate the insights provided in the commentary, and for quick comparison of case results. The aggregate scores were given a traffic light style rating, to illustrate the direction and extent of influence of the governance attributes (see Table 1).

Table 1. Traffic light score categories and descriptions for governance assessment

Score	Description
-2 to -1.1	Governance attribute showing a significant adverse influence on innovation adoption process
-1 to -0.1	Attribute showing some adverse influence on innovation process
0	Governance attribute appears to have a neutral effect on innovation process
0.1 to 1	Attribute has some positive influence on the innovation process
1.1 to 2	Governance attribute has a significant positive influence on the innovation process

It should be noted that high positive scores do not necessarily identify a more successful case of innovation adoption. While more negative scores for governance attributes may show an innovation process with substantial barriers to be overcome, key governance attributes become more critical than others to the progression of the innovation in different phases. Also, negative scores in one attribute may be remedied by strength in other attribute(s). More comprehensive and diverse case studies will need to be conducted to include these sorts of weighting factors within the assessment approach. For the purposes of this research, the scoring system assisted with the cross-case comparisons, by quickly highlighting key commonalities and differences between cases, which could then be further explored in the qualitative material.

The results of the cross case analyses within the three innovation phases are now presented. The detailed governance assessments for each case study can be found in Appendix C.

Initiating innovation

The initiation phase encapsulates the emergence and development of new ideas or approaches, techniques and technologies. The cases included examples of innovative urban design which had some influence over planning guidelines (Fitzgibbon Chase), the initiation of a piece of strategic policy work new to the particular jurisdiction (Department of Water (DoW) urban water policy), and the development of innovative governance models for water service provision (Scottish and Welsh Water).

The cases presented an interesting mix of results, with no strong common governance themes evident (see Figure 4). There was also a large disparity between the Fitzgibbon Chase/DoW water policy cases and the Welsh/Scottish Water cases. This is possibly a reflection of the more advanced progression of the latter cases, as while the analysis focused on the early stages of these policy developments, a certain level of retrospection was evident in the data, and difficult to separate in the analysis. However, looking at a deeper level of detail in the governance attributes, positive influences across all cases could be seen in networking and collaboration, connection to the policy cycle and authority (see Appendix C for details). In examining the influence of these governance attributes in the cases, it was clear that networking and collaboration served to highlight the problem addressed by innovations, and in doing so, allowed the reframing of risks associated with trying new approaches. The analysis also demonstrated the importance of collaboration in this phase, to not only build a support base for innovations, but also to build the legitimacy for using organisational authority to trial new approaches. This was particularly important for building broader acceptance of an innovative idea.

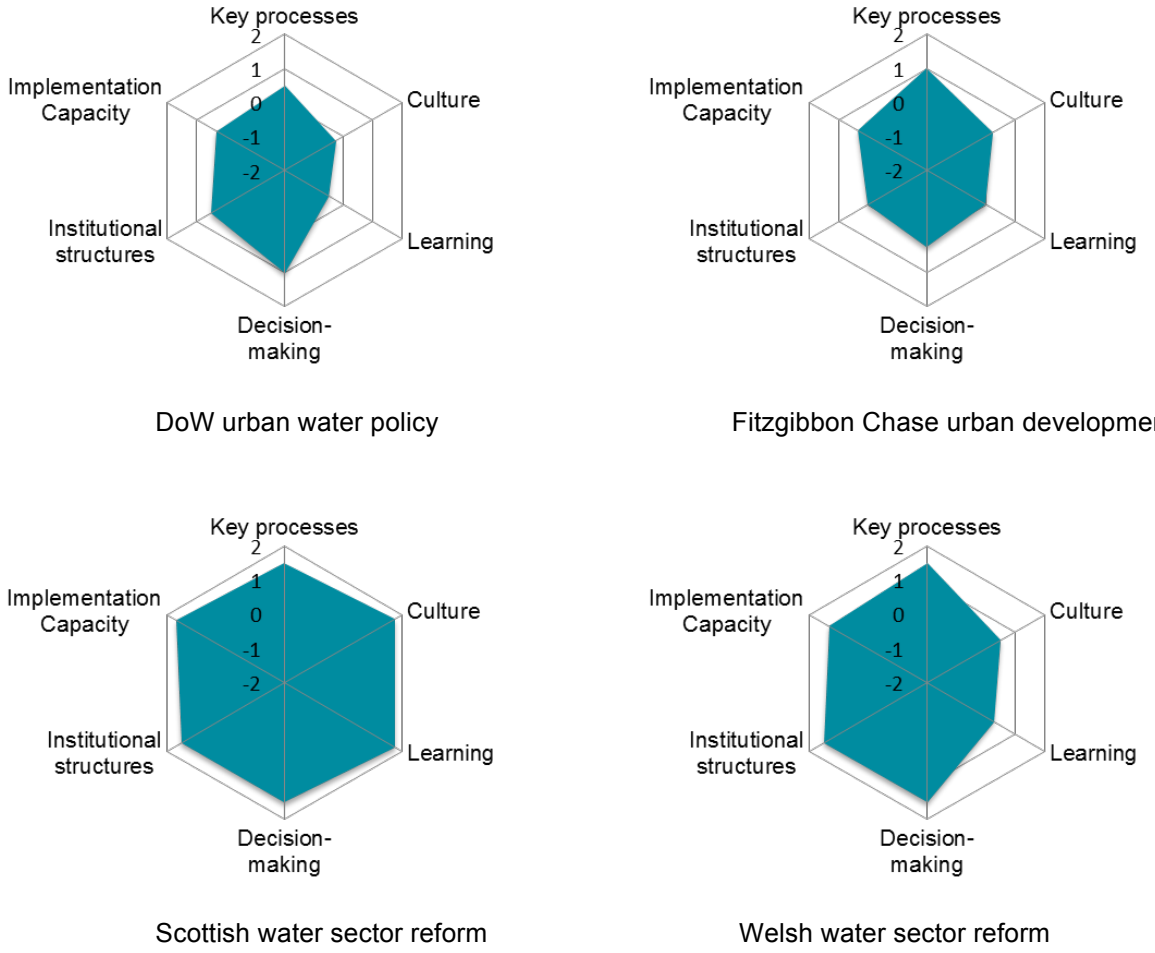

Figure 4. Initiation case governance assessments – aggregate governance theme scores

Reframing risk

Activities in the initiation phase revolved around collective consideration of the suitability of current practices and aspirations, reframing of risk perceptions in light of current trends, and connecting a compelling case for change to the policies of organisations with the authority and access to resources for progressing a change agenda. The reframing of potential risks and identification of additional benefits is a particularly important component of the case for change; without shared acknowledgement that there are new risks to be considered and/or greater benefits to be pursued, the is no strong argument for investing the significant resources needed to alter practices and their supporting institutional frameworks. For example, while still in the early stages of development, the interviewees from the DoW urban water policy case reflected that the main achievement to date had been the recognition from participating departmental divisions that there were some coordination issues with water management in the urban environment, hence the need for a direction-setting policy.

Building a support base

All cases also scored highly in the community and stakeholder engagement attribute, with the exception of the Dow water policy development. This is likely due to the very early stage of this case, and it could be expected that

engagement will increase as the policy development progresses. Discounting this case from the analysis for this reason, it could be surmised that community and stakeholder engagement is also an important activity in the initiation phase, to build recognition of the need for change and thus providing a support base to the case for change, and driving new direction setting activities in policy and new solutions to be developed. The Scottish and Welsh cases demonstrated the importance of community and stakeholder engagement, for without this broad industry and public support, the impetus to resist moves to privatise the water sector in each country in line with England would not have existed, and hence new water governance models would not have been explored.

Balancing decision-making autonomy with collaborative agreement

An interesting outlier in the cross-case comparisons emerged when examining the detailed governance attributes for the Fitzgibbon Chase case. In this study, decision-making governance features such as consultation requirements and transparency scored quite low; a reflection of the significant powers of the government owned Urban Land Development Authority (ULDA) driving the innovative urban design. The ability of such an organisation to make significant and decisive decisions provides a strong driver for change - providing the organisation has a remit to innovate. Establishing these powerfully independent agencies is often used as a strategy to bring about change when substantial institutional blockages exist and other interventions have failed. However, the ability of such organisations to influence more lasting and embedded change appears to be dependent on how the organisation is led and operated. Without close collaboration with existing agencies, it is likely the innovations will not be taken up as standard practice. The Fitzgibbon Chase study confirmed this observation; through close collaboration with the land development industry the ULDA produced innovative housing and lot designs which challenged existing planning regulations, but were progressively being adopted by building companies. This finding demonstrates the balance to be found between establishing an entity with strong decision-making power and a remit for innovation, and ensuring this innovation is embedded in institutions and practice for the long-term by collaborating with key delivery stakeholders.

Fostering innovation

The variation of results in the initiation cases is also a reflection of the difficulty in capturing the largely informal activities which drive this phase. In all cases the emergence of innovative ideas revolved around informal networking to facilitate joint reflection on current practice and operational contexts. Through this process, trends were identified and potential problems recognised. In addition, shared understanding of emerging problems were developed, and risk and benefit perceptions shifted, providing more of an impetus to search for new solutions or more suitable approaches. For example, in the Scottish and Welsh water cases, the lessons from the privatisation trend in England generated a concern in each country that they could ‘lose control’ over their water services, prompting greater consideration of alternative governance models. Peer networks coalesce around these new ideas as the problems become more evident or are broadcast more widely through professional networks. Eventually, the more cultural aspects of governance come into play: a new vision is articulated and communicated, and an organisational or professional culture conducive to trialling and developing ideas to test their viability is needed. These processes of information exchange, learning, and self-organisation of networks drive change across organisations and institutions, and have been identified as key initiators of major systemic shifts in a number of well-studied cases of socio-technical, policy and social-ecological change (Geels, 2002; Olsson et al., 2006; Brown and Clarke, 2007; Meijerink and Huitema, 2010).

However, this variation is also telling, in that the emergence and progression of innovative ideas can draw on a range of governance features. For example, in the Welsh and Scottish water reform cases, the drive for reform came from a desire to reclaim national identity through ownership of essential services like water, and not from a desire to improve water management practices and outcomes per say. In the Fitzgibbon Chase case, a formal authority with significant power was established to deal with bottlenecks in land development, while in the DoW water policy study the driving force was a group of dedicated policy makers who recognised a strategic gap in their organisation’s policy positions and available guidance. The results suggest that to initiate an innovative process, a mix of governance features may be drawn on, dependent on the operational context and nature of the

initiative. Nevertheless, the analysis results support the following broad recommendations on how to initiate an innovation and adoption process.

- A shared case for change, in the form of a narrative, is the first step toward finding the legitimacy to challenge the status quo, and access the resources to do so.
- The case for change consists of the immediate need to change, the risks of not changing, and the potential benefits change could bring. Counter-arguments to the perceived risks of change can also strengthen the argument. These arguments form a narrative with a strong value proposition, as distinct from a vision for the future (though this may help communicate potential benefits) or a business case (which is developed through the experimentation phase).
- A case for change is built from informal professional interaction and reflection, so relevant actors need time and support to come together to discuss issues and think outside current constraints, free of their duty to represent an organisation or position.
- Once a compelling narrative emerges, the strategy is to communicate the case for change more broadly, strengthening the narrative with new insights and perspectives from new audiences and gaining buy-in through the process. This develops a support base, and also finds multiple channels through which a consistent message can reach key decision-makers.
- The case for change needs to find formal legitimacy through incorporation into organisational or government policy or programs, so that legitimacy to challenge the status quo is established, and resources appropriated. This representation may be the rationale for change, proposed new directions, or alternative solutions.
- Supportive actors must then work collectively across organisations and levels of government to connect the new ideas to policy, strategic and business planning activities, targeting organisations with the roles and authority to deliver the changes proposed.

Experimentation

The experimentation phase is a period of developing and testing ideas and solutions according to a number of criteria – Does it work? Can it deliver the outcomes we want? What will this mean for current practice? And if this solution were to be mainstreamed, what would need to change? The phase involves accessing resources and partners to convert ideas and concepts into demonstrable alternatives.

The case studies examined as examples of experimentation represented a range of scales and types of experiments: new approaches to urban design and multi-functional flood management infrastructure in the City of Rotterdam; adoption of a novelty policy mechanism to encourage uptake of household solar energy systems in the City of Berkeley, California; and the introduction of fundamental water sector reform (privatisation) in the UK. Despite their disparities, a common pattern of strong governance features were evident in the case analyses: governance capacity in key processes, decision-making and implementation (see Figure 5).

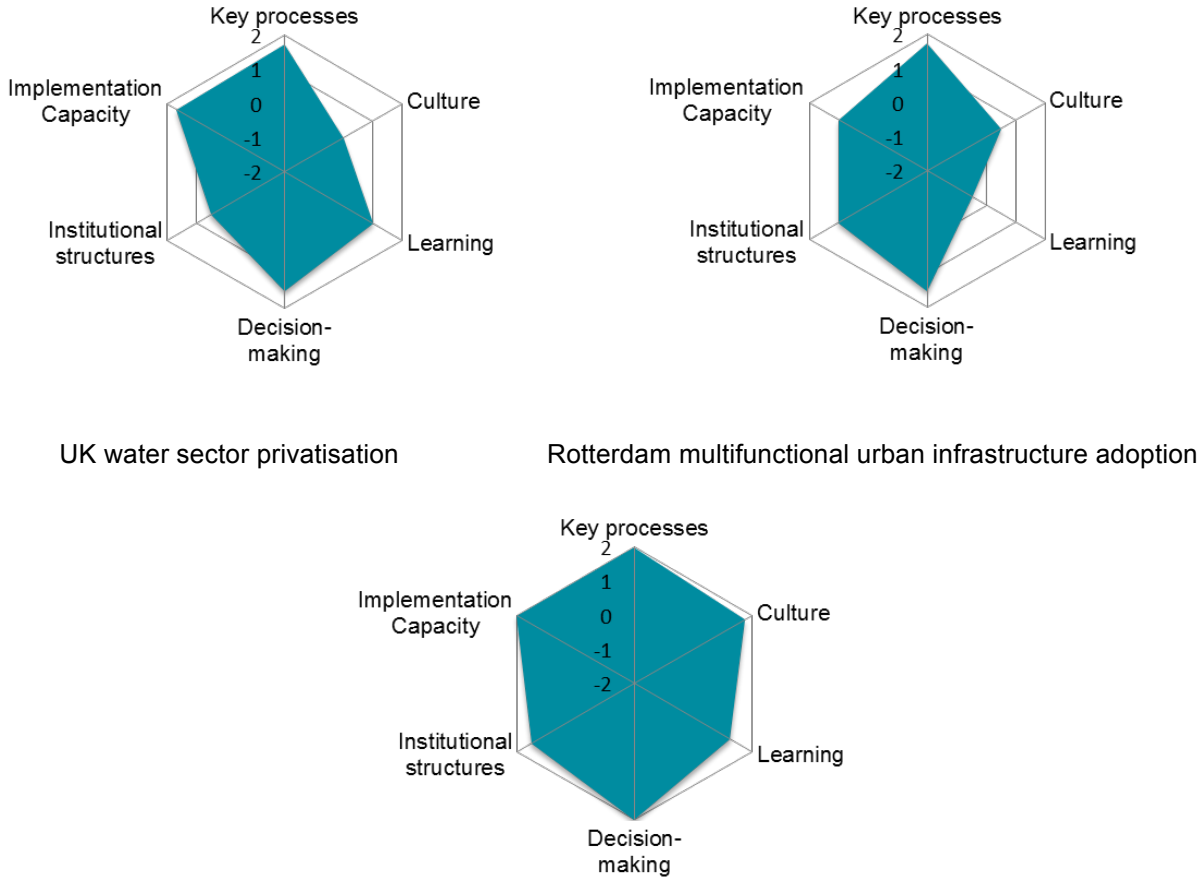

Figure 1. Experimentation case governance assessments – aggregate governance theme scores

Gaining legitimacy, accessing resources, maintaining momentum

The key processes examined in the governance assessment included networking and collaboration activities, connections to policy cycles, community and stakeholder engagement, and long-term planning. Across all the cases, collaboration with other organisations or groups was essential to gain support for the testing of new ideas or technologies. For example, water engineers wanting to develop multifunctional flood management infrastructure in the City of Rotterdam connected with the urban planning department, who were looking for ways to revitalise neighbourhoods while realising the City's densification strategy. These municipal staff also connected with community leaders and entrepreneurs to develop concepts and design/technical solutions that resonated with community concerns. Such collaborations were important in the cases studied to not only pool resources and strengthen the justification for pursuing the project, but to maintain momentum for the process through joint problem-solving and broadening the support base. For example, policy, regulatory and peak industry bodies in the UK case formed working groups to deal with issues arising through the privatisation process. This included the joint development of an evaluation framework for long-term capital requirements and infrastructure management, which was then used as the basis for assessment in the 5 yearly pricing review. In the Rotterdam case, collaborating on a submission to the Rotterdam International Architecture Biennale provided a means of

publically showcasing a new urban development direction for the city, leading to public and national government interest and subsequent permission and resources from the municipality to progress the ideas. The results of the Rotterdam case in particular suggest that not only does collaboration bring in new ideas, resources and support, but enables ideas and concepts to connect with and integrate into activities in other sectors (Bettini and Frantzeskaki, forthcoming). Rather than seeking to influence related sectors (planning) on the importance of water, the successful strategy employed in Rotterdam was to reframe water as a solution to the issues and opportunities in those sectors, i.e. to densify Rotterdam while maintaining a liveable city, by bringing water into the urban landscape in blue corridors and to water public open spaces (Frantzeskaki et al 2014).

Policy connections were also important to embed support for experimental initiatives. For example, a ballot held by the City of Berkeley recognised the role of residents in taking action to meet climate change challenges (http://www.ci.berkeley.ca.us/berkeleyfirst). The public support for the ballot provided a mandate for the Berkeley Financing Initiative for Renewable and Solar Technology (Berkeley FIRST) household solar installation program. The initiative was then included as an action item in the City's broader climate change mitigation/adaptation commitments. This connection to policy enabled Berkeley FIRST staff to progress the series of legislative changes needed to support the funding initiative. Developing policy connections also appears to be critical for shoring up support for broader application of the innovation post-piloting period. Such linkages also ensure recognition for a potential solution within policy circles, meaning the option is 'on the table' for consideration when a policy window opens. For example, when elected in 1979 the conservative Thatcher Government did not have an explicit privatisation agenda for the water sector. However, high inflation, restrictions on public expenditure, and the decision of the European Commission to prosecute the UK government for lack of performance on water quality management prompted a policy window for reform. The then Chair of Thames Water publically stated in early 1985 that the organisation would be able to provide better services under a privatised model. While the Department of Environment had not considered any privatisation models for the water sector, this statement prompted a preliminary round of consultation with water utilities. By 1985 the Government's policy position on water privatisation was affirmed.

Levels of community and stakeholder engagement varied across the cases, but both were strongly represented in this experimental phase. The general public consensus in the UK that water reform was necessary, due to the inadequacy of existing water services, required little public consultation on the new model to be used. However, a major reform such as privatisation required significant stakeholder involvement. Consultation with the water industry informed the design of the privatisation model, and a series of discussion papers canvassed input around particular issues such as economic regulation, the cost implications of EU Directives, and methods of assessing capital costs and asset valuation. In contrast the Berkeley FIRST initiative asked residents to install PV solar systems and add the debt to their property rates, requiring significant levels of community support for success. This included fostering community recognition of the need to take personal action on climate change, and building the willingness of residents to participate in the Berkeley FIRST initiative. These results suggest that the type and extent of consultation varies considerably in the experimentation phase, and is dependent on the nature of the innovation being trialled. However, within all cases consultation processes appeared to build recognition that a problem existed. This acknowledgment of the need for change could therefore be considered a precondition for the experimentation phase i.e. needing to be fostered in the initiation phase.

The final key process which had a strong influence over the progress of innovation was that of long-term planning. In the two municipal cases, linking to targets or contributing possible pathways toward a longer term change strategy (climate adaptation and urban densification) provided the innovations with legitimacy and hence attracted support to continue. In the national level reforms of the UK water industry, the innovation of a privatised model was driven by the view that the current system of water servicing was unsustainable, given economic challenges and poor environmental performance. Thus, while the privatisation experiment was not linked to a clearly articulated plan for the future in the same way as the municipal cases studied, it was linked to recognition of systemic problems in the current system and the need for a better model in the long term. The cases demonstrate that showing tangible links to a 'big picture,' - even if those links are focused on avoiding an undesirable future - helped the innovations to gain legitimacy, and hence resources.

Supporting decisions, managing disapproval

The second major governance influence on successful experimentation evident in the case studies was decision-making capability. This encompassed appropriate consultation practices, transparency through reporting and disclosure on decisions, and clear accountability for decisions and their consequences. Many of these aspects of governance tie closely to community and stakeholder engagement practices.

All cases began with an open consultation process with communities or stakeholders: Berkeley held a ballot on climate action, Rotterdam set out to draw ideas from community leaders and entrepreneurs, and in the UK the option of privatisation was raised by water utilities then developed by government. This type of openness (i.e. without preconceived outcomes) automatically generates transparency, as participants see their views and ideas being taken into account – provided well designed feedback mechanisms are incorporated. However, such openness may not always be possible. In these situations, including an education component in a more guided participation process may be required to help participants see the constraints and opportunities. For example, in the Rotterdam case the densification strategy had already been adopted, but participants were provided with the background information as to why this was a necessary step for the future urban development of the city. The participation process then focused on the problem of how to keep the city liveable within this future scenario. This example highlights how a focus on joint problem solving and solution development can help to move the debate away from issues toward finding an accepted way forward.

