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Toward effective change in urban water policy: the role of collaborative governance and cross-scale integration

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Toward effective change in urban water policy: the role of collaborative governance and cross-scale integration
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Executive summary

This report investigates collaboration and integration of governance across scales and organisations, themes that were identified in previous research on innovation adoption processes in the A3.1 Sub-project, *Better governance for complex decision-making*. The premise of the research is that no individual stakeholder, alone, is able to solve the complex problems of enabling Water Sensitive Cities (WSCs). Rather, individual stakeholders need to collaborate with other water utilities, government departments, and professional organisations. It is argued that collaboration among such organisations is essential to develop effective and robust solutions that are well supported by policy and regulation and by community education.

Investigations into six successful Australian and international case studies and one unsuccessful Australian case revealed that a variety of collaborative strategies are needed for the three innovation phases (initiation, experimentation, and integration) identified by Bettini and Head (2015) in *Governance structures and strategies to support innovation and adaptability*. The mix of informal strategies (those that are based on networked, voluntary, and collaborative arrangements) and more formal strategies (more structured, sometimes mandated, and specified by rules and regulation) seems to be important in determining how innovation proceeds through various stages of development. Firstly, informal strategies appear to be more important during the initiation phase. Secondly, in the experimentation phase, both formal and informal strategies are important. Finally, formal strategies are more important during the integration phase. These observations correspond with the different stakeholders that are involved with innovative projects over time: a smaller number of stakeholders are involved in the initiation phase and a larger number and wider variety are likely to be involved in the integration phase.

The examination of governance across scales and organisations also focused on international and Australian case studies; eight cases were studied. An examination of governance across scales and organisations revealed that there is no single ideal network structure, although having a central, leading, or coordinating organisation can help to maintain participants' focus and momentum over time. In contrast, consistent cultural characteristics were identified across the cases – valuing stakeholder engagement, innovation, and flexibility, and being outcome focused – which will provide a sound foundation for coordinating activities across organisations, scales, and time. The perceived legitimacy of these network structures was enhanced through connections with the democratic process and, where these connections were lacking, strategic and ongoing engagement with political stakeholders was identified as an important strategy influencing the project's success.

Overall, key insights into strategies for advancing collaboration among stakeholders include the following:

- Informal and formal methods of collaboration have advantages and disadvantages, which indicates that these different methods are more or less appropriate during different innovation phases. Initially, before public commitments have been made, informal methods are likely to be effective as stakeholders can express doubts, ask questions, and overcome any reservations before making public statements of support. More formal collaboration strategies are likely to be effective during the experimentation and integration phases.
- Opportunities for advancing novel projects through each innovation phase need to be sought; informal networks may provide these unexpected opportunities.
- Having transparent processes and sharing information develops trust and shared understandings over time. Establishing and continuing these practices is important throughout the three phases of innovation adoption.
- A core team within an organisation or among organisations, with an open culture to facilitate collaboration, can also support colleagues through the challenging innovation process; this was particularly important during the integration phase.

In advancing integration of governance across scales and organisations, the following insights were identified:

- A potential lack of legitimacy can be overcome by basing the governance network within broad democratic structures and processes or, alternatively, developing and implementing a comprehensive and open engagement strategy.
- A central organisation can enhance coordination across the network. Either a pre-existing or newly established organisation can be effective. When coordinating across organisations, a specific bridging organisation can offer an advantage because participating organisations can be represented in the bridging organisation.
- Cultural attributes of valuing stakeholder engagement, innovation, and flexibility, and being outcome focused are likely to provide a sound foundation for coordinating activities across organisations, scales, and time.

Introduction

The A3.1 Sub-project, *Better governance for complex decision-making*, has explored the recent history of urban water governance in Australia (Bettini and Head, 2013) and reviewed a range of research literature on transformative system change and policy studies (Bettini and Head, 2014). A further report examined empirical examples of technological and policy innovation, to identify an innovation model relevant to influencing governance change in the urban water sector, and to provide guidance on how to better connect innovation processes to policy change processes (Bettini and Head, 2015).

This current report draws out and elaborates on two central themes that emerged from the previous research, namely, the need for establishing collaborative governance and the need for integrating governance across scales. These two themes of collaborative governance and cross-scale integration have been found to be important across a series of local and global case studies and literature reviews.

The initial research plan for the A3.1 sub-project in 2012 envisaged two final milestone reports (numbers 4 and 5): the first on models for 'effective partnerships and networks for knowledge development and capacity building', and the second on 'best-practice policy governance for local and regional scales'. The current document has combined these milestone themes into one larger report, owing to the clear synergies between them. To elaborate briefly:

- Milestone 4 had envisaged reviewing and developing new models for effective partnerships and networks for knowledge development and capacity building. The research hypothesis was that individual government agencies, water utilities, professional organisations, and other bodies cannot resolve complex problems alone but need to effectively use various methods for building robust and feasible solutions that are well supported by policy and regulation and by community understanding. These partnership and network models were seen as providing a sound basis for identifying and developing best-practice models for integrating knowledge through stakeholder involvement, with application to Water Sensitive Cities (WSCs).
- Milestone 5 had envisaged research and engagement to identify best-practice governance models for local and regional scales, building on the knowledge gathered in earlier work. This milestone was to address the issue of multilevel synergies and integration, including issues concerning appropriate levels of accountability and flexibility at each level in the urban water system and the role of strategy in setting agreed directions and objectives for urban water–related innovation.

Placing all of these themes together in the present larger report is clearly warranted by their close alignment and the interactive relationships between them.

Urban water governance occurs at the intersection of many policy and planning issues, and across several scales of spatial and organisational complexity (Olsson and Head, 2015; Pahl-Wostl, 2008). The policy and regulatory issues span important matters of human health, economic prosperity, urban 'liveability', and ecological protection. Unfortunately, the experts responsible for each part of this compound puzzle do not necessarily collaborate closely with experts in other sectors. Moreover, the active and informed involvement of citizens in planning for sustainable development has frequently been overlooked by policymakers and water utility professionals. In poorly managed systems, the crucial risks and problems often lie dormant until a crisis brings them into focus – water scarcity, natural disasters, ecological distress, and so on. In such circumstances, questions rapidly arise about the past inadequacies of strategic planning, risk management, and contingency preparedness. In better managed systems, citizens are widely involved in forward planning and expert groups work closely together to scope the challenges and identify preferred and feasible solutions.

In previous reports we have demonstrated that a robust capacity for policy innovation is essential for addressing future challenges in the urban water sector. We have demonstrated that setting goals and strategies through an inclusive process is essential, and that anticipating all opportunities and risks in the innovation and implementation process is necessary for sustained achievement. It is not helpful to have lofty ideals without a detailed understanding of the capacity for implementation. As policy

ambitions increase and more complex issues are tackled, there is a greater need for collaboration across organisational sectors and across levels of government.

This report begins by sketching the attributes required of sustainable urban water management, describing the socio-institutional aspects to provide a broad picture of the attributes relevant for sustainable urban water governance. The report then proceeds in two parts. Part 1 focuses on a more nuanced understanding of collaborative governance, synthesising the literature to identify key principles of collaborative practice. Several case studies are presented to illustrate how collaboration has been effectively undertaken in Australia and internationally. This first part concludes with a discussion on how the principles of collaboration are undertaken in practice. Part 2 focuses on the challenges of integrating governance across scales, with a particular focus on cases that involve drainage issues rather than security of water supply. In urban water management, drainage often requires the integration of water management planning and practice across multiple scales and organisations. In the current governance structures for urban water management, the drainage space is where most lessons about collaboration have been learnt. Whereas water supply and sewerage have largely become corporatised services, the nature of drainage infrastructure and servicing requirements has necessitated a more multiscale approach to governance. Drainage-related issues have therefore become an ideal space for exploring and elucidating key lessons on governance across multiple scales. A literature review on cross-scale governance is followed by eight case studies. The implications for practice are then discussed in a concluding section.

Sustainable urban water management

In addition to the traditional values of water supply, public health protection, and flood protection, WSCs will need to deliver complex values such as waterway health, biodiversity, social amenity and recreation, water conservation and efficiency, carbon neutrality, and urban heat island improvement (Brown et al., 2009). To realise these values, multiple technological and practical innovations are needed, supported by an adaptive management framework. A growing body of scholarship is investigating the characteristics of such an adaptive framework for managing water sustainably. This section reviews the literature to provide a broad picture of the attributes that inform the current research on collaboration and governance across scales. To set the scene, the attributes of actors, processes, and institutional structures are described.

Actors

Actors consist of individuals and organisations, including public and private organisations. Individuals working in a water industry that delivers multiple, complex values are likely to have a systems view of the water sector and its links to other sectors; thus, they are able to understand the different components of the water sector and how these contribute to societal wellbeing (van de Meene et al., 2010). A variety of personal traits have been identified, together with the knowledge individuals hold. Diverse knowledge and skills and an interdisciplinary outlook are required to operate professionally in a WSC (van de Meene et al., 2011). In a dynamic environment, where individuals are continually challenged to learn and adopt new practices, being resilient is an important individual trait (van de Meene and Brown, 2009). Being resilient affects an individual's response to change and is informed by their ability to learn, plan, and build on past experiences (Marshall and Marshall, 2007). A desire to contribute to society is an important motivating factor, which helps professionals overcome the barriers to implementing a new water sensitive strategy, tool, or technology (van de Meene et al., 2010). Being committed to creating change (Cettner et al., 2014), taking responsibility for their work, being open to new approaches, and being willing to take risks are other important attributes (van de Meene et al., 2011).

Organisations operating in a water sensitive setting are likely to value learning and be able to work effectively with external stakeholders and across intra-organisational structures (e.g. departments) (Floyd et al., 2014; van de Meene and Brown, 2009; van de Meene et al., 2010). Public and private organisations should have the organisational structures, processes, and culture to support effective data capture and learning, given the need to implement new WSC approaches. Organisations need to be 'learning organisations', where the leadership values learning and thus supports the resources (staff and time) needed to enable reflection (van de Meene and Brown, 2009; van de Meene et al., 2010). A willingness to engage with and respect others also characterises organisations that are likely

to contribute to a WSC. These characteristics are critical for effective engagement and collaboration, as is trust among individuals and organisations (Dobbie et al., 2016; van de Meene et al., 2011).

Processes

Processes for supporting a WSC are likely to include collaboration and cooperation. These processes acknowledge the need for multiple actors to work together to achieve WSCs (Cettner et al., 2014; Floyd et al., 2014; van de Meene, et al., 2011). The research findings of Sub-project A3.1 support the need for these processes, which are further developed in this report. In summary and by way of introduction, the review of existing literature found that effective and transparent communication is needed to facilitate such relationships and develop a shared understanding (van de Meene et al., 2010). Clear mechanisms for accountability will support collaborative and cooperative relationships and facilitate input from stakeholders (van de Meene et al., 2011). Adequate resources from collaborating stakeholders are needed to support close working relationships and can be a clear indication of the organisations' commitment to the relationships (van de Meene et al., 2010).

Encouraging the importance of learning initiates processes that support continual improvement. Such processes may include: formal, one-way teaching; market innovation; or experiential learning (van de Meene et al., 2011). Learning new skills and competencies and building capacity across the water sector involves developing confidence in new approaches and the technologies needed to support them (Farrelly et al., 2012). Partnerships among researchers, policymakers, and practitioners have been shown to facilitate learning among stakeholders, and thereby develop evidence-based policy change (Farrelly et al., 2012). Learning can also help to reduce risks associated with water sensitive technologies (Blackmore and Plant, 2008) and can contribute effective mechanisms for risk management (Belliveau et al., 2006). For example, risk management may be undertaken by sharing risk among public and private organisations and other stakeholders, thereby 'considering risk management more openly' (van de Meene et al., 2011: 1121). Effective risk management for complex innovation requires communication through inter-organisational, cross-disciplinary forums, which facilitate the co-production of knowledge through lateral knowledge transfer and the establishment of trust (Dobbie et al., 2016).

Structures

In the context of this report, 'structures' refers to systems of rules, such as arrangements for ownership, authority, legitimacy, and accountability, and instruments that create incentives or sanctions (Bettini and Head, 2013). The literature identifies important structures for facilitating WSCs: having a clear vision (Cettner et al., 2014; Farrelly et al., 2012; Floyd et al., 2014), having clear and coordinated administrative arrangements, and using a variety of policy instruments (van de Meene, et al., 2010; van de Meene et al., 2011). These structures reflect the challenges identified by those practitioners who seek to implement new technologies and strategies beyond existing practice. For example, in some local government stormwater-harvesting schemes, local governments were previously drainage authorities but now also seek to become water supply authorities. Establishing performance targets with regular and effective monitoring and evaluation is also important (Farrelly et al., 2012). Coordinating governance functions across organisations and scales is a key challenge. This is reflected in the literature, where having clear organisational roles and responsibilities is frequently identified as an important attribute of sustainable urban water management (van de Meene and Brown, 2009; van de Meene et al., 2010; van de Meene et al., 2011). These structural attributes also reflect the varied governance approaches used in urban water management to date: the historical, hierarchical, top-down approach of command and control, legislation, and regulations; the market-based approach of New Public Management reflected in full cost pricing and incentives; and, more recently, learning through experience and capacity building. Different policy instruments are likely to be suitable for different contexts; for example, regulation is likely to be needed for those who lag when implementing new strategies, while financial incentives are likely to stimulate innovation and rapid implementation (van de Meene et al., 2011).

The above literature review has identified characteristics of actors, processes, and institutional structures that are likely to facilitate and support the implementation of WSCs. Key themes that are shared among actors, structures, and processes include learning, intra- and inter-organisational collaborative relationships with transparent communication and trust. Being willing to learn is important for both individual and organisational actors, with continual learning seen as an important

process to be undertaken within and among stakeholders. Working with other disciplines and stakeholders in trusting, respectful, and collaborative relationships was important for actors pursuing sustainable solutions for the complex problems that arise in developing WSCs. Being outward-looking, working together, and seeking continual improvement through learning and collaboration are themes that have been highlighted in Sub-project A3.1 and are further explored and analysed in the following sections.

Brief overview of the cases

Berkeley FIRST solar financing scheme, California, U.S.A.

The Berkeley Financing Initiative for Renewable and Solar Technology (Berkeley FIRST) case is an example of a local government initiating an innovative approach to supporting households to install photovoltaic solar panels on their properties. The initiative aimed to overcome the financial barriers of installation costs to reduce greenhouse gas emissions. The City of Berkeley (CoB) initiated, planned, and implemented the program with strong support from multiple council departments and external stakeholders. The scheme worked with two main organisations: the CoB and a private financial partner. This partner provided funding for home owners to install solar PV panels, and the home owners then repaid the loans through the property tax system. Using the property tax for repayments meant that the loan remained with the property and was transferred to new owners if the property was sold. This was a pilot program, which was then extended to the statewide California FIRST program – also known as a PACE (property assessed clean energy) program – which is currently operational. The Berkeley FIRST case was the first of its kind in the United States and the CoB fielded over 1000 enquiries about how the program would be implemented (Fuller et al., 2009). Note: this is an experimentation case in the collaboration analysis.

Fitzgibbon Chase urban development, Brisbane, Queensland

The Fitzgibbon Chase development was a strategic greenfield development located in Brisbane, undertaken by the state-owned Urban Land Development Authority (ULDA) in partnership with private sector interests. The development included two novel stormwater and rainwater harvesting schemes and influenced a number of best practice guidelines that were adopted into the planning schemes for subsequent ULDA developments. Anecdotal evidence suggested that some local governments also drew on the guidelines for their own planning policies. The case provides an interesting account of technological innovation and its adoption into planning policy frameworks through collaboration.

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 that a technological innovation could be progressed into a mainstream source of water supply. 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 groundwater replenishment as a new source of water eventually gained acceptance within water licensing and regulatory arrangements and in community perceptions. The case provides some important lessons in how to effectively collaborate across organisations, successfully engage the community on a novel idea, and work across different scales to translate an innovation into common practice. Note: this is an integration case in the collaboration analysis.

Portland green infrastructure adoption, Oregon, U.S.A.

The case of the City of Portland's (CoP) green infrastructure for stormwater management is an example of a local government developing and implementing substantial policy change over two decades. The policy change was initiated in response to the federal government's National Pollutant Discharge Elimination System (NPDES) permit requirements, established in the early 1990s under the *Clean Water Act 1972* to control point source stormwater and sewage pollution. As a result of the comprehensive policy response, Portland has been recognised as a national and international leader in green infrastructure. By using governance mechanisms such as internal and external advisory committees, together with demonstration projects and monitoring, the CoP overcame the 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 (BES) 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 the co-benefits of a green infrastructure approach. Note: this is an integration case in the collaboration analysis.

Room for the River policy shift, The Netherlands

The Dutch Room for the River (RftR) program is a well-known policy and program of capital works, which aimed to improve flood safety and spatial quality. The RftR program represented 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 among the general public, as much as policy and regulatory change. The national government used the existing policy development processes of independent advisory committees and investigations and a collaborative and consultative approach across multiple levels of government to formalise 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 into how such a significant policy change occurs at a national level, and how barriers at multiple levels of government can be overcome. Note: this is an integration case in the collaboration analysis.

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 very ambitious climate adaptation and densification strategies underway, Rotterdam seeks to innovate as it pursues sustainability. The City of Rotterdam partnered with transition researchers to: develop new ideas on how urban development could be conducted; identify and incorporate the citizen's aspirations for their future city; mobilise support; and activate entrepreneurship to innovate with new, sustainable urban renewal approaches. This case study offers an example of policy entrepreneurs connecting with community leaders in a managed process. This process was designed to establish 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. Note: this is an experimentation case in the collaboration analysis.

Scottish and Welsh water sector reforms, United Kingdom

During the privatisation of the water industry in the UK in the 1980s and 1990s, water services in Scotland and Wales were maintained under 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. Note: the Scottish case is an initiation case in the collaboration analysis.

United Kingdom 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 paradigm shift in governance, 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 fundamental governance reform to be implemented successfully. The English, Scottish, and Welsh cases provide an opportunity to examine the diverse governance responses and influencing factors and characteristics linked to a common policy driver for structural reform.

Toowoomba water recycling referendum on potable reuse, Queensland

Many Australian cities faced water shortages during the Millennium Drought, including Toowoomba, a city of 96 000 people in regional Queensland, west of Brisbane. In 2005 the Toowoomba City Council identified a number of strategies to address severe water shortages, including demand management and advanced water treatment to produce potable recycled water (PRW). The advanced water treatment was necessary to meet water demand under conditions of supply constraints, but a regulatory gap existed in Queensland regarding the supply of PRW. Various stakeholders mobilised; local political support was strong and there were indications of state and federal funding support. However, the anti-PRW group became very active, which caused some state and federal parliamentarians to declare their neutrality rather than support the project. Federal funding became contingent on the success of a local referendum, which was lost. Subsequently, the local and state governments negotiated the construction of a pipeline to connect Toowoomba with the regional water grid to solve the water shortage crisis. This case illustrates the impact of poor coordination and a lack of multilevel governmental support, which resulted in the failure of an innovative solution to a water supply problem. Note: this is an initiation case in the collaboration analysis.

