Science-policy nexus: using resource directed measures as policy implementation strategies to promote integrated water resource management, South Africa

S.M. Nzama[1]* and T.O.B. Kanyerere

[1]Reserve Determination, Department of Water and Sanitation, Pretoria, South Africa
[2]Department of Earth Sciences, University of the Western Cape, Bellville, South Africa

ABSTRACT


Science Research
Water Cycle
SUSTAINABLE DEVELOPMENT GOALS
POLICY
Social Well-Being
Food Security
Health
Water Security
Science-Policy Nexus
Science Studies
Water Resources Classification System
Classify Water Resources
Resource Directed Measures
Determine Water Resource Reserve
Determine Resource Quality Objectives
Readily Available Science Results
Science-Policy Interface
Ecological Reserve
National Policies
Policy-Science Interface
Policy Relevant Research
Practical Application
[Case of South Africa]

BACKGROUND

- Scientist investigation possible solutions
- Policy Makers institute intervention measures
- Interaction between Scientist and Policy Makers *Required*
- Scientific knowledge not effectively communicated to decision makers
- Scientific product complex and difficult to understand

RESEARCH QUESTONS AND ARGUMENT

ONLINE CONFERENCE IWRA 2021

Question 1:

How scientists and policy makers engage each other at science-policy interfaces in addressing social challenges linked to water resource quality and availability?

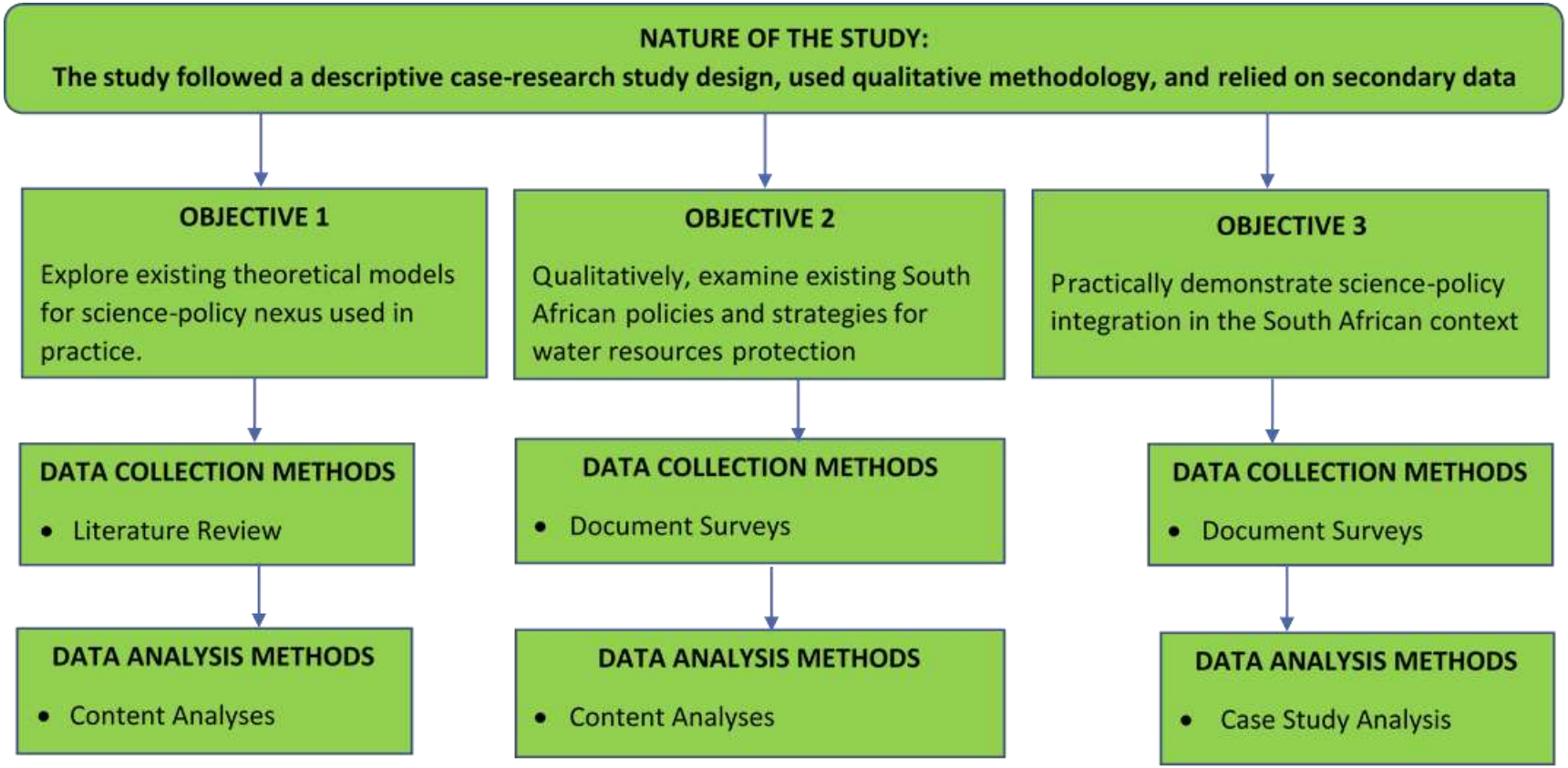
Question 2:

