

Article

Transitioning toward Sustainable Cities—Challenges of Collaboration and Integration

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Received: 23 April 2020; Accepted: 28 May 2020; Published: 2 June 2020



Abstract: The transition towards sustainable cities cannot be solved by individual stakeholders and organisations acting alone. Better governance for tackling such complex problems, including policy change and innovation adoption, will require purposeful collaboration. This is particularly evident in projects that involve integration across scales. Our case-study research compared six water-related innovations in large cities in Australia, the Netherlands, and the US. We found that government agencies, water utilities, professional organisations, and industry innovators were all vital actors, along with supportive community education. In the initiation phase of innovation, informal networks were used by sustainable innovation champions to galvanise support. As pilot projects emerged, more formal supportive processes and financial incentives were crucial. For large projects and for the mainstreaming of pilot projects, the role of formal coordination and integration mechanisms became vital for coherent and successful implementation. Various forms of network-based collaborative work were utilised, but the designation of a key coordinating organisation was found to be helpful in maintaining focus and momentum. Coordination activities across organisations, scales, and time were enhanced by the strength of core values and culture, such as valuing stakeholder engagement, innovation, flexibility, and having a focus on outcomes. Overall, this research demonstrated the need to continually evaluate the innovation process to ensure that key ingredients (suitable for each context) are implemented in a timely manner to strengthen the process and enable effective and purposeful collaboration.

Keywords: policy innovation; collaboration; integration; sustainability governance; urban water

1. Introduction

The governance of urban water sustainability occurs at the intersection of many policy and planning issues and across several scales of spatial and organisational complexity [1,2]. In addition to the traditional values of water supply, public health protection, and flood protection, water-sensitive cities will need to deliver complex sustainability values, such as waterway health, biodiversity, social amenity and recreation, water conservation and efficiency, carbon neutrality, and urban heat island improvement [3]. To realise these values, there need to be multiple technological and practice innovations supported by an adaptive management framework.

There is a growing body of scholarship investigating the characteristics of adaptive frameworks for managing water more sustainably. The policy and regulatory issues span important matters of human health, economic prosperity, urban “liveability”, and ecological protection. Unfortunately, the experts responsible for each sector of this compound puzzle do not necessarily collaborate closely.

Moreover, the active and informed involvement of citizens in planning for sustainable development has frequently been overlooked by policymakers and water utility professionals. Previous research has demonstrated that a robust capacity for policy innovation is essential for addressing future challenges in the urban water sector [4,5]. In democratic countries, setting goals and strategies through an inclusive process is essential, and successful implementation requires careful anticipation and adjustment in regard to the innovation challenges. It is not helpful to have lofty ideals without detailed attention to implementation capacities and community acceptance. As the level of ambition increases to tackle more complex issues, stronger needs arise for collaboration across organisational sectors and across levels of government. The governance arrangements that emerge to support such integrated solutions will also need to operate effectively across different organisations, sectors, and levels of government.

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” was marked by an expanded suite of policy instruments, a wider range of participants with influence in the policy process, and a decrease in the efficiency and effectiveness of traditional top-down methods of governing [6]. The significance of this governance shift has been identified in many sectors of government, including urban water [7].

Governance literature shifted attention away from seeing central government as the primary organisation and centre of authority; scholars and practitioners realised that many different civil society and private sector actors were involved in the planning and implementation of public policy. Analysis of multilevel governance has confirmed this shift towards recognising the importance of governance across scales and levels of government. This shift illustrates the diffusion of authority [8] and the negotiated, less-hierarchical exchange between institutions in the governance process [9] (pp. 131–132). Given the reliance on multiple stakeholders and negotiated exchanges, multilevel governance is often considered to combine formal “vertical” authority with types of network governance [8,10].

Governing water resources across multiple administrative levels and spatial scales is particularly relevant for hydrological systems, which operate at many spatial scales, from small catchments to international river basins to global water cycles, at different temporal scales, and also because water resources frequently cross socially constructed government and administrative boundaries, which results in inefficiencies and spatial externalities [11]. Multilevel governance has been studied at many different spatial scales, from the international, national, regional, metro, and local levels [9,12,13]. These different levels interact and influence each other in continually changing ways [14]. In urban water management, small-scale strategies and technologies are often necessary as pilot schemes or as building blocks contributing to more complex programs [12]. Coordination and integration of planning and implementation are crucially important for effective outcomes in multilevel governance.

Previous studies have identified several key problems in multilevel governance, such as harnessing multiple stakeholders, coordination across scales, lack of clear legitimacy and authority, and ensuring effective participation [15]. Firstly, multilevel governance, by definition, involves multiple stakeholders. Managing their different interests and perspectives is challenging [13] and often involves significant transaction costs [8]. Effective communication is a key ingredient for the successful coordination of multiple parties [16]. To be effective, the close involvement of stakeholders at different levels needs to be maintained, and managing their conflicting interests is necessary to keep the main focus on the shared goals of the program. A lack of communication and coordination can critically hamper the success of projects, and disruption can arise from election outcomes and consequent changes in administrative arrangements [12]. Hooghe and Marks [8] (p. 239) propose two strategies for managing the coordination challenge as the number of network participants increases: (1) limit the number of members, or (2) divide the governance network up into functionally separate sub-networks, thus limiting the need for comprehensive interaction among actors.

Secondly, coordinating effectively across scales is crucially important. Problems that may be faced include misfits between scales, finding the most “appropriate” scale for establishing multilevel governance arrangements, overcoming problems of interplay between different levels, problems of

reconfiguring scales (rescaling problems), and problems of upscaling and downscaling [11]. These challenges were evident in implementing the European Water Framework Directive (WFD) characterised by multiple and nested regional spaces with diverse interests [17]. While the WFD was focused on water, it also required 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 [18]. In the case of alternative water supply projects, Furlong et al. [12] found that the complexity of fit, interplay, and coordination across multiple stakeholders and scales highlighted the challenges surrounding infrastructure decision-making. There tended to be variability and uncertainty across locations as to who had the responsibility for decision-making and what processes were to be followed.