PART 1

Collaboration for effective governance of change

Literature review: collaborative principles and practices

Since the 1980s there has been extensive research in the literature on the nature and effects of collaboration as an alternative form of collective information sharing, deliberation, planning, and service delivery. Gray set the tone when she argued that collaboration should be seen as a process 'through which parties who see different aspects of a problem can constructively explore their differences and search for solutions that go beyond their own limited vision of what is possible' (Gray, 1989: 5). The wide interest in collaborative approaches arises from the common observation that when multiple organisations combine their efforts to address an agreed problem, they can achieve better outcomes than if they worked in isolation or tackled the problem from conflicting positions. On the basis of extensive research in the case study literature on the nature and effects of collaboration in social and environmental policy, we follow Emerson et al. (2012: 2) in defining collaborative governance broadly as 'the processes and structures of public policy decision making and management that engage people constructively across the boundaries of public agencies, levels of government, and/or the public, private and civic spheres in order to carry out a public purpose that could not otherwise be accomplished'.

According to Himmelman, the form of cooperation and collaboration needs to be appropriate for each particular context. Its potential success depends, firstly, on the extent to which 'three limitations to working together – time, trust and turf – can be overcome', and secondly, on the extent to which agreement can be achieved about 'a common vision, commitments to share power, and responsible and accountable actions' (Himmelman, 1996: 27).

This report analyses successful approaches for urban water sustainability by taking seriously the institutional process factors associated with successful collaboration in the face of cross-sectoral complexities. In light of the commentary above on the nature of sustainable urban water management, it is evident that the traditional approach for water governance, which relied on closed decision-making processes driven by water engineers, is no longer viable. New water supply options and management approaches are challenging current institutional arrangements, such as legislated management frameworks, policy directions, and regulatory systems. These features of institutional settings are interwoven. If innovative practices are to be better supported, then such features will need to be comprehensively reassessed. This will affect the roles, responsibilities, and established conventions of organisations responsible for policy setting, service delivery, and resource management, and for environmental, human health, and financial regulation.

As such, a negotiated approach will be necessary to change aspects of the institutional setting in order to:

- align legislation, policy, and regulation to ensure water management outcomes can be delivered as effectively as possible, given the complexity and interdependence of these institutional components
- foster acceptance and ownership of the new arrangements through consultation with organisations and agencies
- build the capacity for key organisations to collaborate, through establishing the relational foundations needed to ensure that future challenges are addressed through more responsive institutional arrangements.

Successful collaboration requires attention to both the goals (aims and directions) and the methods (governance arrangements) required for policy and program changes. In other words, it is essential to examine not only the outcome factors (such as measurable service improvements, public understanding, and political legitimacy), but also the process factors (such as the leadership role of

key actors, transparent decision-making, and appropriate resources, skills, and capacities). The research literature indicates that collaboration may have some advantages over more rigid bureaucratic approaches when the collective goal is to identify and implement innovations. Collaborative processes, if well led and resourced, can generate the creative, adaptive, and flexible qualities required for tackling systemic problems in innovative ways. Those qualities are more difficult to achieve through alternative governance approaches such as traditional regulatory directives. Specifically, it is often suggested that collaboration across boundaries can: help to define important complex problems that have eluded past attempts; focus energy on new priorities and set agendas; create momentum by bringing together all stakeholders; draw on wide expertise and diverse sources of knowledge; value the practical experience of those working in the field; learn from and further refine effective practice models; mobilise potential champions, sponsors, and funders; and help with information sharing and mentoring (Head, 2014).

Bryson and colleagues (2006) surveyed the research literature and identified four sets of issues for cross-sector collaboration: initial conditions, process components, contingencies and constraints, and outcomes. Firstly, in relation to the initial conditions that might give rise to cross-sector collaborative responses, it was found that collaborations are more likely to form in response to 'turbulent' contexts. Public policymakers are more likely to encourage such responses when the 'separate efforts' of the various actors are believed unlikely to 'fix the problem'. Collaborations are on firmer ground when there has already been some development of network relations, shared views about problems, and champions of joint action. Secondly, in regard to process components, the nature of the initial agreement about strategic purposes is critically important for subsequent working across boundaries. This foundation affects both the perception of the collaboration as a legitimate vehicle for joint efforts and the willingness of champions to provide various types of supportive leadership. Working to enhance cross-group understanding, include key stakeholders in negotiations, and utilise their knowledge builds collaborative strength. Collaborations always seek to incorporate conflicting viewpoints, so it is important to equalise influence and manage conflict effectively (Bryson et al., 2006).

Thirdly, in regard to contingencies and constraints, the research literature suggests that system-level planning activities are likely to involve more negotiation than administrative-level partnerships and service delivery partnerships. Different institutional logics among the partners may hinder agreement on key elements of process, structure, governance, and desired outcomes. And collaborations work better if they use strategies for addressing 'power imbalances and shocks'. Fourthly, in regard to achieving outcomes, the research literature suggests that achieving results will always be difficult. It is important to promote resilience, engage in regular review, and aim to pursue a range of direct and indirect benefits for stakeholders and clients. Collaborations are more successful if they can utilise each sector's strengths while compensating for any weaknesses. They are more likely to produce outcomes if stakeholders establish and use a rigorous results management system that monitors information, tracks inputs and processes, and builds accountability for outcomes in close association with key political and professional groups (Bryson et al., 2006; Head, 2014).

Emerson and colleagues (2012) argue that the main drivers of collaboration are purposeful leadership, incentives for action, perceived interdependence, and the need to overcome uncertainties. Building shared commitment and trust is an iterative, long-term process, which becomes the basis for generating the knowledge and capabilities needed for effective joint action. The survival of collaborative processes also depends on their effectiveness in achieving desired impacts: 'cross-boundary engagement must generate "returns" for partners to justify their continued involvement to their own organizations and constituents' (Emerson et al., 2012: 19). Constant adjustments are made to goals and processes as the partners build their capacity for joint action.

The time period for achieving benefits can also affect the partners' motivation and commitment, especially if substantial efforts and resources are required in the early stages. It can be difficult to maintain collective commitment to innovative efforts when the initial wins appear small, even though significant positive outcomes might emerge in the long term. Weick (1984) argues persuasively that achieving 'small wins' along a strategic pathway toward longer-term goals helps maintain momentum and cohesion. Partners can then continue to build capacities and move their projects through the various developmental stages.

In applying this analysis to the urban water sector and the various patterns of reform that have been evident in recent years, it is important to emphasise that the collaborative arrangements appropriate for each problem and policy challenge will need to be tailored to each situation. The collaborative models and processes that 'work' most effectively will be unique to each jurisdiction, because the institutional context, past and present, shapes and constrains the nature of policy leadership, the capacity of organisations to work together, and the resources available for problem-solving. The historical legacies and the recent experiences of key actors shape the possibilities for relationships within organisations and across sectors. The contest of ideas in the political realm also provides constraints, risks, and opportunities.

This section of the report provides insights into the principles and processes underlying successful collaboration for sustainable urban water management. The key opportunities for learning arise through analysing case studies as examples of successful collaborative efforts.

Case studies on collaborative innovation

The case studies discussed below are presented as examples of successful innovation in Australia and internationally. These successful cases are contrasted with one negative case – the failed Toowoomba referendum on potable water reuse. What, if anything, can be learned from a negative example? Certainly the Australian water professionals whom we interviewed claimed to have learned a great deal about how to build stronger support for successful innovations. Throughout these case discussions, a number of key themes emerge concerning formal and informal networks, evidence of trust-building, leadership, and communication and information-sharing strategies. A more detailed description of the research approach is included in Appendix A, and brief overviews of the cases have been presented above in the Introduction (see pages 10–12).

The Toowoomba water recycling referendum 2006 (initiation case)

This case centres on one negative example, which is marked by poor coordination and a lack of multilevel governmental support, a case from which others have explicitly drawn lessons about collaboration, good governance, and the need to work closely with stakeholders.

Toowoomba, a regional city of 96 000 to the west of Brisbane, suffered a dire water-supply crisis during the Millennium Drought. The plight of this city attracted national attention at the height of the urban water-security crisis across much of Australia in 2005–08. The drought had badly affected the water storages on which the city relied, and the council commissioned expert assessments of future water supply options. This advice indicated that water conservation (demand management) measures were crucial but would not be sufficient to solve the underlying supply challenge. A new water strategy was adopted by the city council in mid-2005. Under this strategy, the council proposed water conservation measures and incentives, and, controversially, an advanced water treatment plant designed to produce potable recycled water (PRW) from wastewater sources (Hurlimann and Dolnicar, 2011).

Local authorities operate under mandates provided by the state level of government. Local councils are not self-sufficient in deciding and implementing matters such as PRW; they require regulatory authorisation, financial support, and legitimation from higher levels of government to undertake such a scheme. At that time, Queensland had a regulatory gap in relation to PRW, although the state government was examining the issues during 2006–07 (Power, 2010). At the local political level, the municipal councillors strongly supported PRW, and there were some indications that the state government and the federal minister (on the recommendation of the National Water Commission) would provide matching funding to cover more than half the capital cost of the new facility.

Local opponents quickly launched an advertising blitz against 'drinking poo', with substantial campaign funding from Clive Berghofer, a well-known property developer and former mayor. This strong opposition caused some state and federal MPs for the region to declare their neutrality instead of pledging the political support required to confirm the legitimacy of the project. The federal water minister, Malcolm Turnbull, announced in March 2006 that federal funding ($23 million, to match similar state funds) would be dependent on the outcome of a local referendum, to be held in July 2006. The Queensland government immediately concurred with this process. Following an intense and bitter campaign, the referendum was lost by 62% to 38%.

Having thereby lost federal financial support, and with the water crisis continuing to deepen, the council and the state government negotiated a much more expensive option, namely, a new pipeline to connect Toowoomba with the South East Queensland (SEQ) Water Grid at a cost of $187 million, with the council required to pay more than half the costs (Uhlmann and Head, 2011). Regulatory reform by the state government eventually followed in 2007–08, to authorise future PRW schemes and to facilitate the state's urgent decision to build its own major advanced water treatment scheme, the Western Corridor recycling facility, intended to provide PRW for the whole Brisbane region. The PRW would be pumped via a pipeline to the Wivenhoe Dam and thus into the SEQ Water Grid. This facility was completed, but it was mothballed for political and financial reasons when seasonal rains returned in 2010–11.

Thus, the water security crisis had provided a trigger in 2005–06 for decision-makers at local and state levels to explore alternative sources for producing potable water. Water professionals had been united in attesting that advanced wastewater treatment facilities would meet required standards, and financial support became potentially available as the drought deepened. Nevertheless, the innovation did not proceed. With hindsight, there were three main reasons why the proposed Toowoomba policy innovation in 2006 – the direct introduction of PRW into a city water supply – had a high probability of failure at that time. Analysis of reasons for this failure provides insights into the factors necessary for successfully developing more positive initiatives in the future.

1. **Political leadership in a multilevel system was largely fragmented.** Arguably, in a complex policy/regulatory context in a multilevel system, the levels of government need to be mutually supportive. Although the council leaders attempted to forge a united front among the three levels of government, the basis for a cohesive strategic direction had not been created.
2. **The regulatory gap was fatal.** PRW was not explicitly permitted by Queensland laws in 2005–06, and this absence of authorised standards and agreed decision-making processes played into the hands of those who sought to veto or delay decisions. In a multilevel system of governance, local governments require legislative/regulatory authorisation for many of their activities, especially where innovation might be required. In this case, regulatory silences, gaps, and inconsistencies frustrated the intentions of those who sought innovation. Lack of authorisation implied a lack of legitimacy, which could have affected the capacity to borrow funds, sign contracts, and gain the support of stakeholders and the general public.
3. **The policy debate was politicised and polarising, and this undermined science-based innovation.** This case echoes many decades of international experience with populist campaigns against the introduction of water fluoridation (to improve dental health). Policy debates can rapidly become captured by appeals to emotions, fears, personal values, and special interests. The better alternative is to develop a strategy for communication and education, over an extended period, which fully incorporates key stakeholder groups and representatives of community interests.

The implications of this case are that pursuing breakthrough ideas requires public and political support, and the champions of change need to be well prepared for a wide range of challenges. The balance of incentives and sanctions for innovation is usually weighted in favour of the status quo. Political contingencies and opportunism can sidetrack even well-planned strategies. The case for change (i.e. benefits outweighing costs) is but one voice in a noisy series of claims and debates. Government policymakers sometimes lack the skills, capacities, and permission to develop coherent strategies that facilitate change while ensuring that risks are well managed. In many cases, partnerships and collaborative capacity must be forged between stakeholders, organisations, or levels of government if innovative policy is to be created and implemented.

In summary, several key insights emerge from this negative example:

- Technical solutions for shared concerns about community water supply problems, even with the strong and widespread support of water professionals, cannot be implemented without careful attention to gaining support and understanding from opinion leaders in politics, business, and the media.
- Cohesive leadership is essential. On issues that may be subjected to arguments based on fear and emotion, disunity among opinion leaders can be fatal for science-based innovation.
- Local referenda almost always fail to support innovation; decision-making at a larger (e.g. regional) level may be more appropriate.

- Politicians and communities may respond better if they are offered a choice between options that are clearly argued and costed, rather than being simply invited to support or veto just one preferred option, with no responsibility for selecting between alternative graduated solutions.
- Early engagement with the community in developing future plans is preferable to asking community members to endorse a proposal drafted by experts. This is also observed in the Groundwater Replenishment Trial (GWRT) case presented later.

Scottish water sector reform (initiation case)

The structural reform and introduction of competition policy across the Scottish water sector during the 1990s and 2000s provides insight into how leadership and community consultation contribute to collaboration. In the 1990s, water supply organisations in Scotland were restructured in several stages, progressing from public water authorities to three regional water authorities and, finally, to Scottish Water, which operates throughout Scotland. The *Water Services etc. (Scotland) Act 2005* created a limited market for competition, provided the means for new participants to enter the market, and established market rules.

Collaboration and networking among government, industry, and the community was critical to the planning and implementation of these reforms. Refer to Table B1 for the governance mechanisms associated with collaboration in this case study. Collaboration and networking can take formal or informal paths. In the Scottish Water case, formal opportunities for stakeholder interaction occurred through feedback committees, panels, and forums. The government, Scottish Water, the Water Industry Commissioner, and Consumer Focus (a customer representative group) also established the Customer Forum to seek community opinions, to undertake research into customers' service priorities, and to inform Scottish Water's business plan and the statutory tariff review in 2014 (Littlechild, 2014). The Customer Forum was considered innovative as it involved government, industry, and the regulator conducting research into consumer opinions and priorities, and the findings were incorporated into formal planning and performance review processes (Littlechild, 2014). Requirements for consultation through various forums were embedded in legislation including the *Water Environment and Water Services (Scotland) Act 2003*, which incorporates structures and processes for ensuring participation and requires explicit consideration for integrating activities across departments and agencies (specifically in relation to flood management).

Informal networking was undertaken when three expert advisors to the Water Industry Commissioner lobbied and worked over a period of two years (2003–05) to persuade politicians and their public servants to support the competition reforms. Subsequently, the *Water Services etc. (Scotland) Act* passed in 2005 with bipartisan political support (Sawkins, 2012). The Water Industry Commissioner's leadership is evident not only in this example, but also through his initiation of the Customer Forum, and his tenacity in working to realise the reforms over a long period. Simpson (2013) contends that the Water Industry Commissioner's work was instrumental in facilitating these reforms and was a 'remarkable achievement' (Simpson, 2013: 6).

The timing of various collaborative and networking opportunities also influenced the success of the Scottish water sector reforms. Importantly, the community and other stakeholders were included in discussions and/or engaged where appropriate to develop shared understanding of the issues. The engagement with and discussions among stakeholders enabled policymakers to address stakeholders' concerns, and this resulted in a more flexible regulatory framework. In another example of how the timing of collaboration affects the reform process, three expert advisors lobbied to gain political support for the competition policy. This occurred in a critical window between 2003 and 2005, after the Scottish Executive had released consultation papers in 2000 and 2001 and before (and then during) the planning of the competition reforms. Without the support of the politicians and their public servant staff, it is unlikely that the stakeholder input would have been incorporated and thus the reforms would not have passed parliament.

Trust is another factor that contributes to the success of collaboration and networking, but it may also develop as a result of these activities. Effective information sharing and management procedures contribute to transparency and trust among stakeholders. In Scotland, numerous government inquiries and reports were undertaken at the start and during the middle of the reform process. Additionally, since the reforms were implemented, Scottish Water and other water suppliers have been required to report annually to the Water Industry Commission and Scottish Parliament. These

public releases of information contribute to a culture of transparency among industry and stakeholders, thus facilitating trust among the parties.

Key insights from this case study include:

- Formal opportunities for a wide range of stakeholders to be heard facilitated the legitimacy of the reforms.
- Informal lobbying was critical in securing political support.
- The timing of consultation and collaboration was effective in garnering a broad base of support.
- Trust was facilitated through the transparent reform process and information provided about performance.

Berkeley FIRST (experimentation case)

The City of Berkeley (CoB), together with a private financial partner, established a scheme to provide funding for home owners to install solar photovoltaic (PV) panels. Home owners then repaid the loans through the property tax system. Using property tax for repayments meant that the loan remained with the property, being transferred to new owners if the property was sold. Collaboration and networking among stakeholders – internal and external to the CoB – were critical to the success of this innovative project. Table B2 describes the governance mechanisms associated with collaboration in this case study. The following section discusses how these attributes contributed to effective collaboration and networking in Berkeley.

Firstly, the Berkeley City Council was given a clear mandate from the community to pursue measures to reduce greenhouse gas (GHG) emissions when, in 2006, over 80% of voters supported a local government resolution to reduce GHG by 80% by 2050. This formal consultation enabled Council to initiate the Berkeley FIRST program. Interdepartmental discussion and collaboration initiated the project and then external experts from the Renewable and Appropriate Energy Laboratory (RAEL) at the University of California (Berkeley) and solar installers joined to prepare the initial plan for the program. The plan was presented to councillors in November 2007 (CoB, 2007). Subsequently, these internal and external stakeholders, together with financial experts, designed and planned the program. Council staff and the installers formally collaborated during the community education phase when installers helped provide community workshops. Council staff also provided advice to residents and answered questions.

Secondly, while formal mechanisms provided most of the opportunities for collaboration and networking among stakeholders, informal networks were critical to the project's success. Collaboration with RAEL academics appears to have been particularly fruitful, as these experts were involved in program design, and informal relationships with Council staff provided links to a funding organisation, Renewable Funding. Subsequently, after numerous efforts by Council staff to identify and engage a funding organisation, Renewable Funding became the Berkeley FIRST financial partner (CoB, 2008b). Without the collaboration and the established trust between Council and the university, it appears that the program would have needed to overcome this hurdle in another way, as it would have been unable to proceed without a financial partner.

