

# DRIVERS AND CHALLENGES OF IMPLEMENTING INTEGRATED WATER-CYCLE MANAGEMENT STRATEGY IN REGIONAL NSW

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## DECLARATION - STATEMENT OF ORIGINALITY

This research is conducted as a part of the Masters in Research Degree. This work has not previously been submitted for a degree or diploma in any other University. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

This is the revised version as per examiners comments.

Human Ethics approval was sought and granted for stakeholder engagement for this research project, Human Ethics Ref. No: 5201951577185 approved on 21 March 2019.

(Signed)\_

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- **All workshop participants**, for sharing their knowledge and experiences.

Participating councils include:

- 1) **Glenn Innes Workshop:** Glenn Innes Severn, Tenterfield, Inverell, Armidale Dumaresq, Kyogle, Lismore
  - 2) **Wagga-Wagga workshop:** member councils of Riverina Eastern Regional Organisation of Councils
  - 3) **Cowra workshop:** *member councils of* Central Regional Organisation of Councils
  - 4) **Nambucca Workshop:** Nambucca, Coffs Harbour, Kempsey, Port Macquarie Hastings
  - 5) **Tamworth workshop:** *member councils of* Namoi Joint Organisation
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Under the terms of the Human Ethics approval and organisational privacy, individual names of participants are not been mentioned. However, their time and input into the process is greatly appreciated.

The 15 participating organisations for the semi-structured interviews include:

Australian Water Association; Department of Agriculture and Water Resources; Department of Industry-Water, Department of Planning; Environmental Defender's Office; Independent Pricing And Regulatory Tribunal; LG-NSW; NRAR; NSW EPA; NSW Health; Office of Local Government; Productivity Commission; Water Directorate, Water NSW; and WSAA.

## ABSTRACT

Regional water utilities in the state of New South Wales (NSW) are recommended to prepare a 30-year Integrated Water Cycle Management (IWCM) strategy. The aim of IWCM strategies is to ensure that the regional town water supply, sewage, stormwater and related infrastructure, is safe, secure, efficient and sustainable, fit for purpose and meets with community needs at fair price. But, barriers to implementation of IWCM strategies are fraught with many challenges including multiple regulatory obligations, differing community expectations, shifting political priorities and influences and having to navigate institutional silos. This study reveals an insight into the challenges and opportunities faced by and for rural-regional water utility's strategic planning and its implementation. The method used is stakeholder engagement of the bottom-up perspectives of strategic and operational water managers and top-down perspectives of state level water managers and regulators. The vertical and horizontal approach is designed to facilitate the needed step change in IWCM to future proofing water services of regional towns in NSW. The findings from on-grounds, bottom-up barriers in IWCM strategy development is that: process is very expensive and resource intensive; used as procedural document to obtain funds; multiple and prescriptive regulations leading to prolonged approvals processing times; resource limitations and internal organisational silos. The top-down solutions as suggested by the strategic water managers and regulators are: acknowledgement of governance as a major reform area; identified need to streamline the IWCM processes and procedure, but that the options analysis requirement - needs to consider all available options; taking ownership of the strategy development process (*reducing reliance on consultants*), legislations are enabling the pieces in the puzzle of achieving water security; These challenging, complex and interwoven settings, if not overcome, may result in towns being without a reliable supply of water as has, and is, presently occurring across the rural-regional NSW.



## TABLE OF CONTENTS

Declaration - Statement of Originality .....	ii
Acknowledgements.....	iii
Abstract .....	iv
List of abbreviations.....	viii
1 Introduction .....	1
1.1 Aim.....	3
1.2 Objectives.....	3
1.3 Thesis structure .....	3
2 Literature Review: Development of IWCM in the last century.....	4
2.1 IWCM: Brief contemporary history .....	4
2.2 The state of water governance in NSW.....	5
2.3 Water governance in NSW: Policy, tools and mechanisms .....	7
2.4 Changing governance structures: major challenge to efficient operating systems .....	10
2.5 Strategic planning in rural-regional water utilities in NSW.....	12
3 Research Method.....	14
3.1 Data collection method .....	14
3.2 Data analyses.....	16
4 Data collection: Literature review and stakeholder engagement .....	18
4.1 Literature review: Information collection and analysis .....	18
4.2 Workshops: Summary of responses.....	20
4.3 Semi-structured Interviews: Summary of responses .....	22
5 Analytical discussions: a review of stakeholder responses .....	27
5.1 Workshops: Ranking of challenges and drivers by workshop participants .....	27
5.2 Workshops: Strategy development - Challenges and Drivers.....	28
5.2.1 Internal challenges .....	28
5.2.2 External challenges .....	32
5.2.3 Internal drivers: Overcoming challenges .....	33
5.2.4 External drivers: Overcoming challenges.....	34
5.3 Workshops: Strategy implementation - Challenges and Drivers .....	35
5.3.1 External regulatory challenge .....	35
5.3.2 Internal regulatory challenge.....	36
5.3.3 Strategy implementation - Drivers.....	37

5.4	Semi-structured Interviews: Overcoming the operational challenges .....	37
5.4.1	Value proposition .....	37
5.4.2	Governance proposition .....	39
5.4.3	Management proposition .....	40
5.4.4	Regulatory proposition .....	42
5.4.5	Resourcing proposition .....	43
5.4.6	Research Limits .....	44
6	Recommended actions .....	46
6.1	For regional water utilities .....	46
6.2	For water regulators and strategic managers .....	47
6.2.1	Recommendations for DOI-Water .....	47
7	Conclusions and future directions .....	50
	References.....	51
	Appendix A .....	1
	Appendix B .....	3
	Appendix C .....	4
1	Workshop Presentation and Revised Interview questionnaire .....	4
1.1	Phase 1: Workshops .....	4
1.2	Phase 2: Semi-structured Interviews .....	7

#### [List of Figures](#)

Figure 1: Map of Murray Darling Basin; NSW with governance divisions as numbered.....	10
Figure 2: Extent of participation: Workshops and Interviews .....	15
Figure 3: Research approach and analysis process.....	16
Figure 4: Factors impacting Drivers and Challenges referred to, for X no. of times .....	19
Figure 6: Drivers and challenges as ranked by workshop participants on Likert scale .....	27
Figure 7: Catchment-wise participation and water levels .....	45

#### [List of Tables](#)

Table 1: IWCM Timeline - expanding definition .....	4
Table 2: Prominence of government agency roles in governing LWUs – complexities .....	8
Table 3: Water governing State Government Agencies-Roles and responsibilities as at May 2019 ..	9
Table 4: Impact factors of diverse geographic and demographic areas.....	9

Table 5: Broad role in water governance of participating agency for interviews .....	17
Table 6: Summary of responses - workshops .....	21
Table 7: Summary of responses – Semi-structured Interviews .....	23
Table 8: Timeline of state government agencies governing water portfolio, as at April 2019 .....	1

## LIST OF ABBREVIATIONS

AWA	Australian Water Association
CENTROC	Central Regional Organisation of Councils
DAWR	Department Agriculture and Water Resources
DOI	Department of Industry
DOI-Water	Department of Industry - Water
DoP	Department of Planning
DPI	Department of Primary Industry
DPIE	Department of Planning, Industry and Environment
EDO	Environmental Defender's Office
EPL	Environment Protection Licence
IPART	Independent Pricing and Regulatory Tribunal
IWCM	Integrated Water Cycle Management
JO	Joint Organisation
LG Act 1993	Local Government Act 1993
LG NSW	Local Government New South Wales
LWU	Local Water Utility
MDB	Murray Darling Basin
MDBA	Murray darling Basin Authority
NOW	New South Wales Office of Water
NRAR	Natural Resource Access Regulator
NSW EPA	New South Wales Environment Protection Authority
NSW Health	New South Wales Health
OLG	Office of Local Government
PC	Productivity Commission
REROC	Riverina Eastern Regional Organisation of Councils
SDG	Sustainable Development Goals
UNCED	United Nations Conference on Environment and Development
WA 1912	Water Act 1912
Water CI	Water Critical Infrastructure
WMA 2000	Water Management Act 2000
WNSW	Water NSW
WSAA	Water Services Association Australia
WU	Water Utility

# 1 INTRODUCTION

Water is a scarce (Sun, Wang et al., 2016) and valuable natural resource with high level of dependency on the climatic conditions. Mekonnen and Hoekstra (2016) assessed the extent of water scarcity and found that the issue of water stress has been underestimated and that two thirds of world's population lives in severe water scarcity at least for one month a year. The 6<sup>th</sup> initiative of the 2030 Agenda of Sustainable Development Goal (SDG) (UN, 2019) sets specific targets for access to clean water and sanitation to reduce the impending water scarcity envisaged under future climate scenarios (Pahl-Wostl, Kabat et al., 2008) and the trend towards urbanisation. Australia declared its commitment to the 17 SDGs (UN, 2019) for global prosperity in 2015 and has participated in a voluntary national review in 2018 (Australia, 2019). Following from the national commitment and review, a state plan was developed for NSW – The NSW State Plan 2021 - that has Goal 21 addressing water security by 'renovating' the current water infrastructure.

Water Critical Infrastructure (*water CI*) is defined as the public and private water infrastructure that a society and economy needs to function (Allen, Crawford et al., 2019; Birkett, 2017; Greenberg, 2016). Delivering water CI is a socio-technical challenge that requires, among other factors, consideration of water usage, recycling and reuse technology options and how these intersect with existing infrastructure, planning and community expectations (Lim, Suh et al., 2010; Markard & Truffer, 2008; Scott, Bailey et al., 2012). New structured approaches will be needed to deliver water CI so as to avoid the risk of water scarcity and transition towards a new and innovative future (Cardoso, Silva et al., 2012; Kuzdas, Wiek et al., 2015). This must overcome the challenges of the unreasonably high cost of gathering information, resistance to change, fear of increased transparency that leads into loss of control and assumed fear of failure combined with socio-political risks, uncertainties and security in realising future benefits (Borgomeo, Mortazavi-Naeini et al., 2018; Lee, 1993; McHenry, 2013). While these insights are more than 25 years old, more contemporary research has arguably only reinforced these challenges and added to this list. For example, Parange (2018) notes that lack of awareness about quantifiable benefits of water infrastructure developments are associated with high costs of implementing future-proof initiatives, that, which is complicated by an ongoing paradigm shift for modern water planning and delivery.

Australia is not unique in addressing water CI challenges. From a transition perspective, Australian water utilities are subject to many concerns (Bettini, Brown et al., 2015; A. J. Brown, Gray et al., 2014) and arguably captured by the embedded challenges of existing policy and governance processes (OECD, 2015). Specifically, these include lack of finances; staff resources; complex



processes; and the regulatory burdens of planning and implementation of long-term strategies. Moreover, fast evolving technologies, resource availability, social and political expectations - individually and combined - are implicitly and explicitly impacting social, commercial, agricultural and environmental water needs (R. Brown, Ashley et al., 2011; Curran, 2015; Halbe, Pahl-Wostl et al., 2013; Parange, 2018). Collectively, these factors highlight that water management is a complex problem (Pahl-Wostl, Kabat et al., 2008; Werbeloff & Brown, 2016). It brings with it many stakeholders and diverse interests and a need for cooperation and collaboration within, and between, all levels of government (Birkett, 2017; Greenberg, 2016; Scott, Bailey et al., 2012).

Integrated Water Resource Management (IWRM) conceptual originates from bringing together the horizontal and vertical aspects of water management and practices under one umbrella, to better manage the changing water use demands. 'Horizontal' defined as *one organisation – competing interests- sectoral interests protected*) and 'Vertical' defined as *multiple organisations of governing authorities – importance of individual sectors lost to achieve higher goals*) (Varis, Enckell et al., 2014). IWRM has its roots in history, since early 1900s and has been evolving, ever since. In Australia, particularly in NSW, IWRM is referred to as Integrated Water Cycle Management (IWCM).

In NSW, the aim of developing and implementing an IWCM strategy for regional towns, is to ensure water security, financial viability and reliability of water supply. The enabling funds for the development of the IWCM strategy itself was fully supported by the then State agency, the NSW Office of Water, and recommended alignment with the '*NSW Best Practice Management of water supply and sewerage guidelines 2007*'. According to the '*2015-16 NSW Water Supply and Sewerage Performance Monitoring Report*', 88% of Local Water Utilities (LWUs) in NSW had prepared their strategy. However, implementation of these strategies remain highly irregular (R. Brown, Farrelly et al., 2009). What is known, however, is that the assessment of the implementation levels of IWCM strategies relies on inconsistencies in reporting (Tan & Egan, 2018; Tello, Hazelton et al., 2016) by the councils, either as validated reports or self-declared statements, making it difficult to convert the data into reliable knowledge (McDonnell, 2008). Regional NSW faces a less reliable and sustainable water future (Gerlak, House-Peters et al., 2018; Varis, Keskinen et al., 2017); and more broadly planning and implementation as has been observed is sub-optimal (Bishnu, Linke et al., 2014; Wong & Brown, 2009). This reveals an urgent need to identify ways to support the development and subsequent implementation of IWCM strategies as well as improving upon the current governance frameworks to assess strategic, operational and systems performance (Garmestani & Benson, 2013; Halbe, Pahl-Wostl et al., 2013).

## 1.1 Aim

The aim of this thesis is to identify the drivers and challenges affecting the implementation of Integrated Water Cycle Management (IWCM) strategies in rural-regional NSW.

## 1.2 OBJECTIVES

The objective of this research is to identify the support needs and enablers for the rural-regional towns of NSW to have the necessary water critical infrastructure for their long-term sustainability through developing and implementing IWCM in their region.

To achieve this objective, the research design is a three (3) staged stepwise process cognisant of horizontal and vertical inter-relationships within councils and relationships between councils and state agencies/water authorities (Mukheibir, Kuruppu et al., 2013), as discussed in the literature review. This stepwise process is to:

- 1) Critically examine the roles and responsibilities of NSW water agencies over time
- 2) Elicit the tacit experiences of water practitioners in rural-regional NSW in relation to undertaking IWCM activities
- 3) Provide recommendations related to advancing IWCM practices in rural-regional NSW

## 1.3 THESIS STRUCTURE

To accomplish the aim and objective of this research, and capture most critical information, this thesis comprises of seven (7) Chapters. **Chapter 1** provides introduction to broader water management and IWCM research need and questions. **Chapter 2** contains a short literature review that explores various aspects of water cycle management, a brief history of IWCM evolution, water governance in NSW and geographical outreach of the research conducted to-date. The focus of the literature review is to provide an insight into current and existing research that inform the methods and analysis. **Chapter 3** outlines the research approach and methods. **Chapter 4** provides a summary of results from five (5) workshops (*Stage 1*) with local water professionals and 17 semi-structured interviews (*Stage 2*). **Chapter 5** discusses the stakeholder engagement responses that are then framed as recommendations in **Chapter 6**. The summary in **Chapter 7** provides the key learnings and offers future research direction.

## 2 LITERATURE REVIEW: DEVELOPMENT OF IWCM IN THE LAST CENTURY

### 2.1 IWCM: BRIEF CONTEMPORARY HISTORY

Contemporary history of integration of water management components, can be divided into four (4) main evolutionary phases in the last 125 years, the gradually expanding definition of IWRM is as per **Table 1**. The double whammy of world population and rapidly increasing population in urban areas, puts tremendous pressure on the urban water management. (Grigg, 2016 , p. 151) The thinly spread-out and reducing population across large areas, in the rural-regional areas, puts pressures on regional town-water management depending on whether the rural-regional towns are more, or less, developed. (Grigg, 2016 , p. 44)

The current phase (4) defines *“IWRM [as] a process which promotes the coordinated development and management of water, land and related resources, in order to maximise the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems”* (GWP-TAC, 2000, p. 22). This definition highlights the importance of water related management of energy and waste-water to address UN-SDGs (United Nations – Sustainable Development Goals) for best practice water management.

**TABLE 1: IWCM TIMELINE - EXPANDING DEFINITION**

PHASES OF EVOLUTION	DEFINING FACTOR	EXAMPLE WITH BRIEF EXPLANATION
<b>PHASE 1:</b> <b>EARLY 1900s</b>	Recognising and including various components of water for efficient and effective management	The first commonly cited example is of Integrated River Basin Development (IRBD) by Tennessee Valley Authority (TVA) in 1933, integrated the elements of water use, wastewater generation, electricity generation, rainfall patterns of flooding and droughts relating it back to public health, economic development and political drive. (Snellen & Schrevel, 2004) The response was mainly to combine and address all water management related infrastructure issues.
<b>PHASE 2:</b> <b>MID 1900s</b>	Identifying and accepting of solutions beyond infrastructure and engineering	The concept of integrating different components of water management was further developed in the IRBD report, November 1957, to the Secretary General of the UN identifying that in an Integrated River Resource Management (IWRM), <i>“Engineering response is not the only solution”</i> (UN-DESA, 1958). The emphasis was to expand water management to systems and processes beyond infrastructure and engineering solutions and manage water at catchment scale rather than limit to town water supply and wastewater management.
<b>PHASE 3:</b> <b>LATE 1900s</b>	Defining IWCM on a global scale including	IWCM was first formally defined and accepted at global scale during the International Conference on Water and the Environment at Dublin in 1992 based on future development



PHASES OF EVOLUTION	DEFINING FACTOR	EXAMPLE WITH BRIEF EXPLANATION
	population growth and development	issues of the 21st Century (Snellen & Schrevel, 2004). The definition included an appreciation of the impacts on water management due to population growth and development of an area and governance at global scale.
PHASE 4: EARLY 2000s	Including sustainable development principles in IWRM definition	Global Water Partnerships in year 2000, presented a revised definition of IWRM that not only defined the IWRM but also proposed a comprehensive set of principles for implementation of IWRM. The definition followed the principles of Ecologically Sustainable Development ( <i>Brundtland Report, 1987</i> ) that is to meet with our needs without compromising the future needs.
<i>Brundtland Report, 1987</i> : Available at <a href="http://www.un-documents.net/wced-ocf.htm">http://www.un-documents.net/wced-ocf.htm</a> ; Definition of Sustainable development in Chapter 2 of the report. Last visited on 13 June 2019		

Snellen and Schrevel (2004) reiterates UNCED (1992) about fragmentation of governance structures as the most critical challenge in the uptake of IWRM in rural-regional NSW - “[t]he fragmentation of responsibilities for water resources development among sectoral agencies, however, proving to be an even greater impediment to promoting IWRM than had been anticipated - UNCED (1992)”.

