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The Governability of Water Resources: Introducing the PULSE3 Assessment

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The Governability of Water Resources: Introducing the PULSE^3 Assessment Framework

By

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1. Introduction

In an earlier article, I presented a framework for analysing water politics and governance based on Hobson's (2000) conceptualisation of agential power (Meissner, In press) and Mann's (1993a, b) ideological, economic and political power determinants to assess agential power. In this paper I will complement the framework with Jan Kooiman's (2008) concept of governability or theory of interactive governance. Together, agential power and governability constitute a governance and politics assessment framework called PULSE^3 or People Understanding and Living in a Sustained Environment. PULSE^3 signifies the changes in the way something is done or thought about as well as the dynamism inherent in societal and environmental approaches of thinking. The cube denotes three forces: thinking, shaping and change. That is, individuals think, shape and cause changes. The natural environment shapes and affects changes, impacting on human society and the way we live in the environment (Meissner, 2003). The framework is based on the view that 'science' is not the result of the traditional empirical observation of so-called facts. Science is also influenced by an interpretive understanding of the concepts we employ to explain reality. Said differently, post-positivism is a launching pad towards a more integrated model and understanding of ideas and issues around water politics and governance.

Theory, as the basic cognitive feature utilised to make sense of the world, plays a central part in the framework. Thinking of the real world we operate in does not only help us understand it but also how to utilise resources and interact with one another. This notion departs from the accusation sometimes levelled against theories—they are academic and hold little utility for practicalities. PULSE^3 debunks this. The applicability of research or science to the practitioner depends on theory. Arguing either implicitly or explicitly from a certain theoretical paradigm holds the potential to counteract innovation for the solution of real world problems and the generation of opportunities. PULSE^3 is not only of academic value but has a strong practical agenda. Theoretically it rests on the notions of agential power and governability. These perspectives are coached in interpretivism, giving credence to power capabilities and governance systems. This indicates the alternative options available to researchers on how a post-positivist paradigm can influence ideas and research methods. Agential power looks at the ability of an entity or individual to develop, implement and influence policy (Hobson, 2000), while governability is the capacity to give effect to such policy arrangements (Kooiman, 2008).

After discussing governability's components, guiding questions are put forward as assessment paths and practical examples of the framework's components. These questions can be asked by the researcher, as a way to identify trends and issues, and can also be incorporated into methodological instruments such as questionnaires. The questions are substantive and have relevance for real world issues and will hopefully integrate empirical observations with causal stories (Sil and Katzenstein, 2010) so as to paint a fuller picture of issues and generate options for decision makers. The examples will be from fieldwork performed in the Greater Sekhukhune District Municipality's waste water treatment works. According Nortje and Funke (2013), the state of the Municipality's waste water treatment works face a number of challenges as expressed by Municipal officials. These challenges include the non-replacement or maintenance of old infrastructure that has already come to

the end of its designed life, limited funding to replace outdated infrastructure with new plant equipment, inadequate human resources in terms of practical planning and infrastructure design capacity and institutional development gaps. These challenges indicate aspects of governability, or the ability to govern a system like waste water treatment plants. I argue here that these are 'macro' challenges or challenges that are easily discernible. There are also 'micro' or 'hidden' challenges and opportunities in terms of the governability of waste water treatment works. The method I use in explaining some of the examples is to transfer some of the observations during fieldwork in the Municipality as stories or social dramas. Here I employed an ethnographic approach, when I speak of something or somebody (Hastrup, 1992; Nortje, 2006). In the example of the meeting between the Council for Scientific and Industrial Research (CSIR) and the Municipal officials, I deliberately changed the names to ensure the participants' anonymity.

A case is also made for the future progression of the framework through a discussion of panaceas and how to avoid the framework from becoming a fad itself. Of importance in this regard is to constantly ask what the framework is missing, to keep abreast of not only real world opportunities and problems but also the theoretical or paradigmatic developments that explain such phenomenon. This is important, for frameworks, just like any type of technology can become anachronistic and lose their appeal. It would be quite disheartening to see this framework implemented in 10 to 15 years without it taking into account the theoretical and paradigmatic developments of the future 10 to 15 years. A measure of reflexivity is therefore build into PULSE^3 to avoid its stagnation in becoming a panacea. By constantly asking what is missing opens a window for the incorporation and convergence of views, concepts, theories and frameworks from other scientific paradigms. The paper ends with a discussion and conclusion.

2. Theoretical departure

Humans are always busy trying to determine the rules and patterns that govern the characteristics of the tangible world and the complex relationships we have with each other and the bio-physical environment (Du Sautoy, 2008). It is at this level where the cognitive and material world intersects and where a discussion around theories becomes relevant. The link between theory and policy is used as a foundation for the development and requirements of PULSE^3. When considering theory and policy, it would be good to start with Hobson's (2012: 16) assertion that '…theory is inherently politically *performative* in that it is operationalized in the practice or performance of…politics…' Said differently, theories are employed to guide political practices.

The nature of issues around water governance and politics indicates the ways in which they are addressed as scientific discourses (Du Plessis, 2000). For instance, technical issues are likely to be addressed in a natural scientific and predominantly positivist manner. The link with academic or scientific discourses indicates how research is conducted on cross-cutting matters. The South African water research landscape is prevalent with studies, conferences and research institutions that exemplify the character of water resources management and add to the conversation over water. To note, studies are not only confined to technical research and projects such as hydrology and geo-hydrology, but also the social sciences and especially

anthropology, international relations and political science (Du Plessis, 2000; Meissner, 2004; Jacobs, 2009; Claassen et al., 2011; Jacobs, 2012; Funke et al., 2012; Tempelhoff et al, 2012).