Information sharing between Council and stakeholders, including councillors, installers, and the community, was essential to the success of the project because it facilitated a shared understanding of the problems and how the program was to be implemented. This shared understanding enabled councillors and Council staff to collaborate effectively. Council staff shared information with councillors through regular reporting. This included the councillors in the process and gave them opportunities to ask questions and ensure the program was sound, which then helped them support it.

Collaboration and networking were used as means to provide information to installers and then engage them in program design. After the Berkeley FIRST program ended, Council staff used stakeholder feedback to evaluate the program. This evaluation provided opportunities for stakeholders, particularly the solar panel installers and participants, to have input into the review and contributed to an effective relationship between the installers and Council.

Leadership from the mayor and senior managers, together with a culture that supported innovation and collaboration within Council, enabled the project to go ahead. The mayor promoted the creation of the Special Energy Financing District to councillors in 2007 to enable the project. Throughout the program, senior managers such as the city manager and staff in the Mayor's Office supported the preparation of reports and administrative tools, which were submitted to the councillors for their approval. Without this political and administrative leadership, the Berkeley FIRST program would not have been realised.

Key insights from this case include:

- Information sharing was important to develop a shared understanding of the problem and the proposed solution.
- The collaboration was undertaken mainly through formal processes but informal networks provided opportunities in unexpected ways.
- Formal interactions or collaboration enabled feedback and input from a variety of stakeholders.

Rotterdam infrastructure adoption (experimentation case)

Rotterdam is the economic capital of the Netherlands and is working to address some key sustainability and urban renewal challenges. A transition process aimed at bridging the gap between aspirational sustainability visions, such as reducing carbon dioxide emissions, and current practices was undertaken within the Rotterdam City Council. Refer to Table B3 for a summary of the governance attributes related to collaboration in this case study. The transition team from within the City were responsible for implementing the transition management process (Roorda and Wittmayer, 2014). This team comprised two Rotterdam City Council staff from the planning department and two staff responsible for the biennale project. The Rotterdam Biennale was a festival celebration of urban architecture and sustainability held in 2012. Transitions management researchers guided the team through the process.

Interaction among the transition participants was based on formal collaboration through workshops with key city stakeholders. Researchers from the Erasmus University Dutch Research Institute for Transitions (DRIFT) provided the transition team with expertise on transition management, helped facilitate the workshops, and evaluated the process at the end. Network members outside the transition team comprised attendees at internal Council workshops and external 'frontrunners' (leaders in sectors related to sustainability and urban development, such as architecture, urban planning, and housing services) who also participated in formal collaborative processes.

Formal collaboration continued within Council, with the transitions team developing internal Council discussion and commitment to sustainability, while also preparing for the Biennale envisioning process. While the formal collaboration mechanisms are evident in the case documents and are discussed in this section, informal opportunities for networking and collaboration were identified through the transition team's meetings and discussions.

Stakeholder education and engagement was a central part of the project: the transition team worked with frontrunners in order to engage community leaders on climate change and urban livability. The transition team also sought to explore how Rotterdam would develop without the Council leading from the front. Despite these examples of collaboration, the work of the transition team was viewed as a novelty rather than a mainstream approach. However, it appears that trust and a shared understanding of the problem at hand developed over time.

Some key insights from the Rotterdam case include:

- Formal collaboration events provided opportunities for trust and a shared understanding of the problem to develop.
- Events (i.e. Rotterdam Biennale) that occurred concurrently with the transition process were used to generate support among Council staff for the concept of transitioning.
- Collaboration among academics and Council staff was important for facilitating the transition process.

Groundwater Replenishment Trial, Western Australia (integration case)

The Groundwater Replenishment Trial (GWRT) conducted by the Water Corporation in Western Australia provides an example of the time and resources needed to develop trust among stakeholders concerning advanced and innovative water treatment and recharge technologies, and to amend regulatory, monitoring, and policy frameworks for ongoing support of the groundwater replenishment strategy. The data for this case study are taken from Bettini and Head (2016).

Formal collaboration strategies used effectively during the GWRT included an Interagency Working Group (IAWG) and the Groundwater Technical Reference Group (GTRG). The IAWG comprised the Water Corporation (the lead organisation in the GWRT), the WA Department of Health (DoH) (human health regulator), the Department of Water (DoW) (responsible for water allocation, including of recycled water, and for protecting groundwater supplies), and the Department of Environment and Conservation (DEC) (environmental health regulator). The IAWG was formed to address the legislative changes needed to allow water processed through an advanced water treatment plant to be recharged into the groundwater, as it had been previously defined as wastewater and therefore was not permitted to be recharged. The GTRG was a panel of research scientists, consultants, and practitioners with groundwater expertise, established to provide scientific advice during the trial.

These formal inter-organisational groups provided a clear foundation for forming working relationships among key stakeholders. The IAWG was responsible for driving the project, and regular meetings provided staff with frequent opportunities for interaction, which resulted in strong and ongoing relationships. Staff changes within key decision-making positions can be a serious challenge for such long-term projects. This problem was overcome, in this case, by having a key contact person within each partner organisation, who could help to engage successive decision-makers on the project.

The strategic nature of these formal arrangements and interagency interactions and agreements also contributed to the GWRT's success. From the beginning of the trial, strategic thinking was evident in ensuring that the regulators were involved early in the project. This strategy not only developed co-learning and joint ownership of the objectives of the project, but also meant that the restrictive regulatory arrangements could be challenged and new arrangements could be developed and tested during the trial itself. The IAWG members focused on the 'bigger picture', prioritising the success of the trial over potential sector-specific benefits (e.g. environmental benefits). Another example of strategic engagement was the use of the Environmental Protection Authority (EPA) as the lead agency in the public engagement around the project. This was an effective use of the EPA's role as environmental protector, and thus the community's perception of the EPA as a neutral, expert organisation. The CSIRO was engaged to lead preliminary feasibility studies, and this contributed to the independent nature of the scientific evidence underpinning the project.

Focusing on relationships within organisations was also crucial, with the Water Corporation and DoW each setting up internal teams to look at water recycling. Within the Water Corporation, this was critical in establishing internal support for the GWRT concept. An internal culture of openness, shared by the Water Corporation project staff, set the scene for ongoing relationships with internal and external stakeholders and the broader community. Project staff considered this openness within and among organisations to be the only way that the project could proceed, given the potential risks to water supply and community support. This culture of openness facilitated the development of trust within the Water Corporation. Internal trust-building was needed to overcome the potential risks that reusing recycled water posed to the Water Corporation's business, as this was a substantial departure from previous practice.

Central to the success of the GWRT was the community and stakeholder engagement strategy, which was initially tentative and diligent, wide ranging, and focused on transparency as a core attribute. The Water Corporation engaged early with peak bodies and industry associations to survey key industry stakeholders' perceptions, ensure they were well informed, and address or mitigate the issues that could derail the concept as it progressed. The stakeholder engagement strategy involved an extensive range of communication strategies focused on face-to-face communication to provide open and transparent access to information about the trial. Face-to-face communication also provided opportunities for the community to discuss issues, raise concerns, and have input into the process, thus building trust and acceptance of the proposed new water supply. A visitor education centre was constructed at the advanced water treatment plant, and other communication methods, such as an

informative website, newsletters, community forums, and a social media campaign, were also used. Additionally, regular briefings for 120 stakeholders were used to ensure their questions and concerns were addressed. Comprehensive monitoring and evaluation was undertaken around the engagement activities to follow community understanding, perceptions, and attitudes. Additionally, at the conclusion of the trial, the Water Corporation sought an independent audit of the trial's results, and invited a response or endorsement from regulators. This further enhanced the transparency and trustworthiness of the replenishment option for groundwater water supply.

Outreach to ministers and ministerial staff developed ongoing support for the project through successive governments. Project staff worked to embed the water strategy through networking and liaising with ministerial support and policy staff. Regular briefings were held with relevant ministers and shadow ministers, and other parliamentary members, both during the development of the trial and throughout its implementation. This built support and, importantly, ownership of the project across political divides.

In summary, key insights from this case include:

- Trust was facilitated by sharing information and being transparent about the program details.
- A substantial amount of time was required to conduct an effective community education and engagement program.
- Both formal and informal collaboration processes were needed to successfully implement the GWRT, including regulatory reform.
- An open culture among IAWG members influenced the operation of the project and also the design and implementation of the community and stakeholder engagement program. The members were willing to work across organisational departments and across organisations to achieve the end result.

Room for the River (integration case)

The Room for the River (RftR) case is an example of national-level policy change for flood management. The Dutch national government led the shift in policy stance from fighting water to living with water and making 'Room for the River'. After this policy shift, a program of on-ground works was developed; however, the implementation of the on-ground works lies outside this case study. The RftR case relied heavily on stakeholders collaborating and networking over many decades. Refer to Table B5 for a summary of the governance mechanisms associated with collaboration in this case study.

A number of formal consultation and collaboration strategies were used to facilitate transparent development of the policy approach, and the subsequent program of on-ground works. Initially, the national government conducted several inquiries and released reports requiring community and stakeholder feedback. The national government also established an advisory committee, the Water Management in the 21st Century Advisory Committee, which reported to government and whose advice was accepted largely without amendment. Additionally, advice was sought from other external committees and independent research and advisory organisations and then incorporated into the government's position papers and subsequent consultation programs. The policy position papers provided formal opportunities for the community to contribute to the policy's development. In formalising agreements between different levels of government, the national government led negotiations to establish intergovernmental agreements signed by national, provincial, and municipal governments and water board associations, which set the foundation for future programs of policy development and implementation.

While the case material contains limited information on informal networking, initial links between scientists and policymakers helped develop the shared view that current flood management approaches were inadequate for managing future risks. These links, together with the series of investigations and position papers, facilitated the development of shared problem frames and the realisation of the need for a new approach to flood management.

Both formal and informal collaboration strategies contributed to the shift in problem frames and the approach to risk management in the Netherlands. These in turn prompted the shift in risk management approach from 'fail-safe' to 'safe-to-fail', which in turn led to the RftR policy and on-

ground works program. Each type of collaboration provided opportunities for different stakeholders to come together and share their views and perspectives, learn from others, and contribute to developing solutions to the flood management challenge. The national government's leadership was also critical in providing formal opportunities for collaboration and consultation, authorising a change from the status quo, and stimulating development of the new policy using formal administrative mechanisms. Underpinning the national government's leadership and the collaborative mechanisms was the Netherlands' national culture of consensus decision-making.

The consensus-based decision-making model provides room for stakeholders (sometimes those historically opposed) to engage in constructive discussion to overcome barriers and develop solutions. When employing this model, stakeholder engagement and collaboration is not necessarily founded on trust; however, it can often serve to promote trust among stakeholders. At the very least, there is an expectation that discussion and engagement among stakeholders should occur before decisions are made. Thus, this culture of constructive discussion was influential during the RftR collaboration and networking.

As an outcome of the collaboration, information was shared among stakeholders through the formal collaboration and consultation processes (e.g. government and advisory council reports and position papers). This information sharing, together with formal intergovernmental agreements, contributed to high levels of transparency, which facilitated policy development. The two key policy objectives of the RftR were: to guarantee safety in the first instance and to improve spatial quality through water management works.

Key insights include:

- Changing policy can take a long time (in this case, decades).
- Consensus-based decision-making is a foundation of Dutch culture across multiple policy areas. This provided an expectation of engagement and deliberation for the RftR policy change among stakeholders and provided opportunities for trust to develop.
- The RftR project mainly engaged in formal collaborative strategies which provided opportunities for diverse stakeholders to engage with flood management policy.
- Both the time taken and the use of formal strategies enabled stakeholders to develop shared understandings.

Portland green infrastructure (integration case)

The City of Portland (CoP), in the north-western United States, developed a comprehensive suite of programs to improve stormwater management from the mid-1990s and is considered to be a national leader in green infrastructure and water sensitive urban design. After a federal policy directive through the *Clean Water Act (1972)* and National Pollutant Discharge Elimination System (NPDES), the CoP sought to exceed best practice and implement effective and comprehensive green infrastructure throughout the city. The comprehensive program of policy development and implementation was facilitated by a strong culture supporting change in the Bureau of Environmental Services (BES). With this culture, effective strategic planning, and political support, the BES led the cultural change across the organisation. Internal and external stakeholder committees were a key mechanism for formulating the policy and programs over time. Refer to Table B6 for governance attributes associated with collaboration in this case study.

Formal collaboration occurred through a variety of internal and external stakeholder committees, including the:

- Stormwater Policy Advisory Committee (1996) – internal and external committee focused on recommendations for post-development stormwater management
- Stormwater Advisory Committee (1999) – external and internal committee focused on recommendations for the Stormwater Management Manual
- Sustainable Infrastructure Committee (2001) – internal cross-bureau committee focused on applying green infrastructure research locally
- Green Streets Cross-Bureau Team (2005) – cross-bureau and cross-agency committee focused on implementing green streets infrastructure in the relevant council policies.

These committees reported regularly to Council, and thus the formal collaboration led to information sharing and facilitated transparency. Additionally, the committees were important in influencing the problem frame across Council and the community, thereby generating support for change and acceptance of the comprehensive programs for implementing green infrastructure.

Under the auspices of the Sustainable Stormwater Management Program (a formal council program that monitors and tests demonstration projects), multidisciplinary program staff networked and shared information with other catchment management programs on an informal basis.

The lead CoP bureau, the BES, was widely considered to be the key influencing group, and the policy change is considered to be a team effort. However, political influence and leadership at the beginning facilitated the collaboration among members of the Stormwater Policy Advisory Committee.

Implementation of the green infrastructure programs was supported by a community culture that valued environmental protection. This also provided the context for political leadership to implement green infrastructure. Together, this political and community valuing of environmental protection supported the development of stormwater protection by using green infrastructure techniques throughout the CoP.

In summary, key insights from the Portland green infrastructure case include:

- Internal organisational leadership was important in creating an organisational culture that valued the environment, and leaders were persistent in working toward organisational and policy change.
- The formal opportunities for collaboration (i.e. committees) were outcome focused which both maintained the momentum and achieved practical outcomes.
- The broader community valued environmental protection, so the community supported the CoP's implementation of green infrastructure.

Implications and conclusions for collaborative governance

Overview

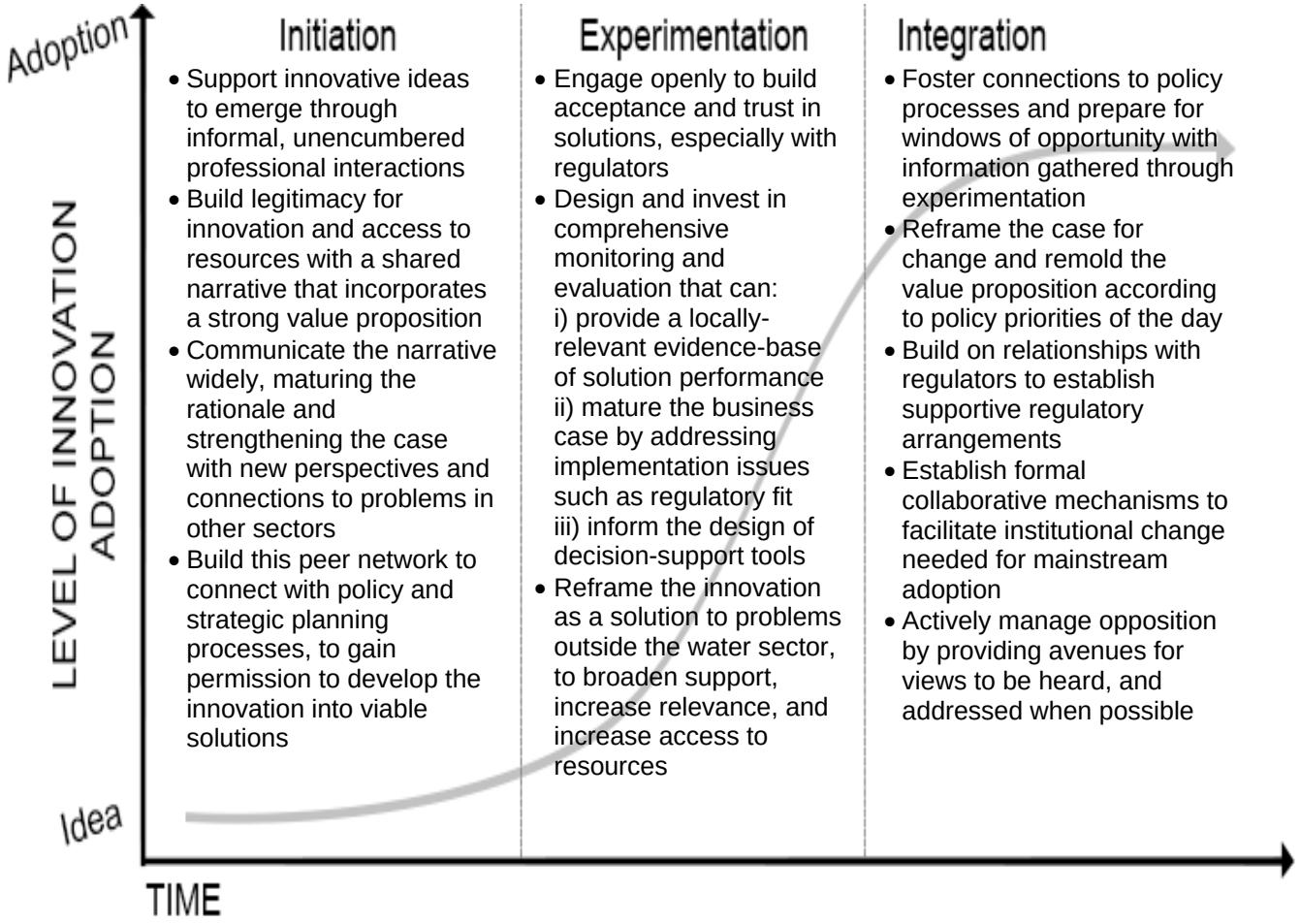
Overall, a number of insights are shared among the cases. Firstly, adequate time must be allowed to develop shared understandings of what the problem is and how it can be solved, and then to design programs to implement the solutions. This observation was particularly evident in the cases of the WA GWRT and the Netherlands' RftR. Secondly, transparency facilitates the development of trust as stakeholders learn to share information, which informs their own decision-making. Finally, significant formal collaboration mechanisms provided opportunities for input from a wide variety of stakeholders. In contrast to formal collaboration, where interaction occurs among a diverse group of stakeholders, the informal collaboration observed in these cases typically focused on interaction between colleagues. The potential impact of informal collaboration is critical, as observed in the Scotland and Berkeley FIRST cases.