Historically, need for co-ordinated efforts within the water sector has been emphasised, which framed the discussions at the Earth Summit in 1992 (Snellen & Schrevel, 2004; UNCED, 1992), and particularly focussed on the importance of coordination within the various governance structures and to be inclusive of all elements of water management.

In the context of Australia, van Roon (2007) has explored the drivers impacting the management of local water cycle and water reclamation. Her research has highlighted trends, successes and challenges in the transition to neighbourhood centred water-based services using ‘Low Impact’ and ‘Water Sensitive’ design and development techniques and confirm the success of applying localised adaptive management solutions and overcoming the challenge of ‘one size fit’ solutions.

## 2.2 THE STATE OF WATER GOVERNANCE IN NSW

Water governance is defined as an administrative system in place to develop, manage and deliver water services in a cost-effective manner by (Ross, 2017), whereas (Newig & Koontz, 2013; Ross, 2017) discusses a participatory approach to achieve better results, within the multi-level (*horizontal and vertical levels*) governance structures. In NSW, there has been an increase in such participatory approach to managing water and is legislated as ‘mandatory consultations’.

Water governance in NSW is complex and uncertain (R. Brown, Ashley et al., 2011; Floyd, Iaquinto et al., 2014). This is particularly so for rural-regional areas that needs to plan and manage water

across geographically distributed centres and with far less financial and technical resources than metropolitan centres. Agricultural water needs accounts for two-thirds water use, while urban water usage less than one-thirds (Roberts, Mitchell et al., 2006; Tello, Hazelton et al., 2016). While most urban water governance research in Australia has occurred within the metropolitan city areas (Rygaard, Binning et al., 2011; Wong & Brown, 2009), there remains a substantial research gap in how regional water utilities undertake and implement their long-term Integrated Water Cycle Management (IWCM) strategic plans for improved water security (Barry & Coombes, 2018; Cardoso, Silva et al., 2012), especially during emergency situations (Huang, Lou et al., 2016) and subsequently, their operational decisions (Chidambaram, 2016; Jeroen Rijke, Brown et al., 2012). This is despite the water security issues faced by many regional towns in NSW. When towns run out of water, their economic and social future is highly vulnerable, and they face an uncertain future.

Governance of urban water management, in NSW, is subject to shifting socio-political and environmental constraints. (Davies & Wright, 2014; Infrastructure-Australia, 2017; J. Rijke, Farrelly et al., 2013). So, governance measures need robust models and effective approaches (Bakker, 2013). The basis of urban and regional water planning has been water security and driven by intermittent problems of water stress (Jeffrey & Gearey, 2006). The current drought conditions affecting much of regional NSW has also seen similar reactive infrastructure decisions by state and local government. Two such examples are:

- 1) In September 2019, the 'Announcement<sup>1</sup>' of a 1 billion dollar package towards *upgrading* Wyangala dam (\$650 million) and *build new* Dungowan dam (\$480 million), to commence in 2020. NSW opposition party, well and truly, highlights the anomaly between the political decisions and pragmatism by pointing out: *"If you are west of the divide in NSW at the moment your concern isn't about a dam, your concern is about water today and tomorrow."* The decision-making was based on political agenda of increasing the voter community (ABC, 2019). (Williams & Grafton, March 6, 2019)
- 2) In June 2016, the state government response - to the town of Broken Hill, when on the verge of running out of water - was announcing the construction of a pipe line from the Murray River, about 270 km long (ABC-News, 2016; DOI-Water, 2017; Hameeteman, 2013; Jensen & Wu, 2018; WaterNSW, 2017).

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<sup>1</sup> Announcement by PM Scott Morrison; Available at: <https://www.abc.net.au/news/2019-10-13/dam-package-wyangala-and-dungowan-to-start-2020/11597602>; Last visited: 14 October, 2019



Both examples, highlight the need to be proactive rather than reactive, to reduce the impacts of intensifying climate and preparing long-term strategic water critical infrastructure planning aka 30-year IWCM strategies. In this thesis, ‘urban’ water research is referred to as, that within metropolitan cities, not the urban areas of rural-regional town centres.

## 2.3 WATER GOVERNANCE IN NSW: POLICY, TOOLS AND MECHANISMS

*Smart water policy is fundamental to smart climate policy and smart development policy.*

– World-Bank (2016, p. ix)

In NSW, water was managed as a ‘resource’. After the partial repeal of the *Water Act 1912* and commencement of the new legislation “*Water Management Act 2000 (WMA 2000)*” in NSW, (NSW-DOI, 2018) water is, now, managed as a “commodity” and commercialised under ‘water trading’ rules and regulations under Section 50 of WMA 2000. This involved the separation of water licences from property titles; development of water sharing plans; water trading; local government rates and pricing protocols regulated by IPART, non-volumetric licences issued for perpetuity under partially repealed *Water Act 1912* were transferred to volumetric licences issued for a fixed term under the new *WMA 2000* and responsibilities shared by DOI-Water and WaterNSW<sup>2</sup>. Collectively these reforms led to a paradigm shift in the way water is governed in NSW.

These changes in water governance measures can be viewed as repositioning water security as a socio-political imperative (Walker, 2010). Within this new focus, water CI must overcome traditional and path dependent perceptions of projects that are deemed ‘unsustainable’ due to their ongoing operational costs, increased vulnerability to drought (Feng, Liu et al., 2019) and likely to be reflective of the new climate norm. This vulnerability reveals basic challenges that has proved to be problematic for water management to migrate from policy to pragmatic practice. This includes operational priorities involving the development, dissemination of appropriate policies, tools and mechanisms (Jeffrey & Gearey, 2006), including the implementation of water CI. (Jeffrey & Gearey, 2006)

The overlap of climate change with governance and management of water CI, reinforces the inherent complexities of urban and regional water planning to tackle water stress. The management measures to address the overlaps requires “an intellectual shift which necessitates social, cultural and economic adaption” ((Jeffrey & Gearey, 2006, p. 1) rather than a standalone technical solution.

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<sup>2</sup> Extracted from <https://www.industry.nsw.gov.au/water/licensing-trade/governance>; Last visited 13 April 2020

As technical solutions expand and water governance arrangements evolve, there remains a need for robust, transparent and accountable frameworks that captures the stakeholder interests.

In NSW, a brief insight into the complex regulatory functions as administered by various government agencies , to oversight the state’s water utility works, is charted in Table 2. In NSW, the water management role and responsibilities, divided between multiple agencies, have been undergoing constant administrative reforms (See Appendix A). These ongoing changes to the governance structures of management poses a challenge to strong ongoing communications, between and across the governments. Gupta, Akhmouch et al. (2013) notes the difficulties in communications between different cultures that is emphasised by constantly changing governance structures. Furthermore the difficulties are amplified due to multiple agencies having a varying degree of responsibility for each area of governance. Each area of governance has atleast three (3) or more responsible agencies. Intensity of shades in Table 2 lists the agency’s degree of responsibility/ies, in that particular area of governance. The darker the shade, the stronger the responsibility.

**TABLE 2: PROMINENCE OF GOVERNMENT AGENCY ROLES IN GOVERNING LWUs – COMPLEXITIES**

Role of Agencies	Administrative	Policy	Regulation	Licensing & Approvals	Compliance	Planning	Impacts Assessments	Advisory support	Funding support	Infrastructure development
DOI-Water										
NRAR										
WNSW										
NSW EPA										
NSW DPE										
NSW Health										
NSW WorkCover										
MDBA										
LGNSW										
OLG										
I-NSW										
IPART										
DAWR										

■ = Primary role ■ = Partial role ■ = Secondary role ■ = Tertiary role

Water governance in NSW is dynamic and transitioning towards the polycentric governance system (Ross, 2017; Schröder, 2018) of multiple authorities regulating one (1) water portfolio. **Table 3** reveals NSW’s current water regulatory roles and overlapping responsibilities. Also evident from **Table 2 and Table 3**, is that the water management portfolios are split, covering a number of different agencies that in effect has created more confusion than in providing support to the regional water utilities. Most recently, the previously singular role and water management responsibilities of NSW Office of Water has been split into 3 separate (*polycentric*) State agencies of: 1) DPI-Water

responsible for policy and regulation; 2) Water NSW responsible for administration of licences and partial compliance; and 3) NRAR's solely responsible for water regulation and compliance.<sup>3</sup>

**TABLE 3: WATER GOVERNING STATE GOVERNMENT AGENCIES-ROLES AND RESPONSIBILITIES AS AT MAY 2019**

State Authorities with <u>primary</u> responsibilities	
Department of Industry, Water (DOI-Water)	Responsible for Driving the strategic water management and planning direction for the State
Natural Access Resource Regulator (NRAR)	Newly formed water regulator is responsible for implementing the Water Management Act 2000 and its regulatory instruments (formed on 01 April 2018)
Water NSW (WNSW) State Owned Corporation	Bulk water supplier to Water Utilities and administration of licences under the direction of DOI-Water (formalised in 2015-16)
State Authorities with <u>partial</u> responsibilities	
NSW Environment Protection Authority (NSW EPA)	Responsible for overall environmental pollution includes water pollution regulation and compliances
NSW Department of Planning and Environment (NSW DPE)	Responsible for driving strategic infrastructure planning direction and land use planning
NSW Health	Responsible for Drinking Water Quality Management
NSW WorkCover	Regulates Work Health and Safety protocols while carrying out any Construction and civil development works by an authorised person
Local Government NSW (LGNSW)	Provides policy advice, procurement support, represents member water utilities at all government levels, industry, business organisations
Office of Local Government (OLG)	Local Government (LG) Reforms - Strengthening the system; Conduct and Governance; Advisory support; local infrastructure renewals
Infrastructure NSW (I-NSW)	Prioritising and delivering critical public infrastructure for NSW
Federal Government Agencies contributing to driving strategic direction within NSW in <u>specific</u> program areas of water management	
Murray Darling Basin Authority (MDBA)	Basin-wide planning and decision making for water trading, water Quality and development/ implementation of water resource plans across 5 basin states.
Department of Agriculture and Water Resources (DAWR)	Develop and implement policies and programs for sustainable agriculture, sustainability of river systems and water resources
Independent Pricing And Regulatory Tribunal (IPART)	Provides independent regulatory decisions and advice to protect the ongoing interests of the consumers, taxpayers and citizens of NSW; This includes: reviews and determinations for maximum prices that can be charged for bulk and retail water by most major water utilities across NSW. We also make recommendations about public utility and alternate water utilities and monitor all utilities' licence compliance.

The vast geographic and demographic diversity adds to the complexities of water management system designs. Table 4 below highlights the different regional management styles and regulatory requirements that need to be factored in while developing state-wide programs, that which addresses all scenarios and protects all stakeholder interests.

**TABLE 4: IMPACT FACTORS OF DIVERSE GEOGRAPHIC AND DEMOGRAPHIC AREAS**

Regions as in Fig 2	Area <sup>4</sup>	Population <sup>5</sup>	Pop. density	Management Style	Governance impact
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<sup>3</sup> Valid and true as at May 2019

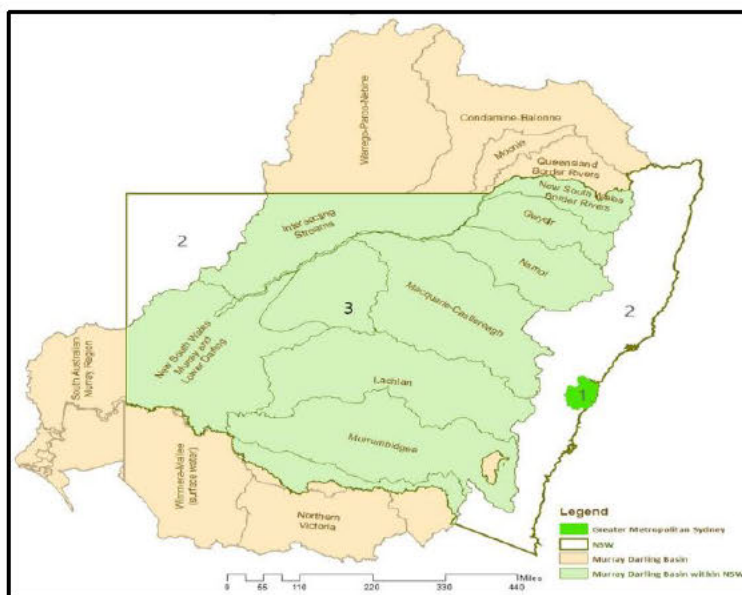
<sup>4</sup> Available at: <https://www.australianexplorer.com/australian-statistics.htm>; Last visited 13 Oct 2019

<sup>5</sup> Available at: <https://www.abs.gov.au/ausstats/abs@.nsf/mf/3218.0>; Last visited 13 Oct 2019



Metropolitan Sydney Marked as 1	160,128 sq kms	5.2 million	32.5 per km <sup>2</sup>	Water utility independent of council operations	<ul style="list-style-type: none"> <li>• Independent authority</li> </ul>
Non-MDB region - NSW Marked as 2	160,129 sq kms	0.69 million	4.30 per km <sup>2</sup>	Water utility responsibilities within the council operations	<ul style="list-style-type: none"> <li>• Decisions dependent on Council's strategic direction and priority actions</li> <li>• MDB rules not applicable</li> <li>• Coastal NSW</li> </ul>
MDB region - NSW Marked as 3	480,385 sq kms	2.07 million	4.31 per km <sup>2</sup>	Water utility responsibilities within the council operations	<ul style="list-style-type: none"> <li>• Decisions dependent on Council's strategic direction and priority actions</li> <li>• Additional responsibilities of MDB rules and regulations for water use and works apply.</li> <li>• Inland NSW; very high water dependency on river systems</li> </ul>

The regional water utilities in the MDB region, are required to meet with the additional regulatory



obligations of the Water Resource Plans by Murray Darling Basin Authority (MDBA), MDBA region is as shown in Figure 1.

The MDBA, especially formed to resolve the Basin's water issues impacts heavily on the regional water utilities in NSW. 75% rural-regional NSW is covered by 56% of MDB region - ABS Statistical Data 2009-10<sup>6</sup>.

**FIGURE 1: MAP OF MURRAY DARLING BASIN; NSW WITH GOVERNANCE DIVISIONS AS NUMBERED**

## 2.4 CHANGING GOVERNANCE STRUCTURES: MAJOR CHALLENGE TO EFFICIENT OPERATING SYSTEMS

The recommendations by World-Bank (2016) report led to a greater focus on robust water governance frameworks to achieve the intentions of long term strategies. Part of the challenge in implementing any governance measures are to address the underlying complexities manifested by administrative changes represented by ongoing agency instability affecting roles and responsibilities

<sup>6</sup> Available at: <https://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/1301.0Chapter3042009%E2%80%9310>; Last visited 10 June 2019

(*Appendix A: Timeline of restructures*) and overcome the seemingly ever changing and arguably fickle nature of politics affecting the Ministerial oversight for water and its various components<sup>7</sup>.

Continuously changing governance structures reveals a need to reflect on the historical top-down and centralised governance approach. However, there is a need to understand and address the inherent complexities within an integrative model inclusive of both a top-down and bottom-up approach (Floyd, Iaquinto et al., 2014; Tantoh & Simatele, 2018). Barry and Coombes (2018), acknowledges that the organisational restructures and centralisation of agencies can overcome fragmentation and duplication to some extent (Gupta, Akhmouch et al., 2013; OECD, 2014), and have implications across the seven scales of complexities in interactions (Cash, Adger et al., 2006; Ross, 2017) These seven scales facilitate in understanding the complexities within the human-environment interactions (Cash, Adger et al., 2006).

Changing governance structures in the water sector are studied by Hill and Hupe (2003); Morison and Brown (2010); Barry et al, 2018) and many others. Barry and Coombes (2018) and Morison and Brown (2010), both proposed the development of bottom-up solutions to avoid miscommunications within the intergovernmental tiers. Then, Morison et al. (2010) goes on to identify the reasons behind these miscommunications concluding that the capacities and rights of the lower tier governments - to adapt or even disregard policies are often, ignored by the upper governmental tiers.

Daniell, Coombes et al. (2014), R. Brown, Ashley et al. (2011) and Smith, Voß et al. (2010), have all acknowledged that the transformation of water sector can be framed as a socio-technical problem but within which inter and intra agency politics (silos) impact on the needed policy reform and how this enables the planning and delivery of the much needed water CI. (Smith et al., 2010). Though, neither top down nor bottom up solution, have been found to be functional, there is a better likelihood of success, if implemented in conjunction with each other.

The asynchronised, polycentric and complex governance systems, in NSW (*as described in Section 2.3 - page 9*) have major impact on bringing about the essential change. Knieper and Pahl-Wostl (2016) research on polycentric water governance systems, management and environmental performance found that a combination of polycentric governance systems (*similar to that of NSW*), high per-capita income and low levels of corruption was sufficient to achieve good water

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<sup>7</sup> List of Ministerial changes in the Parliament: Available at: [https://www.aph.gov.au/About\\_Parliament/Parliamentary\\_Departments/Parliamentary\\_Library/Parliamentary\\_Handbook/Current\\_Ministry\\_List](https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/Parliamentary_Handbook/Current_Ministry_List); Last visited 19 June 2019



management practice. The caveat was that good environmental outcomes depended on demand rather than quality of water management.