Studies investigate, among others, environmental security (climate change and climate variability); resource security (the water-energy nexus); water (in)security; water scarcity caused by problems in quality and quantity; regulatory mechanisms for the protection of water resources; water conflict and cooperation at local, regional and transnational level and the management of these issues in the policy domain. Of importance for PULSE^3 is that these studies do not (a) represent a discrete type of theorising, (b) unequivocally contextualise the water discourse in a particular theoretical mode and (c) scientists or researchers do not deliberately construct a theory of water politics and governance (Du Plessis, 2000; Meissner et al., 2012). There are of course different thinkers such as Turton (1999), Swatuk and Vale (2000), Meissner (2004), Meissner (2005), Jacobs (2009), Jacobs and Nienaber (2011), Dent's *CMA Leadership Newsletters* (although these are not peer reviewed), Pollard and Du Toit (2011) and Goldin (2012). Even so, and with the exception of Swatuk and Vale (2000), Meissner (2004), Meissner (2005), Jacobs and Nienaber (2011) and Goldin 2012, current studies in the water discourse are framed in a predominantly positivist or rationalist paradigm, while the exclusions are generally coached in a post-positivist or interpretivist 'mode of theorising' (Du Plessis, 2000: 10) (see Table 1 for an overview of the differences between post-positivism and positivism).

Table 1 Post-positivism and Positivism

	Post-positivism	**Positivism**
How is knowledge generated?	Observation influenced by an interpretive understanding of the concepts we pose.	Empirical testing of propositions or hypotheses against facts and evidence.
Methodology	Qualitative in that human agency influences the link between facts and concepts and theories and values.	A quantitative separation of facts from values.
Nature of knowledge produced	Subjective through human perception and understanding.	Objective truth claims.
Measurement	Humanly constructed incorporating norms and values.	Humanly constructed incorporating measuring instruments.

Sil and Katzenstein (2010) make a valuable observation in light of paradigms and their impact on research endeavours: 'Paradigm-bound research provides powerful insights, but in the absence of complementary efforts to compare and integrate insights from multiple paradigms, the latter can become a "hindrance to understanding"'. Panaceas, something Ostrom (2007) warns against, in the consideration of issues around social-ecological systems are born this way. It is here where caution should be exercised. In the words of Smith (1996: 13)

> '…the stakes are…high because of the links between theory and practice. …[T]heory underpins and informs…practice, even if there is a lengthy lag between the high-point of theories and their gradual absorption into political debate. Once established as common sense, theories become incredibly powerful since they delineate not simply what can be known but also what it is sensible to talk about or suggest [discourse]. Those who swim outside these

> safe waters risk more than simply the judgement that their theories are wrong; their entire ethical or moral stance may be ridiculed or seen as dangerous just because their theoretical assumptions are deemed unrealistic. Defining common sense is therefore the ultimate act of political power. In this sense what is at stake in debates about epistemology is very significant for political practice. Theories do not simply explain or predict, they tell us what possibilities exist for human action and intervention; they define not merely our explanatory possibilities but also our ethical and practical horizons.'

The interplay between theory and reality extends much further than mere practicalities derived from theories. Power play between humans is just as dependent on theory and is informed by theorising over real world issues. To reiterate, the South African water discourse is not without theoretical substance but a particular type of theorising (post-positivism) is absent. It is very much infused with theory, although implicit or subliminal. This is not surprising, since many participants in the discourse are from beyond social scientific fields of study such as anthropology, sociology, development studies, political science and international relations; fields that are underpinned by a strong theoretical tradition (Meissner et al, 2012). 'Therefore, they [natural scientists] tend to be importers of non-political constructs (a beneficial, interdisciplinary practice not to be frowned upon)…' (Du Plessis, 2000: 10).

Pockets of different 'thinking' individuals who often take part in interdisciplinary work exist in the water discourse, although they are mostly from a positivist background (Pers. Comm., K. Nortje, 6 June 2012). This is not to say that scientists with a positivist background are wrong, anything but, as noted by Du Plessis (2000). The problematique lies therein that a predominant positivist epistemology can detract the water epistemic community from problems lurking in the shadows. Positivism and its adherents hold a hegemonic position within the South Africa water research community (see Meissner et al, 2012). Emphasis is placed on certain types of causal factors rather than others, which leads to the discovery of new facts and progressively more sophisticated arguments. The representatives of a certain paradigm see this as progress, which is not always the case. Generally speaking, '[i]nstead scholarly discourse risks becoming dominated by self-referential academic debates at the expense of addressing the complexities and messiness of everyday problems' (Sil and Katzenstein, 2010: 2). PULSE^3 does not aspire to replace the positivist paradigm, it is an attempt to augment it and bring into view those aspects neglected by positivist thinkers. The development of the framework is an attempt to balance the hegemonic position, so to speak. To reiterate, positivism is not wrong and has taught us much about the pressing issues facing the country's water resources. It should therefore not be demonised and abolished and neither should its adherents.

In short, theory follows reality just as much as reality produces theories. The South African water research community is pinning a lot of hope on government, especially the Departments of Environmental Affairs and Water Affairs to alleviate the so-called water crisis (CDE, 2010) through compulsory licensing, the implementation of catchment management agencies, and other regulatory mechanisms such as the ecological reserve, outlined in the National Water Act (No. 36 of 1998). Theories that underpin this reality is therefore in huge demand, with the inverse not occurring where innovative theories are developed to inform the optimal responses from a

range of stakeholders to address the countries water woes. Governability can hopefully help to alleviate or remedy the situation since it is very much infused with interpretivism.