The final challenge facing multilevel governance is the criticism that it may lack democratic legitimacy. Scholars such as Termeer and colleagues 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” [19] (p. 6). The advantages of multilevel negotiation in terms of flexibility and adaptation to different contexts are balanced by concerns that decisions are not always able to be subject to full citizen participation and engagement. However, some strategies have been suggested to overcome the perceived lack of legitimacy, including generating locally relevant knowledge [13] and basing the multilevel governance network within existing democratic governance structures [8].

Clearly, the structure of the governance arrangements will contribute to the success of the program. A combination of horizontal and vertical links, together with intermediaries or bridging organisations, provides important conduits to mobilise and link actors and disseminate knowledge quickly across different levels [13,19]. Furthermore, the governance arrangements must have key stakeholders, such as mayors and other community leaders, involved to gain support of local constituents [13]. Intermediaries are used to facilitate strategy implementation. Medd and Marvin [17] 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 a responsibility for the values and priorities of the project. Shared values are essential—for example, environmental health and protection of water supply quality across municipalities [13].

In this paper, we aim to investigate the challenges of collaborative governance for urban water governance by asking the following research question: How have collaborative governance principles and practices contributed towards successful innovation in water management? At the heart of the collaborative governance challenges is the need for publics, technical experts, policymakers, and regulators to collaborate to find solutions to emerging sustainability challenges and develop appropriate governance arrangements to support the solutions. We seek to answer the above question by focusing on several cases of innovative water security and flood management at different stages of innovation. This analysis provides some findings on factors contributing to collaboration success for urban sustainability.

First, the paper briefly explores the literature on collaborative problem-solving in the context of governance and policy innovation. Next, we outline an analytical frame for exploring empirical examples of innovation in the urban water sector. We then briefly outline the six case studies, and draw insights about how the collaborative features in these cases supported innovation and pathways to mainstream adoption. Finally, we endorse the value of supportive collaboration in overcoming the challenges underlying sustainable urban development.

2. Principles and Practices of Collaborative Innovation

Since the 1980s, there has been extensive research literature on the nature and effects of collaboration as a form of collective information-sharing, deliberation, planning, and public 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" [20] (p. 5). The wide interest in collaborative approaches arises from the common observation that the combined efforts of multiple organisations addressing an agreed-upon problem can achieve better outcomes than if they tackled the problem in isolation, often from conflicting positions. We follow Emerson et al. 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" [21] (p. 2).

The research literature indicates that collaborations 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. These are fundamental challenges for sustainable development. Those innovative approaches are more difficult to achieve through traditional regulatory directives, which rely on authority and standardisation. Specifically, it has been 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 [22].

According to Himmelman [23], the chosen form of cooperation and collaboration needs to be appropriate for each specific context. The potential success of the collaboration 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" [23] (p. 27).

Bryson and colleagues [24] surveyed the research literature and identified four sets of issues for cross-sector collaboration: Initial conditions, process components, contingencies and constraints, and outcomes. 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 policy makers are more likely to encourage such responses when the "separate efforts" of the various actors are believed unlikely to "fix the problem". Collaborations are better grounded where there have already been some developments 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 seen as critical for subsequent working across boundaries. This foundation affects the perceived legitimacy of the collaboration as a vehicle for joint efforts and the willingness of champions to provide supportive leadership. Inclusion of key stakeholders in negotiations, and utilising their knowledge, enhances cross-group understanding and builds collaborative strength. Given that collaborations must incorporate conflicting viewpoints, it is important to equalise influence and manage conflict effectively [24].

Thirdly, in regard to contingencies and constraints, the research literature suggests that system-level planning activities are likely to require continuing negotiation rather than formal reliance on administrative and service partnerships. Different institutional logics among the partners may hinder agreement on key elements of process, structure, governance, and desired outcomes, and therefore require ongoing discussion [24].

Fourthly, in regard to the achievement of outcomes, the research literature suggests that achieving results from innovation 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. They are more likely to produce outcomes if they are rigorous in establishing and using a results management

system that monitors information, tracks inputs and processes, and builds accountability for outcomes in close association with key political and professional groups [22,24].

With regard to how innovation may emerge, Emerson and colleagues [21] argue that the main drivers of collaboration are purposeful leadership, incentives for action, perceived inter-dependence, 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” [21] (p. 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 motivation and commitment of the partners, 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 [25] argues persuasively that achieving “small wins” along a strategic pathway towards longer-term goals is helpful for maintaining momentum and cohesion. This allows partners to continue to build capacities and move their projects through the developmental stages.

Thus, applying this analysis to the urban water sector and the various patterns of reform evident in recent years, it is important to emphasise that the collaborative arrangements appropriate for each problem will need to be tailored to each situation and the particular policy problem at hand. In other words, the collaborative models and processes that “work” most effectively will be unique to each jurisdiction. This is because the institutional context, past and present, plays a large role in shaping and constraining the nature of policy leadership, the capacity of organisations to work together, the resources available for problem-solving, and, hence, the policy problem itself. This also means that learning from other projects must be cautious and contextualised, as the generalisation of findings across diverse contexts would be problematic.

This paper analyses some cases of successful approaches to urban water sustainability by taking seriously the institutional process factors associated with collaborative success in the face of cross-sectoral complexities. In the light of research on sustainable urban water management, it is widely accepted that the traditional reliance on closed decision-making processes driven by water engineers is no longer a viable approach. New water supply options and new management approaches for sustainability are challenging the historical patterns of policy, law, and regulation. Providing better support for innovative practices in urban water will require a comprehensive reassessment of the technical, regulatory, and participatory features of the governance setting. This will impact the roles, responsibilities, and established conventions of many organisations responsible for service delivery, resource management, policy setting, and environmental, human health, and financial regulation.

3. A Frame for Exploring Collaboration in the Innovation Process

This section provides a concise account of key attributes of collaboration and governance specifically relevant to urban water innovations across multiple scales. On this basis, we construct a diagram of the dynamics of innovation (see Figure 1). In the following section, we then describe and analyse six case studies to elucidate key insights and principles for innovation governance across organisations and scales.