Having accessible and timely reporting arrangements on how decisions were made and enacted is recognised as important to demonstrate accountability for actions taken. However, the Berkeley and UK cases included avenues for grievances to also be voiced. In Berkeley this included a public hearing prior to the adoption of the Berkeley FIRST initiative in the Council, to hear from those who may have been adversely affected. While in the UK, provisions were made for the water utilities to appeal pricing decisions by the regulator. Such mechanisms allowed opposition to be aired, acknowledged, and where appropriate addressed, reducing the likelihood of these opponents seeking other, less manageable methods to have their say or actively block initiatives.

Finally, the relationships built through consultation and feedback with communities and stakeholders can be particularly important to gain validation of the chose solution or approach. This assists to justify decisions and builds a support base. For example, the ballot held in Berkeley provided all citizens with the opportunity to express an opinion, and the high level of support expressed then provided the City of Berkeley with a mandate for climate action. Stakeholder relationships may be utilised to build more formal validation measures, such as decision support tools, whereby evidence is gathered, jointly interpreted, and built into guidance tools. This was evident in the UK case, where a working group of policy and regulatory agencies and the peak industry body convened to work through issues arising in the initial phases of privatisation. These stakeholders eventually collaborated regularly to develop support tools, such as an evaluation framework for economic regulators to apply in the industry-wide pricing review.

Implementing innovations

The final influential area of governance capability for the experimentation phase, perhaps unsurprisingly, is that of implementation capacity. This encompasses having the authority to take action (as defined in enabling legislation or law), the presence of various forms of leadership, and adequate financial resources.

Having suitable authority to undertake the activities required to test ideas can be relatively straight forward, as in the UK case where policy and regulatory agencies had scope to adjust regulatory arrangements as reforms progressed, or the City of Berkeley, who had the ability to create the necessary administrative arrangements through their own organisational powers. However, often with innovative approaches authority for action is not clear. This was certainly the case in Rotterdam, where water engineers drew on the planning department's ability to set urban development directions and trial integrative urban design approaches. This case demonstrates how the powers of various departments and agencies may need to be pooled and coordinated to deliver innovation

experiments. This will require leadership from management and executive levels to endorse such moves and provide support throughout the experiment. This governance features also crosses over with collaboration and networking, in that effort to developing working relationships is a precursor to gaining the commitment to utilise organisational authority of these partners in new ways.

The provision of resources is of course critical to the delivery of experimental projects. The cases revealed three key considerations regarding resourcing. First, the importance of setting aside adequate resources for monitoring and evaluation. This is critical to build the evidence for broader adoption, and hence move toward the integration phase of innovation adoption. The experience in Rotterdam illustrates the importance of this investment, for although there was a broad base of support for the new approach to flood management and related urban infrastructure, the lack of performance data made it difficult for planners and engineers to determine where best to implement these solutions. Indeed, there was anecdotal evidence that the innovative urban development in Rotterdam had stalled; while there was broad external support and a strong change narrative, the evidence to inform broader uptake of these solutions was not available.

The second insight into resourcing involved a shared understanding or interpretation of the cost and benefits of new options. While robust data on these decision-making criteria may not initially be available, in some circumstances gaining shared interpretations of the ‘best available’ information may help to progress the innovative idea, regardless. For example, in the UK privatisation reform process a working group of regulators, policy agencies and water utilities was convened to reach agreement on the service quality requirements for the 1994 Period Review of Prices, in the absence of clear figures for different levels of service. Thus, joint interpretations of available information may help to overcome barriers to progress resulting from a lack of evidence.

Lastly, the Berkeley FIRST case illustrates the use of innovative funding mechanisms. By attaching debt for installation of PV solar systems to property taxes, the municipality ensured investment in these systems was affordable and attractive to householders, while various conditions ensured financial risks to both the Council and participants were managed. While this approach challenged property lending rules and drew open criticism and sanctions from the Federal Housing and Financial Authority (FHFA), this did not deter the City of Berkeley or the State of California (who were adopting the Berkeley FIRST scheme at the time of the FHFA’s threat) from pursuing the option. This example illustrates that foundational institutions such as taxation and financial regulation may need to be challenged in order to progress innovations. The Berkeley FIRST case demonstrates that with good science and modelling, and multilevel government partnerships, this can be achieved. Sustainable and efficient funding will be a key element for delivering the new water services a WSC calls for, and innovative financial mechanisms will need to be developed. The Berkeley FIRST case suggests this task will require collaboration between water utilities, policy agencies and financial regulators, with a commitment to find flexibility in existing financial regulation.

Strategies for successful experimentation

Reflecting on the cases studied thus far, many of the governance capabilities identified in the initiation and experimentation phases appeared to influence innovation throughout the adoption process. Some governance features can also influence capacity development in other areas of governance. As such, building capacity in these governance attributes through the early phases of innovation adoption appears to be critical for maintaining the momentum behind the innovation adoption process, and for problem-solving barriers as they emerge. Some of these critical linkages are described in Table 2, and provide a wish-list of capacity building areas practitioners should aim to incorporate into demonstration projects and other experimentation activities.

Table 2. Key governance capabilities for experimentation phase, and their impacts on innovation process

Governance theme	Governance attribute	Influence on innovation adoption process
Key processes	Networking and collaboration	Contributes new ideas Gains support for testing of new ideas or technologies Pools resources Strengthens the justification for pursuing the project Maintains momentum through problem-solving and broadening the support base Enables ideas and concepts to connect with and integrate into activities in other sectors Helps to reframe water as a solution to the issues and opportunities in other sectors
	Policy connection	Embeds future support for broader application post-piloting period Builds recognition for a potential solution within policy circles to ensure the option is 'on the table' when a policy window opens
	Community/ stakeholder engagement	Garners recognition that a problem requiring change exists Canvasses input around particular issues
	Long-term planning	Links to a plan for change, or shows how to avoid an undesirable future, enhancing legitimacy and justifying investment
Decision-making	Consultation requirements	Builds understanding where an open process is not appropriate Ensures a pathway forward by focusing on solutions rather than issues Validates options and builds a support base
	Transparency	An open process and appropriate feedback creates transparency Reporting to participants is essential for transparency and accountability
	Accountability	Provides a way to more actively manage opposition if mechanisms for opposition to be heard are included in consultation processes
	Support tools	Enables robust decision-support tools to be developed through stakeholder relationships that collectively consider and interpret available information
Implementation capacity	Authority	Delivers innovations when resources and authority are pooled and coordinated to address existing gaps in roles and responsibilities. Requires a foundation of working relationships to have been built
	Leadership	Endorses the use and sharing of resources (including authority) in new ways
	Funding sources	Builds a local evidence-base to strengthen and mature the business case, and informs the development of new tools to support decisions, when adequate resourcing for monitoring and evaluation is provided

Integrating innovation

The integration phase of innovation adoption involves the rationale for the new approach or solution becoming deeply embedded into practice standards and supporting institutions, facilitating the broader application of the innovation to achieve ‘standard practice’ status. The cases examine in this phase included: the development of groundwater replenishment technology in Western Australia and associated regulatory adjustment and community support; a major flood management policy shift in the Netherlands; and the widespread adoption of green infrastructure solutions across the activities of the City of Portland.

Perhaps unsurprisingly, all cases in the integration phase scored highly for all governance themes, representing the maturation of the governance framework around the particular innovations. Analysis of these cases therefore focused on the journey which has led to this maturation. However, the learning governance theme stood out as not producing a significant influence in these cases – though it still produced an overall positive influence on the innovation process (see Figure 6). This can be explained by the fact that these cases are at the point of stabilising their institutional arrangements, after the period of uncertainty that accompanies experimentation (as new ideas and novel solutions challenge the legitimacy of existing institutions). As such, the focus switches away from questioning and challenging the assumptions embedded in institutional arrangements through learning processes, to investing confidence that the new governance structures are enabling suitable actions and guiding appropriate behaviours.

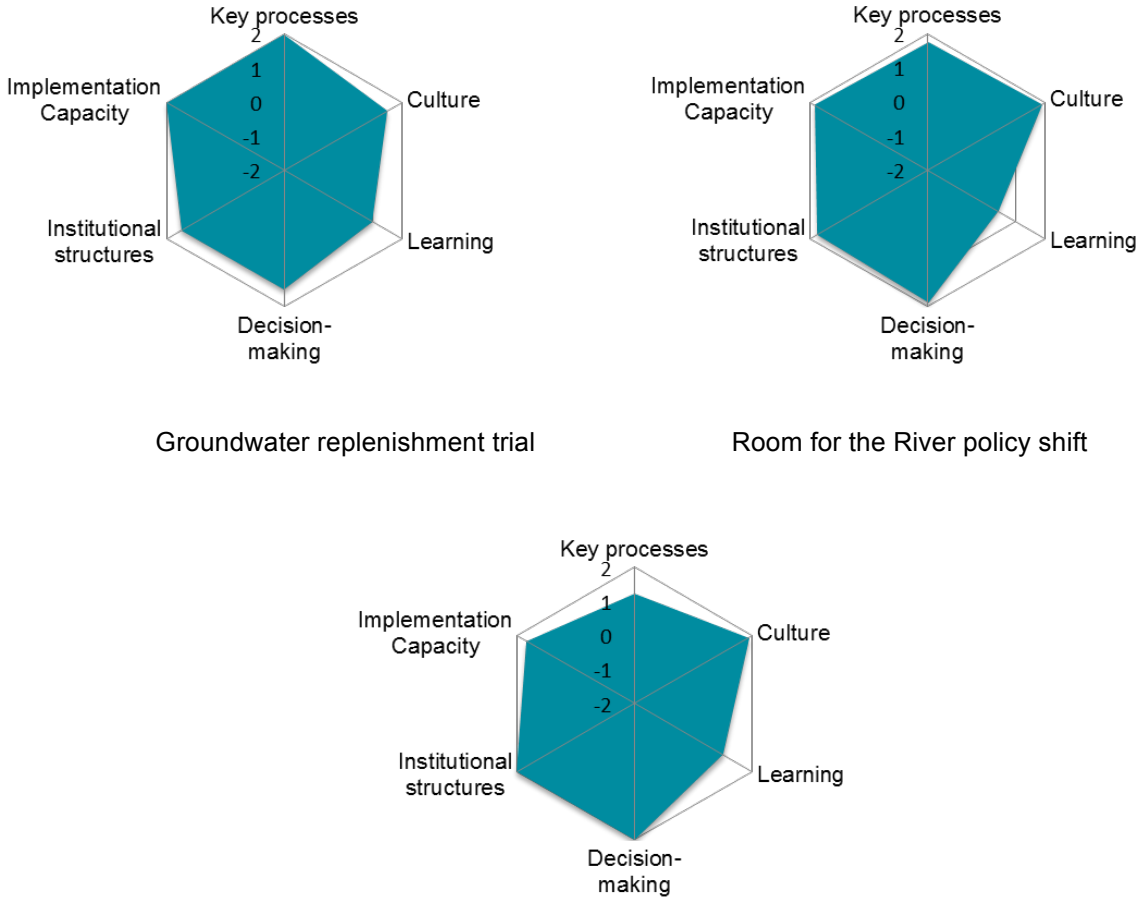

Figure 6. Integration case governance assessments – aggregate governance theme scores

An outline of innovation adoption

All cases of integration showed a long lead period, when the case for change was emerging, actors were beginning to coalesce around core ideas and concepts, and pressures for change were growing (climate change recognition, focusing events, community dissatisfaction). Eventually, there was enough connection between actors (through informal networks or work teams) to begin to mature these ideas into a narrative for change. This narrative was then spread more widely using a variety of communication mechanisms. For example, in Portland new division of the municipality, and their perspectives, were included in the development of green infrastructure solutions, connecting the narrative and solutions to a need for change in sectors such as transport planning and building regulation. Another strategy was the use of strategic advice functions and independent reviews to examine current practice and make the case for change. For example, in the groundwater replenishment trial, the EPA was asked to prepare strategic advice on the topic, which served to start community and stakeholder engagement, and helped to manage public concerns by placing a protective organisation (EPA) in the lead consultation role and to provide recommendations to Government on the options. In both the Portland and Room

for the River cases, committees and advisory panels were established to provide independent assessment and advice on critical issues and topics throughout the innovation process.

In all cases, this predevelopment activity culminated in the embedding of a need for change and a direction/plan in a policy statement, through some form of public consultation process (GWRT: EPA Strategic advice; RftR: Government memorandum – *Dealing with water,* policy guideline - *Room for Rivers,* position paper – *Room for Rivers*; Portland: CoP application for a national pollution discharge permit). This marked the initiation of the innovation process, and preferred options were then put on the table for investigation with accompanying programs of administrative and/or legislative reform to facilitate implementation.

The importance of monitoring and learning

The period of experimentation in each integration case showed significant investment in monitoring and evaluation, with the exception of Room for the River, though this is likely due to the large-scale of the case study and the lack of this type of specific detail in the published materials. Both the groundwater replenishment trial and Portland's adoption of green infrastructure utilised pilot projects, which not only demonstrated the performance of the new solution(s), but also provided information needed to inform the reform of regulatory frameworks or create new mixes of policy instruments, and to build trust and support for the approach through education and outreach activities. The Portland case in particular showed a gradual maturation of the business case for green infrastructure adoption, and increasing sophistication of the policy instruments used. Beginning with the City of Portland's tweaking of standard sewer services charges to incentivise preferred management options on private land, green infrastructure was then promoted more broadly throughout the organisation, based on the performance information gathered through monitoring activities. A monitoring program had very strategically been included in the City's application for its discharge licence, requiring the resources be made available to meet the licence conditions. The information gathered led to green infrastructure being recognised as a viable solution or approach to a broad range of the City's management and service activities. As a result, a greater variety of policy instruments were utilised to implement green infrastructure: from inclusion of green infrastructure works in community grants and other watershed programs; offset schemes for sewerage services in new and retrofit development; rewards programs for managing stormwater onsite by decreasing impervious areas and maintaining tree coverage; relaxing of building regulations on floor area ratios to encourage green roofs; to various training and behaviour change programs. Without the information gathered through the monitoring and evaluation of trial projects, the case for green infrastructure providing solutions to a broader range of the City of Portland's responsibilities would not have been made. Also, the interdependencies with other sectors would not have been identified to the level of detail needed to design policy instrument mixes to achieve successful outcomes and limit perverse incentives and outcomes.

Cases from other innovation phases demonstrate the risks when comprehensive monitoring programs are not designed and resourced around pilot projects. For example, in the Fitzgibbon Chase development, while extensive monitoring of novel water management systems proved their technical performance capabilities, evaluation in terms of their fit within existing tariff structures and business models, and implications of operation and maintenance requirements in regulatory frameworks caused difficulties in establishing ownership of the systems. Similarly, though there was support for multifunctional urban infrastructure within the City of Rotterdam and in national flood management policy, limited evaluation of pilot projects appears to have delayed the mainstream uptake of the solutions, as the information to identify suitable locations and to inform engineering standards had yet to be gathered.

These results show the critical role monitoring and evaluation has to play in the adoption of innovative options into mainstream practice. In particular, the importance of scoping the monitoring program to include not only information on technical performance, but to inform how to fit the solution to regulatory systems, financial models, and policy instruments.

Business case versus narrative

An interesting observation from tracing the innovation process in these cases was that a full business case around alternative approaches was not necessary to gain recognition as a viable option. Often the narrative around the additional, unquantified, benefits was enough for decision makers to accept them as potential solutions. For example, the adoption of alternative infrastructure solutions in both Portland and Rotterdam progressed without a comprehensive cost-benefit assessment; the narrative was persuasive enough for resources to be allocated to investigate and experiment with options. However, the contrast between these cases, Portland accelerating the adoption of green infrastructure while Rotterdam had stalled, shows the importance of continually building the business case through development of more mature cost-benefit assessments and broader research on performance (beyond technical to social and environmental), in order to keep the option viable in the face of challenge from existing solutions and rule structures

Another insight in relation to the narrative for change, is that many of the cases did not show linkages between the innovation and visions in long-term plans. Room for the River, a major policy shift for the Dutch from fighting water to making room for flooding, was not linked to an overall ideal of what the country's cities and towns aspired to. Instead the rationale for change was simple, water safety that also delivered spatial quality. Likewise, the Portland and Berkeley innovations were seen as solutions to pressing problems - stormwater quality and climate change - and not (initially) as pathways to sustainable futures. While linkages to such visions will likely be needed over the longer term to adapt approaches and coordinate implementation, and visions themselves are a critical communication and empowerment tool, these results suggest that innovative solutions can be developed and progressed in the absence of a vision. However, connecting them as solutions to the realisation of a shared vision will no doubt provide greater legitimacy and support for their uptake.

Collaborative foundations

In all cases, actors pursued a range of strategies to consult early and often with stakeholders and communities. Examples included: garnering community support through open engagement processes (GWRT, City of Rotterdam); intergovernmental agreements on processes to develop policy, the proposed content of reform packages, and implementation roles and responsibilities (Portland, Room for the River); and creating formalised channels within policy development processes for supportive independent experts to enhance the case for change and endorse the solutions (UK/Scotland/Welsh water reforms). It appears that a greater variety of channels through which key decision makers were exposed to the case for change and rationale for particular options built their confidence and acceptance of the proposed solutions.

These engagement processes also served to build relationships and partnerships that were critical to progressing innovations, particularly in multilevel governance contexts and when the nature of the innovations challenged existing institutional structures. For example, relationships built between regulatory agencies and water utilities in the UK during the design and development of privatisation models became critical to negotiating conflicting approaches to regulation, and resolving problems as the reforms progressed. Likewise, the Dutch 'polder' model of consensus decision-making laid the foundation for national, regional and local agencies to come to agreement on how to utilise their respective authorities and revenue streams to deliver the radially new flood management approach.

Thus, collaboration plays a large part not only in the emergence and momentum for innovations, but in finding ways to implement novel ideas which may not be possible under existing institutional arrangements. Therefore, collaboration plays a critical role in policy and governance change processes, and building collaborative capacity in relevant governance attributes should be a priority from the outset of an innovation process.

Regulatory flexibility to balance risk and innovation

Institutional, and particularly regulatory, structures are often cited as the main blockages to the uptake of innovation (Brown et al 2009). Interestingly all the cases studied did not set out with institutional reform as an explicit aim, with the exception of the UK/Scottish/Welsh water sector reforms, where governance reform was the innovation. Each case began with separate, more operationally focused arguments for change, and were pursued within existing frameworks. Implementation planning then identified suitable policy mechanisms and barriers, and the necessary adjustments to these institutional arrangements. A legislative or regulatory reform process would then run alongside the policy or program initiative, in order to pave the way for implementation. The groundwater replenishment trial illustrates this approach well, as testing whether existing regulatory conditions would support further uptake of the novel technology was an explicit aim of the trial. In contrast, the regulatory conditions for ownership and operation of novel water systems in Fitzgibbon Chase were not considered until late in construction/commissioning. While approvals to build the systems were negotiated early, the uncertain fit within operational aspects of the regulatory regime added delays and uncertainties to the ongoing viability of the systems. The analysis suggests that governance and particularly regulatory arrangements need to be considered, tested, and adjusted through the course of an innovation process, and not as an afterthought. The function of regulation, to manage a range of risks, also needs to be taken into account, as the following quote illustrates:

> '…no one can argue that using resources in new ways to maximize productivity and effectiveness is an unworthy goal. But although entrepreneurial activity on the part of government has these obvious benefits, it is also worth noting that it has liabilities as well. On the credit side of the ledger, entrepreneurs create and innovate; on the debit side, they may take excessive risks or run roughshod over people and principles.'
> (Denhardt and Denhardt, 2003: 6)

While the more progressed cases in this research showed the close involvement of regulatory agencies through the design and development of innovations, anecdotally regulators can be reluctant to compromise their independence in this way. This independence, and the maintenance of their capacity to veto or block actions, is an important way to ensure the public that harmful activities can be managed and ended if necessary. However, willingness to reconsider regulatory conditions, and flexibility to negotiate new approaches, emerged as critical to the adoption of novel alternatives as standard practice. A participatory model where regulators can balance their involvement in activities which challenge regulatory frameworks, while still maintaining independence and provisions for veto power, need to be negotiated.

Innovation as a coordinated process

Finally, a stand out feature of the more progressed cases studied was the interpretation of innovation as a process requiring management. Dedicated groups or teams were established to facilitate and coordinate the implementation of the initiative across agencies or internal divisions. The existence of these groups ensured not only cohesive implementation of the initiatives, but also served to broaden the acceptance and adoption of options; scaling up and broadening out the change agenda and solution adoption. In addition, without the allocation of staff, supported by senior management through memoranda or formalised group structures (committees/work teams), the identification of institutional barriers and negotiation to resolve these would most likely have fallen to no one to progress. In particular, the involvement of regulators in these collaborative mechanisms, as early as possible, was recognised as a key success factor.

These coordinating teams also proved to be critical bridging entities between practitioners and policy makers. This connected practice innovations to policy processes, increasing the likelihood of capitalising on a policy window. For example, by connecting with strategic policy planning processes, water engineers in the City of Rotterdam were able to sell their multifunctional infrastructure as a solution to the densification/liveability dilemma faced by city planners. However, it is also important for these policy-practice connections to operate in the opposite direction. For example, close working relationships between water utilities and their industry

associations, community consultative committees, and regulatory and policy agencies, were critical to fine-tune the privatisation reforms in the UK case studies. Such two-way exchange mechanisms are critical to progress innovations once they begin to challenge existing institutional arrangements. Thus, having dedicated teams, working groups, or formal collaborative arrangements to oversee and manage the innovation process are a crucial element to negotiate these institutional barriers.