Collaboration and innovation adoption

The case studies have been linked with the three innovation phases identified in A3.1 – 3 *Better governance structures and strategies to support innovation and adaptability* (Bettini and Head, 2015): initiation, experimentation, and integration (refer Figure 1 for strategies for the different phases). The case studies and the different innovation phases are as follows:

- Initiation: Toowoomba water recycling and Scottish water reforms
- Experimentation: Berkeley FIRST solar finance support and Rotterdam infrastructure adoption
- Integration: Groundwater replenishment trial, Room for the River, and Portland green infrastructure.

Figure 1: Key strategies to progress through innovation adoption



Considering the collaboration analysis and the different innovation phases, different approaches to and outcomes from collaboration are evident. The initiation phase is a smaller scale, less formal part of the innovation adoption process and is therefore characterised by more informal collaboration processes and information provision. However, transparency is still an important quality in the processes and procedures in this phase. Informal collaboration processes were observed in the Scottish water reform case when three advisors to the Water Industry Commissioner lobbied politicians to support the reforms. This lobbying resulted in bipartisan support for the reform legislation, thus making the reforms stronger and less likely to be reversed when a different political party was elected. In the Toowoomba case, there was a lack of informal collaboration to develop support among opinion leaders in politics, business, and the media. Support from such stakeholders is critical when implementing innovative water projects. Establishing transparent processes, such as for information sharing, facilitated the development of trust in Scotland, thus supporting ongoing collaboration.

Both formal and informal collaborative processes facilitated the development of shared understanding in the experimentation phase. Formal opportunities were important in the Rotterdam and Berkeley cases for enabling both internal and external stakeholders to participate in the innovation adoption process. The importance of informal collaboration processes was less evident in the Rotterdam case; however, such processes were critical in the success of Berkeley FIRST, where they enabled a financial partner to be identified. Engaging in a variety of mechanisms for collaboration provided opportunities for further trust to be developed, which was evident as stakeholders developed shared understandings of the problem and potential solutions in these cases.

The case studies for the final, integration phase employed mainly formal collaboration processes, particularly around community and external stakeholder engagement. This shift in collaboration fits smoothly with the integration phase's focus on linking innovation with policy processes. The WA GWRT, the Dutch RftR, and Portland green infrastructure cases all demonstrate the substantial time needed to effectively engage with stakeholders and the importance of providing multiple opportunities for communication and feedback. A key attribute of leading organisations, which contributed to ongoing engagement, was an open culture. That is, viewing the engagement process and outcomes as valuable even when the feedback was not necessarily supportive. These attributes are particularly evident in the WA GWRT and the Dutch RftR cases.

Collaboration and practice

A number of broad recommendations for practice have been identified from the case analysis, as follows:

- Develop an awareness and understanding of the advantages and disadvantages of formal and informal collaboration methods at different phases of innovation adoption. Initially, before public commitments have been made, informal methods are likely to be effective as stakeholders can express doubts, ask questions, and overcome any reservations before making public statements of support. More formal collaboration strategies are likely to be effective during the experimentation and integration phases.
- Look for strategic opportunities for advancing innovations through each phase; informal networks may provide these unexpected opportunities.
- Use transparent processes and share information to develop trust and shared understandings over time. Establishing and continuing these practices is important throughout the three phases of innovation adoption.
- Establish a core team within an organisation or among organisations with an open culture to facilitate collaboration, maintain momentum through changing circumstances, and support each other through the innovation process; this was particularly important during the integration phase.

PART 2

The challenge of integration across scales

This section begins with a review of the existing literature on governance across scales (multilevel governance), clarifying the concept, identifying challenges and benefits to such governance arrangements, and exploring frameworks, which can offer insight into the challenges facing the urban water sector in Australia. Following the literature review, several case studies are described and analysed to elucidate key insights, and principles for governance across organisations and scales are proposed.

Literature review: examining multilevel governance

With the increased complexity of urban water systems and the ongoing expansion of social values that water systems are expected to provide for (e.g. ecological health, amenity, mitigation of urban heat islands, etc.), arrangements for urban water governance are likely to operate across different scales and organisations. In other words, when roles and responsibilities sit across different organisations and scales of government, governance across these scales needs to be integrated. This increased complexity has been underpinned by a broader shift in the structure and operation of Western government bureaucracies. This shift from 'government' to 'governance' recognised the expanded suite of policy instruments available, the wider range of participants with influence in the policy process, and also a decrease in the efficiency and effectiveness of traditional top-down methods of governing (Kjaer, 2009). This governance shift has been identified in many sectors of government, including urban water (Bettini and Head, 2013).

Governance literature stemmed from the shift away from central government being the primary organisation and centre of authority as scholars and practitioners realised that many different civil society and private sector actors were involved in planning and implementing public policy (Kjaer, 2009; see also Bettini and Head, 2013 for discussion in relation to urban water management). Governance across scales and levels of government, or multilevel governance, is a continuation of this shift: an expression of the diffusion of authority (Hooghe and Marks, 2003) and the negotiated, less hierarchical exchange between institutions in the governance process (Peters and Pierre, 2001: 131–2). Given its reliance on multiple stakeholders and negotiated exchanges, multilevel governance is often considered to combine formal, 'vertical' authority with types of network governance (Hooghe and Marks, 2003; Sørensen and Torfing, 2005).

Over recent decades, scale in environmental science and sustainability research has become more important given the multi-scalar nature of environmental problems and the diverse institutional arrangements (Termeer et al., 2010). Thus, recognising and responding to scale challenges and cross-scale interactions is crucial for the sustainable management of social-ecological systems (van den Belt and Blake, 2015: 1581). Governing water resources across multiple administrative levels and spatial scales is particularly relevant because hydrological systems operate at many spatial scales, from small catchments to international river basins to global water cycles, and at different temporal scales. Also, water resources frequently cross socially constructed government and administrative boundaries, which results in inefficiencies and spatial externalities (Moss and Newig, 2010). Multilevel governance may become more relevant as responsibilities and competencies shift both upward (e.g. to national or international levels) and downward (e.g. to regional or local scales) (Moss and Newig, 2010).

Multilevel governance is applied in water resources and environmental management at many different scales, most often to address the challenges of institutional fit and interplay, for example, where there is a mismatch between spatial scale and temporal scales. Other scales that may be considered include institutional, management plans, jurisdictional, networks, and knowledge (Cash et al., 2006). Multilevel governance has been studied at many different spatial scales, from international, national, and regional, to metro and local levels (Furlong et al., 2016; Peters and Pierre, 2001, Naustdalslid, 2015), which interact and influence each other in complex and continually changing ways (Jacobs, 2010). In urban water management, smaller scale strategies and technologies are essential to complement and expand the options available to meet the complex and diverse challenges faced

(Furlong et al., 2016). Multilevel governance is advocated as a way to meet these integration challenges; however, coordinating across scales and resolving issues of interplay and fit are key challenges faced by multilevel governance (see below).

Multilevel governance is considered better able to deal with complex multiscale problems (Termeer, et al., 2010). Governance arrangements and processes are more flexible in a multilevel setting than when governance control is centralised (Hooghe and Marks, 2003; Termeer et al., 2010), and governance arrangements can be altered to fit different local contexts, thus avoiding the problem of 'one size fits all' (Hooghe and Marks, 2003). Programs to build capacity in stormwater management are more likely to be effective if they consider organisational (local government) capacity needs rather than applying the same program across organisations (Bos and Brown, 2014; Brown, 2005). This flexibility in multilevel governance is purported to provide other benefits, including resilience in the face of change and better inclusion of stakeholders' and citizens' preferences (Naustdalslid, 2015). In these ways, governance across multiple jurisdictions is more efficient (Hooghe and Marks, 2003), as it is assumed that it is impossible to find exact matches between administrative and ecological scales (Termeer et al., 2010).

Despite these advantages, several problems have been identified, such as the challenges of coordination across scales and multiple stakeholders, a lack of legitimacy and authority, and the difficulty of ensuring effective participation (Majone, 1998; Huitema et al., 2009). Firstly, multilevel governance, by definition, involves multiple stakeholders; managing their different interests and perspectives is challenging (Naustdalslid, 2015) and involves transaction costs (Hooghe and Marks, 2003). Effective communication is a key ingredient in successfully coordinating multiple parties (Furlong et al., 2016). To be effective, membership of stakeholders at different levels needs to be maintained and managing conflicting interests among participants may be required to keep focus on the purpose of the program, for example, conflicts between upstream and downstream parties (Naustdalslid, 2015). A lack of communication and coordination, which can critically hamper the success of projects, is exacerbated by election cycles and subsequent changes in administrative arrangements (Furlong et al., 2016). Hooghe and Marks (2003) propose two strategies for managing the challenge of coordinating the network as the number of participants increases: 1) limit the number of members, or 2) divide up the governance network into functionally separate subnetworks, thus limiting the interaction among actors.

Secondly (and closely related to the above challenge of multilevel governance) is the difficulty of coordinating across scales. Relevant problems that may be faced include: a misfit between scales; finding the most 'appropriate' scale for establishing multilevel governance arrangements; and overcoming problems of interplay between different levels, problems of reconfiguring scales (rescaling problems), and problems of upscaling and downscaling (Moss and Newig, 2010). These challenges are evident in implementing the European Water Framework Directive (WFD), where multiple and nested regional spaces overlap and have multiple interests (Medd and Marvin, 2008). While the WFD is focused on water, it also requires the involvement of related sectors (e.g. land use planning, transport, agriculture, nature conservation), which makes planning and implementing the WFD and other policies and programs more complex (Moss, 2004). In the case of alternative water supply projects, Furlong et al. (2016) found that the complexity of fit, interplay, and coordination across multiple stakeholders and scales highlighted the challenges surrounding infrastructure decision-making. Specifically, who was making the decisions varied across locations and there was uncertainty about how the decisions were made.

The final challenge facing multilevel governance is the criticism that it may lack democratic legitimacy. This is acknowledged by scholars such as Termeer and colleagues (2010: 6) who suggest that multilevel governance may conflict with existing norms of democratic legitimacy and transparency because it will go 'beyond the control of elected politicians or state executives'. The advantages of multilevel governance, in terms of flexibility and ability to meet the context of different programs, mean that decisions cannot always be subjected to full citizen participation and engagement. However, some strategies have been identified to overcome the lack of legitimacy, including generating locally relevant knowledge (Naustdalslid, 2015) and basing the multilevel governance network within democratic structures (i.e. within elected democratic government structures) (Hooghe and Marks, 2003).

Among many empirical studies, factors contributing to the success of multilevel governance arrangements have been identified: specific capacity attributes, structural arrangements (e.g. intermediaries or bridging organisations), and shared values or culture. An important capacity attribute of multilevel governance arrangements is the presence of strong leaders. Leadership is vital for maintaining the momentum of the arrangements, for example through a capable project manager and the leadership of community members (Naustdalslid, 2015).

Clearly, the structure of the governance arrangements will contribute to the success of the program. Key factors include a combination of horizontal and vertical links, together with intermediaries or bridging organisations to quickly mobilise and link actors and knowledge across different levels (Naustdalslid, 2015; Termeer et al., 2010). Furthermore, the governance arrangements must include key stakeholders, such as mayors, to gain the support of local constituents. Intermediaries are used to facilitate the implementation of strategies and they do so by strategically adapting to different stakeholders and ordering and defining relationships (Medd and Marvin, 2008). In Medd and Marvin's (2008) study, it was found that the regional-level intermediaries were effective at adapting and translating their communication efforts to facilitate the implementation of water management strategies at local levels. Finally, the multilevel governance arrangements will be more likely to succeed if the participants share responsibility for the values and priorities of the project, for example, environmental health and protection of water supply quality across municipalities (Naustdalslid, 2015).

Although multilevel government faces both advantages and challenges, there are concepts and tools that can be used to help practitioners to understand, plan, and implement multilevel governance in urban water management. Moss and Newig (2010) identify three dimensions of governance that are critical to water management: establishing democratic legitimacy, addressing problems efficiently using policy tools, and navigating the politics of scale changes (scaling and rescaling). Four principles for multilevel governance are proposed by Huitema and colleagues (2009): management on a bioregional scale, polycentric governance, public participation, and an experimental approach. These categories are useful for understanding and addressing the common criticisms made of multilevel governance. A useful typology of multilevel governance network types has been developed by Hooghe and Marks (2003). The authors propose two types of networks: Type I and Type II, as outlined in Table 1.

Table 1: Types of multilevel governance

Type 1	Type 2
General-purpose jurisdictions	Task-specific jurisdictions
Nonintersecting memberships	Intersecting memberships
Jurisdictions at a limited number of levels	No limit to the number of jurisdictional levels
Systemwide architecture	Flexible design

Source: Hooghe and Marks, 2003: 236

Type I is related to existing democratic networks and principles; members of this network type are not members of other networks (i.e. nonintersecting memberships). Type I comprises general-purpose jurisdictions that are territorially discrete, durable, and difficult to change, and there are a limited number of levels. Type II comprises task-specific jurisdictions; members of this type of network may be members of other networks (i.e. intersecting memberships), and borders of different jurisdictions will overlap. Type II network types also have unlimited jurisdictional levels and a lean and flexible design, and may change or start and stop as required, in response to tasks or stakeholder preferences.

Types I and II can coexist because they are effective for managing different tasks and so are complementary. Typically, Type I networks have greater legitimacy as they are linked to existing democratic processes, while Type II networks are more flexible; both face the challenge of coordination among members. Membership of Type II networks is voluntary, while membership of Type I networks is not because, in Type I networks, a stakeholder's identity is entwined with the network and is often territorially defined. A study in the Morsa River Basin in Norway (Naustdalslid,

2015) identified a hybrid type of multilevel network combining horizontal and vertical governance, where central and regional governments facilitated many of the policy initiatives but lower levels participated freely (although with a threat of central government coercion backed up by the EU Water Framework Directive if they did not participate).

This literature review has identified the advantages and challenges associated with multilevel governance arrangements, or governance across scales. The strengths of flexibility, ability to fit the context, and ability to respond to stakeholder preferences have been discussed and contrasted with the challenges of a lack of legitimacy, the difficulty of coordination across scales and stakeholders, and a lack of effective participation. Some strategies for overcoming these challenges have also been identified. Hooghe and Marks's (2003) typology of governance network types, together with empirical studies (e.g. Naustdalslid, 2015) suggests that the typology may be useful in analysing governance arrangements. We now turn to reviewing and analysing the case studies to identify insights into governance across scales and the influence of institutional context.

Case studies on integration

Eight Australian and international case studies are presented. The cases are all examples of relatively **successful** innovation. The key themes of inter-organisational arrangements, communication and negotiation strategies, power and authority, and flexibility are examined. A description of the research approach is included in Appendix A and a very brief overview of the cases is outlined in the Introduction (pp 10–12 above).

Groundwater Replenishment Trial, Western Australia

The WA Groundwater Replenishment Trial (GWRT) involved multi-organisational governance arrangements across a number of government organisations (water authorities and government departments), which sought to trial the replenishment of groundwater with water that was subject to advanced water quality treatment in an indirect potable reuse scheme. The organisations also amended the regulatory regime to enable water replenishment to become mainstream practice. Refer to Table B8 in Appendix B.

The multi-organisational governance arrangements comprised a variety of organisations and sub-structures with differing but equally important roles throughout the GWRT process. The Water Corporation was the lead agency, central to the network both structurally and from a concept innovation leadership perspective as it initially developed the idea internally. Other organisations involved included the Department of Water (DoW), the Department of Health (DoH), and the Department of Environment and Conservation (DEC). The Environmental Protection Authority (EPA) led the initial community engagement and consultation, which was critical to the project's success, and advised government. A key network structure was the Interagency Working Group (IAWG) comprising the Water Corporation, DoW, DoH, and DEC. Charged with developing a regulatory regime for the treated water and aquifer recharge system, the IAWG provided another influential centre within the multi-organisational governance arrangements. Finally, the community was an important part of the network as final consumers of the treated and recharged water.

The links between intra- and inter-organisational networks, namely the IAWG, were important as they provided the means to transfer information and enable organisations to discuss and make decisions on the GWRT as it progressed, and to feed these decisions back through the IAWG. Clear inter-organisational agreements about roles and responsibilities facilitated the smooth operation of the IAWG. Thus, these subnetworks improved the efficiency and efficacy of the decision-making processes.

In terms of communication, an extensive community and stakeholder engagement strategy, designed to build acceptance and support for the future water supply option, operated throughout the course of the trial. The EPA, which was identified as an impartial and trusted authority, led this strategy. The strategy sought to engage broadly with the general community, the media, and key experts and opinion leaders, such as peak bodies, industry associations, and prominent scientists. Face-to-face engagement was employed as much as possible, and an educational facility was built as part of the advanced water treatment plant so that tours and open days could be held. More traditional

communication methods such as a website, newsletters, and community forums were also used, as well as a social media campaign.

The focus of these engagement techniques was to provide open and transparent access to information about the GWRT, but to also provide opportunities for the community to discuss issues, raise concerns, and to have input into the process, so as to build trust in and acceptance of the water supply option. This also meant that community concerns could inform subsequent communications materials, and potential issues were identified and addressed in a timely way. An extensive monitoring and evaluation program around the engagement activities was also conducted to track community understanding, perceptions, and attitudes, and included a review of communication materials, media monitoring, and market research. At the conclusion of the trial, the Water Corporation also sought an independent audit of the trial's results, and invited the regulators to provide an endorsement. This further enhanced the transparency and trustworthiness of groundwater replenishment as a water supply option. Interviewees identified community consultation expertise as important to the success of the engagement strategy.

In terms of power within the multi-organisational governance arrangements, the Water Corporation, EPA, and IAWG had high levels of power (and responsibility) for successfully implementing the GWRT project; some organisations also had significant veto power so engaging them early and giving them ownership of the project was also an important strategy for successful implementation. These organisations were supported by political stakeholders. While political interest was evident from the start of the project in 2003, project staff also worked to embed backing for the project in the succession of water-related policy-setting documents of the two main political parties. This strategy helped to build bipartisan support for the project and required staff to have good connections with policy staff within the offices of the relevant minister and shadow minister.

The governance arrangements had a high level of legitimacy, which was implied through the bipartisan political support described above. This legitimacy and trust in the network organisations, particularly the EPA and DoH, contributed to the community's trust, firstly in the GWRT and secondly in the full implementation of groundwater replenishment. The trust between DoH and the EPA preceded the trial; therefore, these organisations were selected to lead parts of the study. This trust was leveraged through their involvement and was coupled with the open and transparent manner in which the water reuse concept was initiated and trialled. This trust and transparency gave the Water Corporation more legitimacy to adopt groundwater replenishment as a mainstream solution at the end of the trial. Additionally, the extensive engagement strategy described above contributed to the community's trust in the trial and the delivery organisations.