How South Africa translates abstract of a legislation into practice using science and how science is used in policy development and implementation?

Argument:

The study argues that science-policy interface must be practical, reflective and must consider the nexus approach where scientific results are translated into readily usable formats

STUDY OBJECTIVES AND METHODOLOGY



OBJECTIVE 1: RESULTS AND DISCUSSION

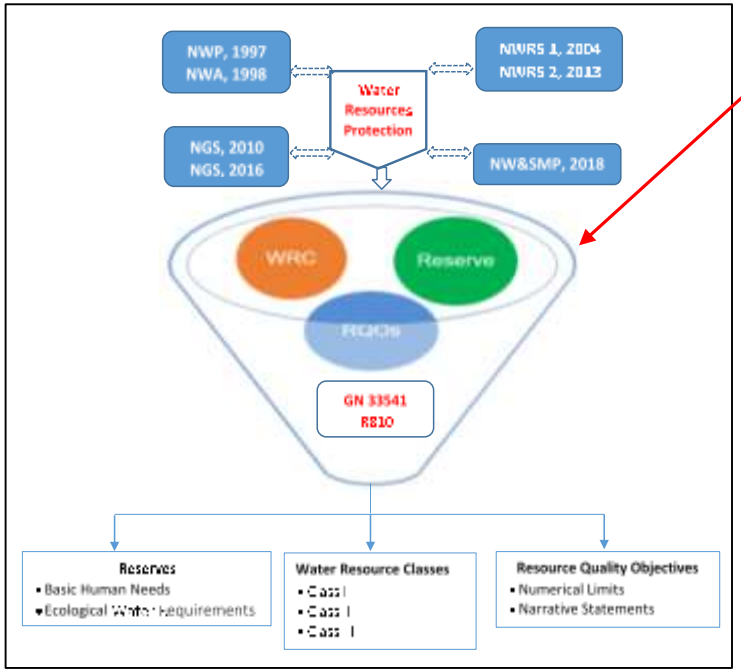
ONLINE CONFERENCE IWRA 2021

ENGAGEMENT	NATURE OF ENGAGEMENT
Science-Policy Integration (SPI)	Provides rationale and evidence-based solutions
	Independence from political influence
Policy-Science Integration (PSI)	May provide policy relevant solutions
	Allows for incorporation of general public opinions
Mixed Integration (MI)	Policy relevant problems are investigated
	Scientific research products understood by both parties
	Science research products implementable

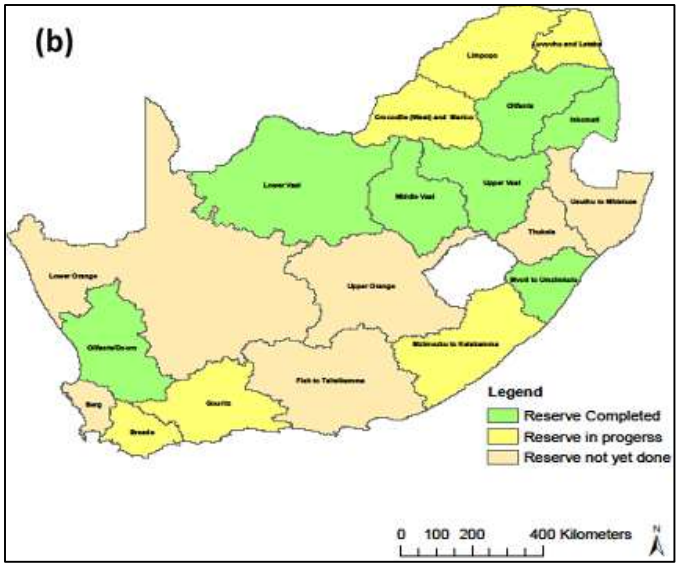
COMPARATIVE ANALYSIS		
Type of integration	**Current Study**	**Previous Studies**
Science-Policy Integration (SPI)	• Favours Scientist	• Dunn et al., 2018
Policy-Science Integration (PSI)	• Favours Policy Makers	• Tieberghien, 2014
Mixed Integration (MI)	• Favours both Scientist and Policy Makers • Research question and science results understood by both parties	• Akhtar-Schuster et al., 2016 • Hughes et al., 2018