Conclusions

To understand how to evolve and adapt governance arrangements, this research has investigated how policy innovation occurs. The assumption is that innovative policy changes will incrementally adapt governance arrangements overtime, as practices, attitudes and circumstances change. Overall, this study has found that shifting the problem frames and risk perceptions through collective reflection provides the opportunity for innovation to emerge in the initiation phase. Developing a narrative with a strong value proposition helps to gain legitimacy for the innovation in the form of inclusion in policy and program plans, which also helps attract resources to move into the experimentation phase. Monitoring and evaluating to build a comprehensive business case, test the regulatory fit, and build community trust of potential solutions becomes important in the experiment phase. Critically, collaborative relationships built throughout the previous phase then become necessary to problem-solve institutional barriers and move the innovation toward mainstream adoption. This adoption takes place in the integration phase, where institutionalisation of the innovation occurs, facilitated by dedicated groups managing the innovation process, embedding solutions in multiple agencies and levels through close collaboration, particularly with regulators. Specific governance attributes important in each phase and recommendations on successful strategies, structures and capacity building needs observed in this multiple-case analysis, are illustrated in Figure 7.

Managing innovation as a process from the outset appears to maximise the chances of success. It is useful to plan for adoption as the final end point, rather than seeking only to demonstrate the viability of a solution. This invites consideration and testing of other aspects critical to the adoption pathway, such as community acceptance and regulatory fit, during the experimental phase – thus paving the way for uptake.

Innovation will inevitably challenge existing rules – whether practice standards, regulatory frameworks, or in some cases legislated foundations. Leaders of successful innovations seem to acknowledge the likely points of contention upfront, and work toward either finding an acceptable fit within the rule structures, or concluding that these rules are hindering a suitable solution or outcome, and thus need to be adjusted. Often, this involves bringing rule makers and enforcers along on the innovation journey.

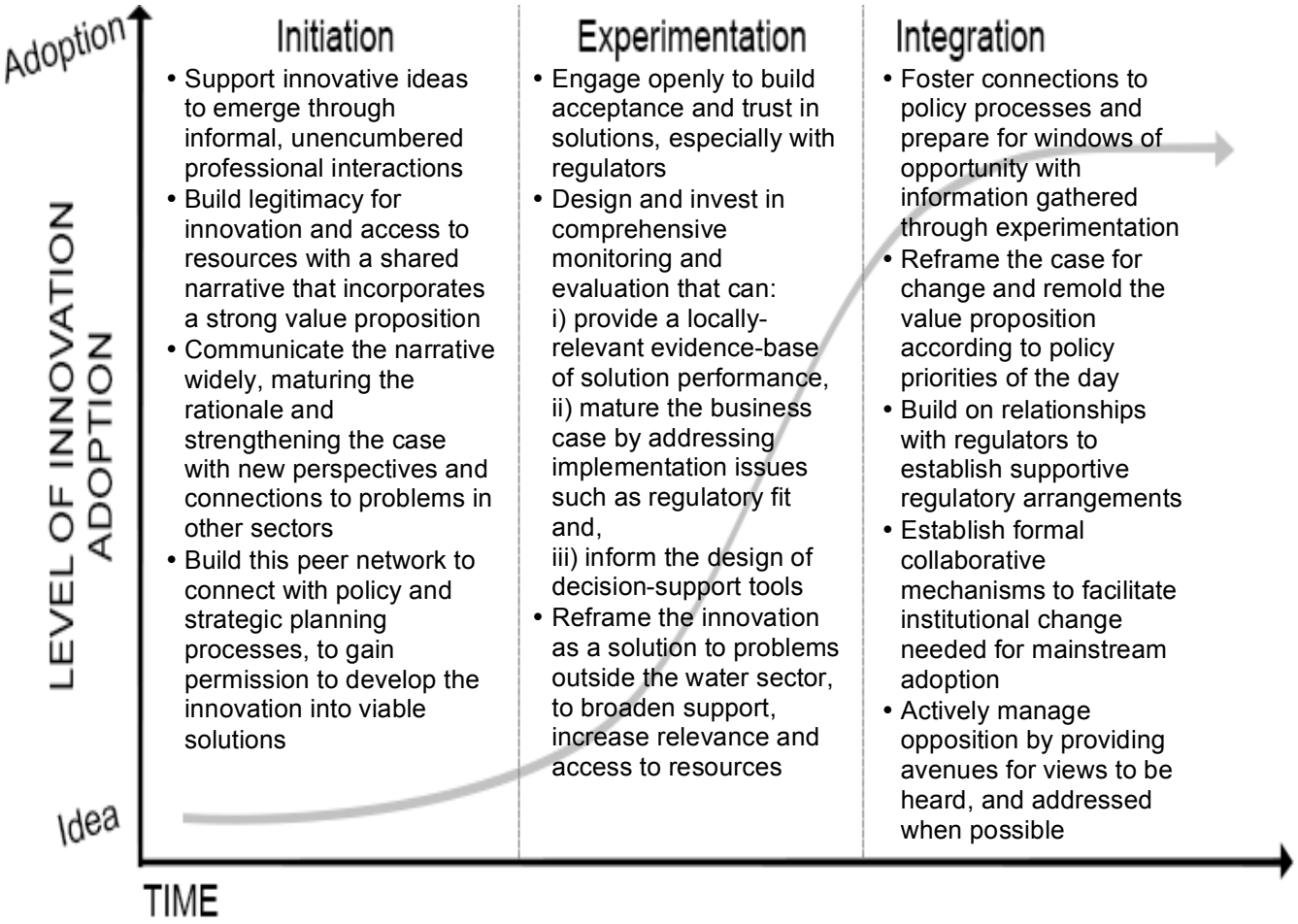

Figure 7. Key strategies to progress through innovation adoption

The implementation of innovative ideas and options will likely require many actors and/or organisations, and thus will require significant collaboration. By their nature as novel approaches, innovative solutions require a combination of roles and redistribution of responsibility, and particularly powers to act, in order for these solutions to be delivered. Negotiation to determine who can do what in this cross-organisational context can be a contested process, as it involves the exercise of power according to interpretations of problems and solutions within existing administrative, legal and cultural frameworks. The research results suggest that an open collaborative and participatory approach as early as possible is needed for the key actors to come together, agree on the problem, see the value of the innovative approach, and thereby build the legitimacy and justification for applying their authority and power in alternative ways.

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Appendix A: Governance context assessment framework

This section describes a framework complied to analyse case studies for *Better governance for complex decision-making* (Project A3.1). The framework aims to assess the governance context of case studies, to understand what governance features or factors help or hinder governance change. The assessment framework and comprises of three elements:

1. A conceptualisation of the innovation process. The fundamental proposition of the research is that governance change is predominantly driven by a series of incremental technological/technique innovations. These innovations successively challenge institutions and, through the process of adoption, lead to governance change.

2. A governance attributes wheel. This wheel identifies the range of factors that comprise the governance context of urban water management and are important to governance change processes.

3. An assessment protocol to score governance attributes and aggregate these scores to provide an indication of the level of support for governance change with the governance context of a particular initiative (described in Section 3).

The aim is to situate case studies at different stages of the innovation process, and compile a snapshot of their governance features using the assessment method. This will help to illustrate the governance attributes at different stages of the innovation process, and give an indication of the level of institutional support for governance change. Qualitative data analysis will also provide more detailed empirically based descriptions of governance attributes, as well as strategies to progress change used by actors within the case studies. This will help inform practitioners of possible pathways to governance change.

Innovation process stages

Concept of stages based on capability maturity models (Kayaga et al., 2013), stages based on literature review of pathways to governance change (Bettini and Head, 2014). This conceptualisation recognises different levels of institutional support for governance change, and provides a series of progressive stages toward governance change.

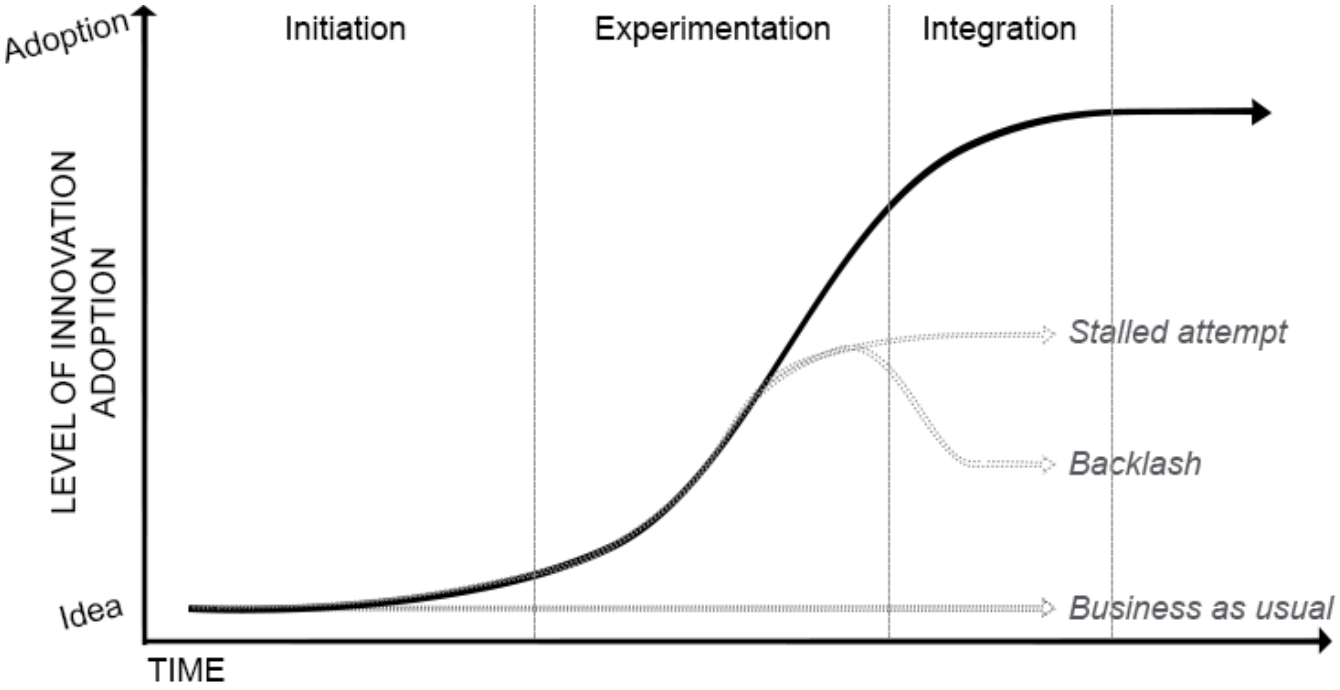


Figure A.1. Innovation adoption curve

This research examined cases on the innovation curve, but there would be value in examining cases of 'Stalled attempts' to learn where and how the innovation trajectory may shift, and 'Business as usual,' to understand where in a specific context the barriers to change exist.

Governance attributes wheel

An extensive literature review of frameworks and models for understanding governance from a variety of perspectives was drawn on to compile a list of governance principles and objectives for sustainable urban water management (Bettini and Head, 2013). These sources were then used to compile a list of governance attributes cited as being important for sustainable approaches to urban water governance. These sources included studies of institutional adaptive capacity (Dovers, 2001; Gupta et al., 2010), institutional sustainability (Kayaga et al., 2013), attributes of sustainable water governance regimes (van de Meene et al., 2010), indicators for adaptive and integrated water management (Huntjens et al., 2010) and assessments of good governance (Graham et al., 2003). Most of these sources are themselves extensive meta-analyses of literature of transformative institutional change.

The list of governance attributes was then refined then grouped according to thematic headings, building on Gupta and colleague's Adaptive Capacity Wheel (Gupta et al., 2010), but tailoring it to the urban water context by providing governance themes and attributes specific to this context, based on previous historic reviews of Australian water policy (Bettini and Head, 2013), research, and interactions with industry partners. The resulting wheel of governance attributes are illustrated in Figure 2, with attributes in the outer ring, collected under themes in the inner ring. Definitions of the attributes are provided in Table 2, along with explanations about their influence on governance change processes. The definitions of governance attributes were used as guide to conducting a governance assessment of each of the cases studied (see Section 3). The descriptors were continually refined and reassessed against the empirical data throughout the research process.

These descriptors do not intend to provide a checklist for what a sustainable governance regime looks like, but represent the key thematic areas that have been shown to be important in governance change

processes, and provide descriptors or attributes of these themes with which to assess the underlying context of an innovative initiative. In generating a better understanding of this context for change and the governance factors commonly involved at various points of an innovation process, the research can provide guidance on how to leverage better adoption of an innovation and supporting governance adjustments.

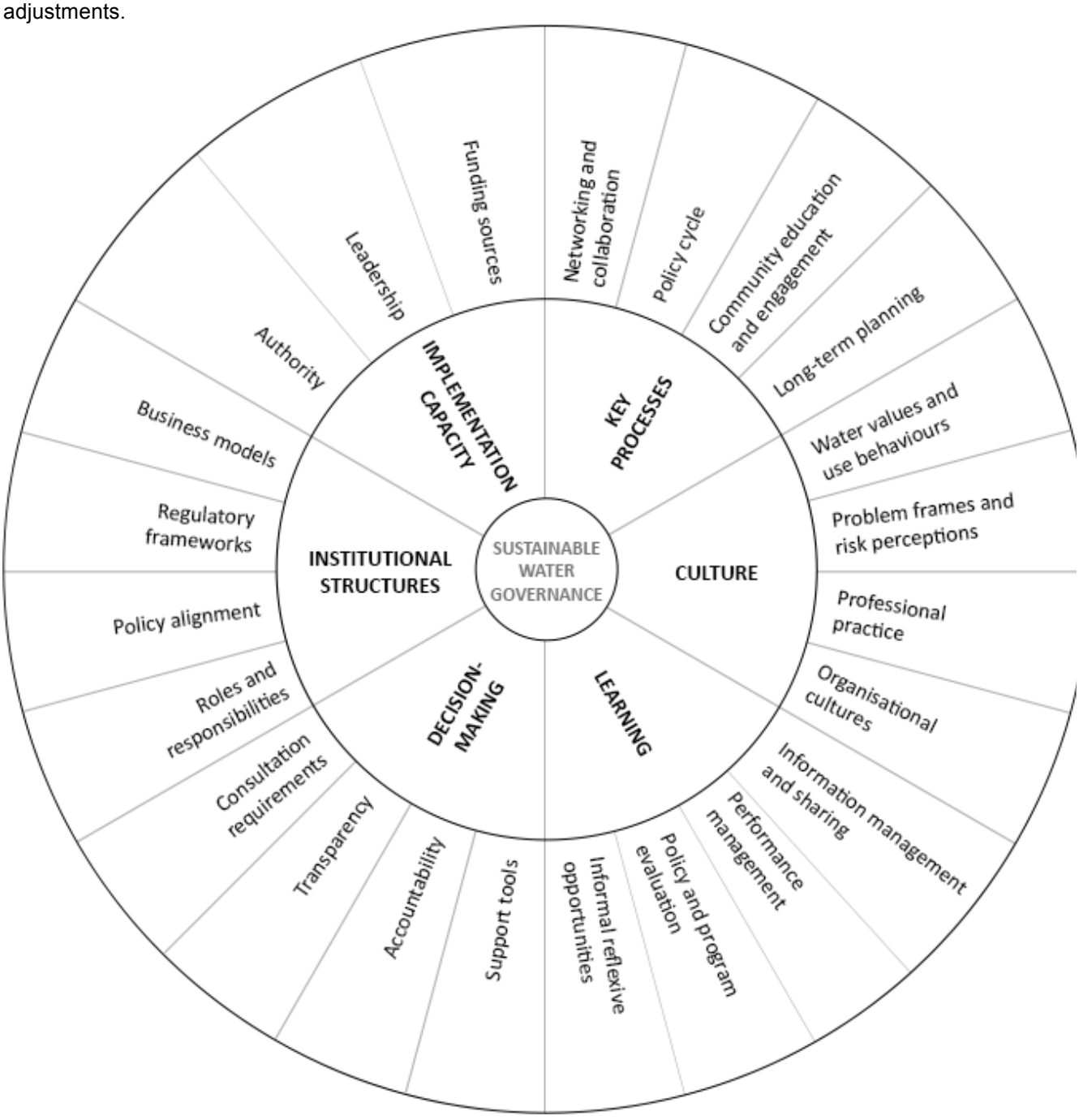


Figure A.2. Governance change attributes wheel

Table A.1. Definitions of governance change attributes and their influence on the change process

Theme	Attributes	Influence on governance change
Key processes	*Networking and collaboration*: Regular informal peer interactions, opportunities for collaborative projects, and ongoing partnerships.	Build trust and operational knowledge between individuals or organisations Connect policy, regulatory and delivery agencies through people rather than processes Surface emerging issues and trends that cut across organisational responsibilities
	Policy cycle: Connections into policy processes exist, including problem framing, agenda-setting, design, implementation, evaluation and termination	Policy initiatives provide a major avenue for adjusting existing governance arrangements in new policy frameworks, or for pursuing reforms
	Community and stakeholder education and engagement: Programs aiming to communicate aspects of water management to communities, and formal channels for input into decision making for communities and stakeholders	Ensure a level of understanding about water issues and decisions Allow two-way exchanges to establish value of water to different end-users, and build shared values and goals Empower citizens to be involved in water management and governance
	Long-term planning: Opportunities to plan toward visions over long time horizons, which include using scenarios	proactively anticipate shocks, prepare for opportunities and manage risks Enables setting and review of aspirational goals and directions Clarifies roles and responsibilities as operating environment changes
Culture	*Water values and use behaviours:* Collective understanding of the benefits water provides, and socially acceptable water uses	Shared values determine appropriate water use behaviours Generates understanding and acceptance of management actions
	Problem frames and risk perceptions: Shared understandings of water issues, possible solutions and the potential costs and benefits	Reduces conflicting demands for water resources, and other conflicts Increases likelihood of successful implementation of management efforts
	Professional practices: Industry standards, training and day-to-day practice align and adapt to changes in the operating environment	Produces a best practice sector with diverse skills-sets Reduces cognitive lock-in to outdated practices
	Organisational culture: Key organisations have performance systems and managerial styles that incentivise improvement, are open to experimentation and recognise the value in learning from failure	Enables innovations to emerge and progress Ensures continual improvement Helps breakdown inter-organisational silos
Learning	*Information management and sharing:* Information management systems	Knowledge generated informs practice through peer learning or

Theme	Attributes	Influence on governance change
	are established to monitor progress, and accessible to relevant organisations.	capability building programs
	Performance management: Formalised systems in place to encourage performance improvement through innovation incentives, links to KPI's and other organisational mechanisms	Ensures organisations are adapting to their operating environment
	Policy and program evaluation: Comprehensive and resourced monitoring and evaluation programs in place to capture and assess experiences from key initiatives and policies	Ensures information is collected which can inform future improvement to policy designs and implementation processes Ensures unsuccessful approaches are recognised and adjusted
	Informal reflexive opportunities: Safe and open forums exist for individuals to reflect informally and collectively on practices, initiatives, institutional arrangements, and broader trends and developments	Provides a forum for learning that is not constrained by organisational roles/representation, or bounded by existing institutional frameworks and conventions
Decision-making	Consultation requirements: Processes are embedded in institutional arrangements and organisational culture for relevant stakeholders to have an appropriate level of input into decision-making processes	Reduces likelihood of opposition or conflict Increases likelihood of successful implementation
	Transparency: Processes of reporting and disclosure on decisions and water management outcomes are formally required, with sanctions for non-adherence	Increases trust in public institutions Reduces opportunities for corrupt behaviour
	Accountability: Clear lines of accountability for decisions and actions	Drives delivery of outcomes
	Support tools: A range of decision-support tools are available and widely accepted as providing robust justification for decisions, including comprehensive cost-benefit analysis methods and balanced risk assessment methods and management protocols	Ensures decisions are well informed, can be justified on the basis of evidence and sound logic Helps to improve decision's made
Institutional structures	*Business models:* Administrative and regulatory frameworks promote good financial management practices but are also flexible enough to enable delivery organisations to provide broad benefits in the public interest (i.e. non-commercial benefits)	Ensures appropriate use of public funds to deliver public benefits
	Regulatory frameworks: Alignment between relevant regulatory systems and flexibility to incorporate new technologies, techniques, and outcomes	Ensures appropriate actions and reduces risks
	Policy alignment: Current policy directions across relevant sectors do not conflict or create perverse incentives, while recognising local autonomy and encourage collaboration	Delivers integrated actions to ensure best use of available resources and reduce unintended consequences
	Roles and responsibilities: Administrative arrangements provide clarity around organisational roles and responsibilities, including collaboration requirements for areas of overlap and emergent issues	Establishes accountability Designates authority Establishes how outcomes are to be delivered and goals and objectives achieved
Capacity	*Authority:* Institutional frameworks allocate sufficient powers for	Enables action to be taken

Theme	Attributes	Influence on governance change
	appropriate actions to be taken to fulfil their roles and responsibilities	
	Leadership: Individuals in management and executive positions have the skills and permission to provide various forms of leadership including political, visionary entrepreneurial, and collaborative leadership	Political leadership to gain policy and funding support, visionary leadership to communicate long-term aspirations and the case for reform, entrepreneurial leadership to champion solutions and stimulate actions, and collaborative leadership to act as brokers across various boundaries
	Funding sources: Clear revenue streams and accounting methods for funding appropriate levels of service, broader environmental and social benefits, and learning and evaluation. Discretionary funds to seed innovation are also available	Re-investment of revenue to improve services and provide broader non-commercial benefits Stable funding mechanisms are required for innovation and learning, and to ensure opportunities can be utilised when they arise

Governance assessment protocol

To provide a snapshot of the governance context underlying case studies, an assessment protocol was devised based on the method of Gupta et al (2010). This involves using qualitative data to conduct an expert assessment of the various attributes contained in the governance attributes wheel. A rating scheme is based on a Likert range, with a neutral assessment equating to a score of zero, a score of 1 or 2 is assigned where a particular governance attribute is assessed as having some (1) or a significant (2) influence on the innovation adoption, and scores of -1 or -2 where governance attributes appear to be having a minimal (-1) or significant (-2) negative influence on innovation adoption. A short description to justify the assigned scores was also documented, then discussed and compared between researchers familiar with the cases until an agreement on an appropriate score was reached.