The multi-organisational governance arrangements for the GWRT can be considered a combination of Hooghe and Marks's (2003) Type I and Type II networks, that is, a hybrid network. The network is fundamentally a government network, that is, a Type I network; however, the network does not have explicit links to the democratic process and so the network members (e.g. the Water Corporation and EPA) are not directly elected. It can also be considered a Type II network because it was formed on a single issue, that of the GWRT, and was presumably dissolved after the trial was completed and the full-scale plant had been commissioned. Therefore, the GWRT governance network is a hybrid Type I and II network.

Scottish, Welsh, and English water reforms

The multilevel governance arrangements for the Scottish, Welsh, and English water cases involved the central UK government and the devolved Welsh and Scottish governments. The Scottish Parliament has greater independence than the Welsh Assembly. The urban water sector in Wales followed the privatisation reforms undertaken in England, while the reforms in Scotland resulted in water services being publicly owned with opportunities for private sector involvement. After the reforms, multiple organisations held responsibility for water supply and sewerage in all three jurisdictions. The following section discusses the organisational arrangements, how communication was undertaken, where power and authority is located and exercised, and the perceived legitimacy and flexibility of the arrangements. Refer to Table B9 for a summary account.

England and Wales

The governance arrangements in England and Wales are complex with multiple organisations involved across scales. The privatisation reforms in England and Wales involved floating the Regional Water Authorities (RWAs) on the stock exchange in 1989. After the reforms, there were private water companies, a policy development department (Defra), and three regulators: Ofwat (economic), the Drinking Water Inspectorate (DWI) (drinking water/public health), and the Environment Agency (EA) (environment). The Welsh Assembly Government has responsibilities similar to Defra.

Several communication and negotiation strategies were employed in England and Wales. Ofwat and the water and sewerage companies held informal working groups to discuss regulatory arrangements and communicated regularly with heads of private companies, including an open-door policy (Byatt, 2013). Both formal and informal discussions and negotiations were used by Ofwat and the EA to negotiate and argue for their own agendas. Private negotiations and bargaining occurred between the regulators and also between regulators and water companies to adapt the regulatory framework and incentive mechanisms to further the public good objectives of environmental improvement and lower water tariffs (Maloney, 2001; Page and Bakker, 2005).

The creation of regulators and new organisational relationships changed how power and authority were exerted. With the establishment of the three regulatory authorities, and the increasing influence of the European Community, the government's power to influence the water industry through the Department of the Environment was reduced (Maloney and Richardson, 1994). Ofwat, the EA, and the DWI, as regulators, held a great deal of authoritative power but also recognised that they relied on the private companies' compliance to develop an effective water sector. The EA sought to work with water companies using a regulated compliance approach (e.g. fines, sanctions), while Ofwat used a negotiated compliance approach (e.g. negotiation, bargaining) (Maloney, 2001). Ofwat also used strategies such as stakeholder workshops, which were effective in developing a more comprehensive understanding of stakeholder positions, and also sought to diversify the type of stakeholders involved in consultation processes (Page and Bakker, 2005).

The formation of customer representative organisations (e.g. Customer Service Committees) under privatisation, and the advocacy undertaken by Ofwat, raised the profile of customers in the water policy and regulatory spheres and provided the water sector with some public legitimacy. However, compared with the previous RWA board structure, with its two-thirds local government representation, individuals' ability to influence local water management after privatisation was reduced and influence remained the purview of formalised lobby groups (Page and Bakker, 2005). Individuals have become customers, expected to exert their influence through consumer choices, rather than citizens who exert their influence via voting and lobbying. This shift has been criticised as lacking community representation (Page and Bakker, 2005).

Although the reforms were expected to deliver greater efficiency, they were criticised by the public when tariffs rose despite reduced services, the water companies gave profits to shareholders rather than investing the money into infrastructure (beyond what was required by the regulators), and salaries of senior water company executives rose substantially (Bakker, 2001; Lobina and Hall, 2001; Maloney, 2001; Sawkins and Dickie, 2005). In response, in 1998 Ofwat re-exerted its regulatory power and changed the price review period from 10 to five years, as the factors influencing water companies were too varied and occurred too frequently to make a 10-year review period effective (Ofwat and EA, 2006). These changes appeared to address public criticisms and provided a greater perception of legitimacy. To further improve transparency and legitimacy, Ofwat required the private companies to report publicly on a variety of topics: financial performance and expenditure, service levels, security of supply, leakage and water efficiency, water services usage costs, and tariff structures and charges. Additionally, the DWI and the EA monitored the companies' compliance with environmental and drinking water standards, and progressed toward reporting these results publicly.

Once implemented, the privatisation framework required some flexibility and adaptation to ensure the political and regulatory objectives were being met. The flexibility observed corresponds with a period of maturing in the regulatory system (Sawkins, 2001). Ofwat was particularly flexible in order to achieve the objectives. The change in price review periods from 10 years to five years demonstrates how the regulatory framework was adapted to respond to new information (i.e. significant profits of the water companies) and changed circumstances (water company cost of operations and capital). This

move in turn addressed public criticism of high water tariffs, increases in large salaries of senior water company executives, and water companies' large profits (Lobina and Hall, 2001). The Director-General of Water Services (DGWS) was aware that water companies addressed publicly reported performance measures, while other performance measures were not focused upon. Ofwat incorporated new performance measures or adapted existing measures to address this problem (Sawkins, 2001).

After the privatisation reforms, flexibility and legitimacy were expressed slightly differently in Wales. In response to mounting financial and regulatory pressures during the 1990s, a number of water companies had restructured. The Welsh Assembly supported the sale of the private Welsh Water company assets to a new not-for-profit company, Glas Cymru (Bakker, 2003; Lobina and Hall, 2001; Ofwat and EA, 2006). Glas Cymru does not have any shareholders; rather, it has a board and unpaid members who act as an external source of scrutiny, and it reports to the Welsh Assembly (Bakker, 2003; Owen, 2013). The company aims to reduce customer tariffs and improve customer service and environmental sustainability (Owen, 2013). The sale of Glas Cymru required Ofwat's approval, which it granted. These changes demonstrate a regulatory regime flexible enough to find solutions to the problems faced, while improving the legitimacy of the multilevel governance arrangement – as citizens (through their elected representatives) can indirectly question Welsh Water's management.

Scotland

Scottish water sector reforms occurred later (in the 2000s) and involved the amalgamation of water authorities, the establishment of regulators, and the subsequent inclusion of private sector organisations in the water sector. Before the reforms, water supply and sewerage services were the responsibility of three water authorities: North, East, and West Public Water Authorities. However, after the reforms Scottish Water was responsible across all of Scotland. Drainage was the responsibility of local governments and the Scottish Environmental Protection Agency (SEPA). The organisational arrangements also included SEPA as the drinking water quality and environmental regulator, while a Water Industry Commissioner of Scotland was the economic regulator.

Further changes occurred when the Scottish Parliament legislated to reform the economic regulation of the Scottish water industry in 2005, via the *Water Services etc. (Scotland) Act 2005*, and the Water Industry Commission was established to replace the Water Industry Commissioner. The new commission is responsible for price setting in line with the ministers' broader policy objectives; prior to 2005 ministers had responsibility for price setting (Sawkins, 2012).

During the introduction of competition, the Scottish government published consultation papers (2000 and 2001) and provided a broad policy framework to guide the changes. Between 2003 and 2005, the Water Industry Commissioner and his office worked with expert advisors, Scottish ministers, and their public servants to plan a sustainable competition framework (Sawkins, 2012). This group worked hard to win over politicians who were less supportive of competition and also the industry and other stakeholder groups (Sawkins, 2012). The result was the passing of the *Water Services etc. (Scotland) Act 2005* with support from the major political parties. These informal communication and negotiation strategies were critical in achieving the reforms (Simpson, 2013).

The relationship between government and the water authority in Scotland is closer than that between the government and water companies in England and Wales, given the public ownership of Scottish Water; Scottish Water is directly responsible for delivering ministerial objectives efficiently and providing good service to customers (Byatt, 2006). However, the relationship has been gradually separated, and the responsibility for price setting was removed from the minister in 2005 (Sawkins, 2012). The Scottish Parliament has power to legislate for water and the environment; however, competition policy is the jurisdiction of Westminster, and can influence the Scottish Parliament and the water industry via the *Competition Act 1998* (Hendry, 2003). Similarly to England and Wales, the Scottish regulators hold significant authoritative power. For example, the Drinking Water Quality Regulator (DWQR) was established independently of Scottish ministers, and together with Scottish Water the DWQR monitors compliance with drinking water quality standards. Additionally, the DWQR has powers to obtain information, entry, or inspection, and has emergency powers to require works to be carried out to ensure public safety (DWQR, 2015).

An interesting consumer-focused network for discussion and deliberation is the Customer Forum, established in 2011, comprising Scottish Water, the Water Industry Commission for Scotland, and Consumer Focus Scotland (Littlechild, 2014). The Customer Forum was established through a formal agreement to undertake customer research, to represent the interests of customers to Scottish Water and the economic regulator, and to work toward agreeing on a business plan with Scottish Water (Littlechild, 2014). The forum was considered novel as it brought together stakeholders from across the industry and was also an effective example of industry collaboration (Littlechild, 2014).

The changes to consumer representation in Scotland have followed a similar path to those in England and Wales, with less democratic influence when the industry was restructured (Page and Bakker, 2005) into the three Public Water Authorities (1996), compared with the local government representation that had existed prior to this. These reforms and the introduction of more competition in the Scottish water industry have seen a shift in the role of the individual community member, from a citizen to a consumer. The consumer representation forums have somewhat redressed this shift; however, as in England and Wales, it could be contended that members of the general community still have limited potential for influence.

After the main reforms, a few changes to the water sector signalled the stakeholders' ability to be adaptive or flexible and respond to the challenges faced. Examples of flexibility in Scotland include the establishment of the Customer Forum to address public dissatisfaction with Scottish Water's performance, and also the evolution of the tariff-setting formula from one that was closely related to the Ofwat formula to one that had been adjusted to better reflect conditions in Scotland (Simpson, 2013). A factor that supports the regulatory flexibility is the view that the opening of the market to competition is the start of a process, not a one-off event, where learning and innovation lead to improved outcomes for consumers and water producers (Sawkins, 2012).

In conclusion, the English and Welsh water sector reforms were founded within the broad democratic framework, with substantial involvement of private water and sewerage companies. These networks could be considered examples of Hooghe and Marks's (2003) Type I and Type II multilevel governance networks, thus a hybrid network. Although similar, the Scottish water sector also has the Scottish Customer Forum network. As the Customer Forum is located outside of the direct democratic multilevel network, the Scottish water sector, post-reforms, could be considered a hybrid form of Type I and Type II networks (Hooghe and Marks, 2003; Naustdalslid, 2015). Key factors for success in the case studies of UK water governance reform include the regulators' flexibility to adapt to changing circumstances, which was observed in England and Scotland.

Berkeley FIRST solar panel financing, California, U.S.A.

The City of Berkeley (CoB), together with a private financial partner, provided funding for home owners to install solar photovoltaic (PV) panels. Home owners then repaid the loans through the property tax system. Using property tax for repayments meant that the loan remained with the property, being transferred to new owners if the property was sold. This overcomes a potential disincentive for home owners in not realising the full financial benefits of their investment, which are accrued over a long period of time, possibly longer than the period of home ownership. The financial risk is secured through a lien on the property, which means that the solar PV loan is repaid before other mortgages in the event of foreclosure.

The core multilevel governance structure centred on the CoB staff and councillors. External organisations and stakeholders were also involved, such as PV installation contractors, recipients of the funding, and the finance company (Renewable Funding LLC). Council staff supported the councillors to vote for the Special Energy Financing District (SEFD) and other related decisions. Within the network structure, the mayor provided critical leadership to the project's initiation, as he first proposed the councillors approve the concept of the SEFD in November 2007 (CoB, 2007). The Mayor's Office, the City Manager's Office, the Energy Office, the city's bond counsel and financial advisors, experts from University of California Berkeley, and solar installers were all involved in preparing the councillors' advice (CoB, 2007). The SEFD approval enabled council staff to prepare a more detailed framework for implementing the SEFD. Subsequently, external experts from the University of California Berkeley Renewable and Appropriate Energy Laboratory (RAEL), solar contractors, and financial experts were also involved in designing, planning, and implementing the program.

Communication with the public was critical to the project's success. The benefits of the program were clearly expressed in the CoB administrative and other review documents (e.g. CoB, 2010; Fuller et al., 2009), which laid a foundation for communicating the project's aims to stakeholders. The benefits for residents were continually highlighted to persuade councillors and other readers to support the program. A public outreach strategy was conducted before the project's launch to inform and educate the public about the program. The strategy involved: public workshops, a website, focus groups with installers and suppliers, an online survey of residents, distribution of publicity material through facilities such as libraries and council offices, and local media publicity (Fuller et al., 2009).

The CoB held most of the power in the Berkeley FIRST project, with its position as a local government organisation and its role in program design and implementation. However, other stakeholders, such as the finance partner, Renewable Funding, and the Federal Housing and Financial Authority, also held significant power at different times. The finance partner was critical to the project's success; without the support of this organisation the project would not have proceeded. Indeed, finding a financial partner was a key challenge that council staff had to overcome. Based on problems of trying to access money for the program and uncertainties about the market conditions (i.e. popularity of the program), administrative costs, and funding the money at competitive rates, the CoB selected Renewable Funding LLC as their funder (CoB, 2008b).

The legitimacy of the Berkeley FIRST program was underpinned by a ballot held in 2006, which included an aggressive GHG emissions reduction target of 80% by 2050, and directed the CoB to develop a plan for achieving the target ('Measure G' on the ballot paper) (CoB, 2008a; Fuller et al., 2009). The strong support for Measure G gave subsequent council programs strong legitimacy (i.e. the Climate Action Plan and Berkeley FIRST). With this legitimacy and other supporting CoB environmental policy documents, the processes and procedures undertaken to develop Berkeley FIRST proceeded without any major hurdles.

In conclusion, the Berkeley FIRST network, with the CoB staff and councillors as the central stakeholders, together with the supporting organisations and public participants, is an example of a Type I network (Hooghe and Marks, 2003). The democratic legitimacy provided by the 2006 ballot and subsequent involvement of CoB councillors enabled the public to have input into the design of Berkeley FIRST. Important success factors of the multi-organisation governance arrangements included a culture within the CoB to innovate and collaborate, and of individual staff to persist in attempts to solve the problems encountered. The CoB demonstrated its culture of willingness to show leadership by mobilising internal and external commitment to the common goal of reducing GHG emissions through implementing the Berkeley FIRST program. The organisation also demonstrated its innovative culture by being the first local government area in the United States to employ existing administrative mechanisms to finance solar PV panels on private buildings. Without the support of senior managers such as the city manager and staff in the Mayor's Office, the Berkeley FIRST program would not have been realised. A subset of an innovative culture is the ability of staff to persist in attempting to solve problems, which was evident when a financial partner could not be found and staff adapted the full program to become a pilot program.

Rotterdam infrastructure adoption, The Netherlands

Rotterdam, the economic capital of the Netherlands, has been working to address some key sustainability challenges (e.g. climate change) and urban renewal challenges (e.g. port area redevelopment). This case study focuses on a transition process to bridge the gap between the aspirational sustainability visions, including carbon dioxide (CO_2) emissions reduction, and current practice. The transition comprised a series of workshops with key city stakeholders to explore an aspirational city vision and how it can be implemented. Researchers from the Erasmus University Dutch Research Institute for Transitions (DRIFT) program guided and helped facilitate the workshops, provided expertise on transition management, and evaluated the process at the end.

The multi-organisational governance arrangements centred on the transition, which was responsible for implementing the transition management process (Roorda and Wittmayer, 2014). The transition team comprised two Rotterdam City Council staff from the planning department and two staff responsible for the biennale project. The Rotterdam Biennale was a festival celebration of urban architecture and sustainability held in 2012. Transitions management researchers guided the team through the process. The transitions team aimed to develop internal council discussion and

commitment to sustainability while also preparing for the Biennale envisioning process. Network members outside of the central core comprised attendees at internal council workshops and external 'frontrunners' (leaders in sectors related to sustainability and urban development, such as architecture, urban planning, and housing services).

The transitions team worked consistently to engage internal and external stakeholders. With internal stakeholders, they sought to link the CO_2 reductions with urban quality-of-life issues currently facing the city. Externally, they sought to explore how Rotterdam would develop without the council leading from the front. Three workshops with internal and external stakeholders were held to evaluate and provide feedback on urban greening and densification plans.

The transitions team and thus Rotterdam City Council were central to the transition arena process and held responsibility and authority for the project. The transition process widely engaged internal and external stakeholders, and so could be considered to have a high degree of legitimacy. However, some participants thought that the evaluation of urban greening and densification plans could have challenged the existing council plans more comprehensively by examining the plans' underlying assumptions (Roorda and Wittmayer, 2014).

The Rotterdam transition process can be considered an example of Hooghe and Marks's (2003) Type II network. Although the multi-organisational governance arrangements were focused on Rotterdam City Council and thus a democratic organisation, the actual process and subsequent networks that were formed were outside of the council and community engagement processes. Additionally, the governance arrangements were established for the specific purposes of the transition process and ended soon after the Biennale concluded, which are other key features of Type II networks.

Room for the River policy shift, The Netherlands

The Dutch Room for the River (RftR) program is a well-known policy and program of capital works, which aim to improve flood safety and spatial quality by increasing the area available for flooding and thus lowering the water level along key rivers (Zevenbergen et al., 2013). RftR can be understood as a shift in policy from 'fighting' to 'living with' water. The related program of flood mitigation capital works throughout the Netherlands aims to give more space for flood waters to move through the landscape. This section focuses on the policy shift rather than the capital works program.

The multilevel and multi-organisational governance arrangements involved in the policy shift comprise the national, provincial, and local governments, the Rijkswaterstaat (part of the Ministry of Infrastructure and Environment), and the water boards. The Rijkswaterstaat is the national water and infrastructure agency, responsible for waterways (water quality and transport), road infrastructure, and coastal management. Conservationists, such as the World Wide Fund for Nature and independent advisory committees (some governmental, some independent), provided recommendations on the alternative flood management policy (MTPWWM, 2000; van der Brugge et al., 2005).

Collaborative and consultative processes were used to ensure the new policy had support across multiple levels of government. From the 1980s, a series of national government policy documents were released which provided opportunities for stakeholders to comment on the government's direction and for their comments to be included in future government policy. Additionally, agreements between different levels of government, the water boards, and other stakeholders were drawn up and served to formalise the relationships among these actors in relation to RftR and to progress the policy development. In 2003, the National Governance Agreement on Water was published; this was a joint policy statement across national, provincial, municipal, and water board levels of government, focusing on water safety, water quality, spatial planning, and climate change (de Vries and Wolsink, 2009; Scholten, 2013).