3. Governability

When first coined in 1977 by Crozier et al (1977) on behalf of the Trilateral Commission, governability as a concept has become synonymous with the performance of (liberal) democratic government (e.g. Diamond, 1990; Kohli, 1990; Nasr, 1992; Foweraker, 1998; Pharr et al, 2000; Bidaguran and Estrella, 2002; Nef and Reiter, 2009). It was Jan Kooiman and the work he and colleagues conducted on marine fisheries (Kooiman et al, 1999) that introduced the concept of governability into the management of natural resources (Kooiman, 1993). Warner (2003) also introduced the concept within the disaster studies domain. Governability has a strong normative element and is the outcome of governance (Kooiman, 1999) based on interactive governance theory (Kooiman et al, 2005; Bavinck et al, 2005; Jentoft, 2007; Kooiman et al, 2008; Kooiman 2008; Kooiman and Jentoft, 2009). As outlined by Kooiman and his colleagues, their framework shares a lot of similarities with Ostrom's (2007 and 2009) frameworks for Going beyond Panaceas and Analysing the Sustainability of Social-Ecological Systems (SES). For the purpose of the framework, governance is defined as the result of interactive socio-economic and political forms of governing (Rhodes, 1996) that result in problem solving and opportunity creation (White, 2001). Governability, from the point of view of the governance system, 'is the capacity to bring about, organize and carry out governing interactions in the face of societal and natural diversity, complexity and dynamics in terms of elements, modes and orders of governance as attributes' (Kooiman, 2008: 178). This applies to all societal entities and not only, the state, the market or civil society. In this respect vulnerability and resilience play important roles in that vulnerability reveal possible and actual problems of governability and resilience the opportunities inherent in governability (Kooiman, 2008). Governability should go beyond vulnerability and resilience for these is not the only attributes that characterise a society. For Warner, governability is a ratio between stress and coping: if stress is consistently larger than coping then a situation becomes ungovernable (Pers. comm., J. Warner, 4 June 2013). It is nevertheless more complicated or complex than the dichotomy between vulnerability and resilience and stress and coping. This will become apparent when discussing the framework's components and the real world examples accompanying the components. Vision's and perceptions, for instance, are also of importance and not just the attributes of the situation.

Three main variables are at play in the governability project: the governors, the governed and all the external influences that impact on the system or entity, including natural resources. The three variables add, to varying degrees, to governability. This implies that the complex nature of governance does not always remaining constant; at times it can be high and at others low. Acts of governance as well as external factors can have an impact on the degree of governability (Kooiman, 2008). Here it becomes important to note that it is not only people that govern, but because of the nested hierarchies of systems, the biophysical environment governs all societal entities (Meissner, 2003; Kooiman, 2008; Gillings, 2010). Even so, and just like agential power, governability can be assessed. As in the case with agential

power, the overarching organising question (what compels actors to act and what are the consequences of their actions) (Hobson and Seabrooke, 2007) should be the grounding question too (see Meissner, in press). This question should also be broadened to include the biophysical environment; there are, after all, causes within the natural environment that have an impact on human society (e.g. Gillings, 2010). A range of governability assessment criteria are identified: diversity, dynamics, complexity and scale; modes of governance; images, instruments and action and orders of governance.

3.1.1. Diversity, dynamics, complexity and scale

The development of the framework starts with societal activities or primary processes such as drawing water from a river, catching fish, irrigating a field or flushing a toilet. To be sure, all such processes have become more diverse, dynamic and complex and takes place at different spacial and temporal scales both qualitatively and quantitatively (Kooiman, 2008). This becomes apparent when one considers the water cycle as a supply circle and not a supply chain; everyone is downstream and upstream from one other. This is an important consideration, since it will influence our insight of systems-to-be-governed. It is not a linear progression or regression from the one entity to the other but a complex process of supply, demand and how the perception of such processes changes.

Diversity emphasises the specific and varying qualities of actors in a system-to-be-governed, its governing system and governing interactions. Diversity is the source of innovation and creation and also carries the potential of a system's destruction or disintegration. Dynamics deal with regularity and irregularity and hold the potential for change as well as disruptive consequences. Complexity deals with societal structures, interdependencies and interrelations and is a condition for combining interdependencies. The main question to be considered is how to reduce complexity effectively and responsibly. Scale, as mentioned above, has to do with space and time and represents the level where one can see the combined effects of diversity, complexity and dynamics (Kooiman, 2008). Although separated here, these assessment criteria are either enmeshed or can run parallel with each other.

It is the interactions and interrelationships among economic, social, biophysical and the host of other components of the system-to-be-governed that constitute the system as a whole (Kooiman, 2008). This implies a strong leaning towards complexity theory underpinned by the assumption of positive and negative feedback loops, the impact of small events on the system, the borderless hierarchy inherent in the system, the overall ability of the system to change and at the same time to retain its basic features (Rosenau, 1996; Rosenau, 2006). It is atomism and holism at the same time and in different dimensions. Yet, complexity is not framed as the characteristic with the others dependent on it. It is put on the same plain as the others and in this way complexity thinking does not dominate.

The practicality of Kooiman's (2008) framework as well as later developments of the framework (Kooiman et al, 2008; Jentoft and Chuenpagdee, 2009) is that it does not consider complexity theory on its own but as a characteristic of the system. The utility of this lies therein that it reduces the risk of focussing only on some basic features of complexity, such as feedback loops, and then to explain the function or

dysfunction of a system based on the absence or presence of such features (e.g. Pollard and Du Toit, 2011). This would be an example of ineffective and irresponsible reduction logic, which is contrary to complexity thinking for it highlights a single cause and effect dichotomy. It is here where Kooiman (2008) makes a valuable observation. Within the ambit of resilience it would be tempting to assert that a resilient system, which is better at governing or organising itself is one with higher governability than one with lower governability and less resilience. Kooiman (2008: 178) asks '[b]ut are there direct and positive correlations between governability, self-governance and resilience?' More on this a little later on in the article.