## 2.5 STRATEGIC PLANNING IN RURAL-REGIONAL WATER UTILITIES IN NSW

In NSW, there are 89<sup>8</sup> council owned and managed Local Water Utilities (LWUs) and five (5) regional water counties deliver water supply, sewerage and related infrastructure services to their local communities (Water-Directorate, 2020). Water management in NSW, is informed primarily by *Water Act 1912* (partially repealed), *Water Management Act 2000* and *Local Government Act 1993* (NSW-DOI, 2018, Armstrong, 2008 #305 , p.1). Water services management is the regional water utilities' one of many organisational functions<sup>9</sup>. This management structure contributes positively to reducing external co-ordination requirements, manage internal changing priorities , emergencies and re-allocation of funds and resources.(Armstrong & Gellatly, 2008 , p. 6)

In rural-regional NSW, water utility functions include achieving water security as 'part' of council responsibilities whereas in Metropolitan NSW, water utility functions are independent of the councils responsibilities (Bureau Of Meterology, 2019 , p.115), and discloses the different governance requirements, within NSW. But, the goals of regional councils are not limited to water supply and sewerage services or operate as a profit-making business. The additional responsibilities include operating at best practice levels, continuously improving institutional reform, implement water quality risk management frameworks and co-ordinating water services with stormwater and land-use planning functions. To support a forward-thinking approach of capturing this unique feature of governance structure for an integrated response to water management, the NSW Government recommended, that the regional water utilities, develop an IWCM strategy in 2005-06 and developed the best practice management guidelines document in 2007. The need for robust IWCM strategy has also been identified by (R. Brown, Ashley et al., 2011; Jeffrey & Gearey, 2006; Pahl-Wostl, Kabat et al., 2008). The intent to develop the regional IWCM strategies aligned with the 'Best Practice Management' document was for early identification of Water CI and meet with the changing needs of safe and secure water supply for the regional towns. In support of this planning focus, the state government introduced a funding initiative, linked to the development of a IWCM strategy, to enable the development and implementation of a IWCM strategy. By 2015, 88% of the LWUs had prepared a IWCM strategy (NSW-DPI-Water, 2017), however the degree of

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<sup>8</sup> As at May 2019, post council amalgamations process in NSW, administered by Office of Local Government.

<sup>9</sup> Available at: [https://www.waternsw.com.au/data/assets/pdf\\_file/0020/133940/Water-Roles-and-Responsibilities.pdf](https://www.waternsw.com.au/data/assets/pdf_file/0020/133940/Water-Roles-and-Responsibilities.pdf) ; Last visited 11 March, 2019

implementation remains uncertain. The regional water utilities continue to face a number of challenges in the development and implementation of their IWCM strategies:

- 1) Their performance regulated and monitored by multiple, asynchronised regulatory agencies and Australian industry standards, make it difficult to navigate through the approvals processes.
- 2) The regional water utility's competency and financial strength in delivering services, is largely dependent on their institutional frameworks, low population, large areas and lower rate paying residential, commercial and industrial communities (Mancilla García, Hileman et al., 2019).
- 3) Financially, regional water utilities are dependent largely on grants and external funding. Their rates-income (such as water charges) from a lower rate-payer population base, as compared to a metropolitan water utility.
- 4) In NSW, IPART has responsibility for assessing the rate-pegs (that broadly cover all council's functions less waste and water) and utility charges (IPART, 2019). Both rates and utility charges are levied at the property.
- 5) About 40% of the rural-regional towns, have a declining population of 1.1% per year, with decreasing income stream at pro-rata basis.<sup>10</sup>

These dependency factors of the regional councils contribute to delays in decision making, and procurement service limitations, that obstructs implementation of IWCM strategy in regional water utilities in NSW. Growth rate and performance indicators set by the governing authorities, play an important role in early identification of the problem and as evidence-based policy development studied by (Jensen & Wu, 2018) confirms the contributing factors to the delays in implementation.

The delays in implementation are further enhanced by the polarised governance structures of the metropolitan and regional water utilities in NSW that requires very different management systems. The water utility functions, in Metropolitan Sydney, is independent of the council operations, and is separate entity, whereas in the rural-regional NSW, the water utility functions are an integral part of council operations.

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<sup>10</sup> Available at: <https://www.planning.nsw.gov.au/Research-and-Demography/Demography/Population-Projections>;  
Last visited 24 May, 2019

## 3 RESEARCH METHOD

### 3.1 DATA COLLECTION METHOD

Barry and Coombes (2018) refers to Feng et al. (2011)'s findings of substantial differences in the determination of national water footprints that result from bottom-up and top-down analyses, then recommending a combination of approaches that linked local and regional details across scales. A similar approach of top-down and bottom-up analyses, has been adopted for this research.

To conduct the research, stakeholder engagement was used to explore the barriers to implementation of the IWCM strategy. The stakeholder engagement techniques used for data and information collection were by conducting workshops with the on-grounds developers and implementers of the IWCM strategies for bottom-up views and then by conducting semi-structured interviews with the drivers and promoters of IWCM strategic planning. The responses from the workshops were summarised to develop a questionnaire for the semi-structured interviews.

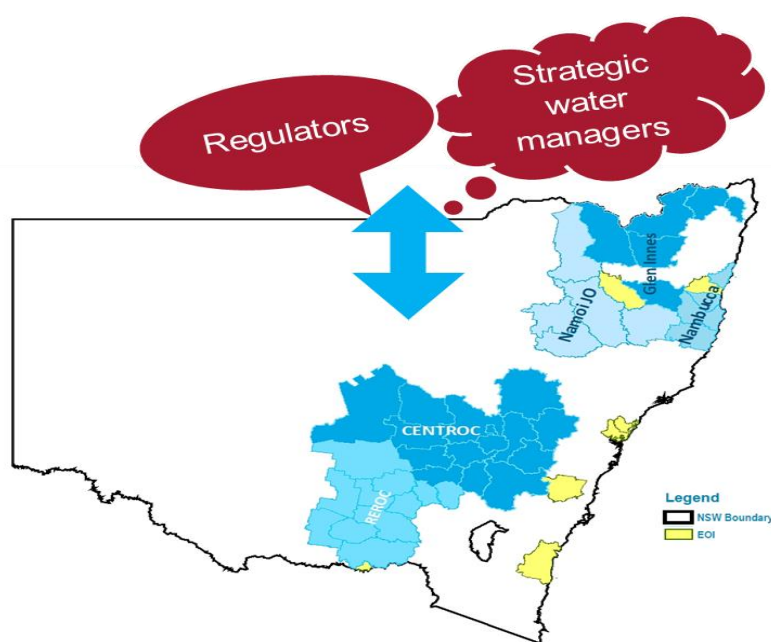
Stakeholders involved in the development and implementation of the IWCM strategies are wide ranging and diverse. Stakeholders as identified and listed by NSW-DOI (2019), in the Information sheet 1, are: councillors, council staff, NSW Environmental Protection Authority, NSW Health, NSW Department of Industry (Water branch), Natural Resource Access Regulator, NSW Department of Planning and Environment, environmental groups, Indigenous communities. water service customers, catchment management groups, property developers, local business chambers including industry and business groups. Though there is a fundamental conflict amongst each stakeholders about the ecological values (Medema, McIntosh et al., 2008); acknowledging and managing the differences of multidisciplinary teams and then strategies should be developed so as not to adversely compromise the implementation of IWCM strategies (Dobbie & Brown, 2014). The different stakeholder groups' perspectives having multidisciplinary backgrounds help improve the breadth and depth of analysis and findings (Mjosund, Eriksson et al., 2017). Limiting the stakeholders, leaves gaps in knowledge and in understanding of all stakeholder perspectives, increases the risk to IWCM strategy implementation.

For the purposes of this research, (three) 3 major groups of the stakeholders that play key roles in the decision making of IWCM strategic planning, driving the development of plans and implementation of the IWCM strategies have been shortlisted for research participation. These groups are: local government, state/federal governments and strategic water managers (water industry groups). It is assumed for this thesis, that the decision makers carry out extensive

consultations with all stakeholders and ensure their interests are protected, as is legislated under Division-8 of *Water Management Act 2000 (NSW)* and Sub-Division E of *Water Act 2007(Commonwealth)*. Thus, there is an underlying assumption of minimum gap in data collection.

Macquarie University Human Ethics approval (Ref #: 5201951577185 for project ID: 5157 – “*Issues and Challenges faced by regional NSW in implementing Integrated Water Cycle Management*”) was obtained for this research. The approval was requested for a maximum of 10 workshops and 20 interviews; ensuring voluntary participation and data collection, reporting and storage methods to follow Macquarie University’s records keeping rules. Human Ethics Approval Letter is attached as **Appendix B**. Workshop presentation and revised interview questionnaire to conduct the stakeholder engagement are as attached in **Appendix C**.

To ensure a voluntary, yet representative participation, expressions of interest were sought from the water professionals in rural-regional NSW. The expressions of interest were targeted to align with to regional organisation of councils(ROCs) meetings. Where ROC meetings could not be tapped into, individual councils - with six (6) or more than six (6) participants in the area - were confirmed for workshops. The extent of participation as shown in the Figure 3. Councils that could not



**Source:** Map generated on ArcGIS, by Tasneem Kanpurwala

**FIGURE 2: EXTENT OF PARTICIPATION: WORKSHOPS AND INTERVIEWS**

participate after expressing their interest are shaded in yellow on the map in Figure 3. The workshops are named depending on the host organisation - whether individual council or ROC.

For the stakeholder engagement process: as part of stage 1, five (5) workshops, of three (3) hours each, were conducted in the regions as shown in Figure 2. The workshops followed the approved ethics process. The

intent of the workshops was to provide an open forum to capture individual and collective challenges faced by each participant in relation to the development of their IWCM strategy and the level of implementation of their IWCM strategy. This involved developing a set of open discussion

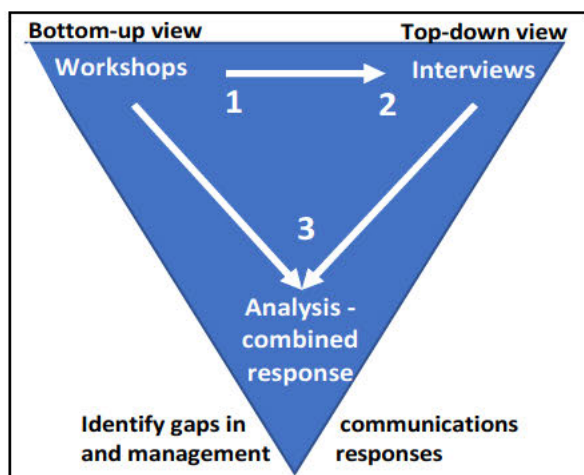


questions for the group, with handouts provided to the participants to note their individual comments, later collected by the author. Data from workshops was captured as notes from the discussions and from participant handout notes. A total of 44 water professionals from the regional water utilities participated in the workshops. Of these, 32 participants had either full or partial responsibility in the decision-making process, development and implementation of the regional water utility's IWCM strategy. The remaining 12 participant roles were either from operations, engineering, asset management, finance or projects divisions.

For stage 2, semi-structured interviews of 30 minutes each were undertaken. Participants were selected based on their role in policy design and/or regulations of water management, in NSW. Initial contact was made by emails to 17 water managers. Selection was based on the author's knowledge of key persons in water sector. All, 17 of the identified participants agreed to partake in the research. Two (2) additional participants were included on the recommendation of the invited participants. Each interview was, on an average, 30 minutes long, ranging between 11 to 42 minutes. Interviews were digitally recorded, with consent, and transcribed manually by a professional transcriber. Interview questions, *as attached in Appendix C - 1.2*, were drawn from the summary of responses obtained from the workshops to unpack the challenges faced at operational level and provide options or offer solutions to improve IWCM delivery.

### 3.2 DATA ANALYSES

To elicit the tacit experiences and knowledge from the research participants, data analyses was



**FIGURE 3: RESEARCH APPROACH AND ANALYSIS PROCESS**

conducted in three (3) stages. In stage 1, workshop responses were collated, summarised and analysed to understand the root cause of the issues impacting IWCM planning and how this has impacted on the internal decision-making processes within the water utilities in rural-regional councils. The summary of responses for challenges, has been categorised into three (3) propositions of: 1) the value of the strategic planning process; 2) the governance frameworks of the institutions; and 3) resourcing requirements for the strategy development and implementation. Responses were then collated within areas that had unanimous agreement or had different views.



For stage 2, semi-structured interviews, the list of questions were derived from the summary table of challenges and from that which were mentioned as most critical to the IWCM strategy. Questionnaire for the semi-structured interviews, was structured as open questions and sub-questions were dependent on the responses received. The interview responses were then collated within five (5) propositions of: 1) the value of IWCM plans; 2) governance measures; 3) management options; 4) regulatory requirements; and 5) resourcing options. Two additional propositions of management options and regulatory requirements were added to summarise the interviewee responses, as the responses had wider breadth of insights and solutions and collated as similar views/responses or different views/responses as mentioned by the interviewees. Interviews were conducted with 19 participants, from 15 organisations, in 17 interviews. The role of these participating organisations at state and national level are listed in Table 5, in alphabetical order. For the 17 interviews conducted, 12 regulators and 7 strategic managers participated.

**TABLE 5: BROAD ROLE IN WATER GOVERNANCE OF PARTICIPATING AGENCY FOR INTERVIEWS**

	AGENCY NAME	MANAGEMENT ROLE	NSW / NATIONAL
1	Department of Industry - Water	Regulator	NSW
2	Department of Planning	Regulator	NSW
3	Independent Pricing and Regulatory Tribunal	Regulator	NSW
4	Natural Resource Access Regulator	Regulator	NSW
5	NSW Environment Protection Authority	Regulator	NSW
6	NSW Health	Regulator	NSW
7	Water NSW	Regulator	NSW
8	Department Agriculture and Water Resources	Regulator	National
9	Productivity Commission	Regulator	National
10	Environmental Defender's Office	Strategic Manager	NSW
11	Local Government NSW	Strategic Manager	NSW
12	Office of Local Government	Strategic Manager	NSW
13	Water Directorate	Strategic Manager	NSW
14	Australian Water Association	Strategic Manager	National
15	Water Services Association Australia	Strategic Manager	National

For stage 3, further analysis of the combined responses from the workshops and semi-structured interviews were carried out to draw out the recommendations for improving the development and implementation of IWCM strategies within the rural-regional NSW. The recommendations were categorised into two (2) main stakeholders involved in the management and delivery of the IWCM strategies, as: 1) the regional water authorities responsible for water supply and sewerage; 2) the DOI-Water (now DPIE).

## 4 DATA COLLECTION: LITERATURE REVIEW AND STAKEHOLDER ENGAGEMENT

This section provides a reflection on the literature focusing on specific studies related to IWCM strategy implementation and identifying the most impactful words. This is then compared to what the stakeholders revealed through workshops and semi-structured interviews with a summary table of participants' responses. The responses were classified into "Internal" and "External" "Challenges" and "Drivers", and correlated with the literature review to identify gaps in knowledge or new knowledge.

### 4.1 LITERATURE REVIEW: INFORMATION COLLECTION AND ANALYSIS

An analysis of literature review was undertaken to reveal the main drivers and challenges of IWCM. The literature search was 'arbitrary' snowball process – that is the order of search is identifying the place of citation, title, abstract, full paper. Forward and Backward snowball processes are defined by (Walliman, 2006; Wohlin, 2014) and has been used by (Bettini, Brown et al., 2015). Keyword search included '*IWRM*', '*integrated management*', '*governance*', '*influences*', '*socio-political*', '*socio-technical*', '*Australian waters*', '*sustainable water management*', '*challenges*', '*barriers*', '*implementation*', '*development*', '*water infrastructure*', '*economic*', '*social*', '*value*', '*resource*', '*cost benefits*', '*analysis*', '*planning*' '*adaptive*' and a combination of listed words. The type of literature viewed for above mentioned word search were journal articles, news articles, technical reports, blogs and peer-reviewed publications focusing on key words to filter information on water topics. The papers included are until 31 May, 2019, date of draft Literature review submitted for assessment. This method has also been utilised by (Dobbie & Brown, 2014) as research method for a framework of understanding risk perceptions - water practitioner's perspectives.

Out of 186 short-listed publications, 29<sup>11</sup> papers cited in the Literature Review<sup>12</sup> in this thesis were analysed in NVivo v12 (Bazeley, 2007). The databases searched were Agricultural and environmental science, GreenFILE, Google Scholar, ScienceDirect, Scopus and Web of Science. The word 'Drivers', were coded as positive sentiment and the word 'Challenges' was coded as a negative sentiment. A query was run to extract the number of times a word was coded either against drivers or challenges in the NVivo-v12 software. Figures 4 shows the number of times each word was referred to, either a 'challenge' or a 'driver'. This analysis reveals efficiency and adaptive planning were the top 2 drivers for IWCM strategy, while governance, adaptive planning and efficiency, were the top

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<sup>11</sup> Valid and true as at 28 June 2019

<sup>12</sup> References cited until 31<sup>st</sup> May, 2019; **To note**, many more references have been added as the Literature review evolved over the next months.



drivers. Thus, we can conclude that the efficiency and adaptive planning have been noted as top drivers as well as challenges and is dependent on the effectiveness of implementation and risks associated with implementation.