Many authors have ventured diverse views on the process of public sector innovation [26], but most have identified three phases that refer back to the classic work of Rogers [27] on the diffusion of innovation. Potts and Kastle [28] propose origination, adoption, and retention; Stewart-Weeks [29] proposes a virus metaphor of infection, inspiration, and implementation; Kastle [30] proposes three action-based phases that are easier to translate: manage innovation as a process; think more explicitly about risks; and experiment to learn, reduce risk, and trigger value creation. The general implications are that water governance arrangements need to be adaptive; conditions need to be fostered that allow

innovation to emerge and flourish; processes need to be designed to develop innovative ideas into viable practical options; and strategies need to be developed to ensure that these new options become embedded in policy and practice and are supported by regulation. In this way, more supportive governance arrangements will be incrementally developed over time. The conceptual frame below is based on three phases—initiation, experimentation, and integration—which move from project ideas through pilot schemes to wider delivery systems and institutionalisation. Figure 1 represents this innovation adoption process in a classic S-curve, often used to depict generic system-change processes, with time on the x -axis and a measure of “change” in the system on the y -axis. This curve has been used to depict the process of innovation diffusion [27] and transitions to new system configurations [31], two areas of research relevant to the problem of initiating more systemic change in the urban water sector.

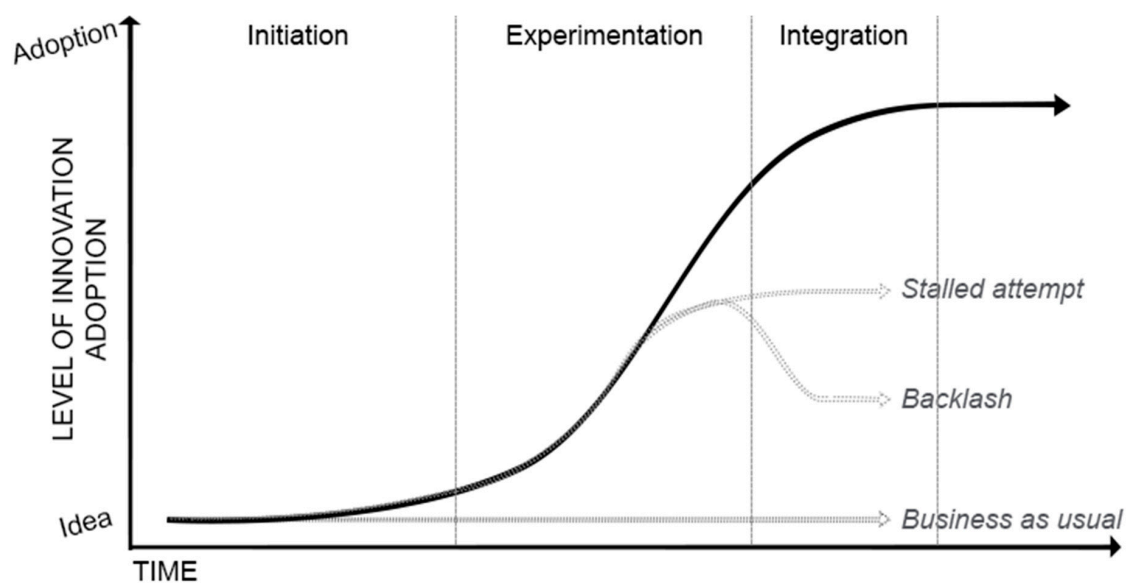


Figure 1. Conceptualisation of policy innovation: tracing ideas to adoption.

This conceptual framing of the innovation process was used to position our case studies at varying stages of innovation in order to explore collaborative elements within these processes. To describe the collaborative elements observed in the case studies, we focused on the actors, processes, and structures that enabled (or limited) collaborative efforts. Actors consist of individuals and public and private organisations. Processes for supporting a water-sensitive city are likely to comprise various forms of cooperative effort. Structures refer to systems of rules (systems of ownership, sources of authority and legitimacy, and accountability mechanisms) and instruments that create incentives or disincentives. Common attributes of these focal points drawn from the literature are set out in Table 1.

Table 1. Attributes of collaborative elements.

| Actors | | Processes | Structures |
|---|---|--|---|
| Individuals: | Organisations: | | |
| <ul style="list-style-type: none"> • Take a systems view of the water sector and its links to other sectors • Have diverse knowledge and skills and an interdisciplinary outlook • Are resilient and able to learn and adopt new practices • Have a desire to contribute to society • Are committed to creating change • Take responsibility for their work • Are open to new approaches and are willing to take risks • Trusted by peers | <ul style="list-style-type: none"> • Leadership values learning by providing resources for data capture and reflection • Work effectively with external stakeholders and across intra-organisational structures • Have some appetite for risk • Are trusted organisations | <ul style="list-style-type: none"> • Effective, transparent, multi-disciplinary communication to develop a shared understanding and trust • Cooperative relationships and partnerships that facilitate input from stakeholders • Adequate resources to support close working relationships • Learning continual improvement mechanisms • Risk sharing | <ul style="list-style-type: none"> • Having a clear vision • Clear roles and responsibilities • Clear and coordinated administrative arrangements • Performance targets with regular and effective monitoring, and evaluation is also important • Arrangements for risk sharing • Utilising a range of policy instruments |
| Sources: [26,32–41] | | | |

4. Case Studies on Collaborative Innovation

Cases showing signs of innovation initiation, experimentation, or integration were identified through a literature review, research networks, and discussions with industry partners and other academics. This is consistent with the case study design strategy of analytical generalisation as outlined by Yin [42], where cases are selected to provide insights into the theoretical constructs—in this case, of innovation initiation, experimentation, and integration, together with success factors of collaboration. We identified a range of cases, from examples of technological innovation influencing policy development through internal bottom-up policy development processes, to top-down policy imposition and translation. This provided a spread of diverse policy drivers in different contexts within which to explore collaborative elements. Cases were selected where primary data collection was possible for the research team, or where there was sufficient published material to gather adequate information to explore the case. Successful examples of innovation are contrasted with one negative case—the failed Toowoomba initiative on potable water reuse—which is included here as a counter-point to the successful cases. Case study materials were analysed using an iterative coding strategy, involving identification of key drivers and barriers, important actors (individuals and organisations), institutional structures, and processes employed. The codes were then compared with the theoretical literature on collaborative governance and technological innovation (refer Sections 2 and 3 above). Case study overviews and insights are described below, ordered according to the initiation, experimentation, and integration phases. Table 2 contains a summary of the key findings.