To assess the diversity, dynamics, complexity and scale of a governance system the following guiding questions can be asked: (1) how do the actors in the governance system view the nature of the governance system and the system-to-be-governed (simple, complicated or complex)? (2) Is complexity reduced responsibly and effectively by the governors and the governed? (3) What is the nature and extent of innovation among the various actors? (4) Are dynamics regular or irregular? (Be careful to ascribe irregularity with disruption and regularity with change for the good). (5) What is the nature of the scale in terms of geography, time and institutional arrangements?

An example will suffice to explain the feature further. While conducting fieldwork on the Greater Sekhukhune District Municipality's waste water treatment works, we visited the Hlogotlou/Monsterlus waste water treatment plant. We noticed that the plant is receiving only a trickle of water (see Figures 1 and 2) and when we asked the operator she indicated that it is because of a blockage upstream from the plant. She was, however, not certain about this. The plant serves around 2 000 households (Stats SA, 2012) and is situated downstream from the Mahtrombi Nature Reserve. The uncertainty regarding the blockage defines the complex nature of the plant, although it receives little water making the dynamics at the plant irregular. Should it be a blockage, it can be removed and should this be done, it is not certain how it will affect the plant. Will it be able to cope with the sudden and increased inflow? In other words, is the plant resilient enough to cope with a sudden change? A clear conclusion or answer to this question cannot be drawn, since there is uncertainty around the blockage upstream. For instance, we do not know what type of blockage it is and how easy it will be to rectify.

Figure 1: Inflow to the waste water treatment plant

Figure 2: The waste water treatment plant at a distance.

3.1.2. Modes of governance

Governability recognises three modes of governance: hierarchical governance, self-governance and co-governance. Hierarchical governance is the most well-known form (i.e. governance emanating from government and regulatory structures or the top-down way of governing) (Hobson and Seabrooke, 2007). According to Kooiman (2008), hierarchical governance is also the mode of governance that is visibly not functioning very well as ever increasing rules and regulations do not live up to their expectations. Co-governance, such as public-private partnerships and co-management of resources, are emerging constantly and are becoming more prominent, while self-governance is an area with little understanding, theoretically as well as politically and ideologically. It is here where there is much scope for innovative research. Such research should ideally, but not exclusively, look at the most optimal mixture of the three modes in society. All three modes are practised in society. In fact, societies need these three modes to function especially considering how diverse, interdependent and complex issues have become (Kooiman, 2008).

The resilience of a system will depend, to varying degrees, not only on self-governance or co-governance or hierarchical governance, but a combination of all three in the face of complexity, dynamics, diversity and scale. It is here where Kooiman (2008) moves away from the learning by doing or adaptive management approaches propagated by, for instance, the late Elinor Ostrom (2007 and 2009). For him, cause and effect relationship between resilience and governability is not clear cut. In fact '[n]o single change is the reason why' (Goldacre, 2009: 327). Said differently, a system that is good at adapting to disturbances (self-organising) is not necessarily more resilient than one that does not practice adaptive management. This brings the notion of panaceas into the spotlight and it is here where Ostrom's (2007 and 2009) Going beyond Panaceas framework becomes useful. She notes that 'We should stop striving for simple answers to solve complex problems. The problems of overharvesting and misuse of ecological systems are rarely attributable to single causes' (Ostrom, 2007: 15181). Even so, when Ostrom propagates adaptive management based on rational or public choice theory and by doing so she inadvertently promotes adaptive management as a panacea. Hobson and Seabrooke (2007) and Kooiman (2008) question the basic assumptions of rational choice and by default the underlying premises of adaptive management. There are instances when

political action is not based on a cost-benefit analysis (Rueschemeyer, 2009). The researcher should not only ask if the system is self, co- or hierarchically governed and to what degree and combination, but also what the dynamic, if any, between the three modes are.

An example where the three modes of governance intersect is in the case of the Motetema waste water treatment plant in the Municipality. The treatment plant is governed by the Municipality and services the Motetema Township, situated 12 kilometres north of Groblersdal (see Figure 3). The plant's design capacity is 2.5 mega-litres per day (Ml/d) and according to the 2012 Green Drop report by the Department of Water Affairs (DWA) the plant is classified as being at a critical risk. This means that the Municipality should give the plant's operation urgent attention and to take corrective measures to abate the risk to pollution of water resources (DWA, 2013) emanating from the plant. The plant has one operator who has been working at the plant since 1992. During an interview with her, she indicated that she gets little support from the Municipality in terms of chemicals and the maintenance of mechanical infrastructure at the inflow of the plant. She sees herself as the sole caretaker of the plant. This indicates that, although the plant is under the Municipality's management, it is largely self-governed by her. In other words, there is a self-governing situation within a hierarchical (Municipal) arrangement (Meissner, 2013). This implies that there is not always a clear separation between the modes of governance and although the Municipality is managing the plant, it is the individual that oversees the day-to-day functioning thereof and looks after its correct functioning. Modes of governance can therefore be enmeshed and the researcher should be on the lookout for situations like these for it can influence the epistemology and ontology of the researcher and ultimately the framing of recommendations. In can become very tempting to recommend that the problem be solved within this hierarchical arrangement only. The situation is, however, much more complicated, as will be seen later on in the article. Outside this arrangement, the Municipality is also in a co-governance partnership with Lepelle Northern Water that operate some of the Municipality's other waste water treatment plants, like the ones at Burgersfort and Steelpoort (Meissner, 2013). Within the geographical limitation of the Municipality the three modes of governance is discernible around one issue.