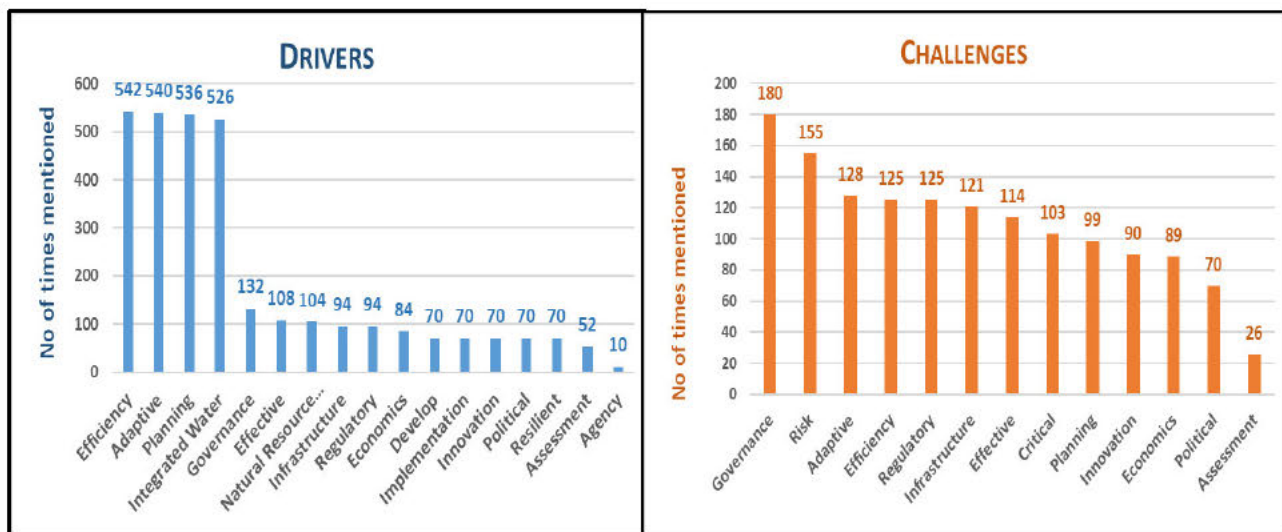


FIGURE 4: FACTORS IMPACTING DRIVERS AND CHALLENGES REFERRED TO, FOR X NO. OF TIMES

To seek another perspective on ‘adaptive planning’, analysis of the cited papers and published articles was undertaken, to find the number of times ‘Adaptive planning’ was mentioned as a ‘driver’ that is, about 540 times, and ‘adaptive’ on it’s own was mentioned 128 times; ‘planning’ was mentioned 99 times as a challenge. This could be interpreted as level of interest in these areas of research, and thus implies the research need. An underlying interpretation could be that in literature, positive framing of sentences is more prominent than negative framing, as can be seen by references for drivers being 3 times higher than for challenges.

*“These challenges are often characterised by complexity, uncertainty, instability, long timeframes between problem recognition and solutions, a diverse group of stakeholders and the need to work across organisational boundaries”*

This quote by *Gordon and Berry, (2006); Portugal and Yuki, (1994)* and cited by Taylor, Cocklin et al. (2012) emphasises the complex characteristics of the challenges associated with the implementation of complex, long term (applicable to IWCM) strategies, and continues to be so, decades later. This shows that challenges even over a 10 year period have changing goal posts.

Furthermore, **Appendix A** presents the timeline of state water agencies from the 1990s to the present. This clearly illustrates the lifespan of the agencies that reflects broader political and administrative trends ranging from the super-departments, cluster agencies, super agencies and the like. These changes have contributed to disconnected water management agencies across all three

(3) levels of the governance system (Morison & Brown, 2010), similar to the Literature review findings of asynchronised governments (*as described in Section 2.3 - page 9; section 2.4 - pg 12*). The historical changes over the past century has been collated in Appendix A. The department's years in operation timeline clearly shows the reducing timeframes of water management agency/ies existence. In 2009, with the cluster agency formations, in NSW, the changes to the water management agencies have been frequent and needs more detailed data search. The insecurities associated with such dynamic environment in polycentric governance structures, (Ross, 2017) has adverse impacts on the management, delivery of the water management initiatives, leading to uncertainties in planning to meet with the changing demands of water supply.

## 4.2 WORKSHOPS: SUMMARY OF RESPONSES

Workshops, stage 1 of the stakeholder engagement process, were most critical to the research. A summary of feedback for the workshops is summarised in Table 4, as below. The workshop participants were local council staff that could be classified as one single type of stakeholder and keeping the review of responses simple.

The summary of responses was compiled using the information from the discussions at the workshops, workshop notes and completed handout sheets. For the key questions, related to IWCM process, challenges and drivers - extra time was allocated for an open discussion – with the author and in-between the participants. The discussion time allowed the author to capture the tacit knowledge of the participants. Some of these internal discussions included council's administrative and management style; local councillor support; political influences; council's history in water management; council's internal operational, operations, financial and asset planning challenges faced, in and during, undertaking the works of developing an IWCM strategy. These were described in a single phrase as “historically, the council's water strategies have / have-not been at the forefront” or “historically, the council has been very pro-development” or resource allocations and priorities are dependent of the councillor's area of expertise /interest”. Then other workshop participants agreeing or disagreeing with comment and then providing their own insights. To capture these insights of the participants, the workshop responses have been grouped into areas of either unanimous agreement on an issue or with different views.

To capture these agreements and disagreements with subtle interactions between the participants as observed by the author, at all the workshops, these insights were further categorised into three (3) propositions of value, governance and resourcing. The categorisation of the responses are a personal perspective of the author as mentioned in Table 6, below.



**TABLE 6: SUMMARY OF RESPONSES - WORKSHOPS**

PROPO-SITION	UNANIMOUSLY AGREED UPON	DIFFERING VIEWS
VALUE	<ol style="list-style-type: none"> <li>1. Perceived lack of benefit for the council</li> <li>2. Lack of ownership of the IWCMS document by the Council</li> <li>3. Lack of motivation from within the Council – complacent approach</li> <li>4. Value for money not realised – financial implications)</li> <li>5. Failure to see value in undertaking process (efforts, time and capacity driven)</li> <li>6. Reluctance, associated in undertaking such large complex projects, is a deterrent</li> </ol>	<ol style="list-style-type: none"> <li>1. Need / usefulness of preparing the IWCMS document</li> <li>2. IWCMS – a missing link in the water management strategy</li> <li>3. Development of an IWCMS should be a priority for council and/or Councillors (political drive)</li> <li>4. Internal drive and corporate commitment to develop an IWCMS</li> <li>5. Operational value of the document</li> </ol>
GOVERNANCE	<ol style="list-style-type: none"> <li>7. Development of the strategy is: <ol style="list-style-type: none"> <li>a. Expensive, tedious and resource intensive</li> <li>b. Consultant driven – most of the work by council staff, for the consultant is unaccounted</li> <li>c. Resources are exhausted while preparing the strategy</li> </ol> </li> <li>8. Very prescriptive and multiple regulatory requirements</li> <li>9. Approvals are: <ol style="list-style-type: none"> <li>a. long drawn out processes;</li> <li>b. too much work, time, effort and monies</li> <li>c. no options, have to do</li> </ol> </li> <li>10. Lack of trust between different levels of governance structures, horizontally and vertically, impacting on delivery of projects</li> </ol>	<ol style="list-style-type: none"> <li>6. Strategic planning and social acceptance of reclaimed water use are equally important</li> <li>7. Reuse of treated effluent can be achieved with minimal fuss</li> <li>8. Providing affordable services to residents</li> <li>9. Executive buy-in / Corporate commitment to project</li> <li>10. Procedural Document – prepared to obtain more funds from the State Government</li> <li>11. Reporting is a waste of time – too onerous – most of the criteria does not even apply</li> </ol>
RESOURCING	<ol style="list-style-type: none"> <li>11. Availability of resources or lack thereof: <ol style="list-style-type: none"> <li>a. Financial</li> <li>b. Staff</li> <li>c. Historical data</li> <li>d. New data collection - IT requirements</li> <li>e. Data / information</li> </ol> </li> <li>12. Reactive works, not enough resource to think beyond meeting with current community demands</li> <li>13. Limitations to capacity of council staff to take on additional work</li> </ol>	<ol style="list-style-type: none"> <li>12. Adequacy of resource- capability within larger Vs smaller water utilities (skill sets and super skills within water utilities massively differs)</li> <li>13. Need for an external consultant to carry out the works</li> <li>14. Re-allocation of resources to develop a futuristic document is simply not possible due to staff shortage and current workloads</li> <li>15. Lack of co-operation/communication internally - within different council areas</li> <li>16. Staff Vs management responsibilities in achieving operational efficiencies during implementation of a planned project</li> </ol>

### 4.3 SEMI-STRUCTURED INTERVIEWS: SUMMARY OF RESPONSES

The semi-structured interviews - stage 2 of the stakeholder engagement process was designed to build upon the responses from the workshops and participants were shortlisted as identified in Table 3. The interviewees were shortlisted based on the author's knowledge and contacts within the water industry. OF the total 17 interviews, 19 participants provided an insight into 15 key organisations; 13 interviews were face-to-face and 4 were phone interviews. For the face-to-face interviews, 2 directorate level staff invited their IWCM program managers, to provide the author (also the interviewer) with an accurate response, rather than provide the 'politically correct' responses. The positions held by the 19 participants for the semi-structured interviews were: five (5)-Directors; two (2)-CEOs; one (1)-Team leader; two (2)-Senior Managers; three (3)-Managers; two (2)-Principal Policy Officers and four (4)-Senior Officers.

The semi-structured interview format allowed to dig deeper into the specific organisational insights of the interviewee and capture the individual organisational approaches, while providing role specific insights. Each interviewee was either fully or partly responsible for regulating, supporting or promoting IWCM strategy development and implementation. The responses by the interviewees, were categorised using a similar structure to that of the workshops. To capture the subtle differences of contextual insights, by the interviewees, agreements and disagreements were examined. While categorising the responses, some of the responses were better aligned to management and regulatory perspectives than governance. The end result was categorising the responses for the interviews into five (5) categories of 1) Value; 2) Governance; 3) Management; 4) Regulation and 5) Resourcing.

For semi-structured interviews, interviewees were classified as per their roles and organisational responsibilities of 1) Regulators or 2) Strategic water managers (See Table 5; page 17). Both types of stakeholders have very different objectives and goals. The regulators are responsible for ensuring legislations and regulations are complied with (*the process*)(PC, 2020); whereas the strategic water managers are focussed on the end-result (*the outcomes*). It was interesting to note that despite the different approaches, they had a common goal of best practice water management.(Colloff & Pittock, 2019) discusses these differences as expectations. To appropriately capture the similarities and differences in views (not necessarily conflicting or disagreements). Terminology was changed to reflect these similarities and differences in views, rather than agreements and disagreements, as was used to summarise the workshop responses. The summary of response format as in Table 7, is slightly changed to reflect and capture the similarities and differences in views of the two (2) types



of stakeholders with difference approaches but common goals, within the five (5) proposition categories as mentioned above.

**TABLE 7: SUMMARY OF RESPONSES – SEMI-STRUCTURED INTERVIEWS**

PROPO-SITION	STRATEGIC MANAGERS	REGULATORS
VALUE	<b>SIMILAR VIEWS AND APPROACHES</b>	
	<ol style="list-style-type: none"> <li>1. Lack of trust between organisations is a deep-seated issue</li> <li>2. Constantly changing community issues and expectations</li> <li>3. Need to be more inclusive and open to new information</li> </ol>	<ol style="list-style-type: none"> <li>4. Strong inter-governmental belligerent attitude</li> <li>5. Ownership:               <ol style="list-style-type: none"> <li>a. cannot be created</li> <li>b. IWCM not valued, so no ownership</li> </ol> </li> <li>6. Managing distances; not just kilo meters but also for developing working relationships</li> </ol>
VALUE	<b>DIFFERENCES IN VIEWS AND APPROACH</b>	
	<ol style="list-style-type: none"> <li>1. State led leadership</li> <li>2. Need for pragmatic solutions that consider capabilities and engages with communities</li> <li>3. Dialogues with internal staff and agencies, need to be:               <ol style="list-style-type: none"> <li>a. Initiated and Improved</li> <li>b. In the direction of team work not about working in silos</li> </ol> </li> <li>4. Complexity excludes people</li> <li>5. Degree of separation required for regulatory agency's objectivity – removes conflicting priorities within the government authorities.</li> <li>6. Crisis response and management: regional WUs historically reactive, then resolutions are 'in time' only, with no view to long term viability</li> <li>7. Governments trying hard to get a coordinated approach</li> <li>8. Important for driving change               <ol style="list-style-type: none"> <li>a. Political, social and technical influences</li> <li>b. Water literacy - financial decision makers</li> </ol> </li> </ol>	<ol style="list-style-type: none"> <li>1. Active leadership required – Proactive not reactive – need for credible regulation prominent</li> <li>2. IWCM Value:               <ol style="list-style-type: none"> <li>c. Positive, realised during drought conditions, robust plans, long term water needs identified and implemented, water usage economised to prolong drought impact</li> <li>d. IWCM banner not valued, but sum total highly valuable;                   <ol style="list-style-type: none"> <li>i. water security planning,</li> <li>ii. setting a clear price path,</li> <li>iii. emergency management plan</li> </ol> </li> </ol> </li> <li>3. Need to work back from the perceptions of:               <ol style="list-style-type: none"> <li>a. Regulations prevent the uptake of IWCM, it is the lack of resources (funds and skilled staff)</li> <li>b. Wastewater is highly toxic, unusable but it is prior to treatment with strict controls in place, much safer than untreated stormwater for many uses</li> <li>c. Stormwater is clean, but it is not, it is filthy</li> <li>d. Storm water in a drain is waste of water. It is a part of natural run off and 'actually' has a place in the health of a downstream wetland.</li> <li>e. Stormwater harvesting is the answer to irrigation uses, comes with baggage</li> </ol> </li> <li>4. Not all stormwater can be harvested for use as it collects contaminants on its way downstream</li> </ol>



PROPO-SITION	STRATEGIC MANAGERS	REGULATORS
GOVERNANCE	SIMILAR VIEWS AND APPROACHES	
	<ol style="list-style-type: none"> <li>1. Governance: identified as major area for reforms</li> <li>2. Governance is fragmented</li> <li>3. Existing philosophical differences on IWCM framework</li> </ol>	<ol style="list-style-type: none"> <li>4. State Authorities, not so effective:               <ol style="list-style-type: none"> <li>a. pre-existing traditional reluctance</li> <li>b. not very good at consulting, engaging</li> <li>c. archaic practices</li> </ol> </li> </ol>
	DIFFERENCES IN VIEWS AND APPROACH	
	<ol style="list-style-type: none"> <li>1. NSW has structural and political issues</li> <li>2. Constructive policy is the key, not legislation or regulation – issues often beyond council boundaries.</li> <li>3. Broad recognition of duplication and oversight reporting,</li> <li>4. Reports drive towards a ‘measurable’ outcomes focused system, where duplication / overlap is reduced/ removed, in an ideal world</li> <li>5. Cost, time and complexity of reports, onerous</li> <li>6. IWCM, like developing your corporate plan, it needs to identify vision, aims, objectives and values – otherwise it’s not going to work – the connections will be missing</li> </ol>	<ol style="list-style-type: none"> <li>1. Regulator role to hold entities to account</li> <li>2. IWCM is the government’s insurance policy</li> <li>3. A regulatory requirement, but financial ‘path’ to assist</li> <li>4. Water governance and service delivery in different landscapes.</li> <li>5. Delivery and management of water rights across governments is an issue</li> <li>6. Legal language used in approvals – to preserve the meanings</li> <li>7. Changes to Ministerial portfolios impact – in creating uncertainties</li> <li>8. Ministerial decisions / sign-offs – based on technical capability, environmental health, but socially/politically driven</li> <li>9. Engaging and involving stakeholders – rethink water as an underlying resource</li> </ol>
RESOURCING	SIMILAR VIEWS AND APPROACHES	
	<ol style="list-style-type: none"> <li>1. Resource gaps difficult to manage; core to asset management side of the operations not strategic water security / water safety initiative</li> <li>2. Knowledge transfer / collaboration needs</li> </ol>	<ol style="list-style-type: none"> <li>3. Skills shortages and development of upto date knowledge is across the industry. It is a universal issue.</li> <li>4. Needs more of the capacity building initiatives for staff to achieve efficiency</li> </ol>
	DIFFERENCES IN VIEWS AND APPROACH	
	<ol style="list-style-type: none"> <li>1. Resourcing for inclusion of stormwater would be too difficult to plan forward, can run out of water and still not have a plan</li> <li>2. Water utilities top 3 priorities are roads, roads and roads – everything else is so much lower; Re-prioritising and re-allocation of staff resources to would help manage their internal management better.</li> </ol>	<ol style="list-style-type: none"> <li>1. State Government provides funds to carry out the works; provide assistance and guidance to water utilities, not about endorsing consultants to carry out the works</li> <li>2. Commonwealth funding support for climate preparedness and IWCM – under the “Strengthening Basin Communities” fund</li> <li>3. Inadequate planning suggests that they haven't looked at all options and/or do not have a backup plan (contingencies not in place)</li> </ol>



PROPO- -SITION	STRATEGIC MANAGERS	REGULATORS
MANAGEMENT	SIMILAR VIEWS AND APPROACHES	
	<ol style="list-style-type: none"> <li>Good planning outcomes:               <ol style="list-style-type: none"> <li>ROIs are generally good</li> <li>saves money by building the correct infrastructure,</li> <li>incorporates ongoing operational costs</li> <li>increases longevity, financial and operational viability</li> </ol> </li> <li>Tyranny of distances in NSW</li> </ol>	<ol style="list-style-type: none"> <li>Streamlined processes and frameworks</li> <li>Data collection a huge issue - progressively turns to big data that cannot be managed internally</li> <li>Silos exist at all levels and across all organisations</li> <li>Need to manage 'total water cycle' for best outcomes</li> </ol>
	DIFFERENCES IN VIEWS AND APPROACH	
	<ol style="list-style-type: none"> <li>Provision of higher levels of service to community at minimum cost</li> <li>Avoiding off-the-shelf solutions by consultants</li> <li>Role of regulator: education but also about values and benefits, not just prescribe solutions</li> <li>Explanations include expectations and desired outcomes, not set of instructions to follow</li> <li>Water utilities: good at management planning and operational planning but not on strategic and long-term planning</li> <li>Role of policy agencies to decide whether methods should be attached</li> <li>Management systems should be flexible and consistent</li> <li>Stormwater not part of LWU business operations</li> </ol>	<ol style="list-style-type: none"> <li>Legislations playing catchups</li> <li>Major licences - Licensing reviews detrimental to the licence itself</li> <li>Methods attached to also depends on the regulatory agency's organisational drive and values, clarity and transparency of approval processes and timelines</li> <li>Sometimes applicant's response time more than 6 months – approving authority blamed for the delays</li> <li>Transparency, communication, collaboration is possible in a regulatory role</li> <li>Uptake of initiatives only if funded by State Government;</li> <li>Need to plan for water supplies, sewerage, and stormwater – so why not as one plan?</li> <li>Clarity on the assessment criteria missing</li> <li>Opportunities to streamline the approval process</li> <li>CHECKLIST is about resolving your highest risks. If you don't have a water security risk or you don't manage bulk water, then checklist is redundant</li> </ol>
REGULATION	SIMILAR VIEWS AND APPROACHES	
	<ol style="list-style-type: none"> <li>IWCM is a guidance document not the law</li> <li>Regulations can get complicated</li> <li>Vanilla approach applied to all applications – requires streamlining the assessment processes for efficiency and effectiveness</li> </ol>	<ol style="list-style-type: none"> <li>Most regulators traditionally attached to methods</li> <li>Important to consider all options during the planning stage, so implementation is efficient and effective, especially in areas of rapid growth, emerging climate change, water scarcity and drying climates</li> </ol>