These scores were then aggregated for each theme by averaging the attribute scores. A 'traffic light' colouring scheme was applied to highlight the status of the various governance themes on innovation processes in each case. The colouring scheme is not based on substantive empirical results from cases across the different stages in the process model, and so it not intended to rate performance against any established benchmarks. Instead, the traffic light assessment is designed to highlight where certain governance themes and attributes have a role in influencing the process of innovation adoption, at various stages of the innovation process model and in a variety of contexts. This may provide focus areas for capacity building or investment. The colouring scheme is applied based on thresholds for aggregated theme scores, illustrated in Table A.2. These aggregated scores were then plotted on a Radar chart to provide an overall illustration of the governance context in each case study.

Table A.2. Traffic light score categories and descriptions for governance assessment

Score	Description
-2 to -1.1	Governance attribute showing a significant adverse influence on innovation adoption process
-1 to -0.1	Attribute showing some adverse influence on innovation process
0	Governance attribute appears to have a neutral effect on innovation process
0.1 to 1	Attribute has some positive influence on the innovation process
1.1 to 2	Governance attribute has a significant positive influence on the innovation process

Appendix B: Case study descriptions

Table B.1. Case study clusters for innovation phases

Initiation	Experimentation	Integration
DoW urban water policy development	UK water sector privatisation	Groundwater replenishment trial
Fitzgibbon Chase urban development	Berkley-FIRST solar financing scheme	Room for the River policy shift
Scottish/Welsh water sector reforms	Rotterdam multifunctional urban infrastructure adoption	Portland green infrastructure adoption

Initiation cases

Department of Water urban water policy development, Western Australia

This case explores an example of strategic policy development. The WA Department of Water had recognised the need for a positioning and direction-setting piece of policy work to focus attention on the coordination of urban water management in the Greater Perth Metropolitan region. Drying conditions, rapid urban development and stressed groundwater systems were exerting major pressure on water resource availability. The disparate responsibilities for water resource management in the urban context were proving difficult to reconcile in order to manage these scarce resources more effectively in order to deliver supply security alongside environmental remediation and quality public open space. Staff within DoW working within the Water and Landuse planning division found fundamental policy questions were arising about the objectives for water management in the urban environment, particularly in the context of urban planning and development approvals. This suggested a need for a more considered discussion of strategic directions for water resources management, to establish a policy position and better guide decision-making. Thus, the development of an urban water policy aimed to facilitate internal discussion of the principles for urban water management to align the activities of different departmental divisions, and open public discourse on the issue to establish community aspirations for water management. At the time of the study, the policy was at the early stages of development, with only internal engagement and discussion having occurred. However, the case provided the opportunity to explore how strategic, direction setting policies are recognised as a need, gain traction and support from executives, and the process of engaging internally on such a conceptual piece of policy work. The case reveals some of the policy capacity needed for gaining bottom-up legitimacy for strategic policy work which aims to generate new thinking and develop shared goals and directions.

Fitzgibbon Chase urban development, Brisbane

The Fitzgibbon Chase development was a strategic greenfield development located in Brisbane, conducted by a State-owned land development agency (ULDA). The development included a novel stormwater/rainwater harvesting scheme and influenced a number of best practice guidelines to be adopted into the planning schemes for subsequent ULDA developments, and anecdotal evidence suggested some local governments also drew on the guidelines for their own planning policies. The case therefore provides an interesting account of technological innovation, and its adoption into planning policy frameworks.

Scottish and Welsh water sector reforms

During the privatisation of water industry reform in the UK in the 1980s and 1990s, water services in Scotland and Wales were maintained in public ownership. Despite a strong push from the Thatcher government, the sense of nationalism in both countries resulted in innovative governance models for water service provision. Taken together, the experiences of Scotland and Wales provide interesting insight into some of the factors and processes that may lead to radical reform of governance arrangements.

Experimentation cases

UK water sector privatisation

During the 1980s and 1990s the water sector in the UK underwent radical reform with the privatisation of the water supply and sewerage industry. This process is often held up as an example of a successful governance paradigm shift, although the environmental and social benefits of the privatised model have been largely debated. Nevertheless, this major reform provides an opportunity to explore a process of top-down, radical shifts in governance arrangements, and the range of policy processes and capacity that enabled successful implementation of fundamental governance reform.

Berkeley-First, solar financing scheme, City of Berkeley, U.S.A.

The Berkeley Financing Initiative for Renewable and Solar Technology (FIRST) case is an example of the introduction of innovative policy mechanisms, in the form of a subsidy scheme for solar panel installation, tied to the land tax system. The case traces the initiative's authorisation, scheme design and supportive legislative changes, implementation and evaluation, and regulatory opposition. It provides insight into the development and subsequent adoption (across the state of California) of an innovative policy mechanism.

Rotterdam multifunctional urban infrastructure adoption, City of Rotterdam, the Netherlands

Rotterdam is the economic capital of the Netherlands and a city changing from a service and trade centre to a sustainable, liveable city. With a very ambitious climate adaptation and densification strategies underway, Rotterdam seeks to innovate in its approach to pursuing sustainability. The City of Rotterdam partnered with transition researchers in order to develop new ideas on how urban development with the city could be conducted, identify and incorporate what the citizen's aspirations for their future city were, mobilise support, and activate entrepreneurship to innovate with new, sustainable urban renewal approaches. This case study offered an example of policy entrepreneurs connecting with community leaders in a managed process aimed to set visions and develop pathways for a transition in the way the City of Rotterdam pursues urban development; with multifunctional infrastructure connected to citizen's needs.

Integration cases

Groundwater Replenishment Trial, Western Australia

The Groundwater Replenishment Trial (GWRT) conducted by the Water Corporation in Western Australia was the first of its kind in Australia, and set out not only to test advanced water treatment and recharge systems, but also to develop the supporting regulatory frameworks, monitoring regimes, and community support needed to ensure a technological innovation could be progressed into a mainstream water supply source. This case study explores how the idea to recycle and recharge water gained traction, how the process of testing and development was managed, and how eventual acceptance of groundwater replenishment as a new source of water was gained within water licencing and regulatory arrangements and community perceptions. The case provides some important lessons in how to take an innovative idea and technological solution, and translate it into common practice.

Room for the River policy shift, the Netherlands

The Dutch Room for the River program is a well-known policy and program of capital works which aim to improve flood safety and spatial quality. Expected to conclude in 2015-16, the Room for the River (RftR) program represents the culmination of a decades-long shift in flood management policy which has seen flood management move from being a 'fight with water' to 'living with water.' For a country largely located below sea level with an extensive history of flooding and engineering responses, this is a significant shift in approach, and involved cultural change in the water management industry and general public as much as policy and regulatory change. The National government used existing policy development processes of independent advisory committees and investigations and a collaborative and consultative approach across multiple government levels to formalisation of the RftR program in national spatial planning policy. Considered together with the unique Dutch 'polder model' of consensus decision-making, the RftR case study can offer some insights on how such a significant policy change occurs at a national level, and how barriers at multiple levels of government can be overcome.

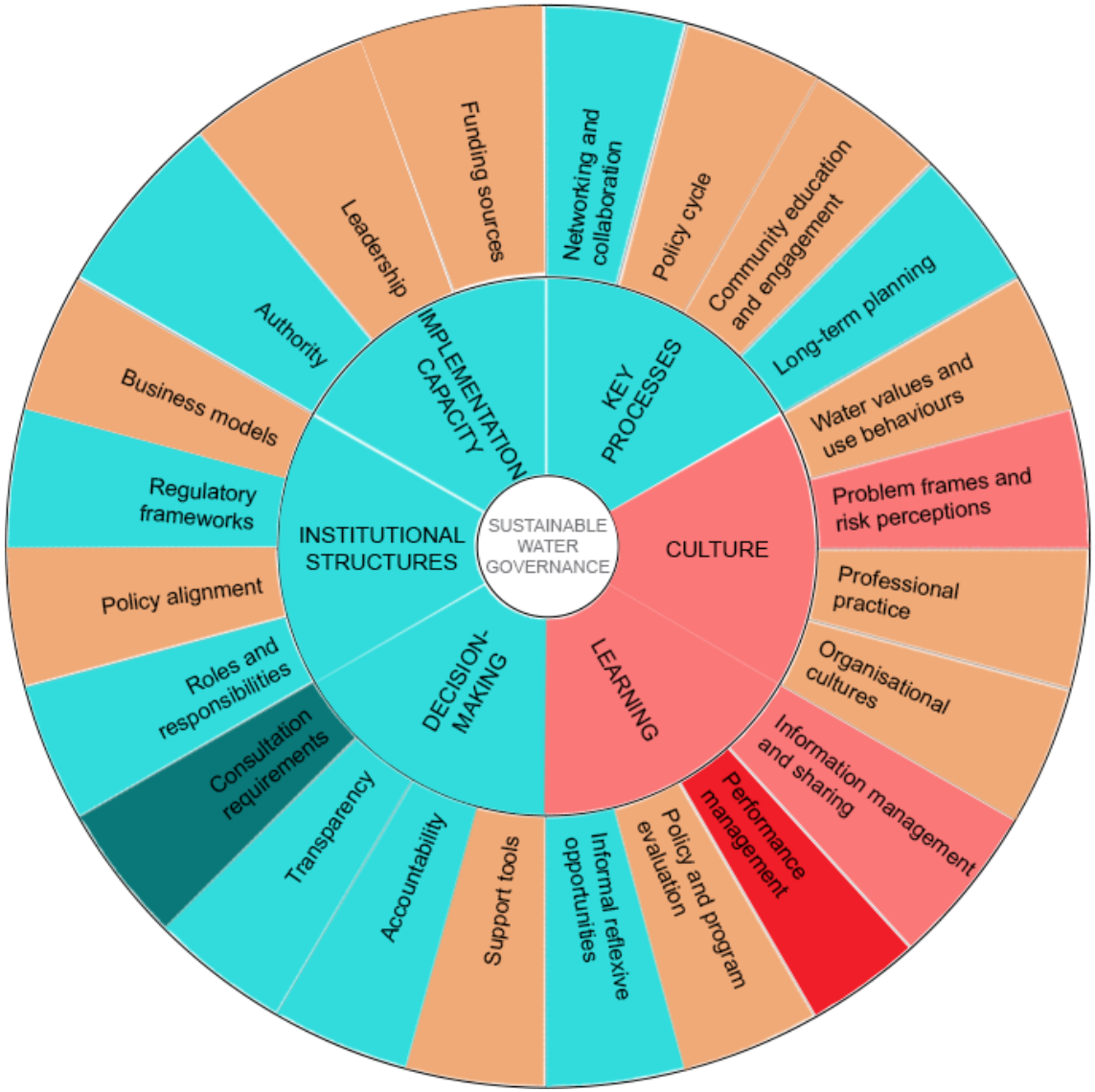
Portland green infrastructure adoption, City of Portland, U.S.A.

The City of Portland (CoP) green infrastructure for stormwater management case is an example of a local government developing and implementing substantial policy change over two decades. Initiated in response to the Federal Government Clean Water Act (1972) National Pollutant Discharge Elimination System permit requirements to control point source stormwater and sewage pollution in the early 1990s, the comprehensive policy response has led to Portland being recognised as a national and international leader in green infrastructure. The use of governance mechanisms such as internal and external advisory committees together with demonstration projects and monitoring enabled the CoP to overcome governance challenges of developing shared understandings among stakeholders and building local capacity to support the policy change. This case illustrates how a strong innovation culture in the Bureau of Environmental Services was used to effect cultural change across the organisation. The city has gone on to have one of the most mature and comprehensive green infrastructure programs in the U.S.A. and it continues to innovate and realise co-benefits of a green infrastructure approach.

Appendix C: Case study governance assessment results

Department of Water urban water policy development

Themes	Aggregate Scores
Key processes	0.5
Culture	-0.25
Learning	-0.5
Decision-making	1
Institutional structures	0.5
Implementation Capacity	0.33



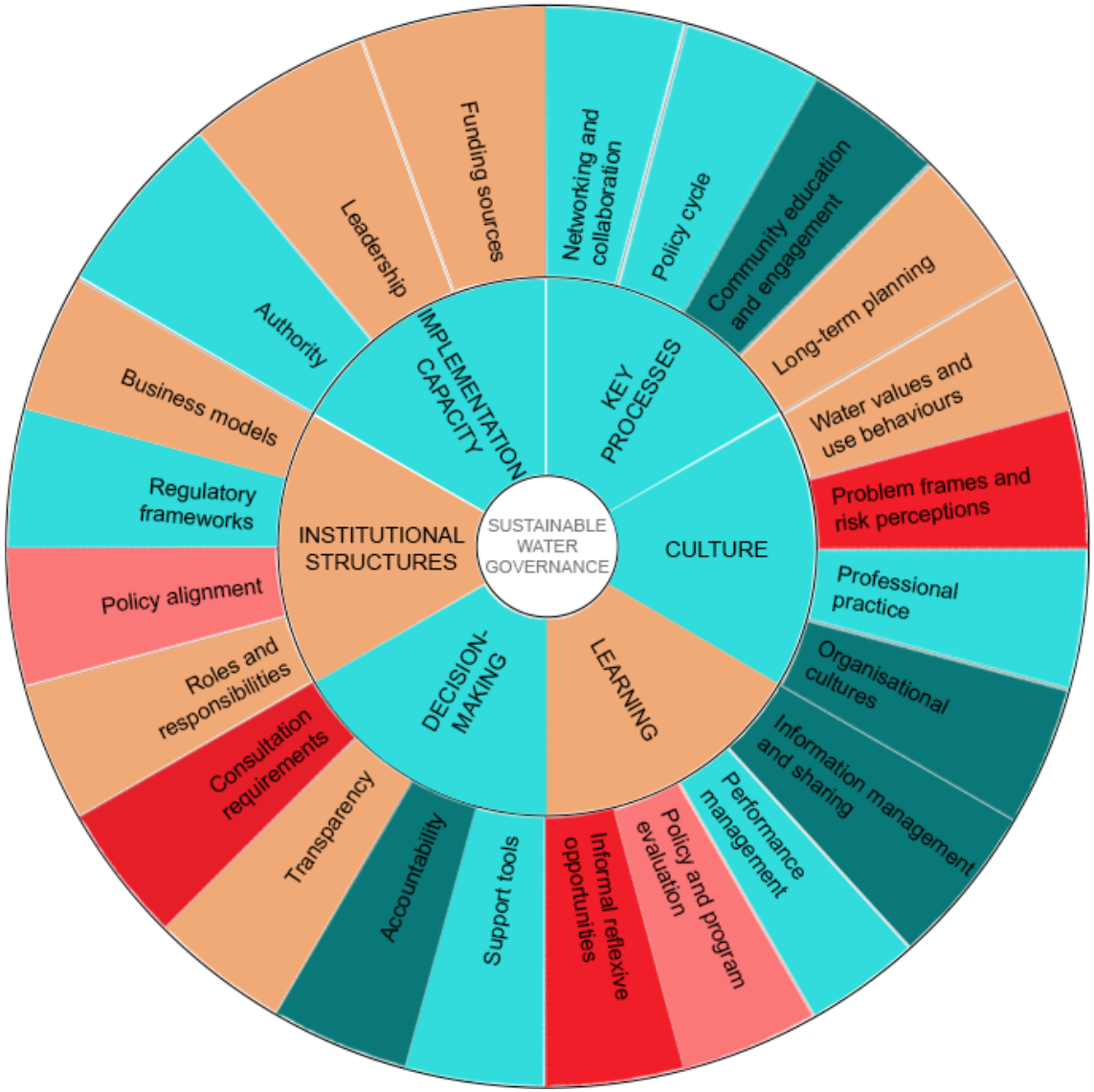
Governance Attributes	Score	Justification
Networking and collaboration	1	The genesis of the need for the policy had emerged from a policy-science partnership project with the CRC for WSC. This partnership convened an executive level workshop to prompt visionary thinking about water management in the city and the Department for Water's (DoW) role in delivering on such a vision. Following the meeting there was general agreement that this strategic direction was a gap, but not much ownership or commitment for progressing some policy work to address this gap. An expression of interest was extended to whole of department to find working group members. Active engagement with potential 'gatekeeper' sections and those with potential to become blocker of the initiative still in its infancy.
Policy cycle	0	The initiative was not aligned to the policy cycle, but emerged as a gap in the Department's overall direction and position for water management in the urban environment. At the time of the case study, the initiative was still being scoped and position statements drafted, so there had been little overall consideration for how it would align/compliment work in other divisions.
Community/stakeholder education and engagement	0	At the time of the study, the policy initiative was in very early stages of scoping. However, the policy officers driving the initiative very much saw the development of the policy as a conduit for engaging with communities and opening up public debate on what the water management needs and priorities were.
Long-term planning	1	The policy initiative was attempting to create a space for long-term thinking within the Department, and to take this out for discussion to the broader community
Water values and use behaviours	0	The policy initiative was driven by the recognition that no collective understanding or aspirations for water management in the Perth metro was strongly held in the community. Given water resources were becoming scarcer, policy officers recognised this would be an important discussion that needed to be had to underlie the Department's strategic directions and positions on issues such as water recycling.
Problem frames and risk perceptions	-1	While members of the working group held similar understandings of water issues, their prioritisation of these issues was not aligned. As such, some divisional representatives did not see a real need for a direction-setting/high level positioning piece of policy. Regional representatives had more specific issues they were making decisions about and sought policy guidance on these issues, rather than agreement on higher level principles and positions. As such, the perceived risks of different working group members related to their own work environment priorities and the consequences of inaction on these issues. These motivations side-tracked earlier meetings of the working group on discussions of operational issues, rather than strategic water management issues.
Professional practice	0	Changes in practice in the policy environment were mixed, some divisions saw no need to change their approach or policy mechanisms in light of the discussion on future directions and emerging issues with water management. Other divisions had already incorporated new approaches or scope to the activities of their area, and were exploring new policy approaches. In terms of extension to on-ground implementation practices, most workshop members recognised a need to engage with local government and the development industry to improve water management outcomes, but agreement on the preferred outcomes was yet to be agreed or prioritised.

Governance Attributes	Score	Justification
Organisational culture	0	While an improvement on the past instability and aversion to non-core business the DoW had experienced, the urban water policy initiative did not have a large amount of executive support. A few senior managers from 2 internal divisions saw it as a high priority, but wanted the policy to be developed to a more concrete document before seeking executive support to progress to external stakeholder and community engagement. The urban water policy initiative was one of the first more strategic pieces of policy work commissioned within the Department, so the organisation had only recently started to embrace more innovative thinking and exploring opportunities to experiment and learn with new approaches
Information management and sharing	-1	Participants noted that the department operated in silo's with little sharing of information between groups, making it difficult to establish shared objectives or priorities for the department as a whole. Also expressed frustration with ministerial correspondence systems, which allowed major changes to be made to advice without original advisors being aware of these changes, and no feedback on advice provided, leaving policy officers with few clues as to how to ensure their proposals were aligned to Ministerial priorities.
Performance management	-2	Innovation had suffered a reputational blow in the Department prior to the urban water policy initiative, with an Innovation Division having been set up, largely as a peer response to similar initiatives in other departments, but with little resourcing or authority to progress ideas. Similarly, the division responsible for the urban water policy had a reputation for not delivering, and the suggestion was made that this was in part due to inadequate leadership at the senior management level. These past events had tarnished views that innovation could improve the Department's operations, and suggest that the internal performance management systems in place in the Department were not adequate to encourage innovation or ensure this activity translated into benefit for the organisation.
Policy and program evaluation	0	Given the early stage of policy development, there had been no consideration of how to examine the implementation of the final policy, or how it might be monitored and evaluated.
Informal reflexive opportunities	1	The design of the policy had been influenced by strategic visioning approaches promoted in the CRC science-policy partnership project. As such the first 3 meetings of the policy working group were open discussions to canvass issues, understand perspective from various divisions, and attempt to build shared understandings. These meetings therefore provided informal reflection opportunities, as the timelines for policy development were not fixed. However, this also caused some frustration, as working group members expressed the view that the meetings were a talk-fest and no progress was being made.
Consultation requirements	2	The working group had been convened to ensure that representation from the majority of departmental divisions was achieved, to establish links and two-way communication into the policy's development. At the early stage of the initiative, there was not yet a need for formalised decision-making channels to these departments or the senior executive, though the project team recognised the need to keep them briefed on developments to establish some sense of familiarity and ownership over the process.
Transparency	1	Internal transparency was high, with representatives from a number of divisions and progress on discussions circulated through internal communications. However at this scoping stage of policy development, transparency with regard to broader communication would be premature.
Accountability	1	While team members were accountable to their line and divisional managers to progress the initiative, the lack of executive level recognition for the policy work left few strong accountability mechanisms, such as inclusion in Departmental strategic and business plan, hence budget accounts.
Support tools	0	The policy was in the process of being scoped, and so robust decision-making tools had not yet come into play.

Governance Attributes	Score	Justification
Business models	0	As above.
Regulatory frameworks	1	The policy discussions were highlighting some regulatory issues, as well as challenging the reliance on existing regulatory mechanisms (i.e. the right water allocation system will deal with all water management issues…) However, there did appear to be a willingness for regulatory flexibility from divisions with this role within the department.
Policy alignment	0	There was initially some disagreement as to whether the urban water policy initiative aligned to divisional priorities, but it was loosely aligned to the Department's strategic directions.
Roles and responsibilities	1	Roles and responsibilities for policy development and internal input processes were clear, but this was a relatively simple exercise, given the initiative was limited to an internal scoping and direction setting piece of policy work at the time of the study, and had not yet been expanded for external engagement and negotiation.
Authority	1	While DoW is the policy agency for water resource in DoW, the Department had been given little Ministerial or executive support for strategic policy work in the past. The urban water policy initiative was the first piece of such work, and represented a shift in the Departments view of its role, as well as the Minister's.
Leadership	0	Little executive leadership for the initiative. Project team expressed concern that a lack of divisional leadership was an issue, but not yet having an impact on the progression of the policy. However, connections between divisional managers and the executive were seen as a potential future problem as the policy work progressed.
Funding sources	0	0.2 FTE allocated to manage the policy development, with input from other staff. However participants expressed a view that this level of resourcing would not be enough once the policy had been scoped and external engagement progressed. Thus, resources for policy work, within the division, were generally thought to be low, but had not hampered work to date.