Figure 3: Motetema Waste Water Treatment Plant

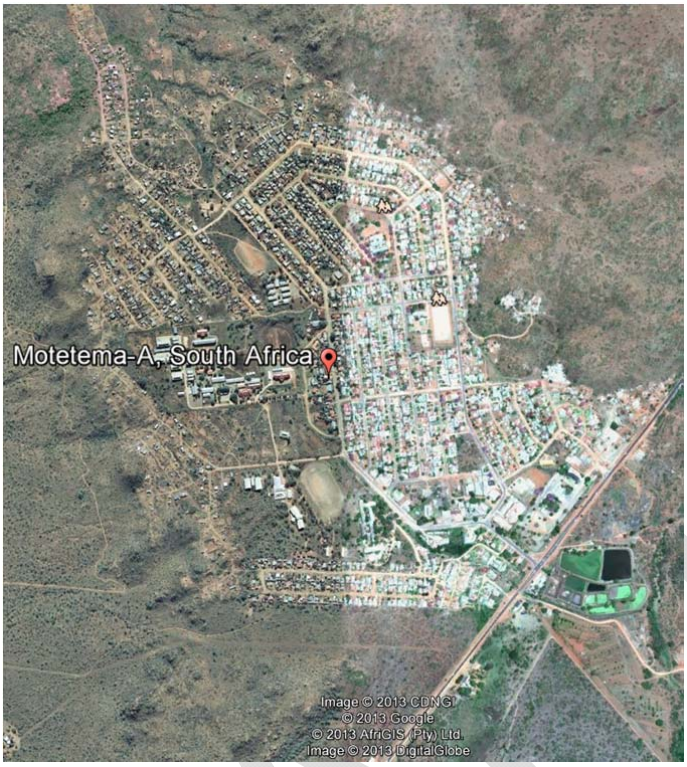

Figure 4: Aerial view of the Motetema Waste Water Treatment Plant (rectangular shapes in the lower right hand corner of the image) in relation to Motetema-A village

3.1.3. Images, instruments and action

Governance systems have a number of attributes: images, instruments and action, which is very much in line with 'agential power' (see Hobson, 2000). Even so, governability deals more with the instrumental qualities of policies and systems, whereas agential power deals more with the normative. Images, instruments and actions are the three elements of interaction through which governors govern. All three the elements play a role in governance interactions. Images are the sets of ideas where a governor wants to go (i.e. the assumptions about fundamental matters, vision, knowledge, facts, judgements, presuppositions, hypotheses, theories, convictions, ends and goals). Instruments give the ideas substance and actions are needed to put the instruments at work. Instruments can be hard or soft and the choice of a certain instrument is not free; it is determined by positions in and views of society. Neither are instruments neutral. Their design, choice and application can lead to strife. Images relate to specific issues as well as the images of the relationship between society and nature and the role of government (Kooiman, 2008). Action is the implementation of policy according to certain guidelines as well as the mobilisation of actors to move into new and uncharted directions. Structural conditions can be more important than governing interactions (Kooiman, 2008) something that is at play within the orbit of reflexive agential power (Hobson, 2000). Here structural conditions include sources of images, resources (renewable and

finite) for instruments, action patterns based on political culture and ideology, available to entities for utilisation (Kooiman, 2008).

The combination of norms and practice become important considerations in the governability of governance systems (Kooiman, 2008). Norms are standards of appropriate, proper or usually expected behaviour for actors with a certain identity (Klotz, 1995; Katzenstein, 1996; Finnemore and Sikkink, 1998; Hornby, 2005; Towns, 2012). Norms, values and principles are applicable to 'substantive governance issues [like] sustainable resource use, and to the governance system [for instance] their institutional design' (Kooiman and Jentoft, 2009: 818). For Kooiman and Jentoft (2009) norms and values are specific to particular situations, settings, cultures and history, while principles are more necessary and concrete. Principles are derived from norms and values and as such are more limited in scope. It is here where social constructivism, as a post-positivist theory becomes compelling. Social constructivism attempts 'to make sense of social relations by explaining the construction of the socio-political world by human practice' (Du Plessis, 2000: 25). The theory highlights the importance or normative and material structures, the role of identity in shaping political action and the relationship between agents and structures (Reus-Smit, 2001). The actions of actors can be constrained by social normative structures (Hobson, 2000) and not just by the lack of material conditions such as financial resources. As norms reconstruct identities, interests change with a spill-over effect on the policy landscape (Smith, 1997; Price, 1998; Hobson, 2000).

Non-state entities can play just as important role as states and the political elite in affecting change because the system allows such entities to act not because they feel compelled to act based on loyalty but because of the norms, values and principles they hold. Here the identity and ideology of an actor play a central part. It is through an identity-informed ideology that actors create norms that will in turn be used to determine the actor's actions towards a particular issue and relationship with another actor. Actors are norm creators through their intersubjective beliefs (Meissner, 2005) and as such, humans, with norms driving behaviour, attempt to influence the behaviour of other actors.

To illustrate how images, instruments and actions operate, I will use a meeting between CSIR scientists and municipal officials from the Greater Sekhukhune District Municipality. The dialogue took place in 2013 when the scientists presented suggested interventions to the municipal officials for the amelioration of challenges the particular municipality is facing regarding its waste water treatment plants. The municipality's waste water treatment works have not done well in terms of their Green Drop Scores, and have received very low percent scores like 0%, 6%, 10% and 20% for all plants and on most of the assessment areas like microbiological, chemical and physical compliance (DWA, 2013). The Green Drop regulation programme forms part of an incentive based regulation that identifies, reward, ensure and encourage waste water management excellence. The Green Drop initiative was launched in September 2008 together with a full scale assessment of all municipal waste water treatment plants across South Africa (DWA, 2013).

One of the CSIR scientists, Liam, suggested that the Municipality can improve the scores substantially by focussing its efforts on 'low hanging fruit' or 'quick wins'.