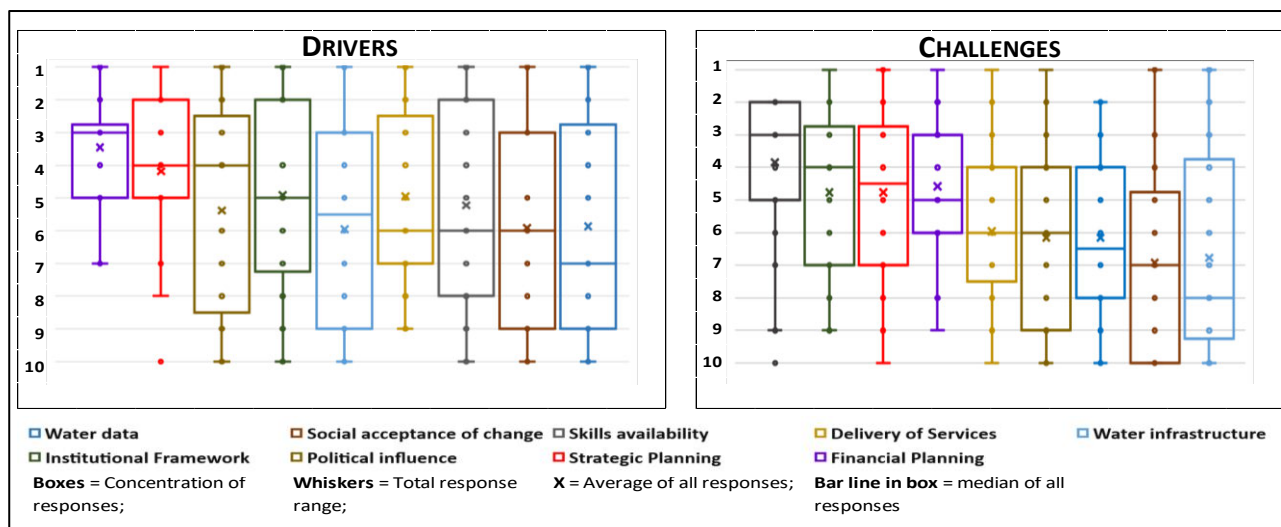
PROPO-SITION	STRATEGIC MANAGERS	REGULATORS
REGULATION	DIFFERENCES IN VIEWS AND APPROACH	
	<ol style="list-style-type: none"> <li>1. Water regulation is complex – implications of changing regulations can be problematic, depending on the level and type of engagement – these changes can have a negative impact both socially and environmentally</li> <li>2. Options Analysis: include traditional and innovative sources</li> </ol>	<ol style="list-style-type: none"> <li>1. Regulations are ‘enabling pieces’ of our planning systems eg: LEPs, DCPs, SEPPs</li> <li>2. Regulators are moving away from prescriptiveness, but practitioners / implementers need guidance and direction</li> <li>3. Regulators’ role is to ensure accountability</li> <li>4. Water regulation ensures good water quality for all needs: social, agricultural, environmental, cultural and political</li> <li>5. Clear rules around drinking water and recycled water use; there “has to be certainty” where people’s health is concerned, ‘potential to harm’ is not an option</li> <li>6. Complexities not around regulatory requirements - understanding the connectivity is complex</li> <li>7. Assessments of IWCM documents have been a longstanding issue – Strategy was a 300+ page document and then they wondered why the department did not respond “immediately”?</li> <li>8. NSW historically relies on prescriptive regulation due to resource deficit, having prescription helps them with a direction rather than having to find their own.</li> <li>9. A level of prescription brings consistency across the state.</li> </ol>

## 5 ANALYTICAL DISCUSSIONS: A REVIEW OF STAKEHOLDER RESPONSES

The responses from the workshops emphasize the extent of the challenges faced by regional water utilities as they balance operational level demands with strategy. The stakeholder engagement was with all three (3) tiers of governments, primarily local and state government. The first three (3) sub-sections of 5.1, 5.2 and 5.3, address the different discussion phases of the workshops and participants' responses are segregated into 5.1) Ranking the responses; 5.2) Strategy development; and 5.3) Strategy implementation. Both, challenges and drivers are individually addressed in each of the 3 sub-sections. The fourth sub-section 5.4 is on overcoming these challenges as discussed at the semi-structured interviews and segregated into the five (5) proposition responses. Sub-section five 5.5 discusses the limitations and implications of the stakeholder engagement.

### 5.1 WORKSHOPS: RANKING OF CHALLENGES AND DRIVERS BY WORKSHOP PARTICIPANTS

Of the 44 participants at the workshops, 28 participants completed an individual survey to rank a list of drivers and challenges. The choices of drivers and challenges were derived from the literature review and participants were asked to rank these on a Likert scale of 1-10 (*1 being highest to 10 being lowest*) (Figure 6).



**FIGURE 5: DRIVERS AND CHALLENGES AS RANKED BY WORKSHOP PARTICIPANTS ON LIKERT SCALE**

In terms of drivers, each of the choices was selected by respondents suggesting a high diversity of opinion. Overall, financial planning was ranked the most important driver followed by strategic planning. This differed in part from the analysis of the literature (Figure 4), where efficiency and adaptive planning were the most prominent. This may suggest participants are more closely impacted by the financial decisions of their organisations and how this enables or otherwise investment in IWCM.



For challenges, the availability of skills had the highest average response, although notably was not singularly identified as the most important. This was followed by institutional frameworks, aligning with the literature that placed governance as the most important challenge (Armstrong & Gellatly, 2008). The top three (3) challenges identified from the Box-and-Whiskers chart were: skills availability, institutional frameworks and strategic planning. The top three (3) drivers identified were financial planning, strategic planning and political influence. There was only one outlier response in each, denoted by the isolated single dot. No additional challenges were added to the list, apart from the list of challenges provided and stated as 'Other'.

Both, the literature review and the workshop survey results identify 'planning' as the most impactful driver, whereas 'political influence', 'institutional framework' has varying degrees of impact. 'Skills' and 'delivery of services' has greater impact on the performance of regional water utilities (Armstrong & Gellatly, 2008) but is not captured in the literature review. These changes are reflective of the changing community expectations. (Floyd, Iaquinto et al., 2014; Mankad & Tapsuwan, 2011; Schröder, 2018) detailed discussions in the sections and sub-sections of 5.2 to 5.4

## 5.2 WORKSHOPS: STRATEGY DEVELOPMENT - CHALLENGES AND DRIVERS

All workshop participants agreed that - the development of an IWCM strategy - was viewed as additional workload, over and above their routine responsibilities. The preparation of an IWCM strategy requires a number of baseline studies, many of which require the engagement of external consultants. This is in addition to the staff resources required for project coordination and data collection across many areas of council. Workshop discussions reveal the importance on intra-council co-operation that many participants noted was not always present, suggesting the presence of institutional silos. Finance and operations were other areas of major challenges. The main challenges faced are then segregated into the internal and external challenges. During the discussions, when asked what would help them overcome these challenges, the responses are collated into internal and external drivers, in the subsections of 5.2.

### 5.2.1 INTERNAL CHALLENGES

Within the regional water utilities, five (5) major challenges were identified that influence the development and implementation of their IWCM strategy, as discussed below.

#### 1) Availability of skilled resource to carry out the works.

All participants agreed that availability of skilled resource is 'the' major challenge within the rural-regional NSW. Participants, frequently mentioned, that staff resources are limited in rural-



regional councils, noticeably more so in smaller councils. Numerous responsibilities and high workload contributes to reduced capacity building opportunities to upskill staff and develop their professional capabilities. Lack of upskilling opportunities act as personal limitations to keep up with the current practices. This was especially true, if their work was not directly relevant to their immediate and priority tasks. But, reliance on consultants to provide them with concurrent knowledge and information was a mixed bag.

It was interesting to note that 'most' water utilities had only one manager with responsibilities for both water and waste management portfolios and that the organisational restructures following the council amalgamations is endless. (Blayden, 13 November, 2017) in particular mentions the pursuit of addressing difficult challenges should not be endlessly prioritised over administrative decision-making process. The IWCM strategy development requires options analysis and asset planning requirements over a period of 30 years. This requires considerable staff time and intense co-ordination efforts across different areas of council operations such as asset management, financial services, human resources, operations and within the water team itself. Coordination efforts, were viewed by the participants as time consuming, requiring administrative support and financial resources that most councils lack. Moreover, co-ordination by itself does not tick any boxes and so not valued by either the senior management or the potential employer. In regions, where job opportunities are limited, this is a major risk to their career and so efforts are made where value is recognised.

Many workshop participants were of the opinion that current limitations to staff resourcing constrains their activities to reactive works only, not strategic planning. Some participants, however, stated their personal drive to prioritise strategic or proactive activities. But such initiatives often had little or no support from the top and senior management teams. This was particularly problematic where projects had long planning and delivery timeframes that require ongoing and consistent senior level support. Structural constraints inherent in the legacy of a management tradition are major barriers to change. (Pahl-Wostl, 2009). On the other hand, for some participating water utilities, resourcing of water related projects was entirely consumed in the strategic planning process leaving little or no capacity to actually undertake a project. This observation was also found by (R. Brown, Farrelly et al., 2009).

## **2) Data collection, collation, storage and management.**

Data collection was identified as one of the top three (3) challenges for regional water utilities. Many local water managers expressed the view that it was difficult to keep up to-date with

technological changes. These changes, more often than not, led to more data collected and the need, although not capacity, to manage and use data for informed decision making. (Specht, Guru et al., 2015) identifies that transdisciplinary collaboration is difficult but has the capacity to deliver innovative solutions. Some participants expressed the concern that they are now having to engage external specialists to collate, manage and analyse data and translate it into useful information and knowledge, But, this comes at a huge financial cost. From a data-technology transition perspective, the lack of upskilling opportunities, and use of information technologies was seen as widening of the internal staff's skills gap, making them less employable and more reliant on consultants.

With increasing amount of data collection there is a need to update data storage and, more broadly, council's Information Technology (IT) systems. This is an additional financial expense that requires staff training and ongoing high level of maintenance expenses, as these, large amounts of data collected cannot be captured, managed, and processed by the conventional software tools. (Jiang, Chen et al., 2019)

In three (3) workshops, the collection and management data was seen as an issue, by the smaller councils. For some councils, this has been maintained as either hard or soft copy files by individual staff, who is no longer a part of the network systems, sometimes it had been lost and often simply forms part of an individual's corporate knowledge. Combined this presents system vulnerability. At the remaining two (2) workshops, management process of keeping all records in a shared folder and was made accessible to senior management. Such data management controls have proved to minimisation of data and knowledge loss. (Souza, Pires et al., 2011) and (Ferrari, 2010) both confirm that shared access such as Peer2Peer (P2P) data management systems and access control measures in place provide greater data security.

### **3) Internal organisational silos.**

Increasing workloads and time pressures on staff has led to reduced internal communications and the culture of working in silos. Communication, collaboration and information sharing between teams, was seen as limiting the uptake of large and complex projects. These institutional challenges are not new. Lee (1993) noted that these factors can contribute to resistance by staff to change and innovate that may be attributed to fear of increased transparency (attributing individual blame), loss of control and risk or assumed failure and (Lilenfeld, 2017) discusses the psychological impact of institutional silos on individuals and recommends breaking free of silos.

**4) Local councillor support, top level corporate and executive team → buy-in, or lack of it.**

Participants considered political and executive support for long-term infrastructure projects as resource-intensive and time consuming, diverting efforts from the required tasks. Fear of failure to undertake new initiatives, risk aversion and an ongoing focus on what is perceived as 'core business' collectively contributes to little or sustained investment in many of the strategies within the IWCM plan. (Koster, Reese et al., 2019) The workshop participants emphasised that the decision-making process of elected officials is extensive and has a strong focus on socio-political concern; Institutional-political concerns are also inter-linked with social concerns and impacts on the final decisions. These decisions also rely on the staff's articulation skills and the prominence of position held. Other decision-making driver was the urgency of need for a particular water CI and its financial impact, influencing other project bids of the council. An analyses by (Koster, Reese et al., 2019 , p. 258) is similar to the participants insights of high dependency of urban water governance on institutional, political, cultural and economic context.

**5) The benefits and value of preparing these long-term planning documents are not identified.**

*"Value derived from undertaking IWCM activities does not necessarily warrant the allocation of significant time and resources to complete them. This position needs to be understood in the context of workload and ability to complete all tasks that may be desirable."*

*-Workshop participant*

Many workshop participants expressed the view that developing the IWCM strategy was expensive, time consuming, required considerable institutional effort, and even that it was a consultant-owned process. Therefore, the benefits of the strategy are not clear, so not realised. Where benefits were identified, there remained uncertainties around cost recovery of implementing the IWCM plans or that of realising the positive returns on investment.

IWCM plans, largely consultant driven and prepared, many participants felt strategies were off-the-shelf solutions and not designed for their local needs. Thus, arises the notion of IWCM strategies being a 'consultant owned' document. The ownership of the document, by the council staff, was the 'missing factor'; when attempting to implement these plans. The only and most notable value and support by most regional water utility staff was that the IWCM strategy document was able to directly leverage from the State's water infrastructure development

funds. Most participants saw the time, efforts and cost of preparing these baseline studies were prohibitive and resource-intensive<sup>13</sup> that acted as a deterrent to preparing the strategy.

### 5.2.2 EXTERNAL CHALLENGES

#### **Impacts of externalities on internal operations.**

Many regional water managers view the development and implementation of the IWCM strategy document as state government driven and as a consultant owned document. All participants agreed that the IWCM strategies were fully funded by the state government. (*Sec 2.2; page 6*) Resultant to this was, regional water utilities outsourced the complete strategy development works. That there were very few experts/ experienced consultants, in NSW, working in the IWCM area, and the strategy development time-bound, the consultants churned out off-the-shelf strategy in high numbers, where the regional water utility being the responsible authority to implement these off-the-shelf solutions. Participants revealed that they had a strong sense of strategies provided to them, did not consider the local conditions, needs or capabilities. This scenario according to the participants, is applicable to most regions. Not surprisingly, lack of ownership of IWCM strategies, thus developed, impacts negatively on the subsequent implementation. Literature Review (*Sec 2.2, page 6*) identifies such irregularity in IWCM strategy implementation.

Most of the regional water managers commented that there was only one consultant in NSW, skilled to carry out the secure yield analysis study, the main part of an IWCM strategy. The perception, of this apparent consultant monopoly, is that this important task, in the eyes of the council, is slow in delivery and overpriced.

All workshop participants, identified multiple and prescriptive regulations as an ongoing challenge. Though, we have already established in *Sec 2.3 page 8*, that the continuously changing government agency responsibilities add to the challenge of at least three (3) or more authorities responsible for administering a function. The participants also mentioned long distances – of being situated far from the central government offices and so less accessible – as an issue. The difficulties in contacting the officers and receiving a timely response were also mentioned as minor issues, but very frustrating.

All workshop participants raised the issue of asynchronised governance systems, the long history of 'lack of coordination' between and within the different levels of governments. This confirms previous research by Daniell, Coombes et al. (2014); R. Brown, Ashley et al. (2011) and Smith, Voß

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<sup>13</sup> Resource intensive here means - both, financial resource (expenses) and staff resources (availability of skilled staff and capacity of the staff, to take on additional works)



et al. (2010). All workshop participants agreed that this lack of clear, coordinated and functional governance frameworks have contributed to complacency in council staff, leading to business as usual (BAU) working cultures in regional water utilities. This BAU culture reinforces institutional and technological lock-in of practices that are decades old. Also identified in Section 5.2.1-3), pg. 30-31.

### 5.2.3 INTERNAL DRIVERS: OVERCOMING CHALLENGES

#### 1) Data collection systems and processes.

Many participants revealed that they have outdated data collection systems, making the data collection and retrieval process extremely tedious and leaving gaps in data, thus limiting its decision-making value. Upgrading systems for better data collection, management and storage was seen as important and complement the current SCADA<sup>14</sup> and telemetry systems. For many councils training of these new technologies including data management, was stated as important particularly as this could reduce a reliance on consultants and where the data could support the development, implementation and review of their IWCM strategy.

#### 2) Provision and support for education/ upskilling by water utilities.

Upskilling regional staff was expressed by many participants as vital to achieve efficiency and effectiveness. As one participant stated, “To drive change, educate”. Suggestions for education included access to short courses to expand staff knowledge for knowledge sharing and information exchange within and outside the organisation to break away from the institutional silos.

The author also observed that there is an existing ‘assumption’ within the regional staff that staff in metropolitan city areas are more technology savvy. This perception was attributed to the assumption that the metropolitan water engineering have greater exposure to new ideas and technologies. Whether this is true is uncertain, but nevertheless points to a need for ongoing technical training and educational support to bridge the knowledge gaps (Thapa, Matin et al., 2019).

Community education and awareness programs are also seen as important. This ranged from explaining the provision of different levels of services related to cost of services and to undertake innovative projects to provide better services cost-effectively.

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<sup>14</sup> **Supervisory Control And Data Acquisition (SCADA)** is a system of software and hardware elements that allows organisations to achieve efficiency, process data and communicate system issues to help mitigate data processing downtime.