Table 2. Summary of case studies and findings.

| Case Study | Location | Innovation Phase | Policy Area | Collaboration Insights |
|---|----------------------------------|-------------------|-------------------------------------|--|
| Toowoomba water recycling referendum | Queensland, Australia | Failed initiation | Potable recycled water | Technical solutions require support from opinion leaders across society; cohesive leadership is important; community needs to be engaged early in plan development |
| Fitzgibbon Chase housing and water recycling initiative | Queensland, Australia | Initiation | Land use planning, water recycling | Collaboration and leadership through a central statutory authority developed evidence and industry support; individual leaders were motivated by a shared sense of purpose |
| Rotterdam infrastructure adoption | The Netherlands | Experiment-ation | Climate change, urban renewal | Formal collaboration events facilitate trust and shared understanding, concurrent events helped generate support for transitioning; collaboration among academics and council staff facilitated the transition process |
| Room for the River | The Netherlands | Integration | Flood management, land use planning | Substantial time may be needed for major policy change; the formal collaborative strategies provided facilitated diverse stakeholders engaging with flood policy; shared understandings developed over time |
| Portland green infrastructure | Oregon, United States of America | Integration | Urban drainage, water quality | Internal organizational leaderships created a culture that valued the environment; formal collaboration opportunities were outcome-focused and maintained positive momentum; broader community support for valuing environmental protection provided legitimacy for change |
| Western Australia groundwater replenishment trial | Western Australia, Australia | Integration | Groundwater indirect potable reuse | Sharing information and ensuring transparency facilitated trust; community education and engagement requires substantial time; formal and informal collaboration processes were used effectively; a central network (working group) had an open culture that contributed to achieving desired outcomes |

4.1. The Toowoomba Water Recycling Referendum 2006 (Failed Initiation Case)

This case centres on learning from a negative example—an innovation attempt that failed. An attempt by the city council to introduce potable recycled water was marked by governance uncertainty and lack of multilevel support. As the case attracted great interest, other proponents of innovation have explicitly examined the failures and drawn lessons about the need for collaboration, good governance, and working closely with stakeholders.

Toowoomba, a regional city in Queensland, Australia suffered a dire water supply crisis. The plight of this city attracted national attention at the height of the urban water security crisis across much of Australia in 2005–2008 in the midst of the “Millennium Drought”. The drought had badly affected the city’s water storages, providing a trigger in 2005–2006 for exploring alternative sources for the production of potable water. The council commissioned an expert assessment to identify future water supply options, leading to a controversial proposal for an advanced water treatment (AWT) plant designed to produce potable recycled water (PRW) from wastewater sources [43].

Water professionals had been united in attesting that advanced wastewater treatment facilities would meet required technical standards for water quality; financial support was potentially available. In Queensland, there was a regulatory gap in relation to PRW, although the state government was actively examining the issues during 2006–2007 [44]. At the local political level, there was strong support from the city councillors, 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.

However, local opponents quickly launched an advertising blitz against “drinking poo”, with substantial campaign funding from a property developer and former mayor. This eventually resulted in the federal water minister announcing that the pledged federal funding would be dependent on the outcome of a local referendum. Following an intense and bitter campaign, the referendum was lost by 62% vs. 38%.

Having been denied federal financial support and with the water crisis continuing to deepen, the council and state government negotiated an extremely expensive new pipeline to connect Toowoomba with the Southeast Queensland (SEQ) Water Grid at a cost of 187 million AUD, with the council required to pay more than half the costs [45]. Regulatory conditions to authorise future PRW schemes eventually followed in 2007–2008, which facilitated the state’s decision to build its own major AWT scheme, the Western Corridor Recycling facility, intended to provide PRW for the Brisbane region via a pipeline to the Wivenhoe Dam and thus into the SEQ Water Grid. This latter facility was completed, but was mothballed for political and financial reasons.

Thus, the water security crisis had provided a trigger in 2005–2006 for exploring alternative sources for the production of potable water. Water professionals had been united in attesting that advanced wastewater treatment facilities would meet required standards, and financial support was potentially available. Nevertheless, the innovation did not proceed.

With hindsight, there were three main reasons why the proposed Toowoomba water policy innovation of 2006—the introduction of PRW into a city water supply—had a high probability of failure at that time. Analysis of factors generating this failure provides insights into the success factors for developing more positive initiatives in the future.

1. Political leadership in a multilevel system was fragmented. In a complex policy/regulatory context in a multilevel system, the levels of government need to be mutually supportive. Despite the efforts of council leaders to forge a united front among the three levels of government, the basis for a cohesive strategic direction was absent.
2. The regulatory gap was fatal. PRW was not explicitly permitted by Queensland laws in 2005–2006, and this lack of mandated standards and clear decision-making processes played into the hands of those seeking 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. Regulatory silences, gaps, and inconsistencies frustrated the intentions of those seeking innovation. Lack of authorisation implied a lack of legitimacy, which could affect the capacity to borrow funds, sign contracts, and gain the widespread support of stakeholders and the general public.

3. The politicisation and polarisation of policy debate 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 implications of this case are that the pursuit of breakthrough ideas requires public and political support, and the champions of change will need to be well prepared for a wide range of challenges. The balance of incentives and sanctions for innovation is usually weighed in favour of the status quo. Political contingencies and opportunism can side-track even well-planned strategies. The case for change (i.e., the claim that benefits outweigh costs) is only one voice in a noisy series of claims and debates. Government policymakers, even when in favour of change, may lack the skills, capacities, and permissions to develop coherent strategies that facilitate innovation while ensuring that risks are well managed. In many cases, policy innovation and implementation depend on forging partnerships and collaborative capacity between stakeholders, organisations, or levels of government.

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

- Technical solutions for shared community problems, even with 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 important. On issues that may be subjected to arguments based on fear and emotion, disunity among opinion leaders can be fatal for science-based innovation, and local referenda often fail to support innovation.
- Early engagement with the community in developing future plans is preferable to asking for endorsement of a proposal drafted by experts. This is also observed in the Groundwater Replenishment Trial case presented in 4.3 below.