These are things that can be easily fixed such as monitoring programmes where monitoring systems can be used to assess the quality of the water within the plant. For Liam, the information generated by these systems can be used in the operation of the plant also known as operational monitoring necessary to run the plant. Compliance monitoring is also needed in terms of the Green Drop regulations where the results are generated by an accredited laboratory; a monthly service that can be provided by the CSIR. The results from these tests can then be sent to the Green Drop assessment at DWA. In other words, and according to Liam, the CSIR will be able to assist the municipality in the provision of results to the Green Drop. In addition, tests can be conducted on site at the plant to ensure that everything in the plant is running properly such as chlorine dosing. Systems must also be in place to record operational aspects, like faulty plant equipment. For all this to happen there must be commitment throughout the entire municipal hierarchy and training of plant operators to do the assessments. The scientist reiterated that the improvement of the scores is 'up to the municipality' by providing commitment and resources and the CSIR can assist with the technology such as the water quality monitoring systems and laboratory tests.

A municipal official, Jacobus, replied through an analogy. He said that she 'cannot drive a car that is dirty and broken' meaning that before you can start monitoring the plant must first be fixed. Said differently, the physical infrastructure that is broken must be replaced with functional pumps, valves, electrical motors and so on. If the plants are always in the same state—not functioning properly—then questions must be asked about the commitment of municipal management regarding the status of some of the 'high risk' plants. Payment of service providers to repair infrastructure is a problem. Certain issues need to 'be first unlocked' before the so-called quick wins can be affected. One such issue is bylaws enforcement because the officers in the municipality do not have the necessary training as in other larger and well-resourced metropolitan municipalities, like the City of Tshwane. What is more, in the Municipality, there is no individual budget for all the waste water treatment plants, it is all combined and this situation needs to be changed so that every plant has its line-itemed budget to pay salaries and laboratory testing.

Another official, Thabang, said that in terms of waste water, the municipality is in a bad state, but it can be turned around. This requires willingness from the politicians and senior management. He said that in the municipality it is 'quite difficult to the easiest thing'. Many submissions, for instance, from the water quality department to repair plants are turned down because the department does not present a strong case. Senior management does not really know what is going on with regard to waste water treatment plants, and it is difficult for the responsible officials to convince senior management with a strong case (senior management does have a proper understanding of waste water in the municipality). The engineers and technicians do not know how to present their case to senior management and therefore they are getting 'shut down' from the top. If they can represent their story properly, they will less likely be refused by senior management. Liam recommended that the municipality appeal to DWA for support on this issue. DWA has been assisting other municipalities in providing funds to get things done in terms of waste water treatment plants. A third official then suggested that the recommendations by the CSIR be used to get more funding for water services. Said differently, Thabang wants to use scientific proof to strengthen their case and in that way convince senior

management to allocate more funds. He even went so far as to ask the CSIR to assist in the writing of submissions to senior management. According to Thabang, internally generated reports do not have the desired consequences at senior management level. If a submission is endorsed by the CSIR, it will carry more weight within the municipal council. In this case the CSIR wanted to the role of a technical advisor only. Yet, Jacobus and Thabang had different expectations and want the CSIR to play a political influencer role too.

To summarise this section, a number of guiding questions could include the following. What is the nature and extent of bio-physical change? What types of changes is unique to the bio-physical environment? What norms, values and principles guide the governance of the system? Are these norms, values and principles explicit or hidden? How do they find expression in the governance system and the interaction between actors and actors and the biophysical environment? What developments in society and the biophysical environment can bring about new norms to be taken up by actors and utilised in governance systems? How do norms, values and principles influence images, instruments and actions?

3.1.4. Orders of governance

Governability outlines three orders of governance: first- and second-order and meta-governance. These orders represent the 'different sort of things' governing activities can focus on. Day to day affairs is what constitute first-order governance and exist where people and organisations interact to create opportunities and solving existing problems. Second-order governance is institutional arrangements within which first-order governance takes place. The concept 'institution' means arrangements of agreements, rules, rights and procedures implemented by first-order governors to make decisions. Examples include states, markets, civil society, businesses and epistemic communities. Meta-governance 'feeds, binds, and evaluates the entire governance exercise.' Said differently, meta-governance entails the governance of governance. There are various principles and criteria that guide governance. They can be of an applied nature, like rationality, efficiency, effectiveness or performance. There are those that are more fundamental or ethical, such as equity, responsibility or justice. 'In meta-governance, governors and the governed alike take each other's measure in formulating the norms by which they want to judge each other and the measuring process itself' (Kooiman, 2008: 181). The principles and criteria that guide governance show that it is not only rationality that plays a part in governance systems. Normative considerations are also at work. It should be noted that the opposite of rational behaviour, such as bandwagoning to dominate others (Hobson and Seabrooke, 2007) is a constant and looming possibility. Irrational behaviour is also at work in the relations between humans and humans and nature. Such notions should also be included when considering orders of governance and how the orders are shaped by such behaviour.

As already alluded to, governance is not only a function of government entities, non-state actors and even individuals govern to a lesser or greater extent in different situations. It then follows that scientists can also be governors when they interact with other scientists inside or outside their field and come into contact with people in organisations not part of the scientific community to solve problems and create opportunities (e.g. first-order governance). The CSIR Water Sustainability Flagship

project involves various scientists investigating different aspects of the Greater Sekhukhune District Municipality's waste water treatment works (e.g. first order governance). One of the components deals with the issue of voluntary aquatic toxicity testing (currently the norm) and the changing of the norm to mandatory toxicity testing. The aim is to have toxicity testing become mandatory by potentially influencing DWA officials to make the testing part of a regulatory framework. In order to do so, the scientists need to interact with a number of actors within and outside DWA. Numerous South African scientists had investigated the uptake of toxicity testing into regulation and water resources management practices (e.g. second-order governance) (e.g. Slabbert and Venter, 1999; Muller and Palmer, 2004; Chapman et al., 2011; Slabbert and Murray, 2011). Toxicity testing of water resources is vital in ameliorating the risks polluted water poses to ecological integrity and ultimately human health. There is therefore a strong normative element such as environmental justice (e.g. meta-governance) involved. In order for toxicity testing to become mandatory in the South African policy and regulation landscape a strategy needs to be devised taking the above-mentioned past research and normative or meta-governance element into consideration. Norms can become a central tenet of such a strategy especially with respect to the demonstration of the value of aquatic toxicity testing to policy developers. It is, however, important to interact with other scientists when considering the value of toxicity testing (Pers. comm., Liesl Hill, Council for Scientitifc and Industrial Research 14 June 2013) since there research can aid in highlighting the various actors participating in governance endeavours around toxicity testing as well as the meta-governance aspects. In this way the scientists will initiate strategic social construction (e.g. Weaver, 2010) wherein the uptake of new norms over an extended period of time to bring about change regarding toxicity testing takes place.