OBJECTIVE 2: RESULTS AND DISCUSSION

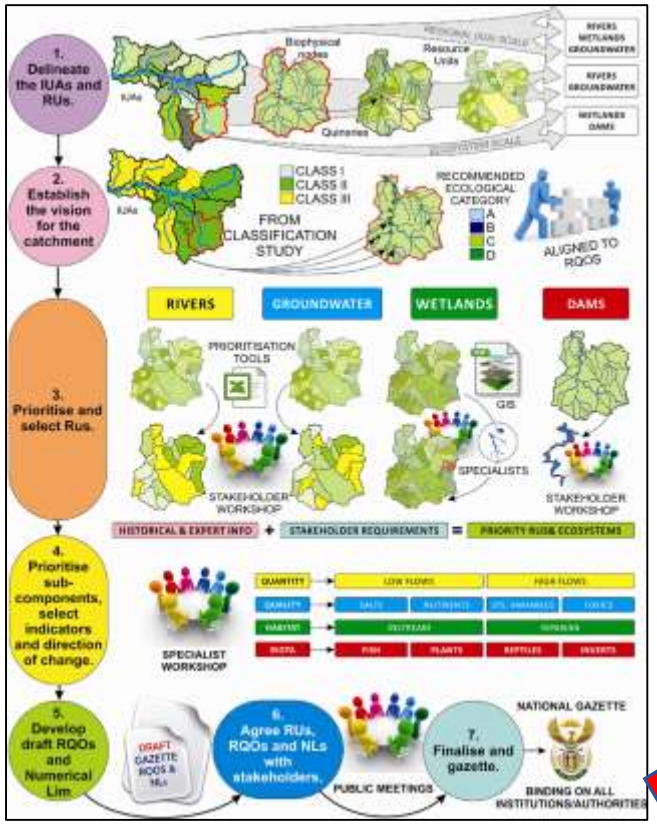
Legislation/Policy/Strategy/Regulation/Plan	Document Type	Promulgation Year
White paper on water policy of 1997 (NWP, 1997)	Policy	1997
National Water Act (Act 36 of 1998), (NWA, 1998)	Legislation	1998
National Water Resource Strategy of 2004 (NWRS, 2004)	Strategy	2004
National Water Resource Strategy of 2013 (NWRS, 2013)	Strategy	2013
National Groundwater Strategy, 1st Edition (NGS, 2010)	Strategy	2010
National Groundwater Strategy, 2nd Edition (NGS, 2016)	Strategy	2016
National Regulation Number 810 of 2010	Regulation	2010
National Water and Sanitation Master Plan (NW&SMP, 2018)	Plan	2018