4.2. *Fitzgibbon Chase Mixed Housing and Water Recycling Initiative (Initiation Case)*

Fitzgibbon Chase is a master-planned residential development northeast of Brisbane's central business district (Queensland). In addition to the water recycling innovations at Fitzgibbon Chase, there were novel urban design elements, such as multi-functional and increased public open space and unique apartment-style housing designs. This development project provided a case study to explore the potential influence of innovative ideas in land use planning policy and, more specifically, the role of a multi-organisational governance network in addressing issues surrounding the ownership and operation of decentralised stormwater and roof water harvesting and treatment systems. The data for this case study are drawn from Bettini [46].

The Urban Land Development Authority (ULDA), created by Queensland state legislation in 2007, was the central actor in the multi-organisational arrangements, as it owned the relevant land and also had significant statutory planning powers. Its mandate was to foster innovation to achieve social, environmental, and economic outcomes, and it 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 potentially enabled considerable flexibility in adjusting 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, who were 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 stakeholders in the learnings generated from the trial and implementation of 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. Another challenge was identified during negotiations with QUU regarding ongoing operation and maintenance of the stormwater and roof water harvesting infrastructure. Despite engaging the water retailer QUU throughout the project, QUU, was reluctant to take on future ownership of the novel water recycling schemes. Explanations focus on a lack of organisational capacity, profitability, and a shift in the executive's tolerance for risk.

In the Fitzgibbon Chase development, the ULDA had significant planning powers, granted through its legislation, while other members of the multi-organisational network made more specialised contributions, such as design elements. The ULDA had a clear mandate for fostering 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 emerging issues.

The ULDA chose not to exercise all its authoritative powers; rather, it played a facilitative role and worked with other stakeholders to achieve the desired outcomes. The ULDA not only sought to deliver innovative development, but also to identify blockages in the planning system and work with the relevant stakeholders to address these barriers. It negotiated with regulators to gain approval for the water harvesting schemes. 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 grid managers to leverage reductions in energy and water headworks charges owing to the efficiencies of these alternative water sources.

Collaborative efforts fostered a community of practice around the new approaches emerging from the Fitzgibbon project. The collaboration built the evidence base, harnessed industry support, and made evidence-based arguments to satisfy the state government that reform of policy or legislative settings was needed. Additionally, there were individuals in leadership positions, both inside and outside the ULDA, who recognised opportunities for change and worked together to utilise these opportunities. Many individuals involved in the network were motivated by a shared sense of purpose and similar values or principles. These coordination efforts and links between practice and policy development demonstrate that the ULDA provided industry leadership.

Through its statutory powers and coordination role in engaging stakeholders, the ULDA enjoyed public legitimacy through its status as a statutory body, and industry legitimacy through incorporating industry stakeholder perspectives into implementing the Fitzgibbon Chase project. The unique combination of planning and development functions within the ULDA enabled it to adjust the planning provisions or development objectives as required to realise the innovative alternative water schemes. Regulatory gaps and complexities have hindered many other local initiatives [47].

The network of public and private sector organisations was developed for a specific purpose of land development for the Fitzgibbon project, and was dissolved after the project's conclusion (2012). The governance arrangements were notable for a strongly centralised network structure focused around the ULDA. The project's success can largely be attributed to the authority granted to the ULDA through its establishing legislation and its collaborative approach when implementing the project. However, in terms of longer-term governance, the water retailer QUU was later able to decline taking ownership of the novel water infrastructure.

4.3. Rotterdam Infrastructure Adoption (Experimentation Case)

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 CO₂ emissions reduction, and current practices. The transition team from within the City led the multi-organisational governance arrangements [48]. This team was comprised of two Rotterdam City Council staff from the planning department and two staff responsible for the Biennale project celebrating urban architecture and future sustainability. The transition process comprised a series of workshops with key city stakeholders to explore an aspirational city vision and how it could be implemented. Researchers from the Erasmus University Dutch Research Institute for Transitions (DRIFT) program helped to facilitate the workshops, provided expertise on transition management, and evaluated the process at the end. Network members included attendees at internal Council workshops and external sectoral leaders in sustainability and urban development (such as architecture, urban planning, and housing services).

The transitions team aimed to develop internal Council discussion and commitment to sustainability by attempting to link carbon dioxide reduction challenges to the quality of life issues currently facing the city. Externally, they sought to explore how Rotterdam could develop sustainably without the Council always taking the lead role. Three workshops with internal and external stakeholders were held to evaluate and provide feedback on urban greening and densification plans. The transitions team and the City Council were central to the transition arena process and held responsibility and authority for the project. The transition process engaged internal and external stakeholders widely, 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 more thoroughly challenged the existing Council plans by examining the underlying assumptions of the plans [48,49].

Although the multi-organisational governance arrangements were focused on Rotterdam City Council, itself a democratic organisation, the actual process and related network arrangements were formed outside the Council. Additionally, the governance arrangements were established for the specific purposes of the transition process and ended soon after the Biennale concluded (2012).

Stakeholder education and engagement was a central part of the project, with the transition team working with frontrunners to engage community leaders on climate change and urban liveability. 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 was 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) occurring concurrently with the transition process were used to generate support for the concept of transitioning among Council staff.
- Collaboration among academics and Council staff were important for facilitating the transition process.

4.4. 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 aim was to improve flood safety and spatial quality by increasing the area available for flooding [50,51]. The Netherlands national government led a shift in policy stance from “fighting” water to “living with” water, framed as making “Room for the River”. Following this policy shift, a program of on-ground works was developed with 34 RftR projects outlined [52]. However, the details of program implementation program lie outside this case study. The RftR case is instructive for its high reliance on collaboration and networking among stakeholders over many decades (1980s–2015).

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, quality, spatial planning, and climate change [53,54]. The national government, via the Ministry of Infrastructure and the Environment, had a powerful role in the multilevel/multi-organisational governance arrangements. However, its approach to decision-making

used the “polder model of compromise”, which creates opportunities for parties (sometimes historically opposed) to engage in constructive discussion [55]. Such an approach to decision-making contributed to the legitimacy of the program, enabling multiple levels of government to develop shared understandings of the objectives and support the policy shift. One way of describing this governance approach is “a steering philosophy of ‘controlled trust’ rather than top-down governance” [56] (p. 374).

Several consultation and collaboration strategies were used to facilitate transparent development of the policy framework and, subsequently, the works program [57]. 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, whose advice was accepted largely without amendment. The effective incorporation of other levels of government and other stakeholders through various engagement processes strengthened legitimacy and limited coordination costs [19].