4. Fostering progression

Ostrom's (2007 and 2009) advice to not rely too much on panaceas is a guiding light for moving towards a progressive assessment framework. What she omits, though, are the criteria of what constitutes a panacea. Here we'll attempt to pen down some. A good starting point would be the business sciences, since the business world is prone to the development and prominence of so called 'fads'. The term might sound dismissive, but panaceas or cure-alls can bring about profound changes and introduce new ideas on how to manage entities or resources, 'even as the fad itself fades from the scene' (Miller and Hartwick, 2002: 26). Be that as it may, they can impact on governance systems in a negative way since they are able to constitute a substantial financial investment to implement, not to mention the waste in human resources if systems or components thereof are already in place and are inadvertently duplicated. In addition, if the fads are inadequately designed, along specific epistemological lines, there predictive value diminishes making them obsolete even before they had been put in practice.

For Miller and Hartwick (2002) and Miller et al. (2004) panaceas or fads share eight qualities. Firstly, they are simple; easy to understand and to communicate and are framed with labels, buzzwords, lists and acronyms—key points give the message and they usually rest on a small number of pillars. Since they are suited for a simple world, they have limited utility in real and complex societies or situations. They are also prescriptive. They tell decision makers what to do through specific actions to

solve problems. Although the fundamental ideas might be sound, 'the need to be simple but prescriptive makes their action points easy to misinterpret or inappropriately [applicable]' (Miller and Hartwick, 2002: 26). They are, thirdly, falsely encouraging since they promise results such as greater efficiency and more effective, motivated and productive managers and employees as well as 'deeply' satisfying outcomes. Even so, they are better at raising hopes than delivering results. What's more, 'they generally fail to specific clear-cut criteria for evaluating whether or not an implementation succeeded' (Miller and Hartwick, 2002: 26). They are based on the principle of one-size-fits-all. Panaceas allege universal relevance by proposing practices that will apply to almost any situation or organisation, from municipalities, national departments, the epistemic community, catchment management agencies to water user associations and irrigation boards and non-governmental organisations to corporations and even individuals (Miller and Hartwick, 2002: 26). In the fifth instance, they are easy to cut-and-paste because they need to be simple and easy to apply and therefore open to one-sided implementation. Panaceas do not challenge the status quo because some of their features can be incorporated into standard operating procedures and made applicable to a number of localities. A significant redistribution of resources is the ultimate consequence (Miller and Hartwick, 2002: 26). They are, furthermore, in tune with the 'Zeitgeist'. Fads resonate with the pressing problems of the day and because of this, they tend to apply to a limited number of issues rather than addressing the underlying weakness or soundness of overall practices. Panaceas are novel and not radical for they grab the attention of many due to their novelty, although they do not challenge basic values. In many cases ideas that have already been embraced are repackaged or extended (Miller and Hartwick, 2002: 27). In other words, it is a case of old wine in new bottles. They are legitimised by gurus and disciples. Here Miller and Hartwick (2002: 27) are explicit in laying down an important criterion something the scientific community is quite prone at doing. 'Many fads', they say, 'gain credibility by the status and prestige of their proponents or followers, rather than through empirical evidence'. When researchers or scientists start looking with stars in their eyes to other scientists and proclaiming them to be some sort of academic or scientific hero, prestige had been adhered to the so called 'guru' (Miller and Hartwick, 2002). Rarely is the guru's or the disciple's ideas questioned and here 'bad science' creeps in with quacks and cranks parading so-called science when in fact they are only peddling nonsense (Goldacre, 2009). And lastly, fads, unlike time tested theories, frameworks, ideas and principles do not outline their risks and trade-offs; they only give their promises, since they are generated for and from the market or whoever or whatever is in need of a quick fix. They can, in this regard, be equated with money making scams. The decision maker has a right to know what the cure all's pros and cons are; it is after all he or she that will ultimately foot the bill for their implementation.

Under this component, guiding questions should include an investigation on whether the governance system is infected with fads. Said differently, are the governors relying too much on quick fixes to address problems and create opportunities. This will give an indication where there are opportunities for improvement. Table 2 below summarises the entire PULSE^3 framework.

Table 2: Components of the PULSE^3 framework.

Organising questions
• Who are the actors, what makes them act and what are the consequences? • What causes changes in the natural environment and what are the impacts on human society?
Paradigm
• What are the dominant theoretical paradigms that underpin research and practice around the issue being investigated? • How are problems and recommendations within research and around the issue framed (for instance in terms of positivism or interpretivism)?
Agential Power

Ideological power.
• How does the actor perceive reality and act on this perception?
• How does the actor justify its choices around a policy issue?
• What is the institutional context?
• How committed are individuals to creating opportunities and solutions?
• How do actors converse or tell stories about the issue?
• What is the nature of the discourse?
• What is the nature of the social-historical context surrounding the issue?
Economic power
• What capabilities do the actor(s) possess to mobilise financial resources?
• Does the actor have the financial means to mobilise the resource?
• What facilitate or impede such mobilisation?
Political power
• To what extent is the state apparatus embedded in society to address the issue at hand?
  • Does a private-public-partnership exist?
  • Are there appeals to corporate social responsibility initiatives to assist and have these actually materialised?
• Are non-state actors and the state present or absent to address the issue?
  • What is the nature of their presence?
Knowledge power
• Individuals
  • What are the roles and responsibilities of the individual?
  • Does the individual have a formal education and at what level?
  • To what extent does he or she interact with other members of the community and external parties to fulfil his or her roles and responsibilities?
  • What is the nature of the person's emotional intelligence (e.g. can he or she empathise or not)?
  • Apart from formal knowledge, what other knowledge does the person poses?
• Institutions
  • What is the role of the institution in the policy issue?
  • Do the members of the institution have the necessary skills to perform their different roles in attaining the organisation's goals?
  • Does a skills audit exist?
  • Are approved job descriptions in hand?