The national government, via the Ministry of Infrastructure and the Environment, had a powerful role in the multilevel and multi-organisational governance arrangements. However, the government engages in decision-making using the 'polder model of compromise'. The polder model is a model of decision-making that creates opportunities for parties (sometimes historically opposed) to engage in constructive discussion (Glasbergen, 2002). Such an approach to decision-making contributes to the legitimacy of the program and enables policy shift. The polder model enabled multiple levels of

government to develop shared understandings of the objectives and how these objectives could be achieved. One way of describing the governance approach is ‘a steering philosophy of “controlled trust” rather than top-down governance’ (Rijke et al., 2012: 374). The focus on an overarching objective of improving flood safety, and a willingness to negotiate, compromise, and collaborate across different stakeholders, was integral to the success of the RftR policy development and program implementation. The RftR program had a high level of transparency, demonstrated by the publication of multiple advisory committee reports and government position papers, consideration of stakeholder feedback, and reporting to the parliament biannually (RftR, 2006b).

Flexibility of the governance arrangements is evident in the capital works program. While the national-level policy document outlines 34 RftR projects, alternative options to those proposed could be implemented, providing the 2015 deadline and budget constraints were met (RftR, 2006a).

In evaluating the RftR multilevel and multi-organisational governance arrangements, it is clear that these arrangements are an example of Hooghe and Marks’s (2003) Type I governance network (Termeer et al., 2010). The powerful role of the national government in leading and steering the policy shift provided strong links with the democratic process. Incorporating other levels of government and stakeholders effectively through different engagement processes limited coordination costs (Termeer et al., 2010) and also expanded the legitimacy of the policy shift. The polder model of decision-making provided a mechanism for gradual policy change by allowing dissenting views to be heard and diffused, thereby reducing the possibility of veto powers being exercised by some participants.

Portland green infrastructure implementation, Oregon, U.S.A.

The City of Portland (CoP) green infrastructure (stormwater management) case is an example of a local government developing and implementing substantial policy change over two decades and becoming a national leader in green infrastructure. While the federal government’s National Pollutant Discharge Elimination System (NPDES) permit requirements stimulated the Portland policy change, the change went beyond a typical minimal response to the federal regulation.

The governance arrangements for the CoP green infrastructure case are primarily focused on internal departments and cross-departmental advisory committees, with some involvement from the federal government Environmental Protection Agency (EPA) through the NPDES. The NPDES was the catalyst for the CoP to undertake a green infrastructure program for stormwater management, but the main implementation and extension work was conducted internally, led by the Bureau of Environmental Services (BES). Established with council support, these committees ensured the policies that were developed incorporated internal and external stakeholder insights and interdisciplinary perspectives, and enabled institutional barriers to be overcome (Reeve, 2014). The committees undertook research, considered the implementation challenges and solutions, and made recommendations to BES and the councillors. These committees included: the internal and external Stormwater Policy Advisory Committee (1996), the internal and external Stormwater Advisory Committee (1999), the internal Sustainable Infrastructure Committee (2001), and the internal Green Streets Cross-Bureau Team (2005).

Political leadership by CoP politicians, including the mayor, was important for facilitating the implementation of green infrastructure (CoP, 2007a). The Portland community has a history of supporting sustainable forms of urban development (e.g. urban growth boundary, public transport) (USEPA, 2010; WERF, 2009), which provided the public support needed for local politicians to propose and support the green infrastructure stormwater management strategies.

Four different communication strategies were used between the network and external stakeholders (e.g. public, technical professionals), which contributed to the advancement of green infrastructure in Portland.

1. Evidence from demonstration projects was used to demonstrate the feasibility and efficacy of the technologies to internal council and external stakeholders, and gain support for policies and programs that extended beyond the BES’s jurisdiction (Reeve, 2014).
2. A clear business case was used to communicate the financial savings of implementing green infrastructure, compared to the benefits of conventional stormwater and combined sewer overflow management, within CoP council and to external stakeholders.

3. Multiple benefits of green infrastructure were used to strengthen the rationale for implementing green infrastructure policies such as the green streets policy (CoP, 2007b), which explicitly identified the links between green streets and other council sectors such as transport.
4. CoP engaged the community through outreach programs, such as the BES providing technical and advisory support to stakeholders (CoP, 2015; WERF, 2009), and providing information about and conducting tours of green infrastructure sites and water art installations.

The CoP became central to the implementation of green infrastructure, both in terms of authority and legitimacy. While the EPA held significant authority over the CoP, the influence of this authority diminished as the CoP went beyond the basic NPDES requirements and became a leader of green infrastructure implementation. Therefore, in the multi-organisation network, the CoP holds the most power through its statutory position and role in community engagement. Because the CoP is a local government, its green infrastructure plan is considered to have a high degree of legitimacy (McGarvey, 2014).

The flexibility developed overtime by the Portland governance network started with small projects and trusted partners. This enabled staff and external stakeholders (developers, engineers, etc.) to learn and the policies and programs to be tested before being scaled up and implemented throughout the city (USEPA, 2010). Opportunities were used effectively; for example, BES staff realised early that much of the run-off causing poor water quality in receiving waters from combined sewer overflows came from public land under the control of the CoP. This presented a significant opportunity for implementing green infrastructure in rights-of-way and roadways throughout the city (Burlin et al., personal communication, 2012, cited in Reeve, 2014: 556). By identifying these synergies (Reeve, 2014) and thinking strategically, the CoP was able to respond flexibly and expand the program effectively.

Beyond the CoP, shared understandings and objectives among internal and external stakeholders developed over time. Although this took some time, without the drive for action from BES and political support it is unlikely that the advisory committees would have been formed. The committees enabled members to share information and discuss problems and solutions to the challenges of implementing green infrastructure, and thus facilitated shared understanding. Practical evidence of this shared understanding is the green infrastructure policy direction, which initially focused only on stormwater but then spread into other sectors (e.g. transport, planning).

The CoP governance network is an example of a hybrid Type I and Type II network (Hooghe and Marks, 2003; Naustdalslid, 2015). The main operation of the network was situated within the CoP, with BES coordinating the internal and external stakeholders. As key members of the network, BES staff could participate in multiple advisory committees. The network focused on the development and implementation of green infrastructure, and thus largely operated outside the local government democratic structures. However, the democratic structures provided legitimacy for the green infrastructure programs over time, with councillors approving funding and providing some political support. Therefore, it is considered a hybrid network.

Fitzgibbon Chase mixed housing and water recycling initiative, Queensland

Fitzgibbon Chase is a master-planned development north-east of Brisbane's central business district. This development project provided a case study to explore a multi-organisational governance network, which needed to address issues surrounding the ownership and operation of decentralised stormwater and roof water harvesting and treatment systems, and the influence of innovative ideas on land use planning policy. The data for this case study is drawn from Bettini (2015).

The Urban Land Development Authority (ULDA) was the central organisation in the multi-organisational arrangements, as it owned the land and also had significant statutory powers. It had a mandate for fostering innovation to achieve social, environmental, and economic outcomes, and also had special planning powers that could override local government planning schemes and approval processes. It was thus a combined land developer and approval authority, which enabled flexibility to change either the planning provisions or development objectives to support innovation. Other members of the network comprised the central water retailer, Queensland Urban Utilities (QUU);

engineering firm Bligh Tanner; and a Japanese government–backed private engineering firm, JFE Engineering, which was involved in designing and supplying the water harvesting and treatment technology. Beyond these specific organisations, the broader land development industry and the community also formed part of the multi-organisational governance network as potential recipients of the learnings generated from trialling and implementing the novel water technologies.

The Fitzgibbon Chase development involved the ULDA and industry stakeholders addressing some regulatory challenges: accessing stormwater from a council drain, determining the regulatory regime for a third-party water service provider, and regulating water quality from both the stormwater and roof water harvesting schemes. These regulatory changes were resolved through negotiation with the relevant approval authorities. Assigning responsibility for the ongoing operation and maintenance of the stormwater and roof water harvesting infrastructure proved to be a further challenge. Ownership of the schemes was offered to QUU, who declined citing the profitability of the schemes, as well as QUU's own organisational capacity and risk tolerance regarding such schemes as key reasons.

In the Fitzgibbon Chase development, the ULDA had significant authority, granted through its statutory powers. Specifically, the ULDA had a clear mandate for fostering and supporting innovation, and a degree of independence from the existing planning system, which enabled it to overcome existing institutional barriers and find new approaches to overcome the issues faced. However, the ULDA did not forcibly use its authoritative powers to deliver outcomes; rather, it preferred to play a facilitative role and work with other stakeholders to achieve the desired outcomes. With a remit to expedite development across the state, the ULDA sought not only to deliver innovative development, but also to identify blockages in the planning system and work with the relevant stakeholders to address these barriers. It used a variety of coordination and communication mechanisms to successfully deliver the development. These mechanisms included negotiating with regulators to gain approval for the water harvesting schemes and negotiating with other stakeholders, such as suppliers, to leverage improved energy efficiency from these alternative water sources. Such collaborative efforts fostered a community of practice around the new ideas and approaches that emerged from the Fitzgibbon Chase project and built the evidence base, industry support, and the case for change to satisfy state government that key policy positions or legislative settings needed reform. Additionally, some individuals in leadership positions, both inside and outside the ULDA, recognised opportunities for change and worked together to try and utilise these opportunities. There were also individuals involved in the network who were motivated by a shared sense of purpose and similar values or principles. These efforts at coordination and links between practice and policy development demonstrate that the ULDA provided industry leadership.

Through its statutory powers and its role in engaging and coordinating stakeholders, the ULDA held substantial legitimacy, both from a public perspective through the democratic process underpinning its establishment, and from an industry perspective as it sought to incorporate industry stakeholders' perspectives and input into the implementation of the Fitzgibbon Chase project. The unique combination of planning and development functions within the ULDA also enabled it to adjust the planning provisions or development objectives as required, thus providing flexibility to realise the innovative alternative water schemes.

In conclusion, the arrangements for multi-organisational governance in the Fitzgibbon Chase case are an example of a Type II network as defined by Hooghe and Marks (2003). The network of public and private sector organisations was developed for a specific purpose, that is, land development within the Fitzgibbon Chase project, and the network dissolved after the project's conclusion. Although the ULDA has some legitimacy derived from its legislative base, there are not any direct links with the democratic process (e.g. compared to a local or state government department, which is accountable to elected representatives). The Fitzgibbon Chase governance arrangements highlight a centralised network structure which was focused around the ULDA. The project's progress can largely be attributed to the authority granted to the ULDA through its establishing legislation and its collaborative approach when implementing the project. But this proved insufficient for achieving a sustained long-term governance arrangement.

Implications and conclusions for governance across scales

Overview of cases

The cases investigated cover a variety of scales and network structures, ranging from multilevel government networks (e.g. RftR) to city-based, local government networks (e.g. Berkeley, Portland) (refer to Table C10, Appendix C for a summary of case studies). The network structures are also varied, with strongly centralised networks (Berkeley, Portland, Fitzgibbon Chase, Rotterdam) and more dispersed structures (England, Wales, Scotland) where organisations have individual relationships with multiple other organisations. The WA GWRT case is unique because a bridging organisation (the Inter-Agency Working Group) was formed for the purpose of the trial and the IAWG led the development and implementation of the GWRT. The Berkeley and Portland cases also had leading bridging organisations; however, these already existed before the innovation was developed. These structures indicate that, while not essential, a central node or bridging organisation can provide focus and leadership and maintain momentum over a period of time when implementing innovations.

Legitimacy was provided mainly via democratic processes, although these were often used indirectly. For example, the network operated within government structures but the network was established and operated without direct community engagement or influence. Clear examples of this form of legitimacy include the UK water reforms and the Portland green infrastructure implementation. Legitimacy was also implied through community and stakeholder engagement processes. These programs were implemented after the network was established but provided important avenues for community members to air concerns and provide feedback to the multilevel governance network. Examples of effective engagement programs include the WA GWRT, RftR, and the UK water reforms.

An important factor that contributed to the success of the innovation cases was the cultural attributes or values of the network. Across all the cases, valuing innovation, being open to engagement and collaboration, and being outcome focused, were identified as important cultural values. These attributes set the foundation for establishing and operating networks, and appeared to provide motivation for champions of change to undertake innovative programs, to be flexible when facing challenges (e.g. UK water reforms, Portland), and to be adept at overcoming differences among network participants by focusing on the long-term objectives.

Another important influencing factor was the extent of political support for the programs. Political support was provided through approving funding and publicly pledging support of the programs (see WA GWRT, UK water sector, Berkeley, and Portland cases). In the Berkeley case, local councillors played a vital role in passing the administrative change needed to create the special financing district, which was required to establish the solar panel funding mechanism.

Finally, a variety of Hooghe and Marks's (2003) network types were observed: Type I was observed in the Berkeley and RftR cases, given the strong influence of democratic legitimacy, while Type II networks were identified in the Portland and Fitzgibbon Chase cases. These latter cases had links to democratic structures (i.e. local and state government), but during the operation of the multi-organisational network, links with democratic processes were weak or non-existent. Half of the eight cases investigated were hybrid or mixed networks, where there were clear links with democratic structures and processes and political support, but the multilevel organisation network operated independently of these links. Examining the hybrid Type I and Type II networks at a local government scale reveals the diversity of networks and illustrates how different structures can be effective at delivering practical outcomes in sustainability innovation. Both the Berkeley and Portland cases were hybrid networks; however, the Berkeley case had stronger legitimacy provided by the public ballot to set the CoB's target for reducing greenhouse gas emissions. Therefore, compared to the Portland case, the Berkeley case can be considered more of a Type I case. The Portland green infrastructure program also had support from elected representatives; however, the direct link to legitimacy, evident in Berkeley, was not present in Portland. It appears that Hooghe and Marks's (2003) network typology is essentially an idealised typology to assist analysis; in practice, it was observed that the network characteristics are more complex.

Integrating governance in urban drainage

Drainage governance has emerged in the cases as a key domain for pursuing sustainable water management: five of the eight cases investigated in this report focused on drainage. Urban water sustainability can be pursued when water discharges (wastewater, stormwater) are considered as part of the water cycle and managed as a resource, and when concern for flow regimes and/or water quality are included in drainage governance arrangements. For example, in their discharge licences, water utilities are responsible for flow regimes and/or catchment management in addition to water quality conditions. In most jurisdictions drainage governance is still underpinned by the aim of flood protection through flow controls, not by resource utilisation goals. Thus, water management for urban water supplies is still quite separate from water management for ecosystem health/ecosystem services. The governance of drainage brings these issues together. In particular, responsibilities for drainage and water supplies could be integrated either through including both roles in the same organisation, or through regulatory arrangements that recognise stormwater and wastewater as a resource and enable the provision of water supply that is fit for purpose.

Traditionally, urban water governance has been separated into three main functions: service delivery, regulation, and policy and planning. However, in many jurisdictions, the task of managing integrated water resources is not as explicit in urban water governance as it is in regional water management arrangements. Thus, incorporating this function more effectively into urban water management arrangements appears to be a leverage point for more integrated governance arrangements to manage the total water cycle.

The cases that focused on urban drainage varied in scale, from national (RftR) and state (WA GWRT) to city or sub-city scale (Portland, Rotterdam, and Fitzgibbon Chase). The Dutch cases (RftR and Rotterdam) focused on drainage and spatial planning, while the WA GWRT and the Fitzgibbon Chase cases focused on drainage water as a resource, and Portland focused on drainage and urban amenity. This diversity illustrates the complexity of urban drainage as an issue and its potential for influencing related sectors of urban planning and water supply. For all of the cases, the structure of the inter-organisational governance network was strongly centralised: each case had a single focal organisation which coordinated the other network participants. This organisation provided a consistent focal point for addressing challenges and maintaining momentum across stakeholders and time.

Integrating governance across scales: insights for practice

From the eight case studies of governing across organisations and scales, some broad recommendations for practice can be made, as follows:

- A potential lack of legitimacy can be overcome by basing the governance network within broad democratic structures and processes. Alternatively, a comprehensive and open engagement strategy can be developed and implemented.
- A central organisation can enhance coordination across the network. Either a pre-existing or a newly established organisation can be effective. When coordinating across organisations, a specific bridging organisation can offer the advantage of enabling participating organisations to be represented in the bridging organisation (e.g. this was achieved in the WA IAWG).
- Cultural attributes of valuing stakeholder engagement, innovation, and flexibility, and being outcome focused will provide a sound foundation for coordinating activities across organisations, scales, and time.

Overall conclusion

This report has investigated two key themes identified from previous research in Sub-project A3.1, namely collaboration and integration of governance across scales and organisations. The hypothesis was that individual government agencies, water utilities, professional organisations, and other bodies, acting alone, cannot solve the complex problems of enabling the development of WSCs. Thus, relevant organisations need to be brought together and work collaboratively to develop effective and robust solutions that are well supported by policy, regulation, and the community.

Building on previous research into innovation adoption (Bettini and Head, 2015), this further research has revealed the importance of formal and informal strategies for collaboration at different phases of innovation adoption. While both formal and informal strategies are important throughout all of the initiation, experimentation, and integration phases, informal strategies appear to be more important during the initiation phase, while formal strategies are more important during the integration phase. In the experimentation phase, both formal and informal strategies are important. These observations correspond with the different mix of stakeholders that are involved with innovative projects over time; a smaller number of stakeholders are typically involved in the initiation phase and a larger number and wider variety are likely to be involved in the integration phase (refer to Bettini and Head, 2015).

A comparative analysis of governance arrangements across scales and organisations revealed that there is no single ideal network structure; however, having a central, leading, or coordinating organisation can help to maintain participant focus and momentum over time. In contrast, desirable cultural characteristics were consistently identified across the cases: valuing stakeholder engagement, innovation, and flexibility, and being outcome focused. These characteristic appear to provide a sound foundation for coordinating activities across organisations, scales, and time. Linking the network to democratic processes and structures enhances the legitimacy of the innovative project or program and can help to overcome potential challenges and opposition. However, without explicit links to the democratic process (e.g. via public voting), it should be noted that engaging with political stakeholders needs to be an ongoing priority of the leading organisations to maintain and/or improve the legitimacy of the governance network and the projects.

Drawing upon the network typology developed by Hooghe and Marks (2003) to analyse the network structure and characteristics helped in formulating the above observations on legitimacy. Most of the cases were hybrid network types or had substantial links with the democratic process and structures (i.e. Type I networks). These links provide clearly established legitimacy and thus support the operation of the innovation network.

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Appendix A: Research approach

Research overview

This study emerged from the research undertaken in A3.1 – 3 *Governance structures and strategies to support innovation and adaptability* (Bettini and Head, 2015), which revealed the importance of collaboration and governance across organisations and scales for realising innovation in sustainable urban water management.

The approach used to investigate the factors underlying the collaboration and governance across scales involved a qualitative assessment of the governance context of each case study. Brief details of each case are provided in the Introduction. Although a similar approach was used, case selection and data analysis for each section were undertaken separately, and the implications of the research were considered at the conclusion of the research. The following sections describe the steps taken in analysing collaboration and integration across scales.