Fitzgibbon Chase urban development, Brisbane

Themes	Aggregate Scores
Key processes	1
Culture	0.25
Learning	0
Decision-making	0.25
Institutional structures	0
Implementation Capacity	0.33

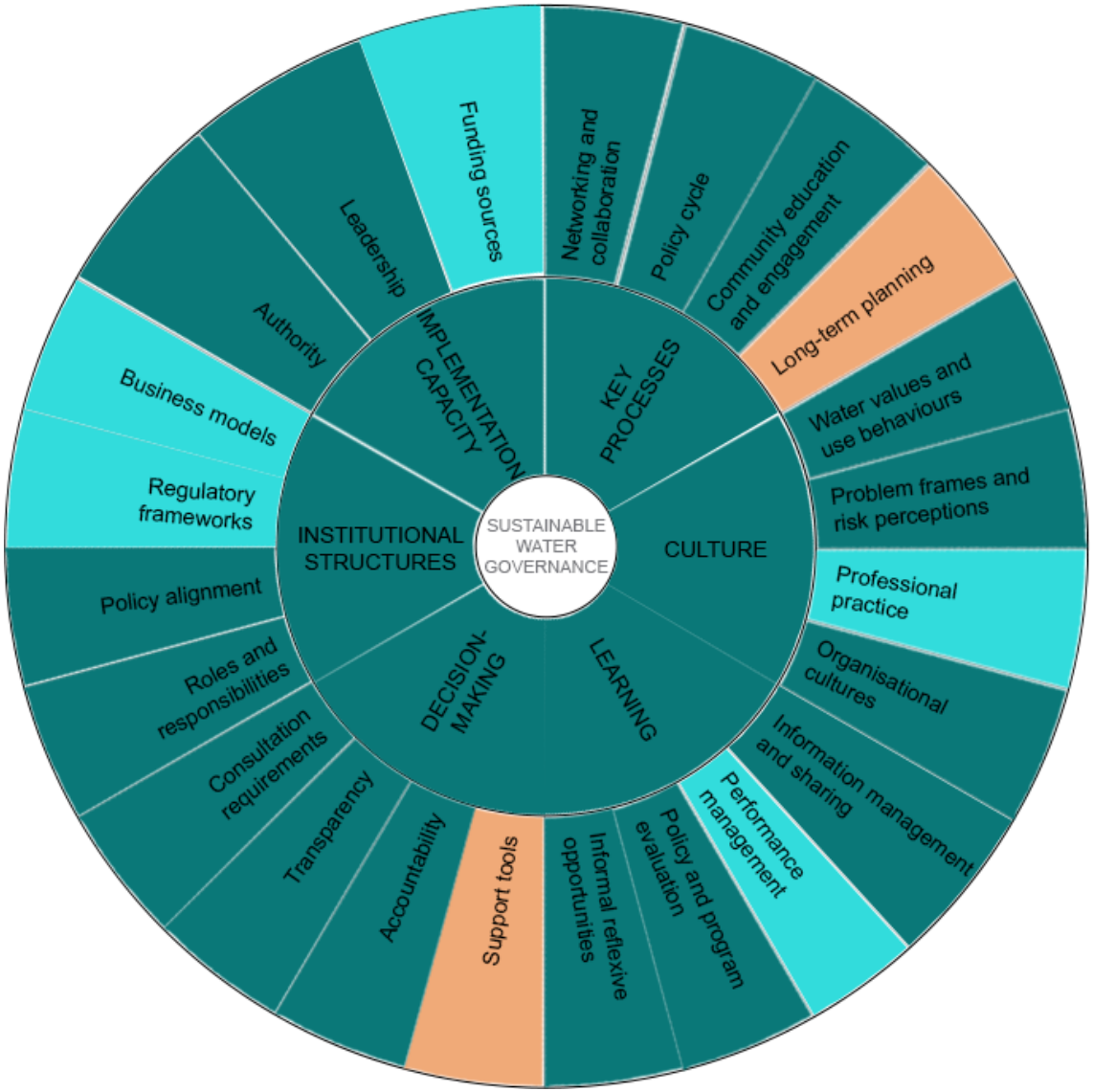


Governance Attributes	Score	Justification
Networking and collaboration	1	A network of development industry practitioners built around the development with good collaboration on urban and housing designs, but was not well connected to water service delivery or policy networks. Some collaboration with Local and State government.
Policy cycle	1	Learning and experience translated into planning policy guidelines and practice notes, but difficulties embedding in planning system. No major efforts to build shared agenda with partners to build on these achievements in a broader reform agenda.
Community/stakeholder education and engagement	2	Significant engagement with neighboring communities in development design phase, and on-going community events.
Long-term planning	0	ULDA working toward improving development process, but not responsible for setting longer-term aspirations and targets for sustainable urban development for these process improvement to contribute to. Also not well linked into other policy agencies (planning, water, NRM) to contribute to these efforts.
Water values and use behaviours	0	Sustainable urban design coupled with community education addresses local water issues (flooding, supply security) through behaviour changes aided by new system configurations, but difficult to assess whether this has resulted in changes in water values.
Problem frames and risk perceptions	-2	Water management problem frames diverge between main Government agencies, but alignment of problem frames with development industry (i.e. quick land-to-market aspirations, acknowledgement of constraints to development). Risk perception of different stakeholders not fully appreciated and risk management approaches for system governance lack clarity in policy and regulation.
Professional practice	1	Development provided opportunity to experiment with urban design and development practices, practitioners informally applying these approaches to other development.
Organisational culture	2	ULDA saw a role for itself as innovator, pushed delivery partners to innovate and documented experiences to inform policy and practice.
Information management and sharing	2	ULDA documented experiences and shared through practice notes, and informal capacity building with industry.
Performance management	1	Objective to improve development processes through organisational activities, but no performance management system in place to embed improvements into planning sector more broadly and permanently (i.e. change to State planning framework).
Policy and program evaluation	-1	No post-development evaluation of new approaches to urban development, though organisational resources (time) invested in documenting learning. Technological monitoring comprehensive but not targeted at questions beyond technological performance (e.g. maintenance and operation, regulatory compliance). As such no evidence-base for broader change built.
Informal reflexive opportunities	-2	Some informal capacity building efforts by UDLA but no coordinated, cross government effort to consider the performance and implications for Fitzgibbon to policy frameworks and practice standards.

Governance Attributes	Score	Justification
Consultation requirements	-2	Little requirement for collaborative approach to decisions, and ULDA consultative where it met their own needs.
Transparency	0	Statutory procedures for developing planning schemes followed by no significant effort to ensure rationale for decisions were well communicated.
Accountability	2	ULDA, as a key policy initiative of government, under considerable pressure to deliver on objectives in the Act.
Support tools	1	Efforts made to utilise standard industry tools to support decision making (standards, costing models, statutory planning guidelines) and adjust these in the process. However little consideration for on-going decision-making needs (e.g. risk management, operation of water systems) and tools and protocols to support the ongoing management of water schemes.
Business models	0	Advances in urban design and delivery worked into development industry models, however water management aspects of the development did not align with traditional water service deliver models, and cost-benefit assessment of water supply scheme not clear/accepted.
Regulatory frameworks	1	Advances in urban design incorporated into supplementary planning system documents, but were not part of any reform effort and were therefore prone to removal as not statutory instruments.
Policy alignment	-1	Clear policy imperative to improve development process and sustainability outcomes, but did not correspond well to water supply policies/practices.
Roles and responsibilities	0	Administrative arrangements for ULDA did not include requirements for collaboration. Some collaborative efforts were made, but generally the autonomy and power of ULDA led to role clashes, and emergent issues not addressed in a collective way.
Authority	1	Administrative arrangements provided ULDA with sweeping powers, but did not consider potential conflicts with other organisation's authorities (e.g. local government).
Leadership	0	Clear political leadership, and entrepreneurial leadership, but visionary and collaborative leadership not strong. These leadership deficiencies weakened the ability to build on the gains made in Fitzgibbon (urban design, water systems) to drive a broader governance change process.
Funding sources	0	ULDA able to profit commercially to fund future development projects, and discretionary grants also accessed to fund technological innovations. However, revenue for operation and maintenance of water systems unclear, and dedicated funding for comprehensive monitoring and evaluation missing.

Scottish Water

Themes	Aggregate Scores
Key processes	1.5
Culture	1.75
Learning	1.75
Decision-making	1.5
Institutional structures	1.5
Implementation Capacity	1.67

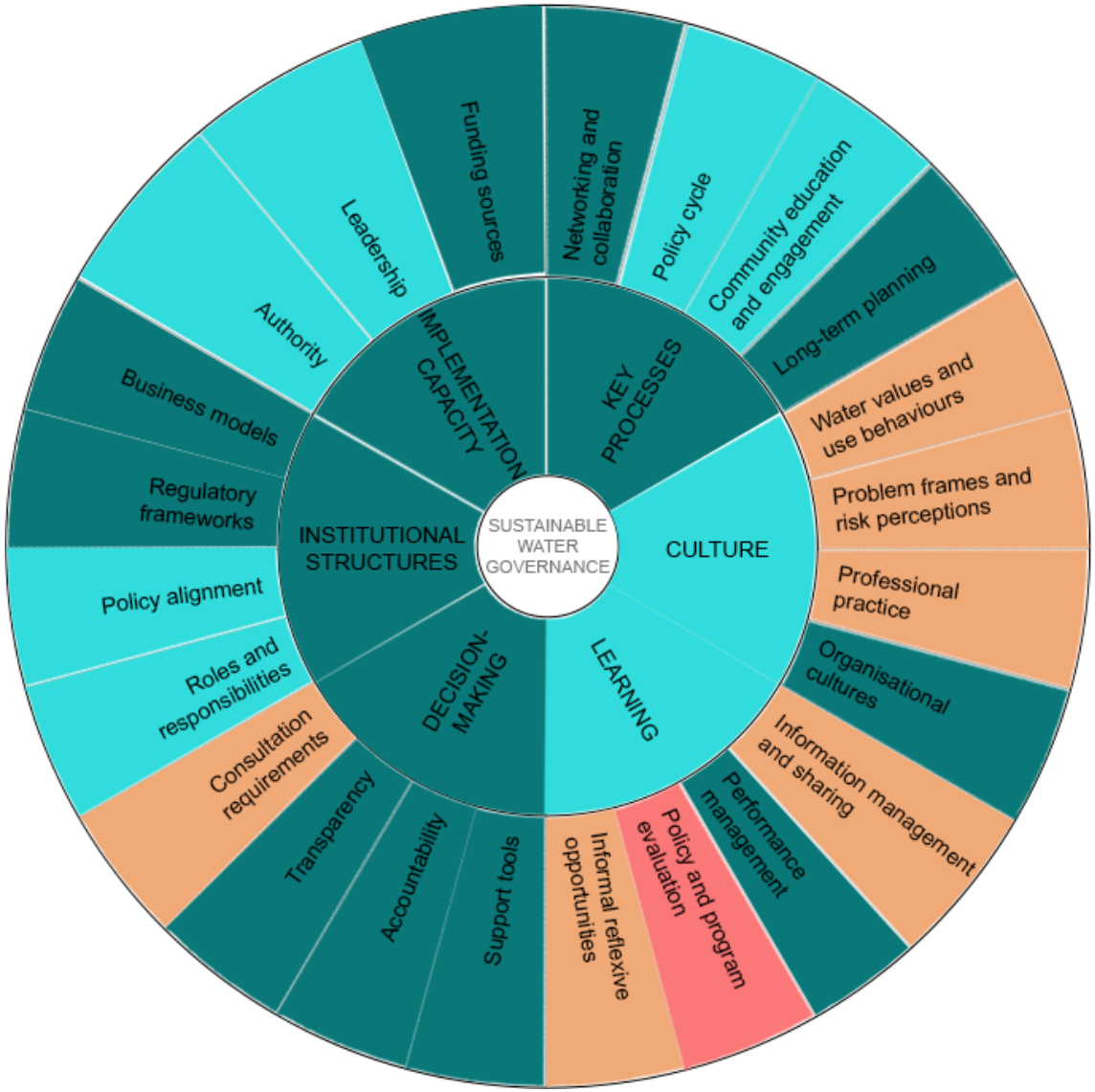


Governance Attributes	Score	Justification
Networking and collaboration	2	Collaboration with non-government organisational representatives occurred in the development of the Water Environment and Water Services Act 2003. There were high levels of networking by the Water Industry Commissioner for Scotland in the lead up to competition reforms (amalgamation of 3 water utilities into Scottish Water). A number of consultative working groups were later established (Customer Forum and Output Management Group).
Policy cycle	2	Reform of the Scottish Water sector was aligned to broader privitisation reforms coming from the UK, and arguably learnt from the implementation experiences of the UK and Wales. Also, the reforms were linked closely to the process of devolution to a Scottish Parliament, which allowed the water industry to avoid full privitisation.
Community/stakeholder education and engagement	2	Restructure of water services and sewerage into three public water authorities was preceded by a series of discussion papers from the Scottish Office. The Scottish Water and Sewerage Customer Council was also set up in these reforms to allay community concern that a local voice for decision making would be lost. Subsequently the Water Industry Commissioner for Scotland was set up with similar functions, and was required to set up Water Industry Consultative Committees for each public water utility. (Community avenues for involvement have subsequently been removed, replaced with a Water Industry Commission, and Customer Focus Scotland being set up and then transferred to 'Citizen's Advice Service,' while complaints have been deferred to the Ombudsman. However, as this case explores the initiation phase, these subsequent developments have not been included in the score).
Long-term planning	0	Long-term objectives appear to be set through 'Minister's policy objectives' - but the exact mechanism is not discussed in the case materials. While water suppliers are required to provide annual reports to the regulator (Water Industry Commissioner, then Commission), the scope of these reports is not discussed.
Water values and use behaviours	2	At various points in the reforms, commentators have noted that social learning has occurred, or shared objectives have been set. Information on customer behaviour is also centrally collected and shared through the Central Market Agency. Also the strong desired to maintain water assets in public ownership suggests a shared aspiration for water management activities to deliver more than just safe and reliable water supplies (?)
Problem frames and risk perceptions	2	There did not appear to me any major diversions in problem frames and risk perceptions, and consultative/collaborative/lobbying strategies at various stages of reform implementation appear to have resulted in a shared understanding of issues and flexibility in the regulatory framework to address them.
Professional practice	1	Incentives within the reforms have induced greater management efficiency and meeting customer expectations, including self-financing bonuses. While the Water Environment and Water Services Act 2003 requires integration, it is not clear how well this translates to the activities of Scottish Water.
Organisational culture	2	The development of a culture of consensus and collaboration across the sector is recognised by many commentators.
Information management and sharing	2	An independent company, Central Market Agency, has been set up by water market participants as a not-for-profit company to facilitate information sharing for data relating to customer registration, quantities supplied and charges. Water suppliers must also report annually to the Water Industry Commission, and Scottish Parliament.
Performance management	1	Scottish Water is incentive to improve its performance through limitations on the amount of capital it can borrow and bonuses linked to performance. Other entrants to the market must be able to provide services more economically than Scottish water. However, how much organisational performance extends to social and environmental outcomes appears to be limited, with the general view appearing to be that responsibility for social and environmental outcomes rests with policy setting by the Scottish government and not the utilities or regulator directly.

Governance Attributes	Score	Justification
Policy and program evaluation	2	There have been ongoing adjustments to the regulatory framework as a result of monitoring by working groups. Also the Output Management Group was established to monitor progress in implementing capital works programs.
Informal reflexive opportunities	2	Commentators state that these conditions exist within the various formal working groups, and due to the open culture of the industry
Consultation requirements	2	Formalised consultation requirement for community set up in various committee, commissioner, commission and panel structures. Water Environment and Water Services Act incorporates structures and processes for ensuring participation and requires explicit consideration for integrating activities across departments and agencies (specifically in relation to flood management)
Transparency	2	Scottish Office and Parliament appeared to have transparent processes of decision-making, with the release of a series of discussion papers, and policy positions limiting shared carriage and reiterating public ownership. Water Industry regulators and environment regulator (Scottish EPA) also have requirements and culture of transparent decision-making.
Accountability	2	Clear accountability established through licensing system, which enables Minister to revoke license, and in financial management systems and powers of Drinking Water Quality Regulator. Accountability for environmental performance not clear, but Scottish EPA does have regulatory powers.
Support tools	0	Not captured in case study material.
Business models	1	Water servicing models appear to be lagging on social equity concerns. Unique models for customer information management (Central Market Agency), and Water Industry Commissioner was funded through levee on water authorities. However, Scottish Water noted as a successful business in cutting operational costs by 40%.
Regulatory frameworks	1	Adaptable and flexible, and integrated for water resources management through the Water Environment and Water Services Act. Does not appear to be conflict between objectives/approaches of different regulatory agencies. However, there is a view that an onus for social and environmental concerns are not stipulated for water authorities, or the main water industry regulator.
Policy alignment	2	Working groups and requirement for integration in Water Environment and Water Services Act appear to be aligning various policy frameworks.
Roles and responsibilities	2	Clearly set out, with working groups operating to deal with cross-cutting and emergent issues.
Authority	2	Authorities for water serving and regulatory roles clearly set out, and have been adjusted overtime.
Leadership	2	Water Industry Commissioner provided leadership during the reforms, particularly to see the industry through the introduction of competition policy.
Funding sources	1	Water services funding and related administrative and regulatory activities appear to be sustainably funded, and funding for innovation for efficiency improvement included in the funding model for the water utilities. However, environmental improvement and social equity funding not as clearly covered.

Welsh water

Themes	Aggregate Scores
Key processes	1.5
Culture	0.5
Learning	0.25
Decision-making	1.5
Institutional structures	1.5
Implementation Capacity	1.33

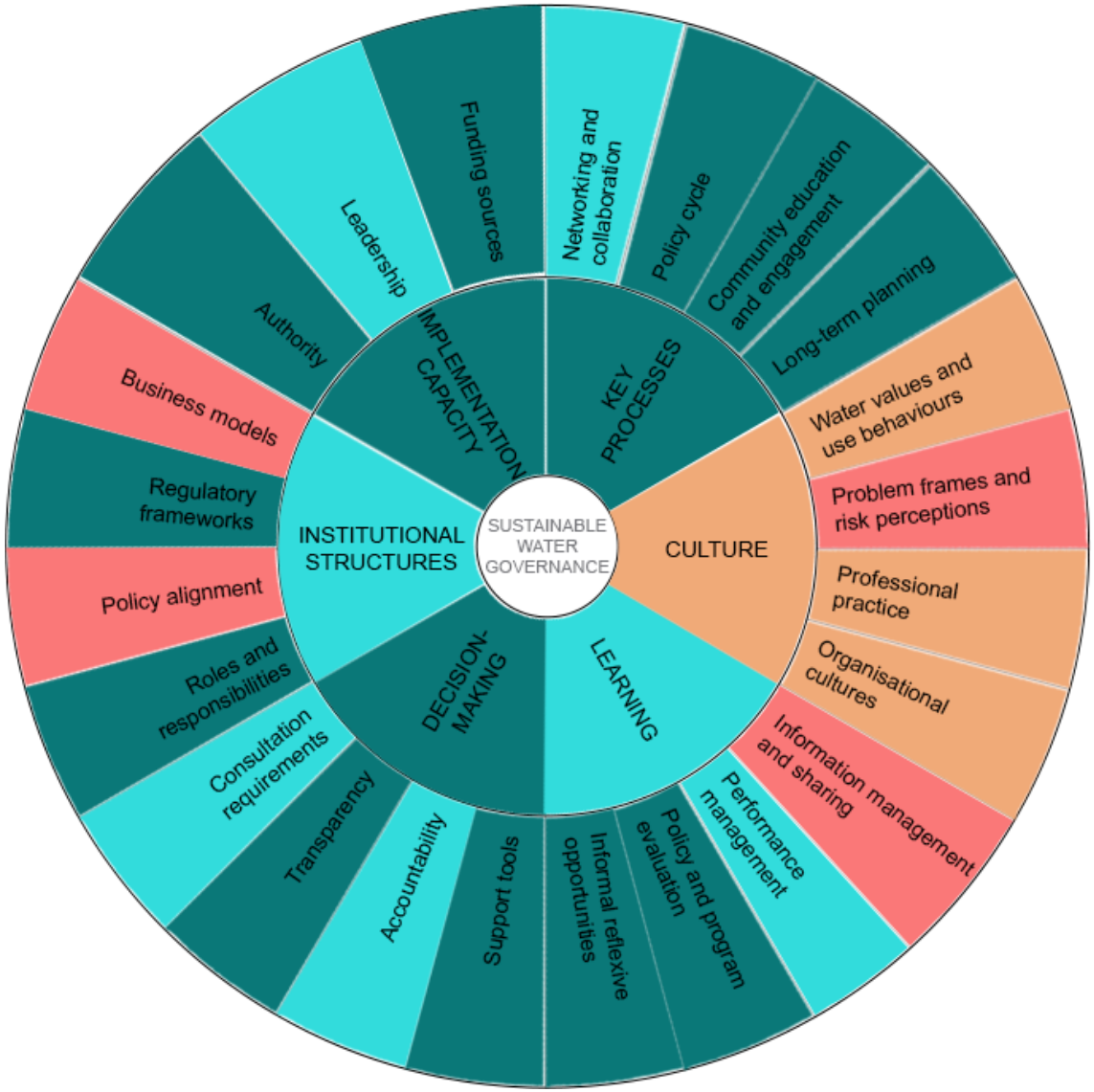


Governance Attributes	Score	Justification
Networking and collaboration	2	The establishment of Glas Cymru itself was a collaboration between a small number of individuals. It is also assumed that in order to gain approval to purchase Welsh Water from Ofwat, there would have been significant networking/lobbying, given Ofwat had rejected other proposals for water companies to mutialise or become cooperative. Commentary acknowledge the support of the Welsh Assembly swayed Ofwat and the Secretary of State for Wales to approve the sale.
Policy cycle	1	The development of Glas Cymru was not connected to Westminster policy positions, but did correspond with the push for devolution to a Welsh Government, and helped to symbolize bringing ownership of Welsh Water back into Welsh hands. While the model of the company initially challenged Ofwat's policy position on maintaining yardstick competition throughout the privatised water sector, a series of conditions ensured that Glas Cymru would not introduce unfair competition to the sector, satisfying Ofwat and leading to their approval of the sale of Welsh Water.
Community/stakeholder education and engagement	1	Specific community engagement mechanisms are not captured in the material. However, given Glas Cymru is a company set up in a charity-like structure with the expressed purpose of reducing customer tariffs, improving customer service and financing Welsh Water to provide sustainable water services in the long-term, the communities main interests in water management could be said to be vested in the very ownership of Welsh Water. Mechanisms for stakeholder engagement at less clear.
Long-term planning	2	EA requires 25yrwater resource planning from companies, including Welsh Water.
Water values and use behaviours	0	Mechanisms for generating shared values and behaviours are unclear. Welsh Water does not seem to have a large community education program.
Problem frames and risk perceptions	0	Initial conflict between Glas Cymru priorities around customer service and environmental protection, and Ofwat's concerns of maintaining competition in the sector. However once conditions were designed to satisfy Ofwat, appeared to be alignment.
Professional practice	0	Not captured in case material.
Organisational culture	2	The structure of Glas Cymru - Welsh Water incentivises innovation (along with the regulatory framework) to increase efficiency. There is also a strong sense of the organisations commitment to continually improve their operations in order to serve customers.
Information management and sharing	0	Not captured in the case material, through Welsh Water is subject to public reporting to regulators (Ofwat and EA) and also the Welsh Government.
Performance management	2	Required to publish remuneration and incentive scheme for executive management, to ensure performance of Glas Cymru. Welsh Water is subject to the UK regulatory schemes, which include incentives to achieve efficiency savings. However, it seems social and environmental performance may be higher, because of the availability of funds in the Glas Cymru model.
Policy and program evaluation	-1	To date, the Glas Cymru model does not appear to have been fully evaluated. However the performance of Welsh Water is considered to be successful, though outsourcing approaches have recently been evaluated due to concerns about risk allocation between Welsh Water and third party contractors.
Informal reflexive opportunities	0	Not captured in case material.