Advice from external committees and independent research organisations was sought and 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. 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 policy development and implementation programs. Links between scientists and policy makers also helped develop the shared view that current flood management approaches were inadequate for managing future risks. These links, together with the series of inquiries and position papers, facilitated the development of shared problem frames, strengthening the perceived need for a new approach to flood management.

Both formal and informal collaboration strategies contributed to the shift in problem frames and risk management approach 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. The role of the national government in leading and steering the policy shift provided strong links with the democratic process. However, underpinning the national government’s leadership and the collaborative mechanisms was the national culture of consensus decision-making in the Netherlands.

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.

An outcome of the collaboration was the information 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 improve spatial quality through water management works. The focus on an overarching objective of improving flood safety and a willingness to negotiate, compromise, and collaborate across different stakeholders were integral in the success of the RftR policy development and program implementation.

Some key insights of this case include:

- The length of time (in this case, decades) that may be required for major policy change.
- 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 used formal collaborative strategies that provided opportunities for diverse stakeholders to engage with flood management policy.
- The extended time available and the use of engagement strategies enabled shared understandings to be developed across stakeholders.

4.5. Portland Green Infrastructure (Integration Case)

The City of Portland (CoP) in the north-western United States developed a comprehensive suite of stormwater management improvement programs 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 under the Clean Water Act of 1972, requiring conformance with standards under the federal National Pollutant Discharge Elimination System (NPDES), the City leaders sought to exceed best practice and implement effective and comprehensive green infrastructure throughout the city. While the federal regulatory requirements stimulated the Portland policy change, the change went beyond a typical minimal response to federal regulation.

The governance arrangements involved internal departments in the CoP and cross-departmental advisory committees, with some involvement from the federal Environmental Protection Agency (EPA). The main implementation and extension processes and cultural change efforts were led internally by the Bureau of Environmental Services (BES). The advisory committees ensured the policies that were developed incorporated internal and external stakeholder insights and enabled institutional barriers to be overcome [58]. The committees undertook research, considered the implementation challenges and solutions, and made recommendations to the Bureau and the councillors. These committees included the: internal and external Stormwater Policy Advisory Committee (1996); the internal and external Stormwater Advisory Committee (1999); internal Sustainable Infrastructure Committee (2001); and the internal Green Streets Cross-Bureau Team (2005).

Political leadership by City of Portland politicians, including the Mayor, was important for facilitating green infrastructure implementation [59]. The Portland community has a history of supporting sustainable forms of urban development (e.g., urban growth boundary, public transport) [60,61]. This history of public support encouraged local politicians to propose and support innovative green infrastructure stormwater management strategies. The City leadership was central to implementation of green infrastructure, both in terms of authority and legitimacy. The crucial regulatory influence of the EPA became less crucial over time as the City went beyond the basic NPDES requirements and became a leader of green infrastructure implementation. Within the multi-organisational network, the CoP held significant power through its statutory role in community engagement and operational responsibilities for stormwater. As a local government, the CoP's green infrastructure plan is considered to have a high degree of legitimacy [62].

Four different communication strategies were used between the planning 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 feasibility and efficacy of the technologies to internal council and external stakeholders, which was then used to implement policies and programs that extended beyond the BES's jurisdiction [58].
2. A clear business case was used to communicate the financial savings of implementing green infrastructure compared to conventional stormwater and combined sewer overflow management benefits.
3. Multiple benefits of green infrastructure were identified to broaden the rationale for implementing green infrastructure policies, such as the green streets policy [63], which explicitly identified the links to other council sectors, such as transport.

4. CoP engaged the community through outreach programs, including the BES providing technical and advisory support to stakeholders [60,64], and providing information about and conducting tours of green infrastructure sites and water art installations.

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 [61]. The BES staff realised early that much of the runoff 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 [58]. By identifying these synergies and thinking strategically, the City 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. The committees enabled members to share information and discuss problems and solutions to the challenges of implementing green infrastructure, and thus facilitated shared understandings. For example, the green infrastructure policy direction had initially focused only on stormwater, but then spread to other sectors (e.g., transport, planning). Program staff also networked and shared information with other catchment management programs on an informal basis.

The governance network was situated within the CoP, with BES coordinating the internal and external stakeholders, and the BES staff participated in multiple advisory committees. The network focused on green infrastructure and associated technical issues, and thus operated in parallel with the local government's democratic structures. However, the Councillors approved funding, provided some political support, and thus underpinned the democratic legitimacy of the green infrastructure programs over time.

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 towards organisational and policy change.
- The formal opportunities for collaboration (e.g., committees) were outcome-focused, thereby maintaining positive momentum.
- The broader community support for valuing environmental protection provided legitimacy for the CoP's implementation of green infrastructure.

4.6. Western Australia Groundwater Replenishment Trial (Integration Case)

The Groundwater Replenishment Trial (GWRT) conducted by the Water Corporation in Western Australia (WA) illustrates the significant investment in time and resources needed to develop trust among stakeholders to develop advanced and innovative water treatment and recharge technologies. At the same time, it was necessary to engage with stakeholders to amend the regulatory, policy, and monitoring frameworks to allow ongoing support for groundwater replenishment. Multi-stakeholder governance arrangements were central to the project. The data for this case study are taken from Bettini and Head [65].

Formal collaboration strategies to facilitate the GWRT included an Interagency Working Group (IAWG) and a Groundwater Technical Reference Group. The IAWG comprised the Water Corporation (the lead organisation), the Western Australian Department of Health (human health regulator), the Department of Water (responsible for water allocation, including of recycled water, and protecting groundwater supplies), and the Department of Environment and Conservation (environmental health regulator). The IAWG was formed in 2007 to address the legislative changes needed to enable water processed through an advanced water treatment plant to be recharged into the groundwater, as it was previously defined as wastewater and not permitted to be recharged. The Technical Reference Group 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 were responsible for driving the project, with regular meetings providing frequent interactions among staff, 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 inter-agency interactions and agreements also contributed to the GWRT's success. From the beginning of the trial, strategic thinking is evident in the involvement of the regulators early in the project. This strategy not only developed co-learning and joint ownership of the objectives of the project, but also enabled the restrictive regulatory arrangements to be challenged and new arrangements to be developed and tested during the trial itself. The IAWG members focused on the "bigger picture", prioritising the trial success over potential sector-specific benefits (e.g., environmental benefits). Another example of strategic engagement was the designation of the Environmental Protection Authority (EPA) as the lead agency in community engagement for the project. The EPA's role as environmental protector underpinned its perception by the community as a neutral expert organisation. Moreover, engaging the Commonwealth Scientific and Industrial Research Organisation (CSIRO) as technical expert to lead preliminary feasibility studies contributed to the perceived independence of the scientific evidence underpinning the project.