Collaboration

1. Cases were selected if they had strong results in the collaboration attributes from the three innovation phases (initiation, experimentation, and integration) (Bettini and Head, 2015). The Toowoomba case study was also included to provide an alternative (unsuccessful) innovation case.
2. The case study reports prepared for A3.1–3 were analysed using an analytical framework derived from the initial literature review. The analytical framework included the following factors: consultation requirements, transparency, accountability, policy alignment, roles and responsibilities, leadership, networking and collaboration, community/stakeholder education and engagement, organisational culture, information management and sharing, problem frames, and risk perceptions. These factors are described in Table A1.
3. A qualitative governance assessment of each case against the key factors was undertaken to identify 1) the importance of each factor and 2) how the context framed/stimulated/constrained these factors.
4. The results were described in Part 1, with summary tables provided in Appendix B.

Table A1: Definitions of collaborative governance attributes and their influence on the change process (Bettini and Head, 2015)

Attributes	Influence on governance change
Networking and collaboration: Regular informal peer interactions, opportunities for collaborative projects, and ongoing partnerships	Builds trust and operational knowledge between individuals or organisations Connects policy, regulatory, and delivery agencies through people rather than processes Surfaces emerging issues and trends that cut across organisational responsibilities
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	Ensures a level of understanding about water issues and decisions Allows two-way exchanges to establish value of water to different end users, and build shared values and goals Empowers citizens to be involved in water management and governance
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
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
Information management and sharing: Information management systems are established to monitor progress, and are accessible to relevant organisations	Knowledge generated informs practice through peer learning or capability-building programs
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

Attributes	Influence on governance change
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
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

Integration across scales

1. Cases were selected if they 1) were successful innovation cases as documented in Bettini and Head (2015) and 2) involved two or more organisations across multiple governance scales.
2. The case study reports prepared for A3.1 – 3 were analysed using a framework derived from the initial literature review. The analytical framework included the following factors: governance arrangements, multi-organisational networks, cultural attributes, inter-organisational agreements, community/stakeholder engagement, transparency, accountability, power/authority, and legitimacy. These factors are summarised in Table A2.
3. A final evaluation of each case was made against Hooghe and Marks's (2003) framework of Type I and Type II governance networks. Briefly, Type I networks are democratic, have non-intersecting memberships, and are general-purpose, territorially discrete jurisdictions that are durable and difficult to change. Type II networks are task-specific, have intersecting memberships, lean and flexible design, unlimited jurisdictional levels, and borders that may overlap.
4. A qualitative governance assessment of each case against the key factors was undertaken to identify 1) the importance of each factor and 2) how the context enabled and/or constrained these factors.
5. The results were described in Part 2, with summary tables provided in Appendix C.

Table A2: Definitions of multilevel governance attributes and their influence on governance across scales

Attributes	Influence on governance change
Multi-organisational governance arrangements: Roles and responsibilities of organisations across scales and relationships with each other	Establishes accountability Designates authority Establishes how outcomes are to be delivered and goals and objectives achieved Establishes how organisations relate to each other
Cultural attributes: Key organisations value openness and engagement with diverse stakeholders and focus on achieving outcomes	Enables interaction, collaboration, and engagement Helps breakdown inter-organisational silos Helps achieve outcomes rather than becoming stuck on small hurdles Enables innovations to emerge and progress Ensures continual improvement
Inter-organisational agreements: Formal documents establishing processes for interaction among organisations	Defines roles and responsibilities Establishes processes for network operation, how interaction and collaboration occur
Community/stakeholder engagement: Programs aiming to communicate aspects of water management to communities and provide formal channels for input into decision-making for communities and stakeholders	Ensures a level of understanding about water issues and decisions Allows two-way exchanges to establish value of water to different end users and to build shared values and goals Empowers citizens to be involved in water management and governance
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
Power/authority: Institutional frameworks allocate sufficient powers for institutions to take appropriate actions to fulfil their roles and responsibilities	Enables action to be taken
Legitimacy: Community and stakeholders accept decision-making process and outcomes	Increases stakeholder buy-in and support

Appendix B: Collaboration case analysis results

The following tables summarise the governance factors that are important for successful collaboration and innovation.

Table B1: TOOWOOMBA REFERENDUM CASE: summary of governance attributes related to collaboration and networking

Governance attributes	Description
Community/ stakeholder education and engagement	There was no community consultation and engagement during the preparation of the water supply strategy; community consultation occurred only after the strategy was finalised. After the release of the strategy, a community opposition campaign was established. In approximately August 2005, council agreed to develop and implement a community outreach and education program to support the PRW proposal. Opponents of PRW launched an advertising blitz against 'drinking poo', with substantial campaign funding from Clive Berghofer – a property developer and former mayor. This caused some state and federal MPs for the region to declare their neutrality instead of pledging the support required to confirm the legitimacy of the project. A referendum was announced by the federal water minister Malcolm Turnbull in March 2006. Federal funding was dependent on the referendum passing. Following an intense and bitter campaign, the referendum in July 2006 was lost by 62% to 38%.
Problem frames and risk perceptions	The problem frames and risk perceptions among supporters and opponents of PRW were strongly divergent. The Yes campaign viewed the PRW as a means of securing Toowoomba's water supply into the future and contributing to environmental protection. The No campaign argued that the PRW project would threaten Toowoomba's population growth, its clean and green image, and property values, and would subject residents to unknown and risky water quality.
Organisational culture	No coherent organisational culture developed, although water professionals were united in support for the advanced wastewater treatment and were confident that it would meet the required standards.
Information management and sharing	Information was provided to the community after the water strategy had been developed, but it did not counter the information (some of which was false) that was circulated by the anti-PRW campaign, for example through blogs.
Policy and program evaluation	The program was not embraced by the federal government in light of the anti-PRW campaign. The federal water minister announced that a referendum was necessary before federal funding would be provided. After the referendum failed, regulatory conditions to permit future PRW schemes were established, which facilitated a state government decision to construct its own major advanced water treatment scheme, the Western Corridor Recycled Water facility. This facility was intended to provide PRW for the Brisbane region via a pipeline to the Wivenhoe Dam and from there into the SEQ Water Grid. This facility was completed, but it was mothballed for political and financial reasons when seasonal rains returned in 2010–11.
Informal reflexive opportunities	There is no evidence that informal reflection occurred during the compressed period covered by this case.
Consultation requirements	There were no regulatory requirements in 2006 for consultation prior to implementing the Toowoomba PRW scheme, but a political decision required a local referendum. During this referendum campaign, the council provided some public funding for the pro- and anti-PRW sides.
Transparency	There was a lack of transparency during the development of the council water strategy, as community consultation only occurred after the council had finalised the strategy. The process by which state and federal governments made decisions about funding also

Governance attributes	Description
	had low transparency, which is illustrated by the federal government delaying a decision on funding by six months, after the National Water Commission had advised the government to support the PRW project.
Accountability	Council was responsible for approving the PRW project, but in the absence of regulatory guidance it relied heavily on funding from state and federal governments. Without such funding the project was unlikely to proceed. During the referendum campaign, there was little accountability from the No campaign for the accuracy of their media advertising. In contrast, the council was accountable for the information it provided to the community.
Policy alignment	There is little case study data to indicate how the water strategy aligned with other policies. Ironically, however, after the referendum, the Toowoomba water strategy became aligned with the state government's decision to build the Western Corridor Recycled Water facility and to plan the introduction of indirect PRW for the SEQ region.
Roles and responsibilities	The roles and responsibilities of local, state, and federal governments were in a process of evolution, and the basis for funding decisions was not transparent.
Leadership	Local community members provided leadership – for the Yes campaign, Mayor Di Thorley, and for the No campaign, local property developer and former mayor, Clive Berghofer. The federal water minister, Malcolm Turnbull, had an influential leadership position through his role in approving funding for the PRW project and announcing that the funding was conditional on the successful referendum.

Table B2: SCOTTISH WATER CASE: summary of governance attributes related to collaboration and networking

Governance attributes	Description
Community/ stakeholder education and engagement	The 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 during 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 were later removed, replaced with a Water Industry Commission, while Customer Focus Scotland was set up and then transferred to 'Citizen's Advice Service', and complaints have been referred to the Public Service Ombudsman. The Customer Forum (a collaboration among Scottish Water, Water Industry Commission for Scotland, and Consumer Focus Scotland) was established in 2011 to undertake customer research to find the best way for Scottish Water to meet its statutory obligations 'at lowest reasonable cost'. The findings were incorporated into Scottish Water's business planning.
Problem frames and risk perceptions	There did not appear to be 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.
Organisational culture	The development of a culture of consensus and collaboration across the sector is recognised by many commentators, led by the Water Industry Commissioner and Commission. This culture is demonstrated through the Customer Forum and the Output Management Group, which comprises representatives from government, the Water Industry Commission, the Scottish Environment Protection Agency (SEPA), the Drinking Water Quality Regulator (DWQR), and Scottish Water. The Output Management Group was formed in 2006 to monitor Scottish Water's progress in implementing the capital program agreed among the participants.
Information management and sharing	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. The DWQR has the power to obtain information from water suppliers if it is not forthcoming.
Policy and program evaluation	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	Commentators state that these conditions exist within the various formal working groups and are due to the open culture of the industry Representatives from three non-government organisations were involved in preparing legislation and worked with the Scottish Executive to develop their understanding of the issues and thus facilitate a process of social learning.
Consultation requirements	Formal requirement for community consultation was set up in various committee, commissioner, commission and panel structures. Water Environment and Water Services (Scotland) Act 2003 incorporates structures and processes for ensuring participation and

Governance attributes	Description
	requires explicit consideration for integrating activities across departments and agencies (specifically in relation to flood management).
Transparency	The Scottish Office and Scottish 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 the environment regulator (Scottish EPA) also have requirements for and a culture of transparent decision-making.
Accountability	Clear accountability has been established through a licensing system, which enables the minister to revoke licences, and in the financial management systems and powers of the DWQR. Accountability for environmental performance is not clear, but the Scottish EPA does have regulatory powers.
Policy alignment	Working groups and requirements for integration in the Water Environment and Water Services Act appear to be aligned with various policy frameworks (e.g. Scottish Executive's National Flood Framework and the Competition Act (Westminster) 1998).
Roles and responsibilities	Clearly set out, with working groups operating to deal with cross-cutting and emergent issues.
Leadership	The Water Industry Commissioner provided leadership during the reforms, particularly to see the industry through the introduction of competition policy. Other individuals in various forums provided leadership, which contributed to the success of the reforms.

Table B3: BERKELEY FIRST CASE: summary of governance attributes related to collaboration and networking

Governance attributes	Description
Networking and collaboration	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.
Community/ stakeholder education and engagement	As a community financial loan scheme, the Berkeley FIRST initiative required significant community education and engagement to ensure its success. In the development of the scheme, consultation with the community 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.
Organisational culture	Councillor 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 (CoB) 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	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 indicates that this information was shared with other stakeholders (state government).
Consultation requirements	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. During the development of the scheme, key stakeholders such as solar installers were also consulted to gain their input..
Transparency	The initial ballot to gauge appetite for climate change action, the design of the pilot scheme through applications, and the process of creating an enabling legislative framework ensured a transparent process of issue awareness, solution development, and implementation.
Policy alignment	There was strong policy alignment, both internally within the CoB, and externally with state government policies and programs on climate action.
Roles and responsibilities	No confusion over roles and responsibilities was evident in the case study.
Leadership	The CoB showed a willingness to take leadership in mobilising community commitment to climate action. The CoB also resolved to call on other local governments to take action, and has joined peer networks to share and benefit from best practice with other local governments.

Table B4: GROUNDWATER REPLENISHMENT TRIAL CASE: summary of governance attributes related to collaboration and networking

Governance attributes	Description
Networking and collaboration	Good relationships with key regulators (health, environmental) prior to trial, and an extensive stakeholder engagement process was used throughout the trial. Clear evidence of trust and better operational working knowledge of other agencies after the trial.
Community/stakeholder education and engagement	Extensive efforts in engagement and education to build community acceptance of recycled water.
Problem frames and risk perceptions	Shared understandings of water security issues, clear effort to develop a collective understanding of the GWR solution, and ongoing effort to identify possible risks and management strategies.
Information management and sharing	Comprehensive data was collected and jointly considered, and was also freely available in audience-appropriate forms online.
Consultation requirements	The GWRT process itself was an extensive consultative and joint decision-making process.
Transparency	Due to the high level of stakeholder participation in the trial, the decision-making process was transparent and open for input.
Policy alignment	Ensuring policy support for future GWR schemes was also part of the trial process.
Roles and responsibilities	MoUs between organisations established clear roles and responsibilities for progressing the trial. In addition, as part of discussions between participants in the trial, overlapping regulatory roles were resolved.

Table B5: ROTTERDAM INFRASTRUCTURE ADOPTION CASE: summary of governance attributes related to collaboration and networking

Governance attributes	Description
Networking and collaboration	Policy officers inside the City of Rotterdam were well networked via internal departments (engineering, environmental, and urban planning) and partnership with transition researchers. They were also connected to various external professional networks.
Community/stakeholder education and engagement	A transition arena was initiated with frontrunners engaging community leaders, initially about climate mitigation, but this evolved into an agenda around greening the city to maintain liveability under the municipality's densification strategy. A presentation at the Architecture Biennale also engaged the general public, as did engaging a visiting celebrity as a spokesperson.
Informal reflexive opportunities	The transition team within the municipality is a cohesive informal network whose members meet regularly to discuss issues and ideas.
Transparency	The transition arena process provided a highly transparent process for gaining input into future directions and for shaping and informing decisions on urban development directions and projects.
Roles and responsibilities	Urban development is clearly assigned to the planning department of the municipality, with input from water engineering and biodiversity teams. However, the activities of the transition team appeared to be on the periphery of the core activities of this department, their work being viewed as a novel approach.
Leadership	The municipality promotes itself as a leader in sustainable urban development and adaptive management. It allows staff flexibility and space to participate in networks, supports the implementation of innovative ideas, and connects with other municipalities and researchers to share knowledge. The municipality displays political, visionary, entrepreneurial, and collaborative leadership.

Table B6: ROOM FOR THE RIVER CASE: summary of governance attributes related to collaboration and networking

Governance attributes	Description
Networking and collaboration	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 recognising that current water management approaches would become inadequate in the future. There was significant collaboration throughout the development of the Room for the River (RftR) policy, 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 World Wide Fund for Nature (WWF). While the national government operates in a 'top-down' style of 'trust with control', the government nevertheless consulted with stakeholders from the outset, and established clear collaboration processes in intergovernmental agreements.
Community/ stakeholder education and engagement	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 a change in approach, the reform agenda/process for pursuing the change, and then the content of the RftR policy and associated guidelines and legislation.
Problem frames and risk perceptions	As discussed above, there was a long period of interaction between stakeholders, followed by a series of investigations and position papers, which facilitated the development of shared problem frames. The explicit issue of risk management 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-to-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.
Organisational culture	The Dutch culture is known for consensual decision-making, and the development of the reforms behind the RftR policy by central ministries suggest organisations that practised open consultation. The shift from 'fail-safe' to 'safe-to-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	While the national government provided all-inclusive funding, which included research, it was not clear in the available material how much funding 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

Governance attributes	Description
	Dutch cities and other European cities. It is unclear whether the changes in learning and professional practice developed through the implementation of RftR are informing more formal professional development and teaching curricula.
Informal reflexive opportunities	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 opportunities for informal reflection and information capture.
Consultation requirements	The RftR 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 were established to represent local views and needs. The ministry also drew on past reports from external organisations 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	The proposed reform approach to water management was published by the Rijkswaterstaat in response to the recommendations of the independent committee (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 mechanisms, roles, and responsibilities for implementing it. 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, that is, to guarantee safety in the first instance and to improve spatial quality through water management works.
Policy alignment	There was substantive effort to align policy in a number of domains (climate change, water management, spatial planning, and EU directives), in terms of both their high-level objectives and directions, and the integration of various policy instruments, such as 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	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 (an Initial Agreement for the new approach, the National Governance Agreement on Water).
Leadership	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 pressured the national government to act.

Table B7: PORTLAND CASE: summary of governance attributes related to collaboration and networking

Governance attributes	Description
Networking and collaboration	The material does not capture significant networking and informal interactions. However, the multidisciplinary Bureau of Environmental Services (BES) and the group's culture of support for sustainable solutions appear to have generated significant collaborative efforts and projects.
Community/ stakeholder education and engagement	Stakeholder engagement was sought early in the green infrastructure developments in the City of Portland (CoP), with a Stormwater Policy Advisory Committee 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 training in maintenance, as well as designing education and incentive programs to encourage stormwater management on private land.
Problem frames and risk perceptions	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.
Organisational culture	The culture in BES was supportive of 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, by means of 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 divisions with explicit responsibility for diffusing green infrastructure solutions into the council's operations.
Information management and sharing	Information was widely shared in collaborative efforts across groups within the 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.
Consultation requirements	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 engage 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 CoP's original permit application to the National Pollutant Discharge Elimination System (NPDES) required a lengthy public consultation process.

Governance attributes	Description
Transparency	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 offset programs, changes to building regulations, redistribution of taxes, and grants programs, were all required to be endorsed by the 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.
Policy alignment	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	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 maintaining decentralised systems.
Leadership	While a CoP commissioner provided political support for the green infrastructure, 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 the environmental literacy of the public and incentives such as external awards. As such, the success of green infrastructure adoption in Portland is largely recognised as a team effort.

Appendix C: Integration across scales case analysis results

This section presents the important factors for governing across scales and organisations.

Table C1: Summary of the WA Groundwater Replenishment Trial case: integration across scales

Factor	Description
Governance structure	The Water Corporation was the lead agency, central to the network both structurally and from a concept innovation – leadership perspective. The Department of Water (DoW) was responsible for protecting groundwater sources and clarifying the allocation rights for the recycled water. The Department of Health (DoH) was the agency responsible for human health, including drinking water and wastewater treatment. The Department of Environment and Conservation (DEC) was responsible for the environmental impacts of the discharged water and activities associated with the treatment facility. The Environmental Protection Authority (EPA) led the community engagement and consultation, which was critical to the project's success, and advised government. A key network structure was the Interagency Working Group (IAWG) comprising the Water Corporation, DoW, DoH, and DEC.
Communication/ negotiation strategies	The Water Corporation adopted a collaborative approach to the GWRT, working with network members to solve problems and ensure the trial's success. Also, individual staff members were critical to the effective network operation, including having a full-time staff member to manage the trial project. An extensive community- and stakeholder-engagement strategy, led by the EPA, operated throughout the trial to build acceptance and support for the future water supply option. Key experts and opinion leaders, such as peak bodies, industry associations, and prominent scientists, were prioritised for engagement. Face-to-face engagement was employed as much as possible, and an educational facility was built as part of the advanced water treatment plant. These engagement techniques aimed to provide not only open and transparent access to information about the trial, but also opportunities for the community to discuss issues and raise concerns.
Power/authority	The Water Corporation, EPA, and IAWG had high levels of power for implementing the GWRT successfully. These organisations were supported by political influence.
Legitimacy	The governance arrangements had a high level of legitimacy inferred through the bipartisan political support. This legitimacy and trust in the network organisations, particularly the EPA and DoH, contributed to the community's trust in, firstly, the GWRT and, secondly, the full implementation of the groundwater replenishment.
Flexibility	Explicit data not evident in case materials.
Implementation processes	Explicit data not evident in case materials.