Governance Attributes	Score	Justification
Consultation requirements	0	Unclear whether the general UK community consultative committees provide an avenue for community consultation, or the structure of Glas Cymru is assumed to provide this avenue.
Transparency	2	Conditions of Ofwat make Glas Cymru highly transparent, as they are required to make public statements guaranteeing that profits have been reinvested into customer rebates, and publish its executive remuneration and incentive scheme.
Accountability	2	Welsh Water/Glas Cymru is accountable through the regulatory system, but also to the Welsh people and parliament.
Support tools	2	Assumes that Welsh Water accesses the same tools and frameworks as those in the UK, and is involved in their development.
Business models	2	The not-for profit, bond financed financing model of Glas Cymru appears to be an successful example of long-term financing for a water company, with the ability to invest profits back into customer and environmental improvement.
Regulatory frameworks	2	The Welsh not-for-profit model appears to have been encompassed successfully in the regulatory frameworks of the UK, which are designed based on a privatised model.
Policy alignment	1	The Welsh model does not align with the privatisation policy of the UK, but aligns with the Welsh government's newly granted autonomy for water management, and Welsh people's desire to own and manage their own water services.
Roles and responsibilities	1	Roles and responsibilities for water management are not entirely clear, while Welsh Water seeks to provide environmentally sustainable water services, the scope of its responsibilities for drainage and catchment management are not clear. Also collaboration and partnership with other water management stakeholders is also not captured in the case study materials.
Authority	1	Appears to be sufficient authority, though areas of overlap with other water management organisations (e.g. local government) have not been captured.
Leadership	1	Displayed significant political and entrepreneurial leadership to reclaim public ownership of water services and assets in the face of the privatisation agenda. Visionary and collaborative leadership are not as evident.
Funding sources	2	Glas Cymru has been set up to provide a long-term funding for infrastructure, to service the water needs of the community, and reinvest profits into customer rebates and environmental improvement programs.

UK water sector privatisation

Themes	Aggregate Scores
Key processes	1.75
Culture	0
Learning	1
Decision-making	1.5
Institutional structures	0.5
Implementation Capacity	1.67



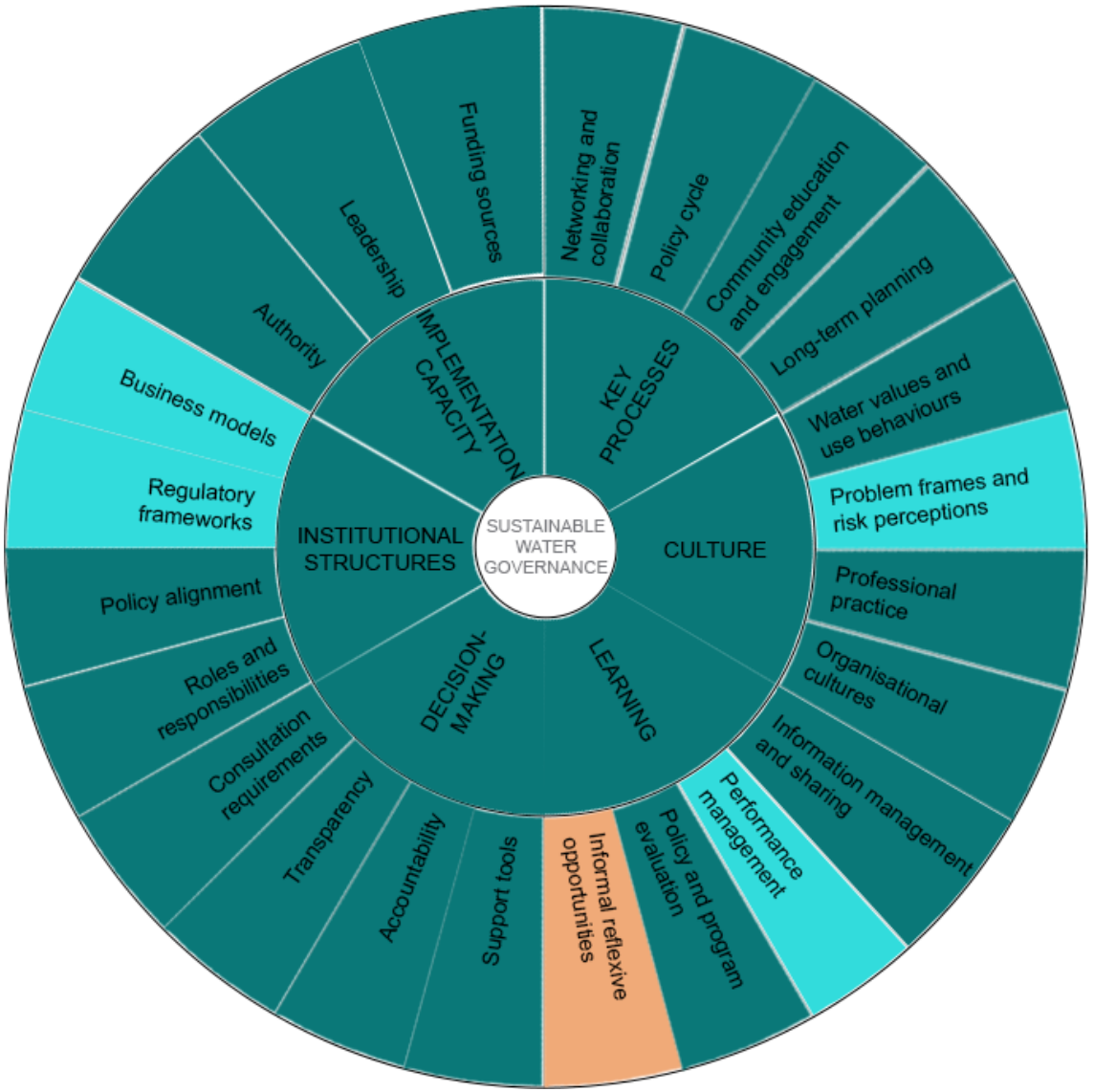
Governance Attributes	Score	Justification
Networking and collaboration	1	Research did not capture informal networking. However, there was much collaboration between regulatory agencies (NRA/EA and Ofwat and to a lesser extent the Drinking Water Inspectorate), water/water-sewerage companies (through peak body, Water Services Association), and the policy agency (DEFRA). Formed quadripartite working groups around particular issues/initiatives. However, there was also open conflict between the regulatory agencies which had a temporary adverse effect.
Policy cycle	2	Close association between policy and regulatory agencies. Early 'nudge' toward privatisation came from water industry, with mixed positions coming from government and the Department of Environment having no developed model. Water Act 1989 prompted 16-17 years of fine tuning reforms, but significant preparatory work/developments from 1979. Key phases of reform very much tied to party election/policy platforms (Thatcher - Full Privatisation - Privatised retail functions/public regulation; Blair - Intervention in profiteering by water companies).
Community/stakeholder education and engagement	2	Community education not explicitly acknowledged. However significant focus, in early stages, on community empowerment with RWA's requiring board membership of 2/3 local government representation. This later removed and focus shifted to providing a voice for 'customers' then 'consumers' through Customer Service Committees, Water Voice and then Consumer Council for Water
Long-term planning	2	Central Water Policy Planning Unit established in 1979 to guide water policy and regulation at national level. However, gamekeeper-poacher situation with RWA's left lots of discretion around achieving environmental outcomes, and requirement for long-term resource planning not clear. Water Act 1989 created National Rivers Authority with this role. EA now uses statutory powers for 25 year water resource plans from companies to ensure this.
Water values and use behaviours	1	Very focused on supply security and quality. Initial pollution management flawed as RWA had too much discretion with target setting and performance (pollution regulators and polluters through sewerage discharge). Both EA and Ofwat have some policy mechanisms to encourage demand management and conservation (under Water Act 2003), but water companies can appeal against EA decisions. Nevertheless, there is acknowledgement that both government agencies and water companies are responsible for demand management. Other values and uses of water are not as clearly established within the regulatory framework (e.g. recycling), however perhaps research did not capture these aspects.
Problem frames and risk perceptions	-1	There were clashes between the problem frames of regulators, EA sought to put environmental water needs at the forefront while Ofwat focused more on customer needs - there did not appear to be any higher level guidance for these trade-off decisions, and the regulators had to resolve these via collaboration and negotiation. Cost-benefit assessments for water services operations were set in regulatory standards, however there were flaws which initially allowed companies to engage in profiteering, and how these commercial operations interfaced with environmental costs and benefits is not reported, though companies are required to submit annual 25 year water resource plans for review by EA.
Professional practice	0	Research did not capture detail on industry capacity building or practice standards. However, with water companies required to submit annual 25 year water resource plans, financial performance, levels of service, security and efficiency of supply and water and sewerage service costs, for review by regulators. These reports are made public, and 'competition' is designed into the UK system through performance comparison, rather than providing customers with the choice of provider. Thus, these public reporting mechanisms, it can be assumed, would drive aspirations for best practice, so as water companies can show efficiency and performance.

Governance Attributes	Score	Justification
Organisational culture	0	The research was not able to examine the culture of UK water businesses. However, given the privatisation reforms were about creating service delivery organisations with more 'private sector' characteristics in regard to efficiency and ability to innovate, it could be safe to assume that there is some level of innovation culture within UK service providers.
Information management and sharing	-1	Following privatisation there were some problems with information asymmetries between Ofwat and water companies, which resulted in tariffs being set about cost price for water services. Ofwat subsequently put in place a mandatory public performance reporting regime to improve information availability. Information exchange and professional learning in water companies was not captured in this research
Performance management	1	Initially there were some oversights in the incentive and sanction structures in regulatory arrangements which enabled water companies to achieve high profit without consideration for broader public benefits. However closer economic scrutiny and more accurate costing models from Ofwat, and environmental monitoring by EA help to ensure sustainability performance of these companies. Through various adjustments to regulatory frameworks privatised water management in the UK seems to be performing appropriately, but the compliance task of regulators seems to have negated the efficiency benefits privatisation reformists initially espoused.
Policy and program evaluation	2	Throughout the introduction and stabilisation of privacy reforms, there was responsive change as issues became apparent. For example, the price review period for water tariffs was reduced to 5 years from 10 years to account for frequent variability in the factors affecting prices. Also, the water company licence periods were extended from 10 to 25 years to provide water companies with more certainty. There appeared to be a staged and flexible approach to the introduction of privatisation, with Government maintaining a controlling share of the companies in the first few years while industry stability was established. Post-privatisation, there appears to be continual adjustment within the industry, due to the collaboration between regulatory agencies, e.g. the development of a 'common framework' for evaluating long-term capital requirements and infrastructure management needs developed for the 2004 price review.
Informal reflexive opportunities	2	Director General of Water Services had an open door policy for water company CEOs, and set up informal working groups to discuss regulatory arrangements, and regular communication to head of the private water companies
Consultation requirements	1	While the independence of regulators has caused conflict in the past, collaboration and negotiation has led to regulatory adjustment. This was not through any official requirement for consultation, however regulatory agencies recognised that to achieve their own objectives, they needed to work closely with other regulators and the water industry (through the Water Services Association). The RWA Consumer Consultative Committees, Customer Service Committees, and eventually the National Consumer Council for Water, represent formal avenues for community input into decision-making.
Transparency	2	There appear to be reasonably high levels of transparency in the regulatory frameworks for water management, with requirements for a range of public reporting requirements placed on water companies, mainly by Ofwat. There were some initial problems with water companies over-estimating capital costs, but closer examination of cost forecasts and further adjustments to the price-setting framework remedied this.
Accountability	1	Strong accountability for economic and service performance, due to public reporting. Initially problems with companies only providing minimal investment in infrastructure, as were not obligated to act in the regulators best interest, outside the regulatory framework (e.g. over estimating cost of implementing EU Directives). This information asymmetry required Ofwat to scrutinise water company plans and reports. Also recourse for water companies to challenge regulators price determinations. Accountability for environmental performance less clear.

Governance Attributes	Score	Justification
Support tools	2	Appears to be ongoing development of supporting frameworks and tools, such as the common infrastructure investment framework, and the guidelines for estimating leakage across financial, social and environmental parameters, both developed by regulators.
Business models	-1	While there are checks and balances to ensure business models of water companies deliver water management in the best interests of the community and environment as well as good financial management, there is an onus on regulators to closely scrutinise water company planning and reporting documents to ensure this
Regulatory frameworks	2	Through much back ground work (beginning in 1973 with the establishment of the Central Water Policy Planning Unit), and a staged and flexible approach to regulation development and implementation, the economic and environmental regulatory systems seem to be in alignment. In addition, collaboration between regulators suggests capacity for future adjustment as issues arise.
Policy alignment	-1	Evidence that policies of regulators have conflicted and caused confusion (e.g. Ofwat focusing on economic efficiency while EA putting environmental protection first).
Roles and responsibilities	2	There appears to be reasonable clarity as to responsibilities for water services, and to a lesser extent environmental protection. How emerging water issues might be dealt with within current regulatory frameworks is less clear, though Defra does have overarching policy responsibility for most aspects of water resources management and could therefore conceivably coordinate a response
Authority	2	Regulators have been able to exercise authority to ensure adjustments can be made to improve water servicing and environmental management outcomes.
Leadership	1	The figure of the Director General of Water Services did provide political, visionary and collaborative leadership by encouraging collaboration, keeping focused on a strategic big picture of what the goals of reforms were and producing discussion papers/reports on emerging issues, recognising the need for flexible implementation while providing certainty to water companies, and being prepared to go against ministerial policy
Funding sources	2	Funding for water servicing carefully regulated. Funding for environmental management and remediation less clear in this research scope, however a series of reports examined the issues of paying for environmental improvement, water quality, growth in supply demand etc. There do appear to be gaps in passing efficiency savings back to customers and to fund broader environmental improvements

Berkeley-First, solar financing scheme, City of Berkeley, U.S.A.

Themes	Aggregate Scores
Key processes	2
Culture	1.75
Learning	1.25
Decision-making	2
Institutional structures	1.5
Implementation Capacity	2

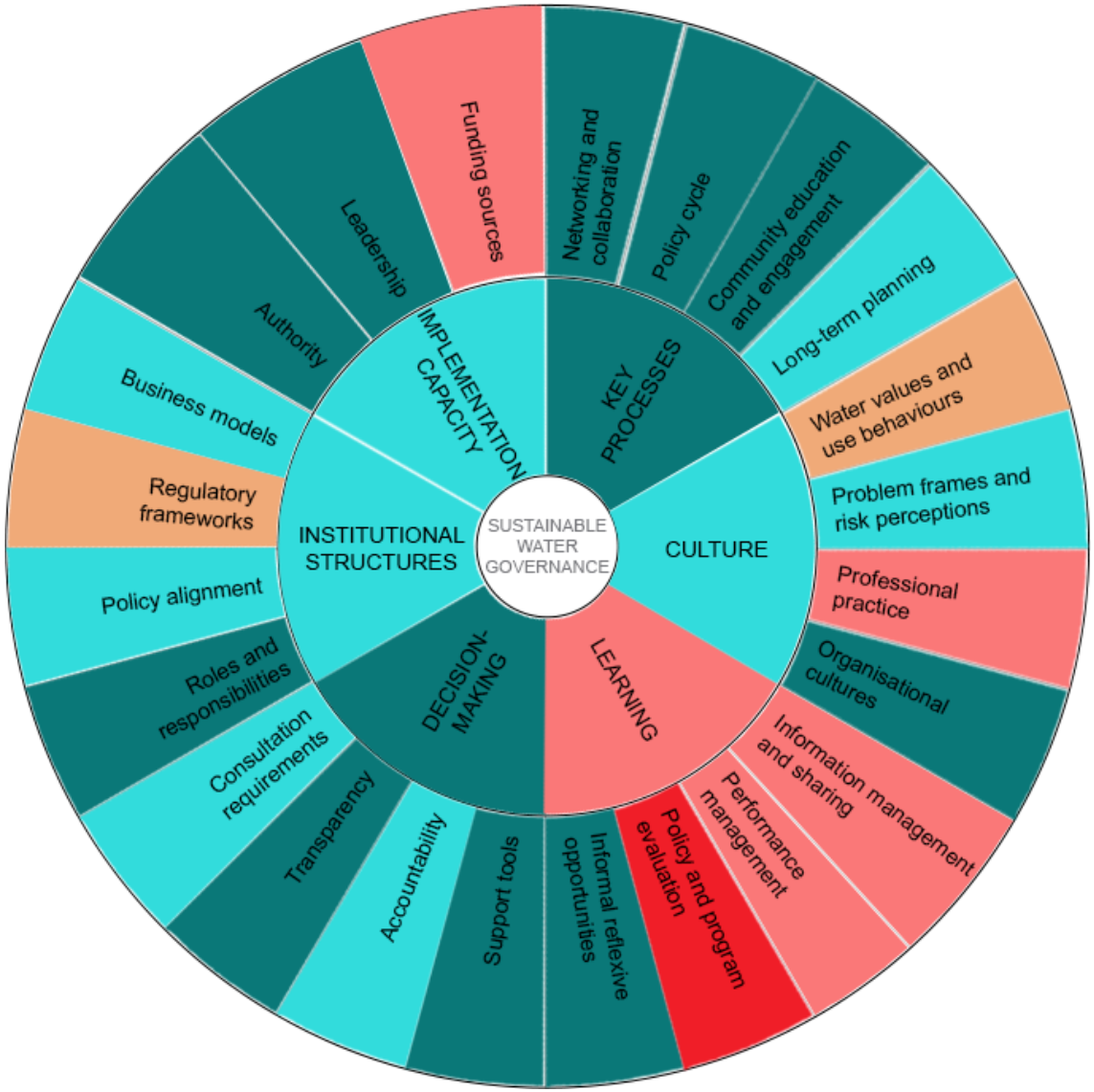


Governance Attributes	Score	Justification
Networking and collaboration	2	The Berkeley FIRST initiative was developed in collaboration with a number of Departments across the council, researchers at the University of California, and also required partnering with an external financing partner. In addition solar installers were also involved in the development of the initial proposal to council.
Policy cycle	2	The initiative required significant legislative change, and so was closely tied to internal policy development at the City.
Community/stakeholder education and engagement	2	As a community financial loan scheme, the Berkeley FIRST initiative required significant community education and engagement to ensure success. The consultation with community in the development of the scheme appeared to be minimal, though the concept was adopted from an existing council scheme for undergrounding poles and wires paid for by residents through local government property taxes over a 20 year period.
Long-term planning	2	The initiative is closely tied to the City's ambitious target to become a climate-neutral city, which was ratifies by the City of Berkeley community through a ballot in 2006 in which 80% of voters supported a 80% emissions reduction target by 2050. The initiative is also aligned to State policy, which has passed a number of legislative measures to reduce emissions and provides programs to support local government capacity to take action on Climate change.
Water values and use behaviours	2	There is widespread citizen support for the City of Berkeley's climate action policies, evidenced through the 2006 ballot. The wording in this ballot also explicitly recognised that actions would be identified for both the City and residents. This suggests a community acknowledgement of a responsibility for climate action, including behaviour change to reduce emissions.
Problem frames and risk perceptions	1	Understanding of climate change problems appears to be shared across the Berkley community, along with general strategies for finding solutions. However, the perceptions of risk were not shared at the national level of government, as the Federal Housing and Finance Authority's position on the financing scheme threatened the broader roll-out of the initiative to the state.
Professional practice	2	The City engaged with tradesmen early in the development of the scheme through focus groups, involving of solar installers in the development of the initial proposal to Council. In addition, supportive policy from the State of California, the California Solar Initiative, had developed installation standards and build professional capacity to install the solar schemes.
Organisational culture	2	Councilor support for the scheme seemed to be strong throughout the development of the initiative, as the processes and procedures for introducing the scheme progressed without any major hurdles. Collaboration across departments and the uniqueness of the policy mechanism also suggest the City of Berkley is an organisation with a supportive culture for innovation. Indeed the Council approved the allocation of staff time to work on the concept in 2007.
Information management and sharing	2	The uptake of the Berkeley FIRST initiative at the State scale demonstrates that adequate information systems were able to provide adequate knowledge on processes and performance of the initiative, and evinces that this information was shared with other stakeholders (State government).
Performance management	1	While the study did not pick up formalised organisational mechanisms for performance improvement, the smooth implementation of the Berkeley FIRST initiative suggests there were few barriers to progress, and adequate incentives to drive improvement and action internally.
Policy and program evaluation	2	The initiative was extensively evaluated during and after the solar installations had been completed, with feedback sought from all key stakeholders.