### 3) Oversight and responsibilities.

Participants' discussion on 'Leadership' and 'role of water champion' was seen to provide initial trigger for IWCM strategy development. Champions - *typically self-driven and presumed to have good communication skills to communicate project benefits and gain top-down approval, inter and intra institutional, buy-in as well as community support* – were regarded to have the inherent abilities to oversight these tedious and resource intensive, long term planning initiative.

Aptly observed and quoted by a workshop participant was *"there are lots of missing links-synergies and intelligence - are missing"* such issues make it difficult for the regional water utility staff to assume responsibility and oversight the development of IWCM strategy.

In summary, as mentioned by the participants, institutional silos, lack of capacity building opportunities and data collection and collation required for baseline study documents and addressing the regulatory requirements contribute to the regional water utility's staff in undertaking the oversight and project management responsibilities.

#### 5.2.4 EXTERNAL DRIVERS: OVERCOMING CHALLENGES

Listed below are the top five (5) external drivers that would help overcome their challenges to develop and implement a regional IWCM strategy - as stated by the participants and summarised in *Table 6: Summary of responses – workshops* (see Sec: 4.2, page 21)

- 1) The need to **simplify** the **IWCM checklist**<sup>15</sup>, a 22-page long document, described as complex, confusing and 'too detailed'.
- 2) **Review of the Section 60**<sup>16</sup> **(LG Act 1993) approvals process** that was described as 'resource intensive', 'time consuming', 'extreme', 'limiting' and 'lacking in operational value'.
- 3) **Provide more options for land application of recycled/ treated water**. It was suggested that expanding the treated water reuse options list and facilitate implementation of recycled water use and relax the approvals process. One of the arguments, for relaxing the approvals process was that 'innovative' technology solutions cannot be considered as an option, even if it meets with the cost-benefit analysis due to specific and prescriptive regulatory conditions by the different water regulatory authorities in NSW.

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<sup>15</sup> Available: <https://www.industry.nsw.gov.au/water/water-utilities/best-practice-mgmt/iwcm>; Last visited 05Oct2019

<sup>16</sup> Under [Section 60 of the Local Government Act 1993](#), local water utilities are required to obtain ministerial approval for the construction or modification of water or sewage treatment works, to ensure fit-for-purpose, robust, safe, cost-effective and soundly based solutions that meet public health and environmental requirements. Available at: <https://www.industry.nsw.gov.au/water/water-utilities/regulatory-assessments/s60-approval-water-sewage-treatment-works>; Last visited: 23 October 2019

- 4) To request the state department **to expand the ‘trained and approved’ consultant list** with specific skills and capabilities to undertake IWCM related studies such as ‘secure yield analysis’; options study, cost-benefit analysis and development of business cases.
- 5) That the **DOI-Water communicate the benefits of IWCM strategy with regional water utilities** and the reasoning behind carrying out, what is perceived to be, tedious, resource-intense and expensive exercise.

### 5.3 WORKSHOPS: STRATEGY IMPLEMENTATION - CHALLENGES AND DRIVERS

While the development of the strategy has been identified as having multiple, multi-level challenges, the implementation of the strategy has been looked upon as equally challenging. Interestingly, most regional water utility staff did not have much to contribute. This was due to the fact that only a select few have developed the strategy and implemented it to some extent, depending on their internal organisation’s priorities. Quite a few, simply outsourced the strategy development works and acted only as administrators of the process. Remaining of them, mentioned overload of work, to undertake what was looked upon as an initiative by the previous staff (not my issue), leaving the development of strategy works incomplete.

The discussion was on the complexities of regulation, in applying for and obtaining approvals from the various regulatory authorities, required to implement the various components of the strategy. Multiple and individually prescriptive regulations are the main deterrents in the implementation phase of the strategies, according to the workshop participants.

#### 5.3.1 EXTERNAL REGULATORY CHALLENGE

The word ‘prescriptive regulations’ was raised multiple times in context of approvals for water infrastructure planning, reuse options for treated effluent and stormwater. In particular, section 60 (LG Act 1993) approvals by DPIE, treated water reuse options and approvals by NSW Health, monitoring requirements for protection of water sources by NSW EPA and the reporting requirements by Office of Local Government (OLG), were all termed as “onerous”. In the Literature review, Figure 1 shows the complexities of multiple authorities responsible for each component from administration to funding, supports the workshop discussions of complex management structures as the single-most major challenge. These multiple, and prescriptiveness of regulations, have proved to be a deterrent for any innovative works proposals irrespective of regional water utility’s core function area and confirmed by all workshop participants.

*How do we know if what we have submitted is 'ok' and it is as the department wants, or do we need to completely redo the strategy? And then how long do we have to wait for a response?*

*- Workshop participant*

For regional council water managers' taking an initiative, the delays in responses from the regulatory authorities is a challenge on its own. These delays (or no response, in some cases) were mentioned to be 'awaited' in form of, either advise or feedback, on submitted works. As these submitted works were not formally approved by the authorities, there was discontent amongst the water managers and questioned the department's support for implementation. These reasons arguably account for comments by some water utility managers that the IWCM plans are '*dust gathering/collecting document*'.

### **5.3.2 INTERNAL REGULATORY CHALLENGE**

Regional water utilities highlighted the 'process' of obtaining the approvals for various water related infrastructure as very long, tedious and resource intensive process. This is linked to requirements for baseline data for the development of the strategy, long delays related to project approvals, administrative (red tape) requirements, infrastructure and services procurement processes and the need to secure long-term funding within council asset and financial planning processes.

To implement projects involving treated effluent or stormwater reuse and reduce the load on potable water use, there is an additional need to address health and environmental concerns. This requires preparing applications that address all components of the IWCM checklist for DoI-Water, (*refer to footnote 19, page 34*) health impacts checklist for NSW Health (*Drinking Water Quality Management Standards*) while ensuring environmental protection for carrying out activities that have the potential of harm to the environment for NSW EPA (*Protection of Environmental Operations Act 1997*). Planning consent needs to be obtained under Environmental Planning and Assessment Act 1979, for any development (construction works) and community concerns need to be addressed via consultations, especially for obtaining social acceptance of recycled water use, its applicable standards and to ensure financial viability within the council. These are often bound by setting the charges in accordance with the standards set by Independent Pricing And Regulatory Tribunal (IPART). Some regional water managers also expressed concerns about addressing the requirements for stakeholder and community input into IWCM strategy. These concerns extended to the amount of detail required as monitoring data and reporting on the delivery of their infrastructure plans for evaluating their IWCM plans.

### 5.3.3 STRATEGY IMPLEMENTATION - DRIVERS

Drought, drought like conditions, severe water shortages, increasing water demand, water availability stress and agricultural needs vs domestic needs, are considered as triggers driving implementation of IWCM, from a regional water utility's management perspective. A quote as mentioned by one of the workshop participants aptly describes the situation and is reflective of the general sentiment at the workshops - *"It was drought, that triggered our IWCM implementation and fast tracked the approvals, even though they were temporary and conditional approvals"*

Regional water managers also expressed that the implementation of the water infrastructure projects was dependent on the availability of external funds.

## 5.4 SEMI-STRUCTURED INTERVIEWS: OVERCOMING THE OPERATIONAL CHALLENGES

To comprehensively summarise information, analyse the result and capture the diversity of responses, the summary table collated from interview responses has a more complex structure than the responses collated from the workshops. To overcome the challenge of strategy development and subsequent implementation, the responses were categorised under the five (5) propositions (as per Sec 4.3).

### 5.4.1 VALUE PROPOSITION

At the workshops, "value" of the document was clearly not realised, nor did the staff connect to the strategy. When the question *"why was the 'value' of IWCM strategy not realised and what could be done to change this perception?"* Both, stakeholders - agreed that there needs to be an awareness about the benefits of the long term strategic planning and that one of the major challenges was constantly changing community expectations and needs.

While the 'regulators' position on the value of strategic planning was philosophically expressed as: *"IWCM is based on fundamental philosophy of life. a) What is the problem? b) How do we fix it? And c) How do we know it's fixed?"*, they promoted "active leadership" not necessarily State or Federal government led.

*"Regional water utilities are historically reactive, then resolutions are 'in time' only, with no view to long term feasibility"* This statement validates the concerns raised by the workshop participants about 'lack of resources' leading to the regional water utilities' capacity for 'reactive works' only. It also clearly denotes that, there is acceptance at both levels of governance that regional water utilities lack resources that impact on their ability to undertake any additional work. Though the



above quote was by a regulator, strategic water managers (SWMs) agreed to this a little differently. The SWMs differed in the perception of “no view to long term feasibility” and said that there was no scope or space for regional water utilities to look at long term feasibility.

Interviewee responses, to gain insights into why was strategy document termed as “dust gathering document” were that *‘its net positive value is not realised’* and both stakeholders agreed that the importance of such longer term planning documents is realised in emergency situations. Lack of planning or due consideration to the cost of equipment, its ongoing operational and maintenance costs and contingencies included in the budget, the question arises as to the validity and feasibility of decision making process of putting in the ‘right’ water CI and of its value.

There was a clear consensus, that the options analysis, in the IWCM long term strategy and planning document, helps identify the correct infrastructure at best pricing and ongoing operational and maintenance requirements. Though it was the “value” of preparing the different plans - *sitting under the IWCM strategy, to identify the water needs, financial plan, asset management plan and a thorough options analysis for water infrastructure needs* - accepted and recognised as ‘required works’ that was not agreed by the SWMs.

Interestingly, it was revealed by a SWM that the different state government organisations, are now taking a step towards a collaborative approach and consolidating the responsibilities, under the cluster organisation of DPIE, (Department of Planning, Industry and Environment). The possibilities of sharing knowledge and leveraging off each other strengths is increased manifold which was considered to be a huge improvement from what could be previously shared between organisations, due to the privacy policy, records keeping and organisation’s information system management requirements. This knowledge sharing between the different water governing state agencies is viewed as avoiding exclusion and silos between the different levels of governance and was aptly stated by a SWM as *“It is complexity that excludes people and maintains a certain level of ignorance, even amongst the intelligent”*.

The complex governance modules, and management systems, have created a ‘siloe’d’ working culture, within the rural regional areas. As a response to overcome the issue of the ‘silo’ culture, most of the interviewees agreed that communications is a “wicked<sup>17</sup>” problem, dialogues need to be initiated and improved between and across the governments, for a co-ordinated approach to promote teamwork for everyone to be open and inclusive.

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<sup>17</sup> Wicked here means “No matter how cautious one is, it is never good enough and is susceptible to misinterpretations”

The discussion on values with regulators, led to existing misconceptions and perceptions, especially targeted to stormwater re-use, its water quality, treatment requirements and offsetting the agricultural water needs. Stormwater was specifically defined as “comes with a baggage” and is “filthy”; that is, it is not as clean as it is perceived to be. Furthermore, one of the comments was that *‘at times, treated water would be cleaner than the stormwater runoff’*.

All interviewees moved from value to either management, governance, resourcing or regulations in the same sentence, highlighting the importance and linkages between these propositions. The value of long-term planning was very closely associated with having good governance and management systems in place, by all interviewees. Though, reduced regulatory burden and efficient resource management, were said to be the outcomes of good governance and management systems, which in turn would lead to increasing the value of an IWCM strategy.

#### **5.4.2 GOVERNANCE PROPOSITION**

*“Constructive policy is the key, not the legislation or regulation, then not just development of these plans but adoption and provision of technical and financial support is equally important.”*

*-Interview participant*

Most participants recognised governance as an area in need of major reform. A recent review report by (PC, 2020) supports this view. That, there is a ‘pre-existing traditional reluctance’ to engage with stakeholders by State and Commonwealth governments and that the authorities are not so effective or good at engaging and consulting was accepted by a couple of interviewees, one of each - strategic manager and regulator. During the workshops, almost everyone had expressed their interest in participating in state-led capacity building initiatives and could do with more interactions with the state authorities. For policy setting and duplication of works, the strategic managers stated that NSW had structural and political issues while the regulators merely looked at water governance and service delivery in different landscapes that leads to overlaps in regulations, but, are necessary. Specifically mentioned, by one of the regulators was that, for every new regulatory requirement, there is a ‘financial path’ to assist its implementation, albeit to varying degrees and depending on the impact and current situations.

When the question was posed to the interviewees about the ambiguities in the governance of IWCM, everyone agreed that there was an existing philosophical difference within the state governments. All interviewees agreed that IWCM strategies are similar to corporate strategic plan, and should be developed by the councils. Regulators focussed on accountability and equality in delivery and management of water rights and allocations and delivery of a measurable IWCMs.

The discussion on the governance of reporting requirements led to varied responses where one of the strategic managers described reporting requirements as onerous, whereas another described the strict reporting requirements as ‘measurable data collection’ for an outcome focussed system. Regulators tended to assert that reporting holds entities to account and ensuring that the works are carried out as per the plan’.

*“Water governance is complex, it’s management is not limited to council boundaries”* quote aptly describes the geographical complexity in governance of water management, was brought to attention by a few interviewees and is also cited in the literature review whereby Taylor et al. (2012) mentions the need to work across organisational boundaries for best practice water management. (PC, 2020 , p. 1) in it’s review of Integrated “urban” water management in context of best practice water management refers to IWCM strategy implementation – requiring significant, ongoing collaboration between the land-use planning and local government sectors and the water sector, in both policy and planning at a range of different scales.

#### **5.4.3 MANAGEMENT PROPOSITION**

The management responses were strongly linked with the value and governance proposition highlights the need for robust planning requirements. The quote *“Does a CFO operate without a budget? So why operate a critical piece of infrastructure without a futuristic plan? Only the first plan will be difficult to prepare then it is reviewing, and reviewing is not that difficult”* questions the reactive management style and the approach to resolving an issue, without due considerations to budgets and financial planning. Then goes on to explain that it is the first-time ‘intelligence gathering’ exercise that is difficult, then it is about building upon it, making it easier, every time. Regulators had strong views on long terms planning as quoted: *“How does one invest in which infrastructure, if there is no plan? How do they know which infrastructure to put in? So, in an emergency, build a white elephant with no consideration to the operating costs later? Why? ....because it is paid for by the State and does not come out of your pockets?”* and questions the decisions taken without any evidence or due diligence for associated costs. The outcomes of such short-term planning has seen billions invested in wasted infrastructure. (Williams & Grafton, March 6, 2019). Yet, another interviewee acknowledges the high cost of strategy development, but points out, the higher costs of running out of water by saying “ *“People don’t plan because it is very expensive to develop a long-term strategy, but it costs more when they run out of water.”* The concerns raised as per the quotes above give an indication of the tensions that exist between the governments and their very different approaches. The regional water utilities find it difficult to

develop a 30-year long strategy, whereas, the state governments prefer a long-term strategy that allows them to take informed decisions based on the long term strategic water plans - *aka an IWCM strategy* - in relatively short periods of time.

The summary of discussion outcomes with both stakeholders, on the broad benefits of a long-term strategy were that the management of water CI and water resources would achieve higher efficiency and effectiveness. The value of decisions based on 'secure yield' study, long term asset management plans and robust financial planning, was stated as "of greater benefit" in realising the recovery of costs or returns on investment for the water CI and ultimately water security (Birkett, 2017; Mapani, Magole et al., 2017). Furthermore, clarification for inclusion of asset management and financial planning requirements, in the IWCM strategy, were major contributors to increased water security in the area. The IWCM strategy design was thus, developed to reduce the risk of rushing in to put infrastructure that may address the immediate needs but not the long-term ongoing needs.

Out of 19 interviewees, seven (7) interviewees described IWCM as 'total' water cycle management as exists in the natural ecosystems. It was acknowledged that though "in a perfect world" IWCM would include bulk water management to treatment and distribution to collection and treatment, discharge, stormwater, recycling and reuse of recycled water. In real life scenarios, the assumed costs and benefits, do not add up and best practice management is difficult to achieve. It was noted that not every council does all aspects of water management. For example, Dubbo does not manage their bulk water storage. They collect water from the Macquarie River and augment it with ground water. But the boundary of their IWCM has to be on the relationship side with the state agency bulk water supplier - WaterNSW, rather than another regional water utility like Warrumbungle which has oversight of all of their storages. An IWCM will be different for each one and the risks associated with business and the levels of service experience or that their customers expect will be different in each situation. So, the management structure needs to be able to address these scenarios and acknowledge that "*councils have boundaries – water does not*".

Another argument by a regulator, was that IWCM 'compels' to look at all available options and make an informed decision, not decisions based on assumptions and include recycled water as an option for source of water, maximising beneficial reuse of reclaimed water. 'All options on table' is widely promoted by Water Services Association of Australia (WSAA).

To ensure the development and delivery of IWCM strategies, following the complaints lodged by the regional water utilities IPART (2016) report recommended, the then DPI-water, to assume full responsibilities and provide support for IWCM strategy development. *Following the IPART 2016*



*report recommendations, DPI-water, allocated resources to the development responsibilities of an IWCM strategy, which back-fired and the strategies were not adopted by the regional water utilities (IPART, 2016 , p. 125, 221-224). It was interesting to note that this information was provided by a 'strategic water manager'.*

#### **5.4.4 REGULATORY PROPOSITION**

For the regulatory challenge the main challenge discussed at the workshops was multiple and prescriptive regulatory authorities (*see sec2.3 page 8*) page makes it difficult for them to “do the right thing” and tick all the boxes of requirements by each. The general response to this issue was that the different aspects of water management sit within different portfolios, so makes it complicated but is “historic” and quite a few mentions of “that’s how it has been”. The responses demonstrate that there is a level of regulatory complacency even at the state level management, not just at the council/local government organisations.

When asked for a resolution to the long approval times, regulator response was “*Vanilla approach is applied to all applications, and that it requires streamlining the assessment processes for efficiency and effectiveness*” whereas another response was ‘*regulators role is to ensure accountability*’. While the need for improvements were accepted by the regulators, the need to balance the role of innovation and accountability, was at the forefront of this discussion.

For IWCM, in particular, one of the arguments was that due to the detailed and complex requirements, the strategies submitted are extremely long and detailed, which takes longer time to review and approve. For example, one strategy document was a 300+ pages long (viewed by the author). The objective of the strategy document was stated to be of comprehensive nature and not to include the finest details, which defeats the purpose of having a strategic document.