Within the Water Corporation, internal support for the novel concept of a GWRT was generated through processes for open discussion, and this 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. Central to the success of the GWRT was the community and stakeholder engagement strategy. The lessons of the failed Toowoomba referendum were that a careful strategy of communication and education should be developed over an extended period, incorporating key stakeholder groups and representatives of community interests. The Water Corporation engaged early with peak bodies and industry associations to survey key industry stakeholders' perceptions, ensure they were well informed, and to address or mitigate the issues that could derail the concept as it progressed.

The stakeholder engagement strategy involved an extensive range of communication strategies, focusing on face-to-face communication to provide open and transparent access to information about the trial and also provide 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 that questions and concerns were addressed. At the conclusion of the trial, the Water Corporation sought independent auditing of the trial's results and invited responses from regulators. This further enhanced the transparency and trustworthiness of the innovative groundwater replenishment water supply option.

Outreach to Ministers and Ministerial staff developed ongoing support for the project through successive governments. Project staff worked to embed support for the water strategy through networking and liaising with Ministerial support and policy staff. Regular briefings were held with relevant Ministers, 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 is 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 held by 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 also organisations to achieve the end result.

5. Implications for Collaborative Innovation Governance across Scales

In relation to collaborative mechanisms for innovation, there are a number of insights that are shared among the cases. First, there needs to be adequate time allowed to develop shared understandings of what the problem is, options for how it can be solved, and then to design, test, and refine programs to implement the solutions. This observation was particularly evident in the WA groundwater replenishment trial and Room for the River cases, and reinforces the comment by Bryson and colleagues [24] that achieving tangible results from innovation should not necessarily be expected at the first attempt. Spaces for trial and error (or quick failures) need to be provided with the appropriate learning mechanisms to ensure that future success can build on reflection about previous experiences, including mistakes. Second, transparency facilitates trust development as stakeholders learn to share information, which informs their own decision-making. Finally, there were significant formal collaboration mechanisms that provided opportunities for a wide variety of stakeholder inputs, while the informal collaboration observed typically focused on colleague interaction rather than a diverse group of stakeholders (see Fitzgibbon Chase and Rotterdam cases). However, the final integration-phase case studies 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 reform and associated regulatory change. The WA groundwater replenishment trial, Room for the River, and Portland green infrastructure cases all demonstrate the time needed to effectively engage with stakeholders and the importance of multiple opportunities for communication and feedback, thus supporting Emerson and colleagues' [21] call for continual goal and process adjustments during collaboration for innovation. A common attribute of leading organisations that contributed to ongoing engagement was an open culture, which would continue to see the engagement process and outcomes as valuable even when the feedback was not necessarily supportive. The attributes of the different innovation adoption phases are summarised in Figure 2.

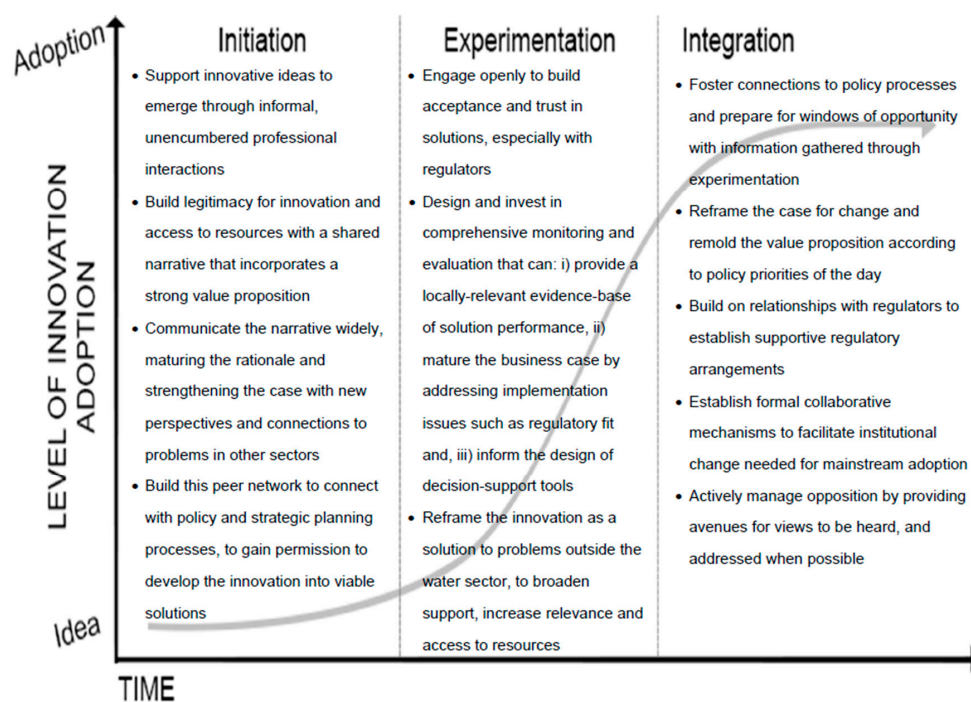


Figure 2. Key collaborative strategies to progress through innovation adoption. Source: [26].

Broad recommendations for designing and managing collaborative networks include:

- Develop an awareness and understanding of the advantages and disadvantages of formal and informal collaboration methods at different innovation adoption 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.
- Be aware that strategic opportunities for advancing innovations may arise in each phase; informal networks may provide insights about such 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 with an open culture to facilitate collaboration, maintain momentum through changing circumstances, and ensure mutual support throughout the innovation process; this was particularly important during the integration phase.