Governance Attributes	Score	Justification
Informal reflexive opportunities	0	The research did not pick up opportunities for informal reflection.
Consultation requirements	2	Given the legislative changes required, there were formal processes for seeking community input into decision making, such as a public hearing to hear protests against the proposed Special Energy Financing District. There was also consultation during the development of the scheme to gain input from key stakeholders such as solar installers.
Transparency	2	The initial ballot to gage appetite for climate change action, design of the pilot scheme through applications, and process of creating an enabling legislative framework, ensured a transparent process of issue awareness, solution development and implementation.
Accountability	2	Accountability to the community to develop the scheme was clearly driven by the City's mandate for climate actions through the ballot, internal individual team accountabilities, and formal processes of accountability for decision-making and legislative development within the administrative framework for local government.
Support tools	2	It appears the collaboration with researchers at the University of California gave City of Berkley staff access to some information and tools to support sound decision-making around the design of the scheme, as did the partnership with the private financing firm. The initiative also drew criteria to assess Berkeley FIRST applications from work on solar installation at the State level.
Business models	1	The business model behind the scheme was slightly flawed in that it was at first difficult to find a private financing firm willing to meet the conditions of City of Berkley for the scheme, and then the withdrawal of a number of applicants as cheaper financing could be sourced elsewhere. In addition, the City of Berkeley had not considered the alignment of the initiative to the regulations enforced by the Federal Housing and Financial Authority, through collaboration with the state this oversight did not derail the roll-out of the statewide scheme.
Regulatory frameworks	1	The Berkeley FIRST initiative built on existing State and local administrative frameworks and regulatory systems, adjusting them to fully support the implementation of the initiative. However, they appear not to have considered implications for federal regulations.
Policy alignment	2	There was strong policy alignment, both internally within the City of Berkeley, and with State government policies and programs on climate action.
Roles and responsibilities	2	No confusion over roles and responsibilities was evident in the case study.
Authority	2	Through its status as a 'charter city,' the City of Berkeley has a greater level of authority to implement a scheme like Berkeley FIRST when compared to other city councils. However, they also utilised their existing legislative frameworks and ordinances to deliver the scheme.
Leadership	2	The City of Berkeley showed a willingness for leadership in mobilising community commitment to climate action. They also resolved to call on other local governments to take action, and have joined peer networks to share and benefit from best practice with other local governments.
Funding sources	2	The City of Berkeley relied on a grant from the USEPA and Bay Area Clean Air District to fund the subsidy scheme. As a subsidy program, there was little need to ensure ongoing funding support for this initiative, only to ensure the financial risks to Council and residents participating in the scheme were adequately managed.

Rotterdam multifunctional urban infrastructure adoption, City of Rotterdam, the Netherlands

Themes	Aggregate Scores
Key processes	1.75
Culture	0.5
Learning	-0.5
Decision-making	1.5
Institutional structures	1
Implementation Capacity	1

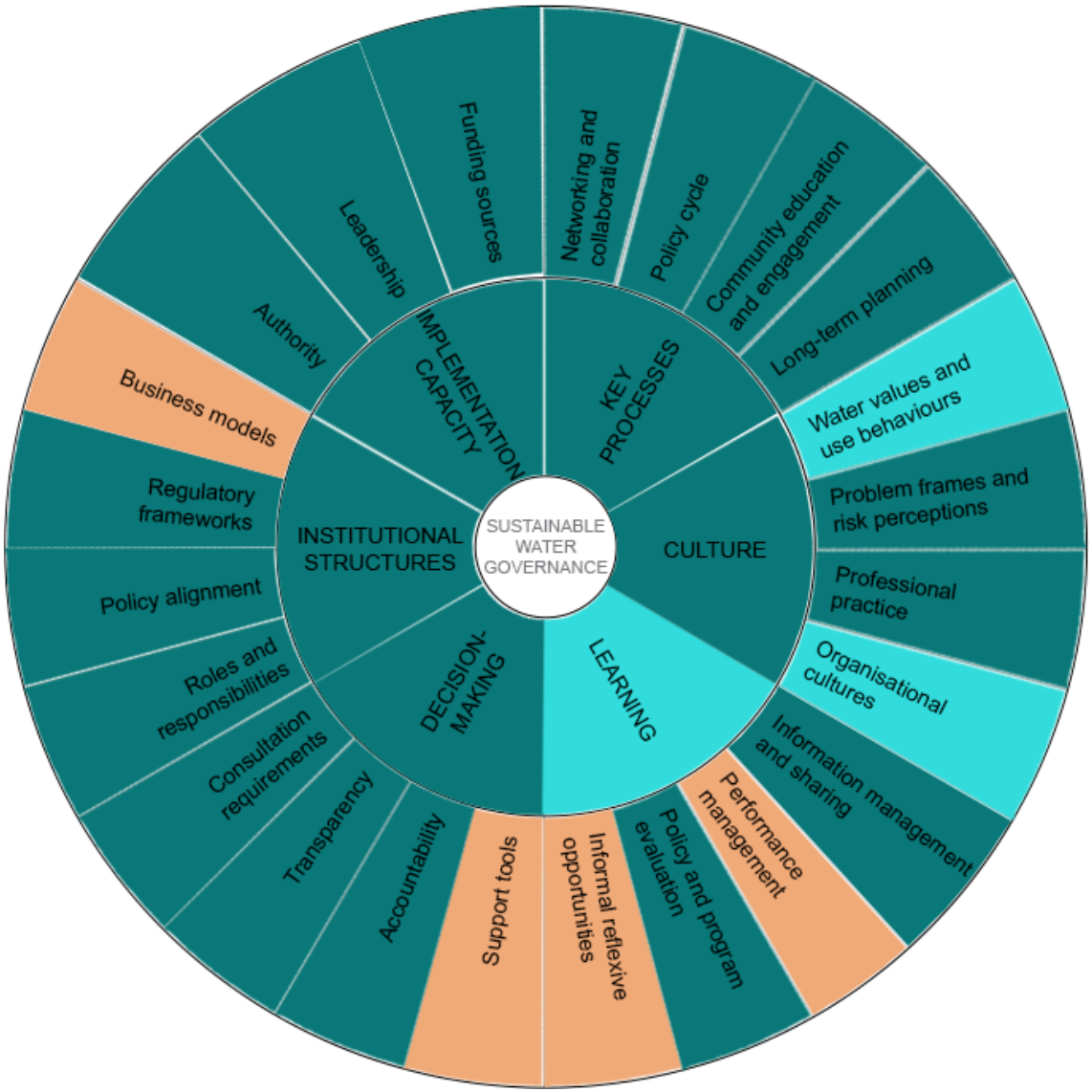


Governance Attributes	Score	Justification
Networking and collaboration	2	Policy officers inside the City of Rotterdam were well networked internally (engineering, environmental and urban planning departments), as well as in partnership with transition researchers and connected to various professional networks externally.
Policy cycle	2	Well connected to the policy cycle of the local municipality, meeting with several departments to ensure their ideas were relevant to other major projects within the municipality. Also well connected to national Room for the River policy implementation (one team member on secondment to national Ministry). However, also used external influencing strategies.
Community/stakeholder education and engagement	2	Transitions arena initiated with frontrunners engaged community leaders, initially about climate mitigation but evolved into an agenda around greening the city to maintain liveability under densification strategy of the municipality. Presentation at Architecture Biennial also engaged the general public, as did finding a spokesperson in a visiting celebrity.
Long-term planning	1	Employing a transition management process created the space for long-term visioning and planning potential transition pathways. However efforts stalled at these visioning processes for some time, until senior management directed team to link transition ideas to tangible actions.
Water values and use behaviours	0	Focus more on climate mitigation, but initiatives provided with an avenue for implementation by national flood management policy, which recognised multi-functional flood mitigation infrastructure, and also about introducing more green public open space and blue corridors to the cityscape.
Problem frames and risk perceptions	1	Visioning processes built shared understandings of problems and potential solutions, however costs and benefits yet to be fully quantified, and risks not collectively considered.
Professional practice	-1	Demonstration projects completed, but process to mainstream new solutions into standard practice did not occur.
Organisational culture	2	Organisational culture focused on innovation and best practice, with the City actively promoting itself as a leader in sustainable development and regularly connecting with researchers to experiment and learn.
Information management and sharing	-1	Formalised information management systems were not established to monitor progress and performance of various urban design experiments. Also, new knowledge formed and shared between members of transition management team, but not well shared across the organisation - appears to be some competition between divisions.
Performance management	-1	Did not appear to be much of a formal performance management system in place, with a long process of developing visions before implementation processes began. However, other more information organisational mechanisms encouraged innovative thinking, and direct from the top down eventually lead to action plans.
Policy and program evaluation	-2	Despite a series of resilience targets and actions being set, systematic monitoring processes or reflection on activities are still with limitations and no strategic plan for fostering integration and adoption of new approaches more broadly within the municipality's operations was developed.
Informal reflexive opportunities	2	Transitions team within the Municipality is a cohesive informal network who regularly meet to discuss issues and ideas.
Consultation requirements	1	Consultation with community was extensive through the transition arena, canvassing their ideas and adopting a shared concept for change ('greenification through densification for liveability'). However, internal engagement within the municipality on how this vision aligned with other strategic policy directions was not as strong.

Governance Attributes	Score	Justification
Transparency	2	The transition arena process provided a highly transparent process for gaining input in future directions and to shape and inform decisions on urban development directions and projects.
Accountability	1	Given the extensive involvement of Rotterdam citizens in the visioning and transition strategy development exercises, accountability to the community was reasonably strong. However accountability for tangible actions for progressing the transition strategies and gaining broader adoption of the targeted actions within the municipality's operational activities was not as well embedded in the organisations performance management systems.
Support tools	2	Municipal officers working towards GIS supported mapping of urban development parameters (e.g. amount and accessibility to public open space) to track progress against transition targets.
Business models	1	Funding for innovative urban development demonstration sites was sourced from internal budgets within the City of Rotterdam. Study did not assess these internal models, but as the organisation is a public entity, it is assumed business models are geared toward delivering broad public benefits (i.e. not profit-making enterprise).
Regulatory frameworks	0	While demonstration sites were constructed within the current regulatory systems, it is unclear whether this is alignment was due to the ad hoc nature of the developments, or whether these systems would enable or pose a barrier for future developments.
Policy alignment	1	While municipal staff consulted with other departments to ensure the transition vision aligned with their activities, the higher-level vision and direction-setting strategies of the transition process did not appear to be embedded and integrated into municipal-wide policies.
Roles and responsibilities	2	Urban development is clearly assigned to the planning department of the municipality, with input from water engineering and biodiversity teams. The activities of the transition team appeared to be on the periphery of the core activities of this department through, their work being viewed as a novelty approach.
Authority	2	The City of Rotterdam have clear statutory authority for urban development in the city, and for translating the national flood management strategy into their operations.
Leadership	2	The municipality promotes themselves as a leader in sustainable urban development and adaptive management, allows staff flexibility and space to participate in networks and supports implementation of innovative ideas, and connects with other municipalities and researchers to share knowledge. Displays political, visionary, entrepreneurial, and collaborative leadership.
Funding sources	-1	Revenue streams available to seed innovative projects and deliver ongoing public benefit through best practice urban development (in partnership with private sector). However, appears to be a lack of attention to monitoring and evaluation resources.

Groundwater Replenishment Trial, Western Australia

Themes	Aggregate Scores
Key processes	2
Culture	1.5
Learning	1
Decision-making	1.5
Institutional structures	1.5
Implementation Capacity	2

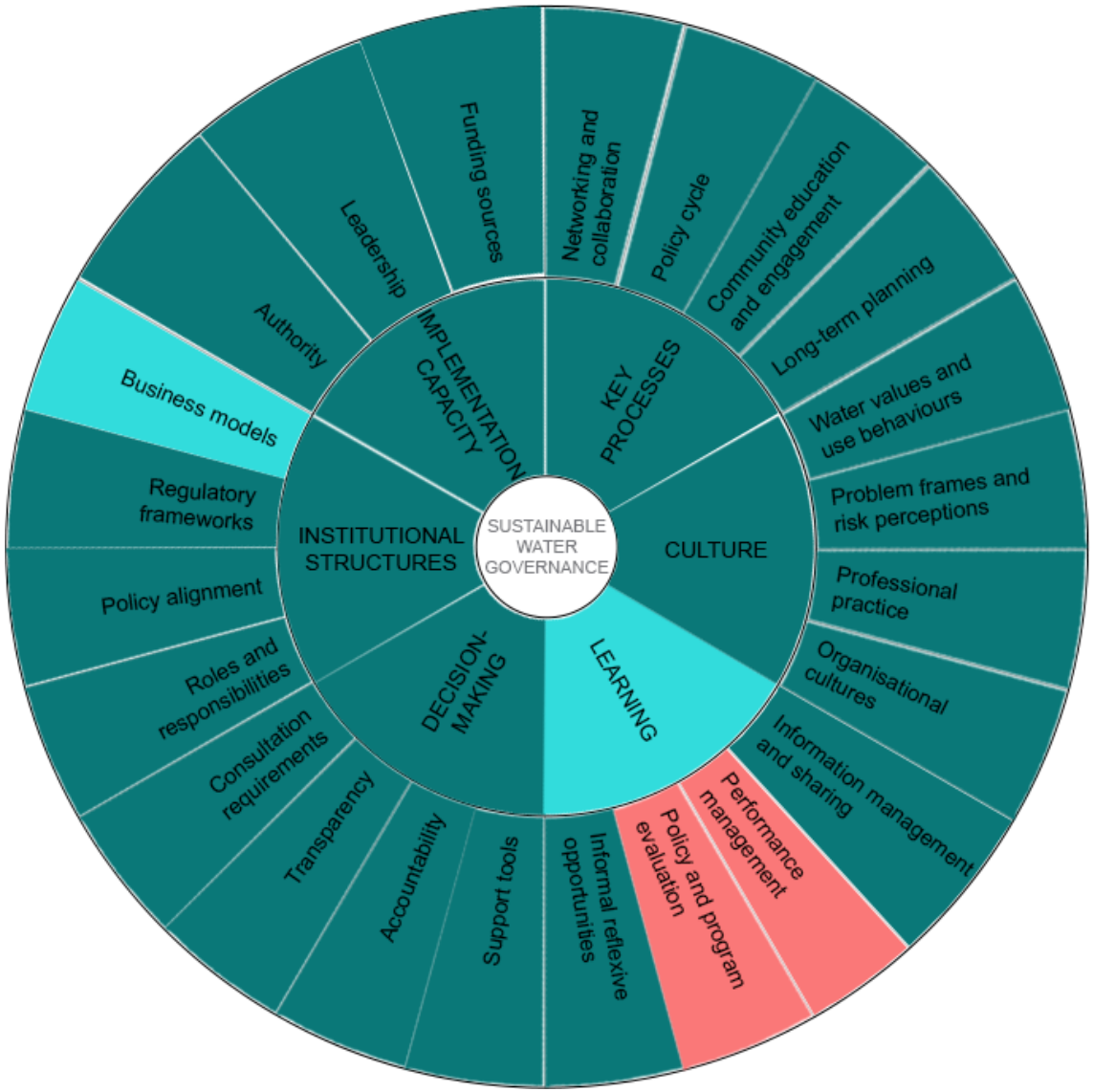


Governance Attributes	Score	Justification
Networking and collaboration	2	Good relationships with key regulators (health, environmental) prior to trial, and extensive stakeholder engagement process used throughout the trial. Clear evidence of trust and better operational working knowledge of other agencies after the trial.
Policy cycle	2	Issues arising throughout the trial were addressed through development of interim policy (e.g. allocation rights), and informed development of broader policy development (DoW MAR).
Community/stakeholder education and engagement	2	Extensive engagement and education efforts to build community acceptance of recycled water.
Long-term planning	2	GWRT a key component of long term water planning efforts, which was consulted with communities, and authorised by regulatory agencies (e.g. EPA strategic advice, Department of Health leading research into the option).
Water values and use behaviours	1	Take a cautionary approach to water use by stressing recycled water is not direct potable, to feed into a longer term community acceptance strategy. However, doesn't serve to reassess value of water, given the drying climate circumstances and the emphasis on source development.
Problem frames and risk perceptions	2	Shared understandings of water security issues, clear effort to develop a collective understanding of GWR solution, and on-going effort to identify possible risks and management strategies.
Professional practice	2	Trial directly informed the water management practices of Water Corporation, the main water services provider.
Organisational culture	1	A culture of improvement existed, but internal business areas were initially opposed to the idea, so an innovative approach was not present throughout the organisation initially.
Information management and sharing	2	Comprehensive data was collected and jointly considered, as well as being freely available in audience appropriate forms online.
Performance management	0	Performance management systems did not drive innovation as much as the drying climate and the need for Water Corporation to meet their service obligations.
Policy and program evaluation	2	GWRT essentially tested out the policy setting for groundwater replenishment with recycled water, and the policy was adjusted through this process.
Informal reflexive opportunities	0	There were no evident opportunities for informal reflexivity in the GWRT, however the formally managed process of the trial provided clear objectives and the focus was on completing the trial, rather than reflecting on the appropriateness of GWR or water management issues more generally.
Consultation requirements	2	The GWRT process itself was an extensive consultation and joint-decision making process.
Transparency	2	Due to the high level of stakeholder participation in the Trial, the decision-making process was transparent and open for input.
Accountability	2	Formal MoU's ensured each organisation involved in the GWRT had clear accountability for aspects of the trial, while the Water Corporation were required to operate the Trial within existing licencing and regulation arrangements.
Support tools	0	Available tools supported decisions, but did not appear to be instrumental in gaining acceptance for decisions.

Governance Attributes	Score	Justification
Business models	0	Non-commercial benefits of GWR were not fully explored, and agreement reached on allocation rights was needed to ensure Water Corporation would have an incentive to continue to invest in developing the technology. This strategy ensured innovation progressed, but consideration of why the organisation's business models may have precluded this investment was not further explored.
Regulatory frameworks	2	Finding regulatory fit for GWR was an explicit aim of the trial.
Policy alignment	2	Ensuring policy support for future GWR schemes was also part of the trial process.
Roles and responsibilities	2	MoU's between organisations established clear roles and responsibilities for progressing the trial. In addition, as part of discussions between trial participants, overlapping regulatory roles were resolved.
Authority	2	The pooled authority of the various key agencies involved in the GWRT enabled the trial to progress. During the trial itself, if authority for resolving a decision was not within the Inter-agency committee, the relevant agency representatives were successful in gaining the authority needed from within their organisation.
Leadership	2	Collaborative and entrepreneurial leadership were very strong throughout the trial, and significant efforts were made to secure political leadership, despite changes in government. Visionary leadership was needed to initiate the trial (particularly selling the case for change in regulatory systems to accommodate the new water supply), but appeared less significant once the trial was in progress and formal commitment from agencies and clear governance arrangements for the trial itself had been arranged. Also, there was a gap in visionary leadership to progress the innovation beyond the trial and development of a new water source, to a broader water management and planning agenda.
Funding sources	2	The GWRT was able to secure grants to cover the costs of the trial, but discretionary funding was also made available when further investment in the treatment train 'kit' was needed. The ongoing operation and management of the future GWR plant would be funded from Water Corporation's general operating revenue.