Science Studies of Resource Directed Measures



OBJECTIVE 3: RESULTS AND DISCUSSION



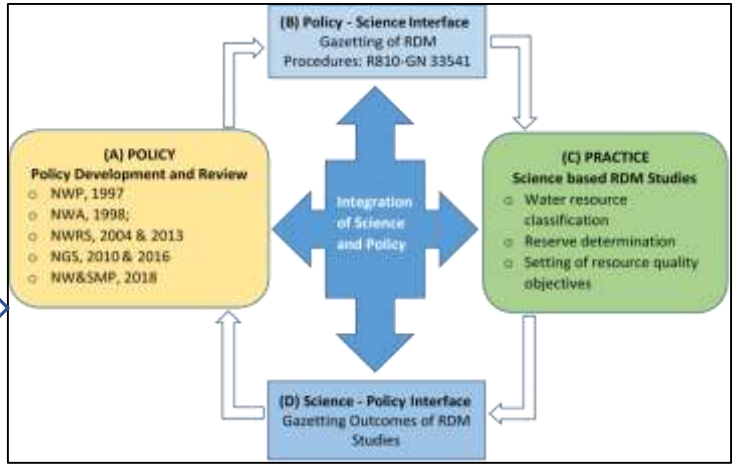
Source: DWS, 2014

Sub-component	TEC	RQO	Indicator/ measure	Numerical limits	TPC
A – Berg River – Bvi6					
Hydrology		Flows sufficient to maintain the river in a D category.	Observed flow.	Table 3.15	
Nutrients		River nutrient levels must be maintained in an oligotrophic condition.	Phosphate (PO4-P)	Median ≤ 0.075 mg/l PO4-P	0.060 mg/l PO4-
			Total inorganic nitrogen (TIN)	Median ≤ 1.75 mg/l TIN	1.40 mg/l TIN
Salts		Salt concentrations need to be maintained at levels that do not adversely affect aquatic ecosystems	Electrical conductivity (EC)	95%tile ≤ 55 mS/m EC	44 mS/m EC
System variables		pH, temperature, and dissolved oxygen are important for the maintenance of ecosystem health.	pH		
			Water temperature	6.5 ≥ pH ≤ 8.5	7 ≥ pH ≤ 8
			Dissolved oxygen	2°C difference from ambient	1.6 °C difference from ambient
Toxins		Toxicity levels must not pose a threat to aquatic ecosystems.	Toxic substances specified in Appendix A (DWAF, 2008, Table 4-8)	5%tile DO ≥ 6 mg/l	7.2 mg/l DO
Pathogens		Concentrations of waterborne pathogens should be maintained in an Ideal category for full contact recreation.	E coli	Concentration limits specified for Rating of 1/Ideal in Appendix A (DWAF, 2008).	
Geomorphology	B/C	Geomorphological condition	GAI score -	> 68% = B/C category	< 62% = C/D category
		Sand particle size	D50	0.576 > D50 > 0.349	0.576 < D50 < 0.349
Aquatic and riparian vegetation	D	Vegetation condition	VEGRAI level 3 score.	> 42% = D category	< 38% = E category
		Marginal zone cover abundance	Exotic species	No exotic plant species.	Exotic species present
			Terrestrial woody species	No terrestrial woody species.	Cover >1%
			Indigenous riparian woody species	Cover 30-50%.	Cover < 20%
			Non-woody indigenous species	Cover 30-50%.	Cover < 20%

Source: DWS, 2018

Integration Depicted

Mixed Integration between Science and Policy



CONCLUSSION

ONLINE CONFERENCE IWRA 2021

CONCLUSSION	
Research question:	How scientists and policy makers engage each other in science-policy interfaces? And how South Africa translates abstract of a legislation into practice using science and vice versa?
Answer to the research question:	Three types of science-policy nexus theoretical models exist in practice, namely, 1) science-policy integration, 2) policy-science integration, and 3) mixed integration. South Africa is able to use mixed integration model of the nexus.
Study contribution:	This study provides a model for collaborations between researchers and/or scientists and policy makers to ensure that science research is answering policy-relevant questions and that results from scientific work are readily available for policy implementation.
Study limitation:	Quantitative factors for impact, adaptation of the nexus were not assessed
Further research:	Assessing application of science-policy nexus for addressing water resources challenges in data scarce catchments.
Recommendation:	Extrapolation of the analytical approach developed and tested to other settings where science-policy integration remains a challenge

CITED LITERATURE

1] Akhtar-Schuster, M., Amiraslani, F., Morejon, C.F.D., Escadafal, R., Fulajtar, E., Grainger, Kellner, K., Khan, S.I., Pardo, O.P., Sauchanka, U., Stringer, L.C., Reda, F., & Thomas, R.J. (2016). Designing a new science-policy communication mechanism for the UN Convention to Combat Desertification. Journal of Environmental Science and Policy, 63, 122-131. https://doi.org/10.1016/j.envsci.2016.03.009

2] DWS (Department of Water and Sanitation). (2014). Determination of Resource Quality Objectives in the Lower Vaal Water Management Area. Private Bag X313, Pretoria, 0001 Republic of South Africa

3] DWS (Department of Water and Sanitation). (2018). Determination of Water Resources Classes and associated Resource Quality Objectives in Berg Catchment. Private Bag X313, Pretoria, 0001 Republic of South Africa

4] Dunn, G., Bos, J.J., & Brown, R.R. (2018). Mediating the science-policy interface: Insights from the urban water sector in Melbourne, Australia. Journal of Environmental Science and Policy, 82, 143-150. https://doi.org/10.1016/j.envsci.2018.02.001

5] Hughes, K.A., Constable, A., Frenot, Y., López-Martínez, J., McIvor, E., Njåstad, B., Terauds, A., Liggett, D., Roldan, G., Wilmotte, A., & Xavier, J.C. (2018). Antarctic environmental protection: Strengthening the links between science and governance. Journal of Environmental Science and Policy, 83, 86-95. https://doi.org/10.1016/j.envsci.2018.02.006

6] Tieberghien, J. (2014). The role of the media in the science-policy nexus. Some critical reflections based on an analysis of the Belgian drug policy debate (1996–2003). International Journal of Drug Policy, 25 (2), 276-281. https://doi.org/10.1016/j.drugpo.2013.05.014

THANK YOU!!!