These type of issues with submissions from state regulator and strategic water managers perspectives were deemed to have prescriptiveness as a support mechanism for the smaller regional water utilities. The ‘*prescriptiveness*’ was said and believed to be providing a direction to overcome the issue of “*resource deficiency*” rather than having to navigate through management or resourcing challenges, finding their own way, to meet with the State’s strategic objectives plus have consistent approach. These challenges have been mentioned as hard to overcome by all three (3) stakeholders.

The interviewees also acknowledged ‘*changing times*’ and ‘*increased reliability*’ on technology necessitates a flexible approach for survival mechanism within smaller regional water utilities with

water management as their core business function which provides for a generic direction and advice to the larger regional water utilities, with multi-function responsibilities. *Facilitation* and/or *provision of further education; development of internal capabilities; and training opportunities* were recognised as good support mechanisms for regional water utilities in NSW, by all interviewees.

All interviewees agreed with the workshop participants that the *'regulators are traditionally attached to methods'*, but that is to ensure consistency in approach, that allows for the State to measure baseline outcomes in a fair and equitable manner. Moreover, a couple of regulators clarified that this baseline data then converts to setting up the funding support guidelines and distribution of funds as per the level of priority and requirements.

It was interesting to note, that all strategic water managers identified water regulation as a *"complicated system"* whereas regulators described water regulations as *"enabling pieces of legislations"* driving towards increased water security.

One interviewee made a point that usually at state level, there is one person looking at 90+ strategies, and acknowledged some delays but also that there was a need for these strategic documents to be comprehensive not minutely detailed. When posed with this multifaceted question, there was a mixed response. While some believed in a need for different components to be assessed separately, some were of the opinion that multiple regulatory requirements are 'needed'. This 'need' was further explained as an attempt at simplifying a complex problem.

#### **5.4.5 RESOURCING PROPOSITION**

The word 'resourcing' has been selected to focus more strongly on the needs and requirements for carrying out the proposed works. The focus in this study is on resourcing 'of, and for' the IWCM strategy development and implementation works.

To overcome the challenges for 'lack of resources', responses were slightly toned down. The most common interpretation of the term 'resourcing' was towards capacity building and finances. *"if I gave you a fish you can eat for a day, but, if I teach you to fish you can eat for the rest of your life"*. This philosophical quote was in relation to upskilling and educating regional staff. IWCM strategies were described as resource-intensive, not just financially but also in terms of staff time and efforts, data collection, collation and analysis [see Sec 5.2.1 – 1]. There was a general consensus amongst all stakeholders on the need for upskilling regional water professionals to reduce 'skilled resources' gaps. Availability and access to upskilling opportunities and professional development training, were identified as ways to minimise knowledge gaps.

When resourcing IWCM strategy and its implementation were discussed, most responses from the strategic water managers and regulators were that *“In the infrastructure space, a council’s top three (3) priorities are roads infrastructure and associated works”* and that resource efficiencies can be achieved with good governance.

For external resource support, in terms of financial support, state government and commonwealth government funds are available, but the council needs to demonstrate capability to deliver. Lack of capacity as previously discussed, is a barrier to accessing these funds. (Mukheibir, Kuruppu et al., 2013) finds that criteria for resource allocation from the state to local government is not reflective of the circumstances in the local government area and are largely based on population size rather than economic, social and government capacity, and is complimentary to the findings of this research.

#### 5.4.6 RESEARCH LIMITS

There is very limited research in the ‘best practice water management’ and ‘governance of water’ in the rural-regional towns of Australia. therefore, this thesis draws from the select studies conducted in regional Victoria and seeks to explore the question from metropolitan based water governance studies.

For this research, 40 regional water utilities out of 89, participated in the workshops. The 44% participation rate, at state level, provided for good representation of differences in the water availability and security, geographic and geological spread. But, there was no participation in this research project from northern belt of NSW, far-western NSW and southern coastal regions.

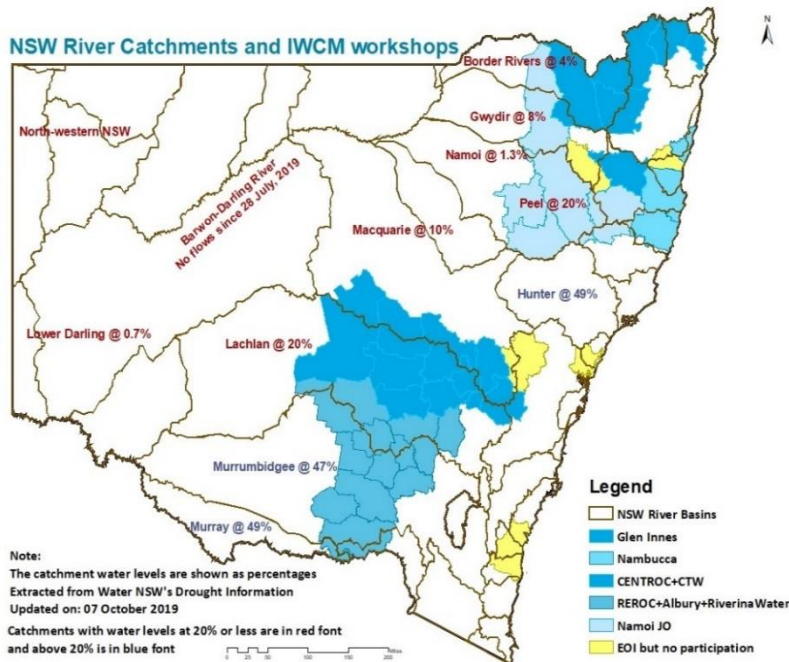
The map in Figure 7 shows the area of workshop participation by regional councils of NSW and the water levels in the catchment regions. The catchment-wise water level information is extracted from Water NSW’s regional NSW drought information pages<sup>18</sup>. The recent drought has dominated and limited the discussions in planning for severe water shortage scenarios. Missing completely, were

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<sup>18</sup> Available at: <https://www.waternsw.com.au/supply/drought-information/regional-nsw>; Last visited 10 Oct-19

the discussions on requirements of water management during flood seasons, fire seasons and high rainfall upstream, impacting the downstream river flood zone only.

Other research limitations briefly touched upon but not discussed with the research participants were the areas of 'ageing infrastructure' and 'changing community expectations' and 'affordability



**FIGURE 6: CATCHMENT-WISE PARTICIPATION AND WATER LEVELS**

of services'. Infrastructure-Australia (2017) and Literature review, both identify these as major challenges faced by regional urban water sector in Australia, is a gap in research.

Moreover, the council's limitation in providing affordable services; the current inadequate pricing frameworks in Australia, inability to respond to the rising cost of water supply or reflect the true value of water (Bichai, Kajenthira Grindle et

al., 2018, Sec 4.4.3), nor is indicative of cost of service provision (Infrastructure-Australia, 2017), reflects poorly on water management frameworks and practices. The cost of providing services to the residents far outweighs the 'rates and charges'. This aspect of water governance had not been scoped into the research, so not discussed and is a research gap.

Limiting the stakeholders, legislations and regulatory instruments were purposefully left out of the research discussions. Two (2) main reasons were: A) this is too big a topic for a research project limited to a 50-page thesis. B) briefly mentioning would have created more misunderstandings and misconceptions about the intent of the legislation, the development process, finalising as law and then finally, the interpretation of the legislations and its regulatory instruments and including a multi-dimensional discussion. The scope had to be narrow to be completed in nine (9) month period.

In summary, the above mentioned research limitations are the gaps, known to the author, but are not limited to identified gaps. These issues has been scoped into PhD research proposal.



## 6 RECOMMENDED ACTIONS

Recommendations have been made separately for: 1) regional water utilities, and 2) water regulators/strategic managers, with brief explanation about the recommended actions. For the strategic water managers and regulators, recommendations are predominantly for the State water regulators and is further subdivided into 2 sections for: 1) DOI-Water, who has the primary policy and soft regulatory responsibilities and then 2) for NSW Health and NSW EPA, that clearly identifies the room for improvements.

### 6.1 FOR REGIONAL WATER UTILITIES

#### **Recommendation 1. *Inclusions to develop an ‘adaptive’ IWCM strategy a ‘living document’.***

**It is recommended** that the IWCM strategy document be compact and succinct that identifies the key issues and a broad overview of management plan. Then develop the detailed management plans under each topic area including the ‘review timelines’, to incorporate changes related to emergency or unusual situations. Including review timelines will contribute to making an IWCM strategy ‘adaptive’ and ‘living’ document, as was suggested by workshop participants. The underlying studies conducted for the development of the plan, contributes to providing validity to the process and the baseline data for future planning, monitoring and reporting requirements. (Sec 5.4.4; page 42)

#### **Recommendation 2. *Owning the problem***

All workshop participants agreed that there was ‘lack of ownership’ and ‘missing connection’ to the IWCM strategy document. To overcome this issue, it is imperative to ‘own’ the problem. **It is recommended that** regional water managers work with the consultant/s in developing their regional IWCM strategy, ensure region specific issues and needs are appropriately identified with context and met. This will provide for the much needed connection to local problem for local resolutions (*as and where applicable*), for successful implementation of the IWCM strategy. [See Sec 5.2.1 – 5); page 31]

#### **Recommendation 3. *Capacity building of regional water utility staff to undertake complex works.***

**It is recommended to** allocate resources for upskilling staff, build their capacity to undertake complex works and have provisions for internal career progression opportunities to staff. Such opportunities instil confidence in staff, contributing to knowledge sharing, increased working efficiencies, creating a collaborative environment to eliminate the ‘siloes’ working cultures and provide for and alternative career progression opportunities, reducing the fear of failure and job-loss. [See Sec 5.2.3 -1), page 28; Sec 5.2.3 -3), page 34; Sec 5.4.2 page 39; Sec 5.4.5, page 44]

**Recommendation 4. *Reducing the reliability on the consultant and active participation in the development of the IWCM strategy.***

Not all regional water utilities, lack 'all' resources. **It is recommended to** identify the existing internal resources and outsource works where gaps in skills and resources have been identified. This will reduce the regional water utility's financial burden. This 'internally driven' IWCM strategy document, a) eliminates the risk of 'off-the-shelf' solutions provided by the consultant/s, b) has provision to incorporate 'local knowledge' and 'local solutions', through an IWCM strategy and implementation plan, that adds value to the 'local economic growth'. [see Sec. 5.2.1 – 5), page 31]

**Recommendation 5. *Project Champion.***

**It is recommended to** identify the 'local champion' to communicate the 'value' and quadruple bottom line benefits of the IWCM strategy to peers, management, local political leaders and be the 'influencer'. [see Sec. 5.2.3 – 3), page 33]

## 6.2 FOR WATER REGULATORS AND STRATEGIC MANAGERS

The water regulators and strategic water managers responsible for driving the IWCM strategy plays a vital role in providing support services to the regional water utilities. A clear pathway has been identified by the regional water utilities, in external or state level, support requirements to overcome the challenges of implementing the IWCM strategy.

### 6.2.1 RECOMMENDATIONS FOR DOI-WATER

**Recommendation 1. *Simplification of IWCM checklist that demonstrates level of alignment to the "NSW Best Practice Management of water supply and sewerage guidelines" document.***

IWCM checklist was described as complex, confusing and 'too detailed'. **It is recommended to simplify and reduce the length** of the checklist (currently, 22 pages). Then develop supporting factsheets, that are concise and clear and written in plain English language, with a specific mention that "not applicable" ticks the box. So, if the issue does not apply to the region, there is no need to address it or report on it. [see Sec. 2.5, page 12; Sec. 5.2.1 – 5), page 31; Sec. 5.3.2 page 36]

**Recommendation 2. *Section 60 (LG Act 1993) approval requirements for construction and modification of water or sewage treatment works - criteria and process.***

S60 approvals process under the LG Act 1993 was described as 'resource intensive', time consuming', 'extreme', 'limiting' and 'lacking value at operational level'. [See: Sec 2.5, page 13; Sec. 5.2.1- 5), page 31; Sec. 5.2.4 -2), page 34]

To overcome the challenges of s60 of *LG Act 1993*, it is recommended that DOI-Water undertake and prioritise the following:

**R2.1. Simplify the s60 approvals process** for regulatory requirements during the IWCM strategy's implementation phase.

It is recommended to develop a 'triage process'<sup>19</sup> for prioritising assessments of applications and process approvals. This will reduce the timeframes of approvals while allocating resources to the more complex proposals, 'as needs' basis and be 'effective'.

**R2.2. Provide timeframes for assessments** of IWCM strategy's approvals.

It is recommended to set a reasonable timeframe for processing of approvals. Then provide professional level written feedback, to achieve the desired outcomes, should the strategy not meet with the department's regulatory requirements and best management outcomes.

For transparency in the approvals process, develop an online tracking system of the approvals process with status and available online.

**R2.3. Identifying the gaps/lack of resource areas within the regional water utilities for IWCM strategy development and implementation.**

It is recommended to provide 'Advisory services' to the regional water managers to identify existing resources of funding and staff support requirements required to carry out IWCM related works and count as justification for calculating and providing for the proposed works.

**R2.4. Allow for innovation in carrying out the works or in provision of services.**

It is recommended to develop a 'subjective and conditional' approvals system for new and innovative works, following the 'triage process' then provide guidance and advisory support to undertake licencing conditions specific monitoring and reporting requirements, and as per the legal requirements.

**R2.5. Develop a standards document for 'optimising' water distribution networks** that can be used as a resource while developing an 'implementable' IWCM strategy, with information on clear do's and do-not's while developing an infrastructure project plan.

### **Recommendation 3. Multiple, prescriptive and asynchronised regulatory authorities**

The IWCM strategy implementation requires multiple regulatory authority (*all prescriptive in nature*

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<sup>19</sup> Triage process here means a process to identify exempt, approved with standard conditions, needs more information, then process these, allocating time and resources to the more complex applications.

*and traditional in approach*) to process approvals for various components of water management, water CI, recycled water use, environmental waters, and protection of the water courses. Currently, these are required to be obtained separately. [See: Sec. 2.3, page 8; Sec. 2.5, page 13; Sec 5.2.2, page 32; Sec. 5.3.1, page 35; Sec. 5.4.4, page 43]

**It is recommended that DOI-Water:**

- R3.1. Oversight of the development of resources that comprehensively addresses the requirements of IWCM strategy's development and implementation phase** – to align the regional water utility plans consistently across NSW, with contact details (responsible position/ roles) required for the development and successful implementation of the IWCM strategy, in plain English.
- R3.2. Oversight of the inter-departmental communication process to fast track the s60 assessment and approvals. It is recommended** to form a technical assessment committee from all relevant agencies to fast track the IWCM strategy related approvals, instead of multiple approval requirements processes by the different water regulatory authorities. This will contribute to minimising the workload on the regional water utility staff for obtaining separate approvals of individual components, for IWCM strategy's implementation plan.
- R3.3. Roll out an IWCM awareness program, specifically designed for regional water utilities**, to communicate and inform the benefits of 'development and implementation of IWCM strategy', and future costs of implementation, to help understand the necessity for undertaking what is, considered to be a tedious and an exorbitantly expensive exercise.
- R3.4. Provide for upskilling opportunities for regional water utility staff** that helps support the expansion of their capabilities in carrying out the main works requirements related to IWCM strategy development and implementation.
- R3.5. Expand approved consultant base, to carry out the studies and/or works related** to IWCM, 'not just one' and ensure that the consultant is familiar with IWCM process and governance requirements. **It is also recommended** to roll out a training program for consultants to ensure consistency in delivery of the services.

Recommendations for NSW Health and NSW EPA – other prominent regulatory authorities – is for them to allow for innovation by providing 'conditional approvals': to ensure human health and environmental protection, to reduce the assessment timeframes of regulatory requirements.



## 7 CONCLUSIONS AND FUTURE DIRECTIONS

Integrated Water Cycle Management (IWCM) has been conceptualised, defined and re-defined since early-1900s and is continuously evolving, to integrate new knowledge. But, the integration of the various aspects of IWCM has failed to connect. The design process of IWCM strategy and its successful implementation has become a challenge for the sustainability professionals. The research assumes “*IWCM is necessary*”. So, we ask - *Is it really effective? If not, then why not? and what can we do to change it?*

The research particularly focuses on current water management practices in rural-regional NSW, due to very limited research in the area. The stakeholder engagement method used for this research, looks to gain an insight into the challenges from bottom-up and then seek solutions from top-down. To-date, either top-down or bottom-up views have been discussed, designed, researched and implemented. Neither have been found to be functional.

Fast-paced technological advancements has major impact on the water-use needs and water security, conflicting cultural norms, social and political acceptance, (Bichai, Kajenthira Grindle et al., 2018 , Sec 4.4.2) making it crucial for water managers to respond holistically and collaboratively to the impending water security issues (Cisneros, 2019, page 29); (Sec. 2.1, p.5). The aim is to find the common ground for multidisciplinary stakeholders involved from conceptual planners to on-grounds implementors of IWCM.

The key finding of this research is that the real challenge lies in the ‘development’ of the IWCM strategy not so much in implementation. The workshop discussions led to identify key challenges faced by regional water professionals (*IWCM strategy context*): a) multiple and prescriptive regulations; b) perceived lack of benefit for the required amount of works; c) unprecedented gap in resource availability; d) organisational and institutional silos. Then, the interview conversations focused towards solutions. Key themes of responses were a) ownership cannot be created b) IWCM highly valuable - water security planning, setting price-paths and emergency response management c) identify champions for cause; 3) Co-ordinated and collaborative approach to connect governance and service delivery d) long term planning translates to identifying the right infrastructure needs, increases financial viability and better management of operations; e) regulations though complex and confusing, can be enablers. The recommendations are author’s perspective of successfully developing and implementing an IWCM strategy.

Future directions identified from this Master’s research project, is to identify a process with improvements for developing an implementable IWCM strategy towards a sustainable water future.