Room for the River policy shift, the Netherlands

Themes	Aggregate Scores
Key processes	1.75
Culture	1.875
Learning	0.375
Decision-making	1.875
Institutional structures	1.75
Implementation Capacity	1.83



Governance Attributes	Score	Justification
Networking and collaboration	1.5	The level of informal networking is not clear in the analysis, however close links between scientists and policy officers were noted as a factor in recognition that current water management approaches would become inadequate in the future. There was significant collaboration throughout the development of the Room for the River policy (RftR), owing to the Dutch consensus model for decision-making, and recognition that works would need to be delivered by regional authorities (provinces, municipalities and water boards). This collaboration also extended to the NGO WWF. While the national government operate in a 'top-down' style of 'trust with control,' they nevertheless consulted with stakeholders from the outset, and established clear collaboration processes in intergovernmental agreements.
Policy cycle	2.0	Connections to policy were well established, given the lead agency was the Rijkswaterstaat (Directorate-General for Water), and the objectives explicitly aimed to strengthen spatial planning policy and water management (flood protection), and also linked to the climate change policy and creation of an integrated water management policy.
Community/stakeholder education and engagement	2.0	Community dissatisfaction with the 'fighting water' approach to flood management was a major driver for the policy change. This assumes a community that is aware of the issues and complexities of flood management, and the sources suggest this was the case, driven largely by the environmental movement in the 70s. There is also mention of community engagement through the various policy position papers that were published, providing an avenue for community input. Also, the structure of the water boards, with representation from local communities, also provided an existing avenue for community input. The consultative approach of the central government enabled this, by engaging closely with regional bodies in developing the case for change in approach, the reform agenda/process for pursuing the change, and then the content of the Room for the River policy and associated guidelines and legislation.
Long-term planning	1.5	While the Room for the River policy was very much driven by long-term concerns such as climate change impacts and economic productivity of Dutch agricultural land and urban centers, the policy itself is due for completion in 2015. The administrative arrangements associated with the program, in terms of allocations of roles and responsibilities for water management, will not expire. However, the Key Planning Decisions policy, which set decision-making criteria for water project under the RftR program, expires in 2015. The funding program is also set to finish then. While there appears to be goodwill between stakeholders, it is not clear how the policy direction of 'making room for rivers' will continue after this program (which is essentially a capital works program, albeit with explicit aims for social and environmental outcomes). The legislative changes associated with the RftR policy linked to climate change, integrated water management and spatial planning policies, so presumably the instruments within these other legislative frameworks will continue. In particular, the integrated water management policy includes an integrated planning system for water resources, requiring a number of plans for water quality and quantity be produced at all levels of government. Thus, while long term planning and connections to other policy domains appear to be strong, it is unclear how these plans will be implemented once the intergovernmental administrative arrangements, decision guidelines, and funding, expire.

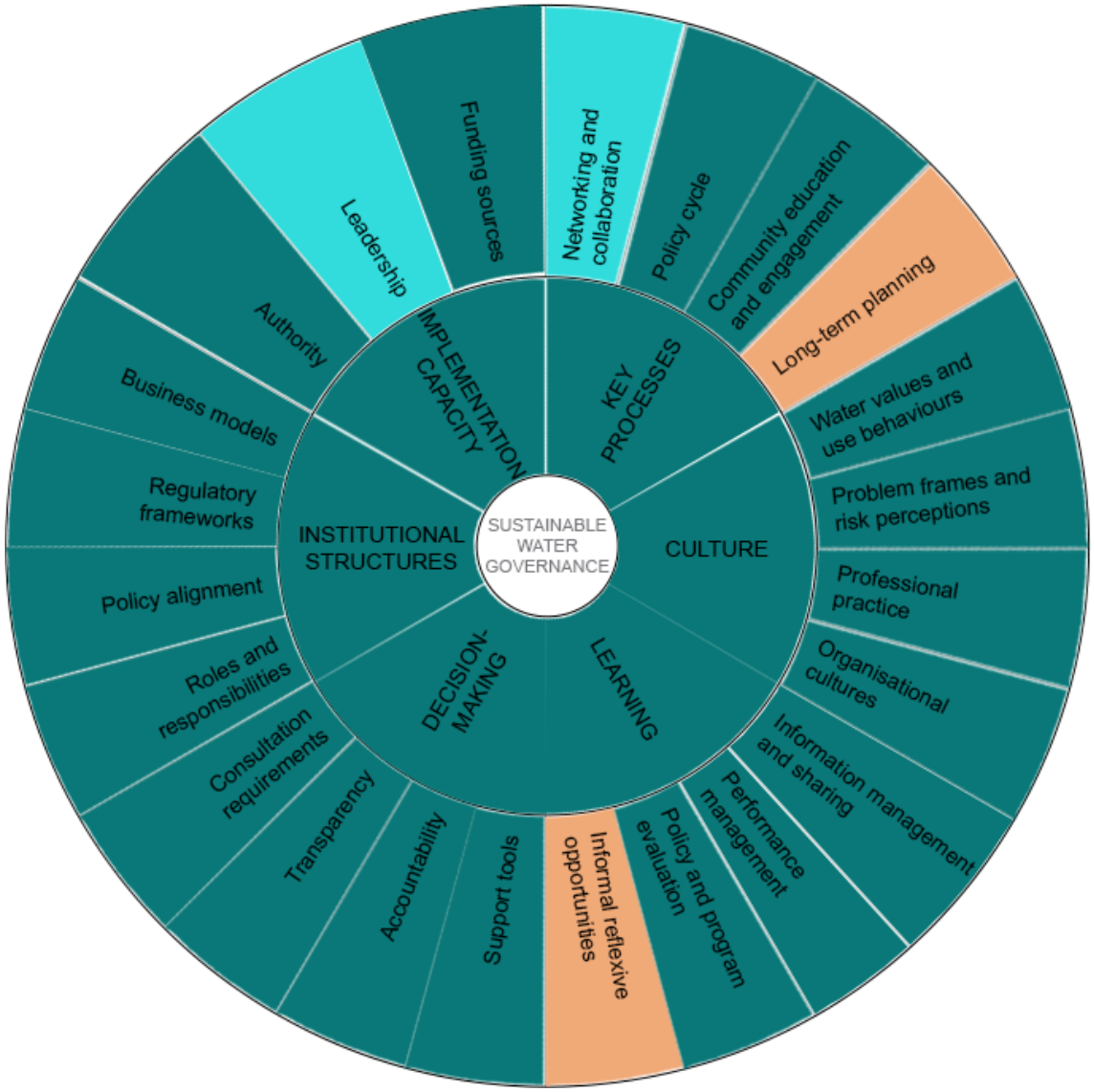
Governance Attributes	Score	Justification
Water values and use behaviours	2.0	The development of RftR was largely driven by changes in community expectations of flood management (due to the emergence of environmentalism). This attitudinal shift began to include concerns for environmental and socio-cultural aspects of water management, alongside the concern for flood safety. Also, consideration of aquatic ecosystems began to emerge within the Rijkswaterstaat, driven by one of the regional managers who recognised the importance of these ecosystems and began hiring more ecologists. This began to change the culture at the organisation to consider ecology alongside engineering concerns. In addition, the shift from fighting the water to making room for it occurred over a long lead-time before the actual adoption of the RftR policy. Sources suggest that the period from 1970 to 2000 represented a shift in understanding and attitude, and specifically 1989 to 1996 a problem framing period where many practitioners and policy makers began to converge on the idea that spatial planning and water management needed to go hand in hand. Coupled with the near floods in 1993 and 1995, all these cultural and cognitive changes eventually provided the politicians with the courage to pursue reforms.
Problem frames and risk perceptions	2.0	As discussed above, there was a long period of interaction between stakeholders, and then a series of investigations and position papers, which facilitated the development of shared problem frames. Risk management was an explicit issue that was examined through investigations, in terms of the risk of the engineering based approach to deal with future water related trends, and also the financial risks of this business as usual approach. An independent committee was also formed to establish the costs and benefits of new and old approaches, and found that once social impacts were considered, the new approach was usually the most beneficial option. Overall, the RftR policy represented a shift from 'fail-safe' engineering solutions to 'safe-fail' alternatives which reduced the level of risk but built an increased acceptance that flood risks were inevitable and a more resilient approach was needed.
Professional practice	1.5	The RftR program drove significant practice changes in the delivery of water management (predominantly flood protection) works within the program. There was also evidence from practitioners that the mindset behind making room for the river also permeated other policy/program areas, specifically the Delta Programme (large-scale on-going public works program which manages major dykes and sea barriers). The research did not capture whether this thinking is reflected in professional training and industry standards. However, there is a large push to explore Dutch expertise on delta/flood management, so it could be assumed that changes in practice as a result of RftR are becoming the industry standard.
Organisational culture	2.0	The Dutch culture is known for consensual decision-making, and the development of the reforms behind the RotR policy by central Ministries suggest organisations which practiced open consultation. The shift from 'fail-safe' to 'safe-fail' approaches demonstrated the acceptance of certain levels of risk, and organisations that are not adverse to new ideas and experimentation. A number of key leaders also enabled this organisational style, from the regional manager of the Zeeland Rijkswaterstaat, to the Vice-Minister for Transport, Public Works and Water Management, who, jointly with the President of the Association for the Water Boards, requested an independent investigation into the long-term viability of the water management approach.
Information management and sharing	1.5	While the national government provided all inclusive funding, which included research, it was not clear in the available material how much is dedicated to monitoring and evaluation. The establishment of a national program directorate to coordinate and support regional delivery of the RftR program explicitly aimed to facilitate the exchange of expertise and experience between Dutch cities and other cities. What is unclear is whether the learning and professional practice changes developed through the implementation of RftR are informing more formal professional development and teaching curriculum.

Governance Attributes	Score	Justification
Performance management	-1	While the RotR program was an innovative new approach to policy, the implementation program was geared toward a set range of solutions. While these aimed to incorporate 'future values' that included resilience and flexibility, there were no specific incentives to encourage future innovation through monitoring and evaluation of the RftR approach. As such, while the program aimed to future-proof water management in the Netherlands, there did not appear to be any mechanisms included in the program to build future capacity for change, by encouraging innovation and continual improvement.
Policy and program evaluation	-1	While the flood management solutions were assessed as providing better value from social and environmental perspectives, it cannot be guaranteed that these solutions will meet future needs. With a limited scope, expiration date on key decision-making guidelines, it was unclear as to whether the policy would be extended or leave a lasting policy legacy. As such, it is unclear whether delivery organisations (water boards, provinces and municipalities) have built capacity to adapt to their operating environment.
Informal reflexive opportunities	2.0	Anecdotally, sharing between practitioners was common. Also, the national program directorate included a secondment program to place staff in regional agencies to liaise with regional staff and the program implementation process. There was also a high level of interaction with researchers, providing opportunity for informal reflection and information capture.
Consultation requirements	2.0	The RotR policy drew on formal policy development processes which included substantive consultation and input, such as independent committee investigations, public and stakeholder consultation on position papers, and input from the water boards, which are established to represent local views and needs. The Ministry also drew on past reports from external organistations such as the WWF. In addition, the tradition of the consensual decision-making model in the Netherlands has developed a culture of consultative decision-making.
Transparency	2.0	The proposed reform approach to water management was published by the Rijkswaterstaad in response to the independent committee's recommendations (The Water Management in the 21st Century Advisory Committee), inviting comment from stakeholders and setting out the plan for the public. There were also a number of interagency agreements between the central ministries and regional bodies, agreeing to both the process for developing the policy, and the implementation mechanisms, roles and responsibilities. The clarity of the RftR objectives also helped to simplify a complex policy area and clearly state what the aims of the policy were for the public, i.e. to guarantee safety in the first instance, and improve spatial quality through water management works.
Accountability	2.0	The RftR policy was granted status as a 'Major Project,' which required the relevant Minister to provide progress reports to Cabinet every 6 months. Also, the central ministry were the key authority responsible for the program, and while delivery was agreed through interagency agreements and decision-making guidance/statutory instruments, the national program directorate was established to work directly with regional delivery agencies to ensure coordination and smooth delivery of the program.
Support tools	1.5	As part of the development of the policy, a range of flood management solutions or techniques were proposed, and jointly assessed by organisations, and decision-making criteria were also established in the Key Planning Decision, a statutory tool under the national spatial planning framework. This provided solid guidance and justification for decisions, providing enough flexibility for the policy to be adapted to suit local context, but provided limited flexibility and longevity to continue the approach once the RftR program and funding ceased.

Governance Attributes	Score	Justification
Business models	1.0	As a one-off program of works, the RotR policy did not need to align with the service delivery models of regional agencies. However, the assessment work to look at more comprehensive costs and benefits of proposed flood management solutions (incorporating social, environmental and local economic development opportunities), which provided some new widely accepted methods for assessing solutions.
Regulatory frameworks	2.0	The RotR policy was accompanied by a legislative reform program to modernise water management legislation in the Netherlands. Specifically, an Integrated Water Management Act was to be created, combining and integrating a number of water related Acts, and meeting requirements of the EU Water Framework Directive. Also, to support implementation of the RftR policy, statutory instruments linked to spatial planning policies were designed and agreed through an intergovernmental process, specifically: the 'water test' which ensured water management would be assessed in a range of spatial planning decisions, and the Key Planning Decision which is a statutory instrument for setting spatial planning direction and providing guidance on decisions.
Policy alignment	2.0	There was substantive effort to align policy in a number of domains (climate change, water management, spatial planning, and EU directives), both in terms of their high level objectives and directions, and the integration of various policy instruments, from requiring water resource plans at various levels of government, applying the 'water test' to spatial planning decisions, and meeting EU Framework Directives for water quality issues with domestic pollution control mechanisms.
Roles and responsibilities	2.0	Traditional roles and responsibilities of central and regional agencies were acknowledged and built upon. Through intergovernmental negotiations, roles and responsibilities, and methods of implementation, were clearly set down in formal agreements (Initial Agreement for new approach, the National Governance Agreement on Water).
Authority	2.0	The Netherlands is a decentralised unitary state, with all powers delegated from the national government. Thus through collaborative negotiation of the intergovernmental agreements, appropriate authority for actions were delegated.
Leadership	2.0	A number of individuals showed visionary, collaborative and political leadership. A culmination of pressures (flood crises, climate impacts, development pressure upstream) along with community dissatisfaction with flood protection also pressurised the national government to act.
Funding sources	1.5	The RftR policy was accompanied by a substantial (€2.3 billion) and inclusive budget, covering capital works, management and maintenance, research, land acquisition, compensation etc. However, while regional authorities have the power to raise taxes or levees to fund their operations, it was not clear whether these revenue mechanisms would be adequate or allowed to fund future works once the RftR policy program expired.

Portland green infrastructure adoption, City of Portland, U.S.A.

Themes	Aggregate Scores
Key processes	1.25
Culture	1.875
Learning	1.5
Decision-making	2
Institutional structures	2
Implementation Capacity	1.67



Governance Attributes	Score	Justification
Networking and collaboration	1.0	The material does not capture significant networking and informal interactions. However, the multidisciplinary Bureau of Environmental Services (BES) and the groups culture of support for sustainable solutions appears to have generated significant collaborative efforts and projects.
Policy cycle	2.0	Following the introduction of the Federal Government's clean Water Act (1972) the City of Portland (CoP) began the journey toward a significant policy shift to extensive use of green infrastructure. The Federal Government's National Pollutant Discharge Elimination System permit process provided a policy driver for activity within the CoP, and over the course of two decades has resulted in a number of policies and initiatives to support green stormwater infrastructure. BES staff strategically embedded provisions for a green infrastructure trial program within the CoP's application for a NPDES permit.
Community/stakeholder education and engagement	2.0	Stakeholder engagement was sought early in the green infrastructure developments in CoP, with a Stormwater Policy Advisory Committee (SPAC) established to develop and recommend policy options. The committee had broad membership, from CoP staff, building associations, state departments, environmentalists and the development community. Later, a Stormwater Advisory Committee with similar membership was created to provide comment on the revision of the statutory-based Stormwater Management Manual. In terms of community engagement, the Portland community was already environmentally active and with a history of civic engagement, provided a solid basis to pursue innovative urban policy. However the CoP invested in community education and engagement programs, fostering a sense of stewardship over green infrastructure and providing maintenance training, as well as designing education and incentive programs to encourage stormwater management on private land.
Long-term planning	0.0	While the green infrastructure program was linked to other watershed improvement programs, and a city-wide push for sustainable infrastructure over-seen by an intra-agency committee, the program was geared toward meeting stormwater pollution commitments, and does not appear to be part of a broader plan for water resource management in the city/region that is linked to urban development. However, this did not have a detrimental effect on the BES's ability to pursue the policy change and integrate green infrastructure into the CoP's operations.
Water values and use behaviours	2.0	The Portland community is known for its progressive environmental values, and this provided a strong foundation of public support for sustainable initiatives such as green infrastructure. While the value of green infrastructure was related mainly to its pollution management capabilities, and not specifically connected to broader sustainability issues such as integrated water resources management, urban development, climate change adaptation etc.
Problem frames and risk perceptions	2.0	The BES team worked to build internal understanding of the benefits and performance of green infrastructure within municipal departments. They used the extensive monitoring of pilot projects to build a locally relevant evidence base, and internal and external committees to investigate current practice, propose solution options, and generally raise the profile of the benefits green infrastructure could provide across the organisation. The pilot project program also provided an opportunity for staff to learn and adjust their practices, helping to identify potential risks and their solutions before the approach was scaled up.
Professional practice	1.5	Staff in the BES were multidisciplinary. Stormwater Management Manual also successively updated based on feedback. The BES also provided technical and advisory support to industry practitioners. Internal training (the Natural Step program) was used to embed sustainability principles within the CoP. However, the research did not capture how ongoing knowledge development was fed into industry training and education programs.

Governance Attributes	Score	Justification
Organisational culture	2.0	The culture in BES was supportive for experimentation, with some individual staff conducting their own personal experiments, and then ensuring there were provisions for experimentation in the pollution permit, to address gaps in local and national research into green infrastructure. This culture was spread through the organisation, through the political support of key Commissioners, and the establishment of advisory committees, whose advice added weight to the case for change. Later, the CoP set up a seconded team from across various division with explicit responsibility to diffuse green infrastructure solutions into the councils operations.
Information management and sharing	2.0	Information was widely shared in collaborative efforts across groups within CoP, and through the investigations and recommendations of advisory committees. Demonstration projects were also used to demonstrate the multiple benefits of green infrastructure to relevant industries and the community. This helped to build trust in the solutions, as well as a locally relevant evidence-base.
Performance management	2	An internal review of stormwater management and the need to meet requirements of their interim NPDES permit initially drove the CoP to explore green infrastructure options. Commissioner's also called for advice and policy development, encouraging new thinking. Later, the establishment of the Sustainable Infrastructure Committee helped to drive the implementation and continued research on green infrastructure across the CoP. The Council also endorsed the work of the Cross-Bureau team, set up to explore the possibilities for green infrastructure in other areas of Council's operations (beyond stormwater management). Overall, the CoP is considered a national and international leader in the use of green infrastructure.
Policy and program evaluation	2	There was very strong monitoring and evaluation of pilot project to inform management approaches (e.g. the Stormwater Management Manual) and to promote green infrastructure internally within the CoP and externally. In addition, continual research informed the range of policies and policy instruments that were successively introduced to incentivise and require the use of green infrastructure. For example, the BES staff collated figures to show the savings of green infrastructure compared to traditional piped approaches, which were great value for money even when social and environmental benefits were not taken into account. The BES also commissioned research to quantify these social and environmental benefits.
Informal reflexive opportunities	0	The research did not capture this information.
Consultation requirements	2.0	The CoP used a range of mechanisms to consult with communities, from the early phase when designing specific incentive programs and outreach and training to engaged and empower communities to help maintain infrastructure, and more formal arrangements such as the Advisory committees. Stakeholders were also included as members on advisory committees, and while the mechanisms were not identified, industry input was also received to update the Stormwater Management Manual. Also, the original permit application of CoP to the NPDES required a lengthy public consultation process.
Transparency	2.0	The submission of the CoP's plan for managing combined sewer overflows and stormwater to the NPDES required the submission of a stormwater management plan and a public consultation process with public reporting of the final plan. The threat of litigation by a citizen suit also exposed the CoP's plan to extended scrutiny. The development of various policy and inventive mechanisms, including off set programs, changes to building regulations, redistribution of taxes, and grants programs, were all required to be endorsed by Council and therefore followed public consultation and reporting processes. Also, the NPDES system included sanctions for non-compliance with stormwater pollution and combined sewer overflow breaches.

Governance Attributes	Score	Justification
Accountability	2.0	The activities of CoP, as a municipality, were accountable to their local community. Membership in the broader regional Portland Metro Council also made the municipality accountable to other councils. In addition, the Portland Metro Auditor was a position in the regional body responsible for reviewing financial statements and conducting performance audits. State and Federal regulations also provided accountability mechanisms for the CoP's activities.
Support tools	2.0	The monitoring and evaluation of pilot project informed the development of a Stormwater Management Manual, which aimed to simplify coefficients and calculations.
Business models	2.0	Cost-benefit assessments were adjusted to better account for the multiple benefits of green infrastructure, even though further research was needed to quantify some of these benefits.
Regulatory frameworks	2.0	A range of regulatory tools were developed to ensure implementation, starting with stormwater management charges, and increased in complexity as the CoPs knowledge and experience in using policy and regulatory tools increased.
Policy alignment	2.0	A dedicated Cross-Bureau Team was eventually set up to facilitate the inclusion of green infrastructure solutions across the Council's operations and policy areas (e.g. expanding from stormwater management to watershed management, transport, urban development and building codes).
Roles and responsibilities	2.0	As a single agency initiative, the Portland green infrastructure experience did not challenge existing roles and responsibilities. However, the Council made efforts to empower the community to take on a greater role in maintenance of decentralised systems.
Authority	2.0	The CoP employed its own administrative authorities to pursue green infrastructure. This had initially been endorsed through the Federal NPDES system, and the environmentally active community also enabled the CoP to use their authority for these sustainable solutions.
Leadership	1.0	While there was political support for the green infrastructure by a CoP Commissioner, most of the literature did not put the success of the program down to individual leaders. Indeed the BES team reflected on a number of strategies that were used to gain and maintain this support, through things such as external awards and the environmental literacy of the public. As such, the success of green infrastructure adoption in Portland is largely recognised as a team effort.
Funding sources	2.0	the CoP's revenue streams (developer contributions, off sets, development charges) were all reviewed to ensure financial incentives for delivery of green infrastructure, in both Council operations and private land.

CRC for
Water Sensitive Cities

Cooperative Research Centre for Water Sensitive Cities

Lvl 1, 8 Scenic Blvd
Monash University, Clayton,
Victoria 3800, Australia

info@crcwsc.org.au

www.watersensitivecities.org.au