The cases investigated cover a variety of scales and network structures, ranging from multilevel government networks (e.g., Room for the River) to city-based, local government networks (e.g., Portland). The network structures are also varied, with more centralised networks (Portland, Fitzgibbon Chase, Rotterdam) and more dispersed networks where individuals were linked to multiple organisations. A number of general insights emerge in relation to the governance arrangements and processes underlying these different contexts of innovation and serve to address coordination concerns raised by scholars, such as Medd and Marvin [17] and Furlong et al. [12]. We observed a variety of network types, both in terms of their complexity, their degree of centralization, and their connections to democratic accountability. Most of the cases involved hybrid or mixed networks where there were clear links with democratic structures and processes and political support, but the multilevel organisational networks continued to operate independently of these links. Examining the stakeholder networks at a local scale reveals how different structures can be effective at delivering practical outcomes in sustainability innovation while meeting the local context requirements argued for by Himmelman [23].

The WA groundwater trial case is unique, as 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 groundwater replenishment trial. The Portland case also had a bridging organisation, but this was already existing before the innovation was developed. These structures indicate that, while not essential, a central node or bridging organisation can provide focus, leadership, and maintenance of momentum over a period of time when implementing innovations. Furthermore, these cases contrast with the lack of cohesive leadership observed in the failed Toowoomba initiation case.

Legitimacy was provided mainly via democratic processes, although these were often indirectly used. For example, the innovation networks operated within government structures, but the network was established and operated without direct community engagement or influence. A clear example of this form of legitimacy is the Portland green infrastructure case. Legitimacy was also implied through community and stakeholder engagement processes (Rotterdam and Room for the River) and statutory power (Fitzgibbon Chase). 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. Thus, these cases suggest an alternative model to that of Hooghe and Marks [8], who advocate for more direct links with the democratic process.

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/collaboration, and being outcome-focused were identified as important cultural values. These attributes set the foundation for network establishment and ongoing operation, and appeared to provide motivation for persisting in developing the innovative programs, being flexible when

challenges were faced (e.g., Portland), and enabling differences among network participants to be overcome by focusing on the long-term objectives. Another important influencing factor was political support of the program. Political support was provided through approving funding and publicly pledging support of the programs (see WA groundwater and Portland cases).

Drainage governance has emerged in the cases as a key means for pursuing sustainable water management. Urban water sustainability can be advanced when water discharges (wastewater, stormwater) are considered as part of the water cycle and managed as a resource, and when concerns about flow regimes and water quality are included in drainage governance arrangements. For example, water utilities are responsible for flow regimes and/or catchment management, in addition to water quality conditions in their discharge licences. In most jurisdictions, drainage governance is still underpinned by the aim of flood protection through conveyance, not resource utilisation. Thus, there is still a major separation between water management for urban water supplies and water management for ecosystem health/ecosystem services. The governance of drainage brings these issues together; in particular, the integration of drainage responsibilities and water supplies either through both roles resting in the same organisation, or through regulatory arrangements that recognise stormwater and wastewater as a resource and enable fit-for-purpose water supply provision.

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

The urban drainage-focused cases varied in scale, from national (Room for the River), state (WA groundwater replenishment trial), to city or sub-city scale (Portland, Rotterdam and Fitzgibbon Chase). The Dutch cases focused on spatial planning and drainage, while the WA Groundwater 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 series of challenges and opportunities and their potential links to related sectors of urban planning and water supply. The inter-organisational governance network structures for all the drainage cases were strongly centralized, with each project having a single body that coordinated among network participants. This provided a consistent focal point for addressing challenges and maintaining momentum across stakeholders and over time.

6. Conclusions

From the six case studies of governing across organisations and scales, some broad recommendations for collaborative practice for innovation can be made as follows.

- To overcome a potential lack of legitimacy, the governance network for developing policy innovation should be located within broad democratic structures and processes; or, alternatively, a comprehensive and open engagement strategy should be utilised, and public expressions of support should be sought.
- A central organisation can enhance coordination across the network. Both a pre-existing and 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 (e.g., like the WA interagency working group).
- Cultural attributes are crucially important, such as valuing stakeholder engagement, innovation and flexibility, and being outcome-focused. Such attributes will provide a sound foundation for coordinating activities across organisations, scales, and time.

- It is essential to align legislation, policy, and regulation to ensure that innovative water management outcomes can be delivered as effectively as possible, given the complexity and interdependence of these institutional components.
- Attention is needed for building the capacity for key organisations to collaborate, not only through shared objectives, but also by establishing the relational foundations needed to ensure that future challenges are addressed through more responsive institutional arrangements.

This research has revealed the importance of formal and informal collaboration strategies in all phases of innovation development and adoption. While both formal and informal strategies are important throughout the initiation, experimentation, and integration phases, it is important to understand what may be “fit-for-purpose” arrangements at different stages of innovation. In the experimentation phase, both formal and informal strategies were found to be important. Informal strategies appeared more important during the initiation phase, while formal strategies were more important during the integration phase. These findings are influenced by the different mix of stakeholders and different forms of coordination that are involved with innovative projects over time; we found that a smaller number of stakeholders are typically involved in the initiation phase and a larger number and variety are likely to be involved in the integration phase [26].

A comparative analysis of governance arrangements 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 participant focus and momentum over time. Some shared characteristics were found across the cases—valuing stakeholder engagement, supporting innovation and flexibility, and focusing clearly on achieving outcomes. These characteristics seem to provide a sound foundation for coordinating innovation activities across organisations, scales, and time. Linking the network to democratic processes enhances the legitimacy of the innovation initiatives and can help to overcome potential challenges and opposition. However, in the absence of explicit links to the democratic process, stakeholder organisations need to engage with political stakeholders to maintain legitimacy for the projects.

Author Contributions: Conceptualization, S.v.d.M., Y.B. and B.W.H., Methodology, Y.B. and B.W.H., Data collection, S.v.d.M., Y.B. and B.W.H.; Data analysis, S.v.d.M., Y.B. and B.W.H.; Writing—original draft, S.v.d.M., Y.B. and B.W.H.; Writing—review & editing, S.v.d.M., Y.B. and B.W.H.; Funding acquisition, B.W.H. All authors have read and agreed to the published version of the manuscript.

Funding: This research was undertaken through the governance research program of the Cooperative Research Centre for Water-Sensitive Cities, funded by the Australian Government.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; the collection, analyses, or interpretation of data; the writing of the manuscript, or the decision to publish the results.

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