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## APPENDIX A

The table below is the timeline of state government agencies managing the water portfolio - created and abolished since early 1900s. Since the creation of cluster organisations, in July 2009, only the cluster organisation that has the primary role in water management and regulations has been included. The cross-over of roles are much more complex than as identified below:

**TABLE 8: TIMELINE OF STATE GOVERNMENT AGENCIES GOVERNING WATER PORTFOLIO, AS AT APRIL 2019**

AGENCY NAME	CREATED	ABOLISHED	YEARS IN OPERATION	FUNCTIONS	CREATION GAZETTED ON / THROUGH NEW LAW	ABOLISHED GAZETTED ON / THROUGH NEW LAW
<b>Water Conservation and Irrigation Commission [I]</b>	20 April 1916	31 May 1949	33 years 2 months	<ul style="list-style-type: none"> <li>✓ Land and Resource Management</li> <li>✓ Infrastructure and Communications</li> <li>✓ Conservation and Environment</li> </ul>	Irrigation (Amendment) Act, 1916 (Act No.22 1916)	Conservation Authority of New South Wales Act, 1949 (Act No.8 1949)
<b>Water Conservation and Irrigation Commission [II]</b>	1 June 1949	29 April 1976	27 years 10 months	<ul style="list-style-type: none"> <li>✓ Land and Resource Management</li> <li>✓ Infrastructure and Communications</li> <li>✓ Conservation and Environment</li> </ul>	Conservation Authority of New South Wales Act, 1949 (Act No.8 1949)	Water Resources Commission Act, 1976 (Act No.34 1976)
<b>Water Resources Commission</b>	30 April 1976	31 December 1986	10 years 8 months	<ul style="list-style-type: none"> <li>✓ Land and Resource Management</li> <li>✓ Conservation and Environment</li> </ul>	Water Resources Commission Act, 1976 (Act No.34 1976)	Water Administration Act, 1986 (Act No.195 1986)
<b>Department of Water Resources</b>	1 January 1987	6 April 1995	8 years 4 months	<ul style="list-style-type: none"> <li>✓ Land and Resource Management</li> <li>✓ Conservation and Environment</li> </ul>	Water Administration Act, 1986 (Act No. 195 1986)	NSW Government Gazette 7 April 1995 p. 1861.
<b>Government Programs Division (1992-1993)</b> <b>Water Services Policy Division (1993-1995)</b> <b>Department of Public Works (1995 – 2016)</b>	01 Jan 1992	06 May 2016	24 years 5 months	<ul style="list-style-type: none"> <li>✓ Advisory Support Services</li> <li>✓ Water Conservation</li> <li>✓ Infrastructure development advisory services</li> </ul>	Administrative Decision	NSW Government Gazette No.39, 5 April 1995, p.1860.
<b>Department of Land and Water Conservation</b>	6 April 1995	2 April 2003	8 years	<ul style="list-style-type: none"> <li>✓ Land and Resource Management</li> <li>✓ Conservation and Environment</li> </ul>	NSW Government Gazette Special Supplement No. 39, 5 April 1995, p.1859	NSW Government Gazette Special Supplement No. 67, 2 April 2003, p.4328
<b>Department of Sustainable Natural Resources</b>	2 April 2003	1 July 2003	3 months	<ul style="list-style-type: none"> <li>✓ Conservation and Environment</li> </ul>	NSW Government Gazette No.67 Special Supplement, 2 April 2003, p.4327	NSW Government Gazette No.102 Special Supplement, 20 June 2003, p.5900
<b>Department of Infrastructure, Planning and Natural Resources</b>	1 July 2003	29 August 2005	2 years 2 months	<ul style="list-style-type: none"> <li>✓ Conservation and Environment</li> <li>✓ Infrastructure and Communications</li> <li>✓ Land and Resource Management</li> </ul>	NSW Government Gazette 20 June 2003 p. 5899- 5900	Public Sector Employment and Management (Planning and Natural Resources) Order 2005
<b>Department of Environment and Conservation (2003-2007)</b> <b>Department of Environment and Climate Change (2007-2009)</b>	24 September 2003	01 July 2009	8 years 9 months	<ul style="list-style-type: none"> <li>✓ Conservation and Environment</li> <li>✓ Land and Resource Management</li> </ul>	NSW Government Gazette No.152, Special Supplement, 24 September 2003, pp.9506-9509. NSW Government Gazette No.56, Special Supplement, 20 April 2007, p.2435.	NSW legislation website 27.7.2009 (amended by Act 2009 No 96, Sch 20; and 2010 (99) LW 19.3.2010 and Act 2010 No 31)
<b>Department of Energy, Utilities and Sustainability</b>	1 April 2004	27 April 2007	3 years 1 month	<ul style="list-style-type: none"> <li>✓ State Water – water management functions included in the utilities and sustainability areas of the department and that relating to particular county water utilities, power stations and water supply bodies</li> <li>✓ Other functions included: Electricity; electricity safety, gas supply and reticulation</li> </ul>	NSW Government Gazette 12 December 2003 p.11208	NSW Government Gazette, No 56, Special Supplement, p.2435



AGENCY NAME	CREATED	ABOLISHED	YEARS IN OPERATION	FUNCTIONS	CREATION GAZETTED ON / THROUGH NEW LAW	ABOLISHED GAZETTED ON / THROUGH NEW LAW
<b>Department of Planning [III] (2005-2011)</b> <b>Department of Planning and Infrastructure (2011-2014)</b> <b>Department of Planning and Environment (2014-current)</b>	29 August 2005		continuous internal organisational changes in roles and responsibilities without name change	✓ Land and Resource Management ✓ Infrastructure and Communications From 2014 onwards the DPE super agency included: ✓ Conservation and Environment In their portfolio	Public Sector Employment and Management (Planning and Natural Resources) Order 2005 (NSW Government Gazette No.108, 26 August 2005, p.6384)	NSW legislation website 3.4.2011 (amended by 2011 (261) LW 2.6.2011);  2014 (233) LW 23.4.2014 (amended by 2014 No 33, Sch 2.1 [1]–[3]) ( <i>Name change from DPI to DPE</i> )
<b>Department of Environment, Climate Change and Water</b>	01 July 2009	4 April 2011	1 years 9 months	✓ Conservation and Environment ✓ Land and Resource Management ✓ Recreation and Culture	NSW legislation website 27.7.2009 (amended by Act 2009 No 96, Sch 20; and 2010 (99) LW 19.3.2010 and Act 2010 No 31)	Public Sector Employment and Management (Departments) Order 2011 (2011 No 184), cls. 7(2); notified NSW Legislation website, 3 April 2011.
<b>Department of Water and Energy</b>	27 April 2007	1 July 2009	2 years 2 months	✓ Conservation and Environment ✓ Utilities and Resource Management	Public Sector Employment and Management (General) Amendment (DNR Corporate Services) Order 2007 in NSW Government Gazette No.56, Special Supplement, 20 April 2007, p.2435.	Public Sector Employment and Management (Departmental Amalgamations) Order 2009 (2009 No 352), cl.16; notified NSW Legislation website, 27 July 2009
<p><b>In July 2009<sup>20</sup>, All government agencies were consolidated in 13 super department clusters by the then Premier Kristina Keneally.</b></p> <p><b>Premier Keneally's aim was to improve government service delivery and efficiency by centralising governance, sharing common services and minimising functional duplication.</b></p>						
<b>NSW Office of Water</b> <b>Transferred to cluster</b> <b>department not abolished</b>	1 July 2009	03 April 2011		✓ Conservation and Environment – Water	Public Sector Employment and Management (Departmental Amalgamations) Order 2009, cl.10; notified on NSW Legislation website, 27 July 2009.	NSW legislation website 3.4.2011 (amended by 2011 (261) LW 2.6.2011- <b>Transferred to Department of Primary Industries</b> )
<p><b>The reform effort proceeded slowly, and following the general election in March 2010, and the Labor government dramatically deposed by Liberal administration. The <u>ongoing overhaul</u> was revised.</b></p> <p><b>The 13 clusters from the Keneally restructure would be further consolidated into nine 'Principal Departments' by Gladys Berejiklian government in 2011.<sup>21</sup></b></p>						
<b>Department of Industry, Skills and Regional Development (2015-2017)</b> <b>Department of Industry (2017-current )</b>	1 April 2015	1 April 2017	2 years	✓ Conservation and Environment ✓ Land and Resource Management ✓ Infrastructure and communications	Administrative Arrangements (Administrative Changes–Public Service Agencies) Order (No.2) 2015 (2015 No.250) cls.6 (1); notified on NSW Legislation Website, 29 May 2015.	
<b>Natural Resource Access Regulator (2018- Current)</b>	01 April 2018			✓ Water Regulation and Compliances		
<b>Public service further consolidated into 8 super-departments, in April 2019<sup>22</sup></b>						

**NOTE:**

- 1) Information is extracted from [NSW State Archives](#); [Government Gazettes: NSW](#) from the [National Library of Australia](#)
- 2) The timeline captures the cluster organisation formations;
- 3) None of the internal re-alignments of sub-agency roles and responsibilities within the cluster organisation that regulate and manage water have been captured or addressed.

<sup>20</sup> Information on first 13 new Super departments formation; Available at: <http://www.hawkerbritton.com/hawker-britton-media/new-south-wales/nsw-departmental-restructure.htm>; Last visited 14 June 2019

<sup>21</sup> Information on Super departments formation and later restructure Available <http://azgovbiz.com.au/index.php/news/76-nsw-government-restructuring>; Last visited 14 June 2019

<sup>22</sup> OEH and OLG abolished SMH News 05 April 2019; Available at: <https://www.smh.com.au/national/nsw/out-with-the-old-in-with-the-new-berejiklian-shakes-up-nsw-government-20190405-p51b7o.html>



## APPENDIX B

Science & Engineering Subcommittee  
Macquarie University, North Ryde  
NSW 2109, Australia



21/03/2019

Dear Associate Professor Davies,

**Reference No: 5201951577185**

**Project ID: 5157**

**Title: Issues and Challenges faced by regional NSW in implementing Integrated Water Cycle Management (IWCN)**

Thank you for submitting the above application for ethical review. The Science & Engineering Subcommittee has considered your application.

I am pleased to advise that ethical approval has been granted for this project to be conducted by Associate Professor Peter Davies, and other personnel: Ms Tasneem Kanpurwala.

This research meets the requirements set out in the National Statement on Ethical Conduct in Human Research 2007, (updated July 2018).

### **Standard Conditions of Approval:**

1. Continuing compliance with the requirements of the National Statement, available from the following website:  
<https://nhmrc.gov.au/about-us/publications/national-statement-ethical-conduct-human-research-2007-updated-2018>.
2. This approval is valid for five (5) years, subject to the submission of annual reports. Please submit your reports on the anniversary of the approval for this protocol. You will be sent an automatic reminder email one week from the due date to remind you of your reporting responsibilities.
3. All adverse events, including unforeseen events, which might affect the continued ethical acceptability of the project, must be reported to the subcommittee within 72 hours.
4. All proposed changes to the project and associated documents must be submitted to the subcommittee for review and approval before implementation. Changes can be made via the [Human Research Ethics Management System](#).

The HREC Terms of Reference and Standard Operating Procedures are available from the Research Services website:  
<https://www.mq.edu.au/research/ethics-integrity-and-policies/ethics/human-ethics>.

It is the responsibility of the Chief Investigator to retain a copy of all documentation related to this project and to forward a copy of this approval letter to all personnel listed on the project.

Should you have any queries regarding your project, please contact the [Faculty Ethics Officer](#).

The Science & Engineering Subcommittee wishes you every success in your research.

Yours sincerely,



Dr Peter Busch

Chair, Science & Engineering Subcommittee



## APPENDIX C

### 1 WORKSHOP PRESENTATION AND REVISED INTERVIEW QUESTIONNAIRE

#### 1.1 PHASE 1: WORKSHOPS

Drivers and challenges in implementing IWCM in regional NSW

- Associate Professor Peter Davies
- Tasneem Kanpurwala

#### **Agenda**

- 5 mins - Introductions
- 3 mins - Research project background
- 5 mins - Regional NSW – Importance
- 2 hours - Individual and Group Exercises
- 10 mins - Questions or Comments
- 2 mins - Workshop closing remarks

#### **Introductions**

#### **Human Ethics Approval and Consent form sign off**

- ✓ Name with one-word descriptor; Organisation; Role;
- ✓ Your role in IWCM
- Research is guided by Macquarie University's Human Ethics Approval. The conditional approval states that:
  - ✓ details of all individuals will remain confidential and data will be de-identified
  - ✓ Participation is voluntary
  - ✓ For the purpose of gathering and analysing data if you wish to put your name on any information sheets these will only be used in the research to allow us to follow up with you and or seek clarification

#### **The Workshop**

- ✓ Research focus
  - Information from this workshop forms part of a research project
  - Aim is a "Enabling implementation of IWCM – a solutions orientated management process identification" by:
    - Identifying the existing challenges in implementing the IWCM Strategy
    - Then identify what would help drive the IWCM in regional NSW
- Participation - Extent and reach
- Why does regional water management matter?

Outside the greater metropolitan area of Sydney Regions;

4 times the size of Greater Metropolitan with population that is half of the Greater Metropolitan region

- ✓ 88% LWUs have completed IWCM Strategy\* includes: 30yr Total Asset Management Plan and 30yr Financial Plan and Report; All LWUs achieving full cost recovery ~93% for sewerage (\*2015-16 NSW Water Supply and Sewerage Performance Monitoring Report)
- ✓ Implementation -????

### **Challenges of conducting research in regional areas**

- ✓ So far limited amount of research on integrated water cycle management in regional NSW
- ✓ Regional NSW face particular challenges
  - Access → Logistics → Resource availability → Broad work role requirements
    - ✓ As does undertaking research in regions
  - Expensive → time consuming → uncertainties in participation rate → uncertainties in robustness of the outcomes due to low participation → uncertainties in usefulness of data collected.

### **Individual Exercise**

Define IWCM in the context of your Organisation?

- ✓ One paragraph statement – 3 mins
- ✓ Provide at least 3 examples that best illustrate or demonstrate this – 3 mins

Group Discussion – 20 mins

### **Individual Exercise**

Thinking about IWCM in your organisation can you identify elements that :

- 1) Pose a challenge or barrier to implementation

Group discussion time: 10 mins

### **Individual Exercise**

For barriers to implementation of IWCM strategy, rank the following according to priority – highest being 1 - lowest being 9

- Challenges and barriers

As group exercise list all the barriers then

1. As a group identify what are the most common (dots)
2. Rank or prioritise these

highest being 1 - lowest being 9

### **Individual Exercise**

Thinking about IWCM in your organisation can you identify elements that :

- 1) Outline a successful project or activity and explain why it was successful

Group discussion time

### Individual Exercise

For drivers to implementation of IWCM strategy, rank the following according to priority – highest being 1 - lowest being 9

Successes

As group exercise list all the success factors then

1. As a group identify what are the most common (dots)
2. Rank or prioritise these (highest being 1 - lowest being 9)
3. Group Exercise

### Planning and priorities

- How is IWCM planned and prioritised in your organization
- Include factors that are:
  - ✓ **significant to lifting the priority** of an IWCM activity or project?
  - ✓ **contributes to lowering the priority** of an IWCM activity or project?

### Step change and the enablers

Thinking about IWCM in your organization or a specific project,

- **Who** has been involved (e.g sections within council (list them), community, other agencies...)?
- **What** has been their role?
- **How impactful** has a person, section, project, policy .... been? (when thinking about this think about whether it has contributed to a step change in the way your council plans and manages its water resources)

**How significant has the person, section, project, policy been?** (think of this in term of step change to current practice)

- Effectiveness of implementation; Looking forward

You are tasked to lead a team to develop an integrated water management strategy.

- List the top 3 things that will need to change in your organization that will be required for this to be a success? What (e.g. systems, processes, behaviours...) are required to achieve this change? What can you do in your role to support this change?

### Reflection and Closing note

- ✓ If you have other comments or would like to talk about a project that you could not discuss today: Please contact Tasneem Kanpurwala; E: [tasneem.kanpurwala@hdr.mq.edu.au](mailto:tasneem.kanpurwala@hdr.mq.edu.au); M: 0423 012 600

THANK YOU ALL FOR YOUR TIME TODAY!

## 1.2 PHASE 2: SEMI-STRUCTURED INTERVIEWS

### Introduction and Ethics Approvals:

1. I would like to record this interview to capture all information and with the context
2. Can I record the interview? If yes, give consent form; The University Ethics approvals require for you to sign off on the consent form; Then after sign in → Switch on the recorder:

### Introduce - the interviewee by saying:

It is at TIME, DATE, and I, Tasneem is interviewing, FULL NAME from ORGANISATION

- 1) What is your organisation's role?
- 2) And role in context of water management?
- 3) What is your role and responsibilities?

Key questions framed around individual understanding and organisational perspectives:

- 2) What is your understanding of Integrated Water Cycle Management? (*referred to as IWCM*)
- 3) How important is IWCM in your Organisation on a scale of 1-10 (1 being lowest, 10 being highest)? **Why?**
- 4) How does your role or organisation practice or resource this initiative? Broadly and in rural-regional context?
- 5) This table summarises the outcomes of the workshop, of which you have a copy. The next question relates to your views on these findings
  - a) Under the value proposition of IWCM, water professionals expressed that they did not see a value in undertaking the process of developing an IWCM, irrespective of their belief about the need of preparing the document. What are your thoughts or perspectives on the importance of preparing the IWCM planning document?
  - b) Under the Governance proposition, water professionals expressed that prescriptive and multiple regulatory requirements that complicate the already complex system. What is your take on the complexities around the regulatory requirements of IWCM?
  - c) Another major challenge expressed by the water professionals was the scepticism existing between the difference levels of governance, leading back to the values of perceived lack of benefit, lack of motivation to carry out such large pieces of work and subsequently ownership of the document. What can be done to improve this interlinked proposition?
- 6) What would you do to address/resolve these? And what are your organisational initiatives towards IWCM
- 7) Is there anything else that you could like to tell me that's not already been covered?

I may get in touch with you, to clarify or expand on some of the discussion, is that OK with you?

This concludes the interview. Thank you for your time.

**Note to self:** Ask Qs intermittently to clarify or expand on particular points.