Table C2: Summary of the English case: integration across scales

Factor	Description
Governance structure	The key arrangements involved the central UK government with the devolved Welsh and Scottish governments. In 1991, the Environment Agency (EA) was formed, comprising the rivers, drainage, water pollution, and waste regulation responsibilities, to provide an integrated environmental protection approach across land, air and water protection. The Office of Water Services (Ofwat) and the Drinking Water Inspectorate (DWI) were established as economic and drinking water quality regulators, respectively. Policy responsibilities were held by Defra (Department of Environment, Food and Rural Affairs), which is the lead water policy agency in England and focuses on supply security, environmental protection while providing services, and furthering of social and economic policies.
Communication/ negotiation strategies	Ofwat and the water and sewerage companies held informal working groups to discuss regulatory arrangements and had regular communication with heads of private companies, including an open-door policy. Private negotiation and bargaining occurred between the regulators and also between regulators and water companies to adapt the regulatory framework and incentive mechanisms to further the public good objectives of environmental improvements and lower water tariffs.
Power/authority	With the distributed governance arrangements, the government's ability to influence the sector decreased. Ofwat, the NRA/EA, and the DWI, as regulators, held a great deal of authoritative power but also recognised that they relied on the private companies' compliance to develop an effective water sector.
Legitimacy	The formation of customer representative organisations (e.g. Customer Service Committees) under privatisation and the advocacy undertaken by Ofwat has raised the profile of customers and provided the water sector with some legitimacy. However, compared with the pre-reform structure where local governments were represented in the RWAs, the ability of individuals to influence local water management after privatisation has reduced and influence has remained the purview of formalised lobby groups. Ofwat has responded to public criticism of tariff increases (see below) and required private companies to publicly report on performance, expenditure, service levels, supply security, leakage, usage costs, and tariff structures.
Flexibility	In response to criticism of tariff increases, Ofwat changed the price review period from 10 years to five years as the factors influencing water companies were too varied and occurred too frequently to make a 10-year review period effective. The Director-General of Water Services (DGWS) was aware that water companies addressed publicly reported performance measures, while other performance measures were not focused upon and, therefore, Ofwat incorporated new performance measures or adapted existing measures to address this problem.
Implementation processes	Explicit data not evident in case materials.

Table C3: Summary of the Welsh case: integration across scales

Factor	Description
Governance structure	The governance arrangements in Wales are similar to England. The Welsh Parliament is devolved from the English Parliament. In 1991, the Environment Agency (EA) was formed, comprising the rivers, drainage, water pollution, and waste regulation responsibilities, to provide an integrated environmental protection approach across land, air, and water protection. The Office of Water Services (Ofwat) and the Drinking Water Inspectorate (DWI) were established as economic and drinking water quality regulators, respectively. Policy responsibilities are held by the Welsh Assembly, which focuses on supply security, environmental protection while providing services, and furthering of social and economic policies.
Communication/ negotiation strategies	Ofwat and the water and sewerage companies held informal working groups to discuss regulatory arrangements and had regular communication with heads of private companies, including an open-door policy. Private negotiation and bargaining occurred between the regulators and also between regulators and water companies to adapt the regulatory framework and incentive mechanisms to further the public good objectives of environmental improvements and lower water tariffs.
Power/authority	With the distributed governance arrangements, the government's ability to influence the sector decreased. Ofwat, the NRA/EA and the DWI, as regulators, held a great deal of authoritative power but also recognised that they relied on the private companies' compliance to develop an effective water sector.
Legitimacy	Wales has similar consumer forums to England's. Additionally, citizens (through their elected representatives) can indirectly question Welsh Water's management and there is increased transparency as Welsh Water reports to the Welsh Assembly.
Flexibility	In response to mounting financial and regulatory pressures during the 1990s, Ofwat approved and had the support of the Welsh Assembly for selling the private Welsh Water company assets to a new not-for-profit company, Glas Cymru. Glas Cymru has a board and unpaid members which act as an external source of scrutiny and it aims to reduce customer tariffs, improve customer service, and improve environmental sustainability. Welsh Water needs to report to the Assembly.
Implementation processes	Explicit data not evident in case materials.

Table C4: Summary of the Scottish case: integration across scales

Factor	Description
Governance structure	After the reforms, Scottish Water was responsible for water supply and sewerage services across all of Scotland, replacing the North, East, and West Public Water Authorities. The Scottish Environmental Protection Agency (SEPA) was responsible for drainage. SEPA, together with local authorities, also has responsibilities for planning approvals related to drainage and flood warnings. SEPA is also responsible for water quality regulation, including discharges to surface water, drinking water quality, and environmental regulation. The Water Industry Commissioner of Scotland was the economic regulator. In 2005, the Water Industry Commission replaced the Water Industry Commissioner.
Communication/ negotiation strategies	During the introduction of competition, the Scottish Government published consultation papers and provided a broad policy framework to guide the changes. The Water Industry Commissioner and his office then worked with expert advisors, Scottish ministers and their public servants between 2003 and 2005 to plan a sustainable competition framework. The *Water Services etc. (Scotland) Act* was passed with major political party support in 2005.
Power/authority	The government–water authority relationship in Scotland is closer than that between the government and water companies in England and Wales, given the public ownership of Scottish Water; Scottish Water is directly responsible for delivering ministerial objectives efficiently and providing good service to customers. Operational decisions are made further from government by the Water Industry Commissioner, SEPA, and the Drinking Water Quality Regulator (DWQR). Scottish regulators hold significant authoritative power. For example, the DWQR was established, which is independent of Scottish ministers and, together with Scottish Water, monitors compliance with drinking water quality standards. Additionally, the DWQR has powers to obtain information, power of entry or inspection, and emergency powers to require works to be carried out to ensure public safety.
Legitimacy	Maintaining public ownership of Scottish Water enabled the Scottish Government to make decisions about the water industry structure. Mechanisms for consumer participation are similar to those in England and Wales, with less democratic influence when the industry was restructured. The Customer Forum, established in 2011, comprises Scottish Water, the Water Industry Commission for Scotland and Consumer Focus Scotland. It undertakes customer research, represents the interests of customers to Scottish Water and the economic regulator, and works toward agreeing on a business plan with Scottish Water.
Flexibility	Examples of flexibility in Scotland include the establishment of the Consumer Forum to address public dissatisfaction with Scottish Water's performance, and also the evolution of the tariff-setting formula, which had been closely related to the Ofwat formula and then was adjusted to better reflect conditions in Scotland. A factor which supports the regulatory flexibility is the view that opening the market to competition is the start of a process, not a one-off event, where learning and innovation lead to improved outcomes for consumers and water producers
Implementation processes	Explicit data not evident in case materials.

Table C5: Summary of the Berkeley FIRST case: integration across scales

Factor	Description
Governance structure	The core multilevel governance structure centred on the City of Berkeley (CoB) staff and councillors, with external organisations and stakeholders also involved, such as the PV installation contractors, recipients of the funding, and the finance company (Renewable Funding LLC). Council staff supported the councillors to vote on the Special Energy Financing District (SEFD) and other related decisions. Within the network structure, the mayor provided critical leadership to the project initiation as he first proposed the councillors approve the concept of the SEFD. The Mayor's Office, the City Manager's Office, the Energy Office, the city's bond counsel and financial advisors, experts from University of California Berkeley, and solar installers were involved in preparing the councillors' advice. University of California Berkeley Renewable and Appropriate Energy Laboratory (RAEL) provided technical advice.
Communication/ negotiation strategies	A clear foundation for communication that was laid in the CoB administrative documents is the clear expression of the benefits of the program. The benefits for residents were continually highlighted to persuade councillors and other readers to support the program. Before the CoB launched the project, a public outreach strategy was conducted to inform and educate the public about the program.
Power/authority	The CoB held most of the power with the Berkeley FIRST project, given its status as a local government organisation and also its role in program design and implementation. The finance partner organisation was critical to the project's success: without the support of this organisation, the project would not have proceeded.
Legitimacy	The legitimacy of the Berkeley FIRST program was underpinned by a ballot held in 2006, which included an aggressive target of an 80% reduction in GHG emissions by 2050, and directed the CoB to develop a plan for achieving the target ('Measure G' on the ballot paper).
Flexibility	The initial project plan was for a larger and more extensive project. However, as financing support was difficult to obtain, the project was scaled back to be a pilot.
Implementation processes	Explicit data not evident in case materials.

Table C6: Summary of the Rotterdam infrastructure adoption case: integration across scales

Factor	Description
Governance structure	The multi-organisational governance arrangements involved the transition team, at the centre, responsible for implementing the transition management process. The transition team comprised two Rotterdam City Council staff from the planning department and two staff responsible for the biennale project. The Rotterdam Biennale was a festival celebration of urban architecture and sustainability held in 2012. Transitions management researchers guided the team through the process. Network members who were outside of the central core comprised attendees at internal council workshops and external 'frontrunners' (leaders in sectors related to sustainability and urban development).
Communication/ negotiation strategies	The transitions team worked consistently to engage internal and external stakeholders. With internal stakeholders, they sought to link the CO_2 reductions with urban quality-of-life issues currently facing the city. Externally, they sought to explore how Rotterdam would develop without the council leading from the front.
Power/authority	The transitions team and thus Rotterdam City Council were central to the transition arena process and held the responsibility and authority for the project.
Legitimacy	The transitions process widely engaged internal and external stakeholders and so could be considered to have a high degree of legitimacy. However, some participants thought that the evaluation of urban greening and densification plans could have challenged the existing council plans more comprehensively by examining the plans' underlying assumptions.
Flexibility	Explicit data not evident in case materials.
Implementation processes	Explicit data not evident in case materials.

Table C7: Summary of the Room for the River policy shift case: integration across scales

Factor	Description
Governance structure	The multilevel and multi-organisational governance arrangements involved in the policy shift comprise the national, provincial, and local governments, the Rijkswaterstaat (part of the Ministry of Infrastructure and Environment), and the water boards. The Rijkswaterstaat is the national water and infrastructure agency, responsible for waterways (water quality and transport), road infrastructure, and coastal management. Conservationists, such as the WWF (World Wide Fund for Nature), and independent advisory committees (some governmental, some independent) provided recommendations on the alternative flood management policy.
Communication/ negotiation strategies	From the 1980s, a series of national government policy documents were released, which provided opportunities for stakeholders to comment on the government's direction. Formal agreements between different levels of government, the water boards, and other stakeholders were drawn up. In 2003, the National Governance Agreement on Water was published; this was a joint policy statement across national, provincial, municipal, and water board levels of governance, focusing on water safety, quality, spatial planning, and climate change.
Power/authority	The national government, via the Ministry of Infrastructure and the Environment, has a powerful role in the multilevel/multi-organisational governance arrangements. However, the government engages in decision-making using the 'polder model of compromise'.
Legitimacy	The polder model is a model of decision-making that creates opportunities for parties (sometimes historically opposed) to engage in constructive discussion and thus contributes to the legitimacy of the program and policy shift. The Room for the River (RftR) program had a high level of transparency, demonstrated by the publication of multiple advisory committee reports and government position papers, consideration of stakeholder feedback, and reporting to the parliament biannually.
Flexibility	It seems that the focus on an overarching objective of improving flood safety and a willingness to negotiate, compromise, and collaborate across different stakeholders was integral in the success of the RftR policy development and program implementation. While the national-level policy document outlines the 34 RftR projects, alternative options to those proposed can be implemented providing they meet the 2015 deadline and budget constraints.
Implementation processes	Explicit data not evident in case materials.

Table C8: Summary of the Portland green infrastructure case: integration across scales

Factor	Description
Governance structure	The governance arrangements for the City of Portland (CoP) green infrastructure case are primarily focused on internal organisational departments and cross-departmental advisory committees, with some involvement from the federal government Environmental Protection Agency (EPA) through the National Pollutant Discharge Elimination System (NPDES). The NPDES was the catalyst for the CoP to undertake a green infrastructure program for stormwater management, but the main implementation and extension work was conducted internally, led by the Bureau of Environmental Services (BES). Four internal and external committees were established with different functions: the Stormwater Policy Advisory Committee (1996), the Stormwater Advisory Committee (1999), the Sustainable Infrastructure Committee (2001), and the Green Streets Cross-Bureau Team (2005). Political leadership by CoP politicians, including the mayor, was important for facilitating green infrastructure implementation.
Communication/ negotiation strategies	Four different communication strategies were used between the network and external stakeholders (e.g. public, technical professionals), which contributed to the advancement of green infrastructure in Portland: 1) evidence from demonstration projects was used to demonstrate the feasibility and efficacy of the technologies to internal council and external stakeholders; 2) a clear business case was used to communicate the benefits within CoP council and to external stakeholders; 3) multiple benefits of green infrastructure were used to strengthen the rationale for implementing green infrastructure policies such as the green streets policy; and 4) CoP engaged the community through outreach programs, providing information about and conducting tours of green infrastructure sites and also locations of water art installations.
Power/authority	The CoP is central to the green infrastructure implementation, both in terms of authority and legitimacy. While the EPA held significant authority over the CoP, the influence of this authority diminished as the CoP went beyond the basic NPDES requirements and became a leader of green infrastructure implementation.
Legitimacy	The Portland community has a history of supporting sustainable forms of urban development (e.g. urban growth boundary, public transport) (WERF, 2009; USEPA, 2010), which enabled local politicians to propose and support the green infrastructure stormwater management strategies. As the CoP is a local government, its green infrastructure plan is considered to have a high degree of legitimacy. The demonstration projects were used to further strengthen this legitimacy.
Flexibility	The flexibility demonstrated over time by the Portland governance network started with small projects and trusted partners, which enabled staff and external stakeholders (developers, engineers etc.) to learn, and the policies and programs to be tested and then scaled up to be implemented throughout the city.
Implementation processes	Explicit data not evident in case materials.

Table C9: Summary of the Fitzgibbon Chase residential development case: integration across scales

Factor	Description
Governance structure	The Urban Land Development Authority (ULDA) was the central organisation in the multi-organisational arrangements as it owned the land and also had significant statutory powers. Other members of the network comprised the central water retailer, Queensland Urban Utilities (QUU); engineering firm Bligh Tanner; and a Japanese government–backed private engineering firm, JFE Engineering, which was involved with designing and supplying the water harvesting and treatment technology. Beyond these specific organisations, the broader land development industry and the community also formed part of the multi-organisational governance network as potential recipients of the learnings generated from the trialling and implementation of the novel water technologies.
Communication/ negotiation strategies	The Fitzgibbon Chase development involved the ULDA and industry stakeholders addressing some regulatory challenges: accessing stormwater from a council drain, determining the regulatory regime for a third-party water service provider, and regulating water quality from both the stormwater and roof water harvesting schemes. These regulatory changes were resolved through negotiation with the relevant approval authorities. Another challenge was identified during negotiations with QUU regarding ongoing operation and maintenance of the stormwater and roof water harvesting infrastructure. Despite engagement with QUU throughout the planning, development, and commissioning of the alternative precinct-scale water harvesting and treatment schemes, QUU was reluctant to take on ownership of the schemes. The ULDA sought to improve urban development processes and quality using a variety of mechanisms. These mechanisms included negotiating with regulators to gain approval for the water harvesting schemes and negotiating with other stakeholders such as suppliers to leverage improvements in energy efficiency from these alternative water sources.
Power/authority	In the Fitzgibbon Chase development, the ULDA had significant authority, granted through its statutory powers. Other members of the multi-organisational network had significantly less power on the project, although QUU had power to decline to own the water infrastructure after construction, which posed challenges outlined above. Specifically, the ULDA had a clear mandate for fostering innovation, organisational authority to support innovation in the form of special planning powers, and a degree of independence from the existing planning system. However, the ULDA did not forcibly use its authoritative powers to deliver on its objectives; rather, it played a facilitative role and worked with other stakeholders to achieve the desired outcomes.
Legitimacy	Through its statutory powers and coordination role in engaging stakeholders, the ULDA held substantial legitimacy, firstly from a public perspective through the democratic process which led to its establishment, and secondly from an industry perspective as it sought to incorporate industry stakeholder perspectives and input into the implementation of the Fitzgibbon Chase project.
Flexibility	The unique combination of planning and development functions within the ULDA also enabled it to adjust the planning provisions or development objectives as required, thus providing flexibility to realise the innovative alternative water schemes.
Implementation processes	Although the organisation did not have much direct control over any changes to the state's statutory planning system, these practice notes supplemented the State Planning Policies, and had some authoritative weight within the planning system.

Table C10: Summary of integration across scales cases

Case	WA Groundwater Replenishment Trial	UK England & Wales	UK Scotland	Berkeley FIRST	Rotterdam infrastructure	Room for the River	Portland green infrastructure	Fitzgibbon Chase urban development
Scale	State–state	National – water authorities	National – water authorities	City, within local government area	City, within local government area	National – provincial – local governments & local water boards	National government – city, within local government area	City, within development area
Structure	Central IAWG as bridging organisation	Individual inter-organisational relationships	Individual inter-organisational relationships	CoB at centre with internal and external stakeholders	Transition team at centre with internal and external stakeholders	National government led with other stakeholders	CoP at centre with internal and external stakeholders	ULDA at centre with external stakeholders
Legitimacy	Implied via engagement	Implied via engagement Customer committees	Via democratic processes Customer committees	Democratic via ballot	Limited	Democratic via elections and engagement	Implied via democratic processes	Limited
Culture/ values	Openness, outcome focused	Flexibility, outcome focused	Flexibility, outcome focused	Innovation, collaboration	Innovation	Engagement, openness, outcome focused	Outcome focused, engagement, innovation, flexibility	Innovation, collaboration
Leading stakeholders	Water Corporation Dept of Water	Regulators	Water Industry Commissioner	CoB Councillors	Transition team	National government	BES Councillors	ULDA
Power/ politics	IAWG, EPA held authority Political support	Regulators held authority Political support	Politicians Regulators held authority	CoB Councillors	Transition team held authority	National government via legislation	BES Councillors	ULDA, QUU
Network type	Hybrid	Hybrid	Hybrid	Type I	Type II	Type I	Hybrid	Type II

Notes: BES – Bureau of Environmental Services, CoB – City of Berkeley, CoP – City of Portland, IWAG – Interagency Working Group, QUU – Queensland Urban Utilities, ULDA – Urban Land Development Authority.

Type I networks – have greater legitimacy as they are linked to existing democratic processes; membership is not voluntary; a stakeholder's identity is entwined with the network and is often territorially defined.

Type II networks – are more flexible; both face the challenge of coordinating among members; membership is voluntary.

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