- In the case of a government entity, has the organisational organogram been approved by executive management?

Interaction/relationships

- What interest do actors have in the issue?
- What is the issue's degree of complexity and how do actors react to this?
- What change control and change enabling techniques are prevalent in the relationship between the actors?
- What change control and change enabling techniques do actors use to enable and react to change in their environment?

Governability

Diversity, dynamics, complexity, scale and ways of governance

- What norms, values and principles guide the governance of the system?
- How do these norms, values and principles find expression in the governance system and the interaction between actors and actors and the biophysical environment?
- What is the nature and extent of the problem?
- What opportunities exist to capitalise on and tackle the problem?
- Is complexity reduced responsibly and effectively?
- Are dynamics regular or irregular? Be careful to ascribe irregularity with disruption and regularity with change for the better.
- Define the scale in terms of geography, time and institutional arrangements.

Images, instruments and action

- What are the fundamental norms linked to the policy?
- Which individuals and organisations are involved in the policy issue?
- What are their underlying normative stance particularly towards the issue and the general policy environment?
- What are their identities and interests, informed by their normative stances, towards the policy issue?
- How do norms influence interactions?
- What is the nature and extent of bio-physical change?
- What developments in society and the biophysical environment can bring about new norms?

Orders of governance

- What is the order of governance arrangements: self, co-, or hierarchical?
- Are these stand alone or mixed arrangements and what is the inherent dynamism?

Progression

- How do different role players perceive the policy issue; simple, complicated, complex, chaotic or disordered?
- What are we missing within scientific domains and especially in the way we construct knowledge (epistemology)?
- What is the state of the art around epistemological and/or theoretical developments around the issue and politics and governance, in general?
- Which theories or paradigms can be converged for infusing policy debates through analytic eclecticism?
- Is the governance system invested with fads?
- Is this assessment framework becoming a fad?
    - Is it going around unquestioned?

5. Discussion and conclusion

PULSE^3's foundation lies in the argument that the South African water epistemic community is operating within a predominantly positivist paradigm. This does not mean that positivist theories or models should be discarded. Anything but, for the knowledge that had been generated from such a line of thinking has taught use a lot about water resources management and the institutions and individuals responsible for and affected by it. The nature of theorising is either implicit or explicit with researchers adhering to a set of theories within this paradigm: adaptive management, complexity, resilience, organisational theory, rational choice theory and game theory among others. That said, it is time to move on, and instead of only developing an opposite view within the same paradigm, develop an alternative to research and ultimately infuse the policy environment with converging elements for better decision making. Because positivism is such a dominant paradigm, PULSE^3 starts off by asking what compels actors to act and what are the consequences of their actions? To bridge the divide between the societal and environmental, it also asks what causes changes in the environment and what are the impacts on humans?

The first question is a deliberate attempt to move away from a positivist agenda. Said differently, it is to highlight the existence of another side of the paradigmatic coin and to indicate that research is possible from this alternative paradigm. One should also note that policy debates can be infused with an interpretivist paradigm. It is therefore possible to step outside positivism and conduct research and give advice to decision makers from an alternative presentation of reality.

Because of PULSE^3's paradigmatic foundation, the framework operates at the meta-theoretical level. It also advances its arguments from this level. Its purpose is not to determine the strengths and weaknesses of particular theories or to undermine certain theories; it is a break with the traditional way of conducting research and to kick off a paradigm shift within the water research discourse. It is for these reasons that researchers using PULSE^3 must consider the paradigmatic agenda of past research of issues and phenomena within the discourse. This could indicate new windows of opportunity in terms of research design, alternative ways of acquiring knowledge (epistemology), the general properties of knowledge (ontology) and addressing of water resources management with a new infusion of argumentation in the policy debate.

The ultimate aim of PULSE^3 is to prevent it from becoming another panacea, miracle cure or fad. For PULSE^3 to not become a fad, it is necessary to question assumptions, other researchers, so-called gurus, their disciples as well as one's own views and research paradigms and theories. The latter consideration n is the moist important because our views and paradigms are influenced not only by our experiences but also by other, the gurus included. By questioning ourselves as scientitists, we are also by implication questioning others and their views. This will hopefully bring out creative expressions on how to take the framework forward on an evolutionary trajectory. The framework's intention is to assist researchers and practitioners to grapple with real world issues and phenomena.

The examples from the Greater Sekhukhune District Municipality indicate that elements of governability can be found at the individual as well as the organisational levels. The case of the low volume of inflow at the Hlogotlou/Monsterlus plant indicates how complex the issue can be at an individual plant level. The Motetema plant shows how enmeshed modes of governance can be. The meeting between the CSIR and the municipality notes how visions, instruments and actions interact not only in a complementary fashion but also at a dialectic level. The images, instruments and actions of the officials and the scientists are different, although they are geared towards the solution of the same problem. The exchange during the meeting furthermore points to a situation that natural science does not always and at all times have the best possible answers for a technical problem. The human dimension, responsible for the framing of images, trumped, to a certain extent, the natural science or positivist answer to the problem. How Jacobus and Thabang perceive their environment and how they react on these perceptions, should also be understood within the framing of possible solutions.

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